EN Free Vent Flame Arrestor Series (EN ISO 16852 Certified)

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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™ 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.

Figure 1. *Typical EN Free Vent Flame Arrestor*

Introduction

Scope of the Manual

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

Flame Arrestor Classification

The flame arrestors within the scope of this document have been tested and certified in accordance with EN ISO 16852:2016 as end-of-line deflagration flame arrestors and are therefore suitable for unconfined deflagrations into an enclosure or vessel.

North America Only

Specifications

The Specifications section lists the specifications for the EN Free Vent Flame Arrestors. The following information is stamped on the nameplate attached to the arrestor: model number, flange size and rating, maximum initial operating pressure, EN number (European Standard), EU type examination certificate, notified body number, gas group, date of manufacture and serial number; other identification and customer tag number are optional.

Available Constructions

See Table 1 and Figure 2

Gas Group

IIA and IIB3

Flange Sizes and Rating

2 to 16 in. / 50 to 400 mm
CL150 RF and CL150 FF **(standard)**
Other connection flange sizes and ratings available upon request.

Housing Size

4 to 30 in. / 100 to 750 mm

Maximum Experimental Safe Gap (MESG)

See Table 2

Maximum Initial Operating Pressure[1]

Atmospheric

Maximum Operational Temperature (T_o)[1]

140°F / 60°C

Temperature Rating of Housing Gaskets[1]

Fiber Gaskets (standard): 450°F / 232°C
Graphite/Metal (optional): 850°F / 450°C

Burning Time Rating

For ≤ 12 in. sizes: 1 minute
For 16 in. size: 8 minutes

Housing Material

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

Element Material

304 Stainless steel, 316 Stainless steel and Hastelloy®

Standards Compliance

EN ISO 16852:2016

1. The pressure/temperature limits in this Instruction Manual and any applicable standard or code limitation should not be exceeded.

Table 1. *EN FVFA Series Available Construction*

MODEL	FLANGE SIZE		HOUSING SIZE		CERTIFICATION	
	In.	mm	In.	mm	IIA	IIB3
EN-FVFA-0402	2	50	4	100	X	X
EN-FVFA-0603	3	75	6	150	X	X
EN-FVFA-0803	3	75	8	200	X	X
EN-FVFA-0804	4	100	8	200	X	X
EN-FVFA-1206	6	150	12	300	X	X
EN-FVFA-1608	8	200	16	400	X	X
EN-FVFA-2010	10	250	20	500	X	X
EN-FVFA-2412	12	300	24	600	X	X
EN-FVFA-3014	14	350	30	750	X	
EN-FVFA-3016	16	400	30	750	X	

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

NATIONAL ELECTRIC CODE (NEC)	INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)	MESG		TEST GAS LIST
		In.	mm	
Group D	Group IIA	0.035	>0.90	Propane
Group C	Group IIB3	0.026	≥0.65	Ethylene
Group B	Group IIC	0.020	<0.50	Hydrogen

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EN					/		-				-						FVFA
	Housing Size	**Connection Size**	**IEC Gas Group**	**Housing Material**		**Element Material**		**Connection Type**		**Options**							
	04 = 4 in. through 30 = 30 in.	01 = 1 in. through 16 = 16 in.	IIA IIB3	C = Carbon Steel 4 = 304 SST 6 = 316 SST H = Hastelloy®		4 = 304 SST 6 = 316 SST H = Hastelloy®		F = Flat face flange R = Raised face flange		2 - Temperature Instrumentation Port 3 - Pressure Instrumentation Port 4 = Miscellaneous 5 = Protective coating 6 = Special feature							

Figure 2. *EN Free Vent Flame Arrestor Available Constructions and Model Numbering System*

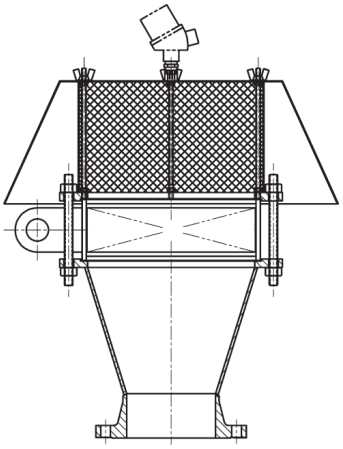

Figure 3. *Free Vent Flame Arrestor*

Table 3. *Warning Label Information (See Figure 4)*

INFORMATION	DESCRIPTION
DEF	Indicates product is a Deflagration Flame Arrestor
L_u/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
Ex. G IIB3	Indicates the arrestor is rated for use with Explosion Group IIB3 vapors
T_o	Indicates maximum operational temperature of flame arrestor
Note: Models EN-FVFA-3014 and EN-FVFA-3016 available for Explosion Group IIA vapors only.	

WARNING			
Flame Arrestors have installation and application limits Type designation in accordance with EN ISO 16852:2016			
DEF	L_u/D = N/A	BC: b; t_{BT} = 1 min	
	Ex. G IIA	T_o = 60°C	

NOTE: Warning label for 2 to 12 in. IIA

WARNING			
Flame Arrestors have installation and application limits Type designation in accordance with EN ISO 16852:2016			
DEF	L_u/D = N/A	BC: b; t_{BT} = 8 min	
	Ex. G IIA	T_o = 60°C	

NOTE: Warning label for 14 and 16 in. IIA

G IIA

HAZARDOUS LOCATION

WARNING			
Flame Arrestors have installation and application limits Type designation in accordance with EN ISO 16852:2016			
DEF	L_u/D = N/A	BC: b; t_{BT} = 1 min	
	Ex. G IIB3	T_o = 60°C	

NOTE: Warning label for 2 to 12 in. IIB3

G IIB3

HAZARDOUS LOCATION

WARNING LABEL (SEE TABLE 3)

Figure 4. *Product Identification and Marking*

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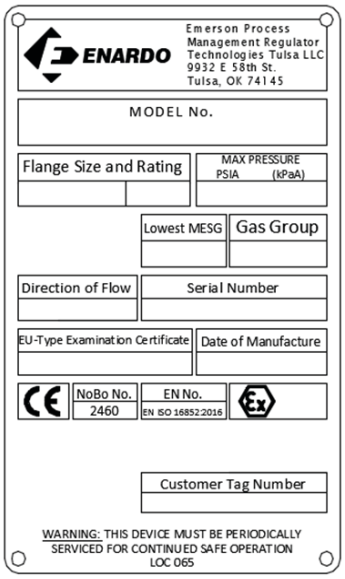


***Figure 5**. Marking Plate*

***Table 4**. Marking Plate Information*

MARKING PLATE FIELD	MARKING
Model No.	Per Order, ex. 1206/IIA-C4R-FVFA-2
Flange Size and Rating	Per Order, ex. 6 in CL150
Max Pressure (P_o)	0.1 MPa (atmospheric pressure)
Lowest MESG	Appropriate Value from Table 2
Gas Group	IIA or IIB3, Per Order
Direction of Flow	N/A
Serial Number	Per Order
EU-Type Examination Certificate	Based on Unit Ordered
Date of Manufacture	Date of Manufacture
Customer Tag Number	based on customer request

Principle of Operation

The EN Free Vent Flame Arrestors (EN-FVFA) prevent flame propagation by absorbing and dissipating heat using spiral wound crimped ribbon flame cells. These cells allow maximum flow with maximum protection. The EN 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.

EN 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.

Additional Protection Measures

Flame arrestors may be used with additional protection measures. The overall safety of the combined installation shall be assessed, taking account of any hazardous area classification (zones) and the likelihood of additional ignition sources.

Limits of Use for EN Free Vent Flame Arrestors (FVFA)

The following vapors are not within the scope of the products covered by this manual:

- Explosive mixtures of vapors and gases, which tend to self-decompose (e.g. Acetylene) or which are chemically unstable
- Carbon Disulphide, due to its special properties
- Mixtures other than gas-air or vapor-air mixtures (e.g. higher oxygen-nitrogen ratio, chlorine as oxidant, etc…)

- Minimum distance between flame arrestor connection and a restriction on the protected side is 10 L/D, but not less than 3 m.
- Arrestors shall only be installed into piping with a nominal size that is smaller than or equal to the nominal size of the flame arrestor connection.

The operational temperature, T_0, shall be limited as follows:

$$-4°F \leq T_0 \leq 140°F \; / \; -20°C \leq T_0 \leq 60°C$$

The operation pressure, p_0, shall be limited to 0.1 MPa (absolute)

Flame arrestor use shall be limited to gas-air mixtures with an MESG equal to or greater than that tested.

Factors Affecting Flame Arrestor Performance

Methanol Warning

WARNING

Methanol is classified as a Group D (IIA) vapor, however; our lab tests indicate that it exhibits characteristics unlike other Group D (IIA) vapors under certain conditions. We therefore recommend that an arrestor rated for Group C (IIB3) vapors be specified for methanol service.

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 Experimental Safe Gap (MESG)

The MESG is 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 stoichiometric 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, p_0

Unlike inline deflagration or inline detonation arrestors, the Enardo Model EN-FVFA end of line deflagration flame arrestors do not have a maximum initial operating pressure, p_0. End of line deflagration flame arrestors are tested at atmospheric pressure, so the maximum operational pressure is not applicable.

Burn Time Rating

CAUTION

Temperature sensors must be used with this product if there is a potential for stabilized burning inside the arrestor. Additional external safety equipment is required to ensure appropriate corrective measures are taken within 0.5 x t_{BT} to protect the system if an abnormal temperature is detected. Never disconnect or remove these devices in active process systems.

All Model EN-FVFA end of line deflagration flame arrestors are rated for short time burning, t_{BT} not to exceed one minute in accordance with EN ISO 16852:2016 except for units which use a 30 in. diameter IIA flame cell (14 in. and 16 in. connection standard). The units that use the 30 in. diameter IIA flame cell are rated for short time burning, t_{BT} not to exceed eight minutes. These burn times were determined at atmospheric pressure. If there are operating conditions which can lead to a stabilized burning event, additional safety measures are required. The devices shall be equipped with temperature sensors in the hood such that the atmospheric side of the flame cell can be monitored. These temperature sensors are installed into the system in such a way that they trigger the initiation of measures for the elimination of the stabilized burning (for example, emergency functions like switching-off the system, inerting or similar). These measures must occur within half of the time for which the flame arrestor is short-time burn proof (0.5 x t_{BT}). See Figure 4 for warning label showing burn rating, t_{BT}. This requires that measures must be able to be taken within 30 seconds or 4 minutes depending on product construction.

Threaded instrumentation ports, with standard 1/2 NPT threads, are integrated into each hood. Other instrumentation port thread sizes can be requested.

If the user requests the addition of temperature sensors by Emerson, they will either be installed and shipped threaded into the appropriate instrumentation

***Table 5**. Temperature Sensor Safety Specifications*

TECHNICAL DATA	THERMOCOUPLE	
Design type	**Standard** with thermowell	**Standard** without thermowell
Model	185 03J1	Code 0185 thermocouple (IEC 584 Class 1) without thermowell
Manufacturer	Emerson Rosemount	Emerson Rosemount
EC-type approval certificate	FM12ATEX0065X ATEX: EN 60079-0:2012+A11:2013; EN 60079-1: 2014	FM12ATEX0065X ATEX: EN 60079-0:2012+A11:2013; EN 60079-1: 2014
Temperature sensor design	Type-K thermocouple	Type-K thermocouple
Type of ignition protection	II 2 G Ex d IIC T6...T1 Gb, T6(–50°C ≤ Ta ≤ + 40°C), T5...T1 (–50 °C ≤ Ta ≤ + 60°C)	II 2 G Ex d IIC T6...T1 Gb, T6(–50°C ≤ Ta ≤ + 40°C), T5...T1 (–50°C ≤ Ta ≤ + 60°C)
Protection type (connection head)	Rosemount Aluminum Explosion proof, 2-wire, 3-wire, 4-wire type A, 4-Wire type as specified by customer. Intrinsically safe option is available.	Rosemount Aluminum Explosion proof, 2-wire, 3-wire, 4-wire type A, 4-Wire type as specified by customer. Intrinsically safe option is available.
Measuring probe (measuring insert)	1/2 MPT or optional M24 x1.5. Intended for installation into thermowell.	Probe length varies by flame arrestor size. Adjustable insertion length.
Connection thread	1/2 MPT. Intended for installation into thermowell.	1/2 MPT. Intended for installation without thermowell.
Transmitter	Optional by customer request.	Optional by customer request.
Intended application	In-line flame arrestors and detonation arrestors	End-of-line flame arrestors. Free-vent style.

TECHNICAL DATA	THERMOCOUPLE	
Design type	**Standard** with thermowell	**Standard** without thermowell
Model	TC 10-2 (for additional Thermowell)	TC10-H (threaded for direct insertion without thermowell)
Manufacturer	WIKA	WIKA
EC-type approval certificate	ATEX and IECEx certifications	ATEX and IECEx certifications
Temperature sensor design	Type-K thermocouple	Type-K thermocouple
Type of ignition protection	II 2 G Ex d IIC T6...T1 Gb, T6(–50°C ≤ Ta ≤ + 40°C), T5...T1 (–50°C ≤ Ta ≤ + 60°C)	II 2 G Ex d IIC T6...T1 Gb, T6(–50°C ≤ Ta ≤ + 40°C), T5...T1 (–50°C ≤ Ta ≤ + 60°C)
Protection type (connection head)	Explosion proof, 2-wire, 3-wire, 4-wire type A, 4-Wire type as specified by customer. Intrinsically safe option is available.	Explosion proof, 2-wire, 3-wire, 4-wire type A, 4-Wire type as specified by customer. Intrinsically safe option is available.
Measuring probe (measuring insert)	Spring loaded plate. Probe allows use of transmitter. Length varies by flame arrestor size.	Probe length varies by flame arrestor size. Adjustable insertion length.
Connection thread	1/2 MPT or optional M24 x1.5. Intended for installation into thermowell.	1/2 MPT. Intended for installation without thermowell.
Transmitter	Optional by customer request.	Optional by customer request.
Intended application	In-line flame arrestors and detonation arrestors.	End-of-line flame arrestors. Free-vent style.

port in the flame arrestor hood or shipped separately with the flame arrestor. To install the temperature sensors that have been shipped separately, simply remove any protective packaging from the temperature sensors and thread the temperature sensors into the appropriate threaded instrumentation ports in the flame arrestor hood making sure to follow temperature sensor manufacturer's instructions, particularly for wiring.

The temperature sensor shall be installed on the downstream or unprotected ("hot") side of the flame arrestor. For end of line deflagration flame arrestors this is the atmospheric side of the flame arrestor and the only location available. If the temperature sensor is shipped separately, the user shall be responsible for installing the temperature sensor in the appropriate instrumentation port in the hood of the flame arrestor. If a temperature sensor is not requested with the flame arrestor then the end user shall be responsible for installation of the temperature sensor on the unprotected ("hot") side of flame arrestor. This is the side of the flame arrestor closest to the source of ignition and is the atmospheric side for end of line deflagration flame arrestors.

A temperature rise of 20 K (36°F / 20°C) above the flame arrestor maximum operating temperature or 20 K (36°F / 20°C) above the process operating temperature, whichever is lower but not to exceed 20 K (36°F / 20°C) above the flame arrestor operating temperature, is the recommended activation temperature for initiation of measures against stabilized burning.

Note that a rise in temperature measured by the temperature sensor can indicate to the user deflagration and/or detonation events have occurred as well. This should be used as a trigger to investigate what conditions have lead to ignition of flammable vapors, to inspect the flame arrestor for damage, and to initiate appropriate corrective actions relative to process system and safety.

Temperature sensors installed by the user shall follow the specifications in Table 5. Different temperature sensors may be installed by the end user; however these must comply with the safety specifications in Table 5. The use of alternate temperature sensors must include evidence of equivalent response rates to the specified sensors in Table 5, particularly as the EN-FVFA Series end of line deflagration flame arrestor is rated for short time burning.

If t_{BT} is exceeded during a short-time burning situation, the flame arrestor safety cannot be assured.

If an elevated temperature has been detected by the temperature sensor, whether due to flash back or stabilized burn, the temperature sensor shall be inspected for damage and replaced as necessary. If the recorded temperature exceeds the design temperature of the temperature sensor then the measuring probe shall be replaced.

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.

Protected Side Pipe Warning

WARNING

For maximum safety, avoid bends and flow obstructions within 10 pipe diameters but not less than 3 meters on the protected (cold) side of the 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. For proper bolt torquing of the flame arrestor flange to the piping, please refer to Tables 6 and 8.

Refer to Table 6 for proper bolt torquing of the arrestor connecting flange to the process piping.

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.

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.

Table 6a. *Torque Values for Raised Face Connection Flange (Steel Only)*

NOMINAL PIPE DIAMETER	NUMBER OF BOLTS	BOLT DIAMETER		TORQUE	
		In.	mm	Ft-lbs	N•m
1	4	0.50	12.70	9	12.20
1-1/4	4	0.50	12.70	13	17.63
1-1/2	4	0.50	12.70	18	24.40
2	4	0.63	16.00	35	47.45
2-1/2	4	0.63	16.00	41	55.59
3	4	0.63	16.00	60	81.35
3-1/2	8	0.63	16.00	34	46.10
4	8	0.63	16.00	43	58.30
6	8	0.75	19.05	80	108.5
8	8	0.75	19.05	109	147.8
10	12	0.88	22.4	101	136.9
12	12	0.88	22.4	135	183.0
14	12	1.00	25.0	168	227.8
16	16	1.00	25.0	159	215.6
Assumptions: Use of SAE grade 5 bolts or studs or stronger No lubricant Compressed mineral fiber material or similar Notes: If lubricant is used on bolts, apply torque reduction factor listed in Lubricant Table. For best results hardened steel washers should be used on all cast flange bolted connections.					

Table 6b. *Torque Values for Flat Face Connection Flange (Steel Only)*

NOMINAL PIPE DIAMETER	NUMBER OF BOLTS	BOLT DIAMETER		TORQUE	
		In.	mm	Ft-lbs	N•m
1	4	0.50	12.70	14	18.98
1-1/4	4	0.50	12.70	16	21.69
1-1/2	4	0.50	12.70	18	24.41
2	4	0.63	16.00	32	43.39
2-1/2	4	0.63	16.00	43	58.30
3	4	0.63	16.00	47	63.72
3-1/2	8	0.63	16.00	26	35.25
4	8	0.63	16.00	32	43.39
6	8	0.75	19.05	49	66.44
8	8	0.75	19.05	68	92.20
10	12	0.88	22.4	69	93.55
12	12	0.88	22.4	98	132.9
14	12	1.00	25.0	138	187.1
16	16	1.00	25.0	125	169.5
Assumptions: Use of SAE grade 5 bolts or studs or stronger No lubricant Elastomer < 70 Durometer Shore A Notes: If lubricant is used on bolts, apply torque reduction factor listed in Lubricant Table. For best results hardened steel washers should be used on all cast flange bolted connections.					

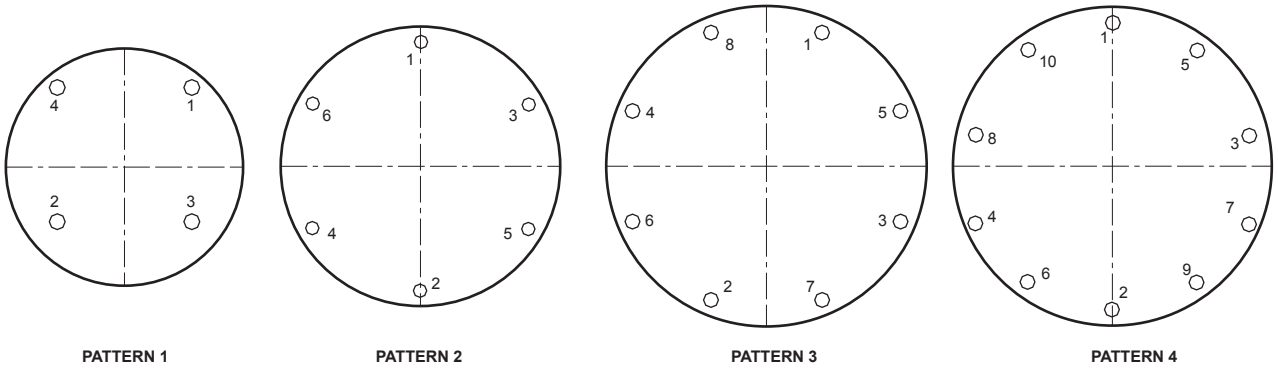
The EN Free Vent Flame Arrestor should be positioned in a vertical orientation. EN-FVFA Series units will have instrumentation ports in the hood for temperature sensor installation. Optional instrumentation ports can also be installed in the conical end sections for other measurements or uses (e.g. pressure to detect flame cell plugging).

Piping Expansions and Reductions Adjacent to Flame Arrestors

An EN 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.



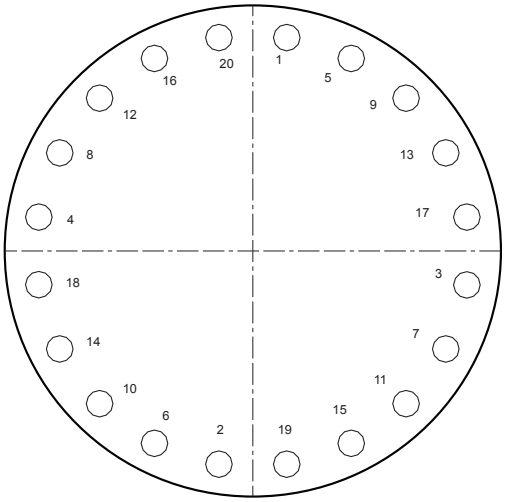


Figure 6. *Flange Pattern Tightening Sequence*

Table 7. *Element Assembly Tightening Steps and Torque Values*[1]

ENARDO™ EN FREE VENT FLAME ARRESTOR SERIES WITH STEEL OR STAINLESS STEEL END SECTIONS ONLY[2]		TIGHTENING STEPS AND TORQUE (FT•LB / N•m)				
Model	**Pattern[3]**	**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 6.
2. Alloy steel element assembly fasteners are provided with a low friction polymer coating. No additional lubrication should be required. When stainless steel fasteners are provided, lubrication is recommended to reduce tightening torque and to prevent potential galling.
3. See Figure 5.

Table 8. *Torque Correction Factors for Common Lubricants*

DESCRIPTION	COEFFICIENT OF FRICTION	MULTIPLY TORQUE VALUE IN TABLE 6 BY
Machine Oil	f = 0.15	1.00
API SA2 Grease	f = 0.12	0.80
Nickel Based Lubricant	f = 0.11	0.73
Copper Based Lubricant	f = 0.10	0.67
Heavy-Duty Lubricating Paste	f = 0.06	0.40
NOTE: Carbon steel element assembly fasteners are provided with a low friction polymer coating. No additional lubrication should be required. When stainless steel fasteners are provided, lubrication is recommended to reduce tightening torque and to prevent potential galling.		

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 with new gaskets.

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:

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.
- Lubricant for fasteners, as appropriate.
- 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 7 following the designated sequence, repeating the sequence as shown. Flange pattern tightening sequences are shown in Figure 6.

Bolt Lubrication

Enardo™ provides low friction polymer coatings on carbon steel element assembly 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 7 assumes that only factory polymer coating is used for alloy steel fasteners and machine oil is used for stainless steel fasteners as a lubricant. Table 8 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 ensure a gas tight seal.

Parts Ordering

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

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