

EN Series Free Vent Flame Arrestor

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Figure 1. Typical Enardo Free Vent Flame Arrestor

 **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 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 must install or service the flame arrestor.

Introduction

Scope of the Manual

This Instruction Manual provides instructions for installation, startup, maintenance and parts ordering information for the Enardo Free Vent Flame Arrestor (FVFA).

Product Description

Enardo Free Vent Flame Arrestors are designed to allow free venting in combination with flame protection for vertical vent applications. This product is installed at the top of an atmospheric vent line or storage tank.

Free Vent Flame Arrestors are typically used for the 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.

North America Only

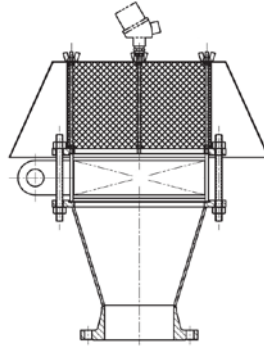


Figure 3. Free Vent Flame Arrestor

Principle of Operation

The Free Vent Flame Arrestors prevent flame propagation by absorbing and dissipating heat using spiral wound crimped ribbon flame cells. These cells allow maximum flow with maximum protection. The Free Vent Flame Arrestor is used to stop the propagation of confined and unconfined low pressure deflagrations. It prevents an ignited atmospheric vapor cloud from propagating beyond the flame arrestor into the vent line or tank.

Free Vent Flame Arrestors allow free venting and flame protection for vertical vent applications. Designed with flanged connections, this arrestor allows removal of the flame cell element without their removal of the venting assembly.

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 International Electrotechnical Commission (IEC) groups gases and vapors into Groups IIA through IIC categories depending on a number of factors including the Maximum Experimental Safe Gap (MESG) of the gas.

Maximum Initial Operating Pressure

The Free Vent Flame Arrestor is intended to operate at atmospheric pressure when at or near static flow conditions.

Burn Time Rating

CAUTION

Temperature sensors must be used with this product. The response time of the sensor must be at least as fast as that of a Type K thermocouple in a stainless steel sheath. The tip of the sensor should be installed such that it is within 5 inches / 125 mm of the face of the element assembly. Never disconnect or remove these devices.

All Enardo EN FVFA Series flame arrestors are rated for short time burning with a temperature sensor in place. If no temperature sensor is installed, this product is not suitable for short time burning.

Installation

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.

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.

Free Vent Flame Arrestor

WARNING			
Flame Arrestors have installation and application limits Type designation in accordance with EN ISO-16852:2010			
DEF	$L_v/D = n/a$	BC: b; $t_{BT} = 1 \text{ min}$	
	Ex. G IIA	$T_o = 60^\circ\text{C}$	$P_o = 0.10 \text{ MPa (absolute)}$

MARKING PLATE (SEE TABLE 2)



Figure 4. Product Identification and Marking

Table 2. Marking Plate Information (See Figure 4)

INFORMATION	DESCRIPTION
DEF	Indicates product is a Deflagration Flame Arrestor
$L_v/D = n/a$	The ratio of pipe length (between the potential ignition source and the flame arrestor) and pipe diameter. Indicates end-of-line configuration. Prevents unconfined deflagration from entering a tank or enclosure
BC: b	Indicates the flame arrestor is for short-time burning, not to exceed 1 minute
Ex. G IIA	Indicates the arrestor is rated for use in Explosion Group IIA vapors
T_o	Indicates maximum operational temperature of flame arrestor
P_o	Indicates maximum operational pressure of flame arrestor

Connection

Enardo flame arrestors are normally provided with CL150 raised or flat face flanges. Other flange patterns including DIN patterns are available upon request. Make sure the companion flange installed in adjacent piping matches the flange on the flame arrestor.

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.

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

CAUTION

The flame arrestor is fitted with lugs for lifting the element assembly during servicing operations. These lugs are not intended for lifting the entire unit during installation. Damage to the flame arrestor may result from improper lifting. Heavy units should be lifted using appropriately rated Nylon (PA) straps rigged on the outside of the tension studs.

The Free Vent Flame Arrestors should be positioned in a vertical orientation. Models that have pressure taps are designed to allow the installation of a pressure gauge determine blockage. The pressure gauge will normally be mounted vertically.

Piping Expansions and Reductions Adjacent to Flame Arrestors

An Enardo Free Vent 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.

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. Special care should be taken not to damage or dent the cell openings as this would hamper the effectiveness of the unit.
3. Arrestor elements shall not be cleaned by rodding to remove blockages, as this practice could damage the elements and seriously impair the arrestor's performance. If the arrestor element cannot be cleaned satisfactorily, it must be replaced.
4. If the flame arrestor sustained a burning event, thoroughly inspect the element for any sign of damage. Replace the element assembly if distorted crimps are visible, particularly near the outer periphery of the flame element. Replace gaskets if any damage is noted.
5. For best cleaning results, a high pressure sprayer with spray wand should be used (1500 to 3000 psig / 103 to 207 bar) to clean the entire element surface. The spray nozzle should be held perpendicular to the surface being cleaned to maximize spray media penetration into the element. Alternately spray each side of the element surface until clean.
6. 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.

Note

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

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

Element Disassembly

WARNING

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

1. Remove the top wing nuts.
2. Remove the hood and screen. It is not necessary to remove the hex nuts located directly under the hood. These nuts are used for positioning the hood.

CAUTION

The screen might have sharp edges. Use care when handling.

3. Remove the upper nuts from the tensioning studs.
4. Remove the upper flange.
5. Remove the element assembly.

CAUTION

Some element assemblies are heavy and will require the use of adequate equipment and manpower to prevent injury.

Element Re-assembly

1. Thoroughly clean the gasket sealing faces being careful not to damage the sealing surface. Lightly grease one side of a new gasket and place it in the machined recess of the interior flange on the conical sections and in the upper flange.
2. Replace the flame element assembly with a new assembly or properly cleaned and inspected existing unit.
3. Re-assemble in the reverse order of disassembly.
4. Tighten the tensioning studs as detailed below:

Free Vent Flame Arrestor

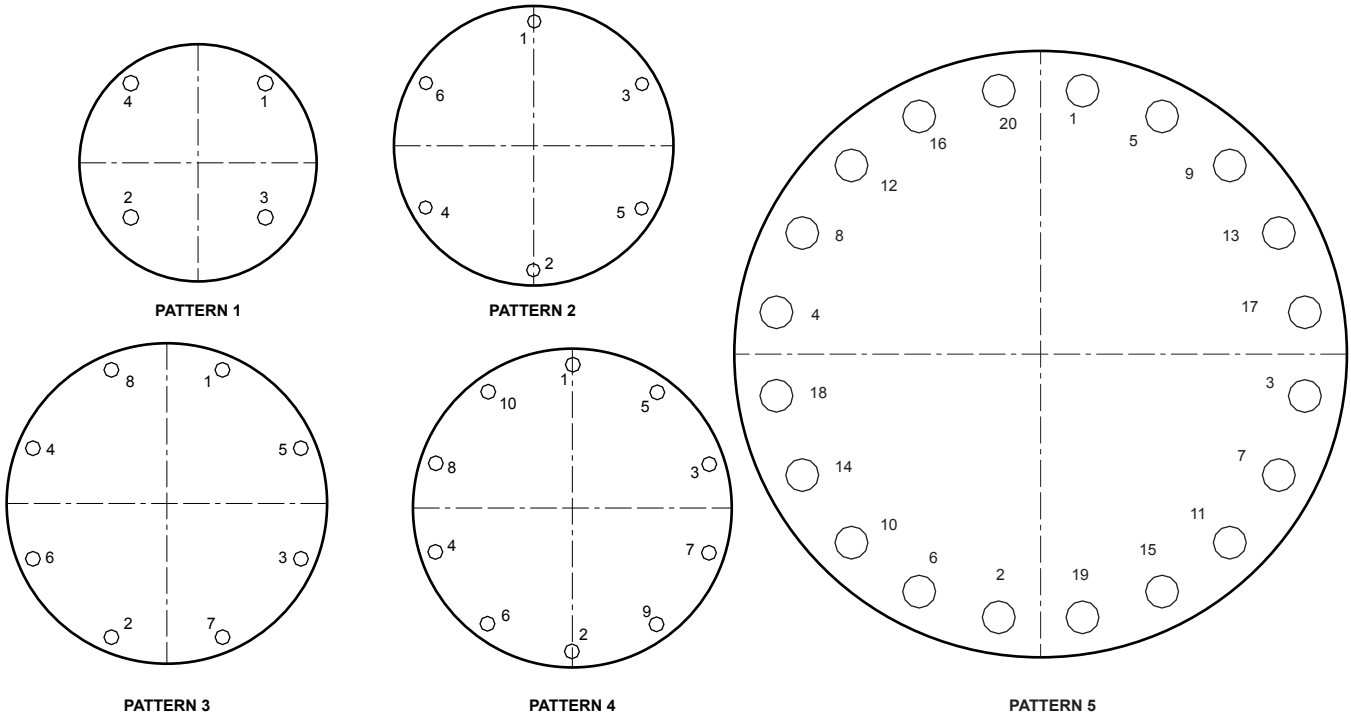


Figure 5. Flange Pattern Tightening Sequence

Table 3. Tightening Steps and Torque Values⁽¹⁾

EN FVFA SERIES FLAME ARRESTORS WITH STEEL OR STAINLESS STEEL END SECTIONS ONLY		TIGHTENING STEPS AND TORQUE (ft-lb / N·m)				
Model	Pattern ⁽²⁾	Step 1	Step 2	Step 3	Step 4	Step 5
EN-FVFA-0401 EN-FVFA-0401.5 EN-FVFA-0402 EN-FVFA-0603 EN-FVFA-0802 EN-FVFA-0803 EN-FVFA-0804	1	Snug	20 / 27	50 / 68	----	----
EN-FVFA-1206	2	Snug	20 / 27	50 / 68	----	----
EN-FVFA-1608	3	Snug	25 / 34	50 / 68	80 / 108	----
EN-FVFA-2010	3	Snug	25 / 34	50 / 68	75 / 102	100 / 135
EN-FVFA-2412	4	Snug	35 / 47	70 / 95	100 / 135	130 / 176
EN-FVFA-3014 and EN-FVFA-3016	5	Snug	35 / 47	70 / 95	100 / 135	130 / 176

1. Using machine oil as lubricant. See Bolt Lubrication section below and torque correction factors for other lubricants in Table 4.
2. See Figure 5.

Table 4. Torque Correction Factors for Common Lubricants

DESCRIPTION	COEFFICIENT OF FRICTION	MULTIPLY TORQUE VALUE IN TABLE 3 BY
Machine Oil	f = 0.15	1.00
API SA2 Grease	f = 0.12	0.80
Never-Seez [®] (Ni base)	f = 0.11	0.73
Never-Seez [®] (Cu base)	f = 0.10	0.67
Molykote [®] G-n Paste	f = 0.06	0.40

Never-Seez[®] is a mark owned by Bostik, Inc.
Molykote[®] G-n is a mark owned by Dow Corning Corporation.

CAUTION

Excessive or uneven torquing can cause permanent damage to gaskets and housing.

Tools/Supplies Required:

- Torque wrench appropriate for the specified torque.
- Socket wrenches of the proper size to fit the hex nuts being tightened.
- Molydisulfide based lubricating paste. Molykote® G-n or equivalent.
- Brush suitable for applying lubricant to the studs.
- Wiping rags necessary for the clean-up of excessive lubricant.

Procedure:

1. Use studs and nuts that are free of visible contamination and corrosion.
2. Apply lubricant to the threads of the stud protruding outboard of the interior flanges and to the face of the hex nuts which will contact the flange.
3. Assemble the nuts to the studs such that the amount of thread extending outboard beyond the nut is approximately equal on both ends.
4. Tighten the nuts to the values shown in Table 3 following the designated sequence, repeating the sequence as shown. Flange pattern tightening sequences are shown in Figure 5.

Bolt Lubrication

Enardo provides low friction polymer coatings on carbon steel fasteners. No additional lubrication should be required. When stainless steel fasteners are provided, lubrication is recommended to reduce tightening torque and to prevent potential galling.

Lubrication will affect required torque of clean fasteners in good condition more than any other factor. In fact, 90% of applied torque goes to overcome friction while only 10% actually stretches the bolt. Table 3 assumes that only machine oil is used as a lubricant. Table 4 lists several common lubricants and their effect on torque required to stretch bolts to 50% of their yield strength. Most are available from local bearing distributors.

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 be stored as a spare for the next maintenance interval.

Note

Element gaskets should be replaced each time the cell assembly is loosened and removed to insure 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.

When ordering replacement parts, specify the complete 7-character part number of each required part as found in the following parts list.

Free Vent Flame Arrestor

Parts List

Table 5. Replacement Element Assembly Gaskets⁽¹⁾

MODEL	PART NUMBER	
	Standard Gasket (Compressed Fiber)	High Temperature Gasket (Graphite Coated 316 Stainless steel)
EN-FVFA-0401, EN-FVFA-0401.5 and EN-FVFA-0402	7008153	7049253
EN-FVFA-0603	7008134	7049234
EN-FVFA-0802, EN-FVFA-0803 and EN-FVFA-0804	7008123	7049223
EN-FVFA-1206	7008136	7049236
EN-FVFA-1608	7008107	7049207
EN-FVFA-2010	7008109	7049209
EN-FVFA-2412	7008111	7049211

1. Two required per assembly

Table 6. Replacement Element Assembly Part Numbers (Group IIA Models)

Housing	PART NUMBER			
	Carbon Steel	304 Stainless Steel	Carbon Steel	316 Stainless Steel
Flame Cells	304 Stainless Steel	304 Stainless Steel	316 Stainless Steel	316 Stainless Steel
Models EN-FVFA-0401, EN-FVFA-0401.5 and EN-FVFA-0402	7134101	7134301	7134201	7134401
Model EN-FVFA-0603	7134102	7134302	7134202	7134402
Models EN-FVFA-0802, EN-FVFA-0803 and EN-FVFA-0804	7134103	7134303	7134203	7134403
Model EN-FVFA-1206	7134105	7134305	7134205	7134405
Model EN-FVFA-1608	7131107	7133707	7133607	7133807
Model EN-FVFA-2010	7131109	7133709	7133609	7133809
Model EN-FVFA-2412	7131111	7133711	7133611	7133811

Table 7. Replacement Element Assembly Part Numbers (Group IIB3 Models)

Housing	PART NUMBER			
	Carbon Steel	304L Stainless Steel	Carbon Steel	316L Stainless Steel
Flame Cells	304 Stainless Steel	304 Stainless Steel	316 Stainless Steel	316 Stainless Steel
Models EN-FVFA-0401, EN-FVFA-0401.5 and EN-FVFA-0402	7131101	7133701	7133601	7133801
Model EN-FVFA-0603	7128802	7131502	7130902	7131602
Models EN-FVFA-0802, EN-FVFA-0803 and EN-FVFA-0804	7128803	7131503	7130903	7131603
Model EN-FVFA-1206	7128805	7131505	7130905	7131605
Model EN-FVFA-1608	7128807	7131507	7130907	7131607
Model EN-FVFA-2010	7128809	7131509	7130909	7131609
Model EN-FVFA-2412	7128811	7131511	7130911	7131611

**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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