Enardo™ EN-7 Series Flame Arrestor

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Figure 1. *Enardo EN-7 Series 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.

Fisher™ flame arrestors 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 (Emerson) instructions.

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 Enardo EN-7 Series flame arrestor.

Introduction

Scope of the Manual

This manual provides specifications, installation and maintenance instructions and parts ordering information for the Enardo EN-7 Series flame arrestor.

This document cover in-line deflagration flame arrestors for short time burning, Model EN-7-*/*-***-***.

Flame Arrestor Classification

The flame arrestors within the scope of this document have been tested and certified in accordance with EN ISO 16852:2016 and ISO/IEC 80079-49:2024 as in-line deflagration flame arrestors and are therefore suitable for confined deflagrations propagating along a pipe into connecting pipework.

Outside North America Only

Specifications

The Specifications table lists the specifications for the flame arrestors. The following information is stamped on the nameplate attached to the arrestor: model number, flange size and rating, maximum initial operating pressure, ISO reference number (International Standard), ISO type examination certificate, notified body number, gas group, date of manufacture and serial number; other identification and customer tag number are optional.

Available Construction
See Table 1 and Figure 2

Gas Group
IIA and IIB3

Flange Size and Rating
1 to 12 in. / 25 to 300 mm
CL150 FF and RF **(standard)**
Other connection flange sizes and ratings available upon request.

Housing Size
4 to 24 in. / 100 to 600 mm

Maximum Operational Temperature (T_o)[1]
140°F / 60°C

Maximum Initial Operational Pressure[1]
15.95 psia / 0.11 MPa

Temperature Rating of Gaskets[1]
Fiber Gaskets (standard): 450°F / 232°C
Graphite Gaskets (Optional): Higher temperature

Burning Time Rating
Less than 1 minute

Pipe Length
See Table 5

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

Element Material
304 Stainless steel, 316 Stainless steel and Hastelloy®

Standards
EN ISO 16852:2016 Certified
ISO/IEC 80079-49:2024

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

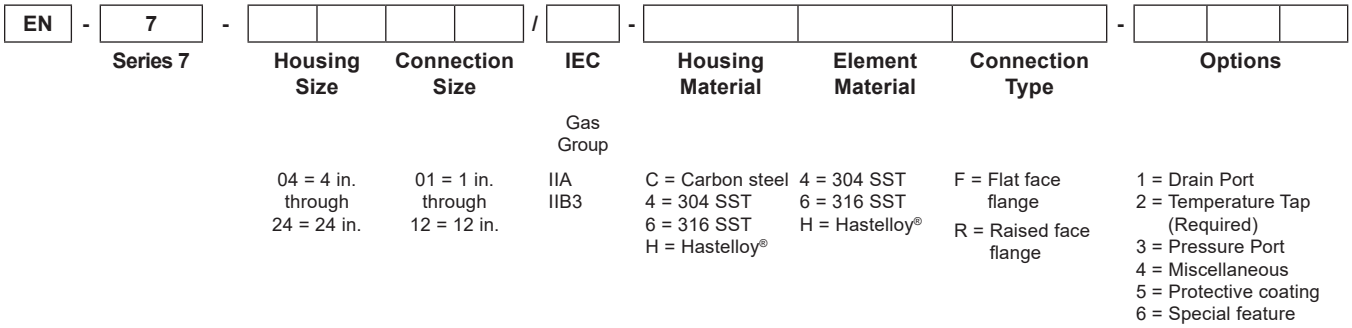


Figure 2. *Enardo™ EN-7 Series Flame Arrestor Available Constructions and Model Numbering System*

Table 1. *Enardo EN-7 Series Available Construction*

MODEL	FLANGE SIZE		HOUSING SIZE	
	In.	mm	In.	mm
Enardo EN-70402	2	50	4	100
Enardo EN-70602	2	50	6	150
Enardo EN-70603	3	75	6	150
Enardo EN-70803	3	75	8	200
Enardo EN-70804	4	100	8	200
Enardo EN-71204	4	100	12	300
Enardo EN-71206	6	150	12	300
Enardo EN-71606	6	150	16	400
Enardo EN-71608	8	200	16	400
Enardo EN-72008	8	200	20	500
Enardo EN-72010	10	250	20	500
Enardo EN-72410	10	250	24	600
Enardo EN-72412	12	300	24	600

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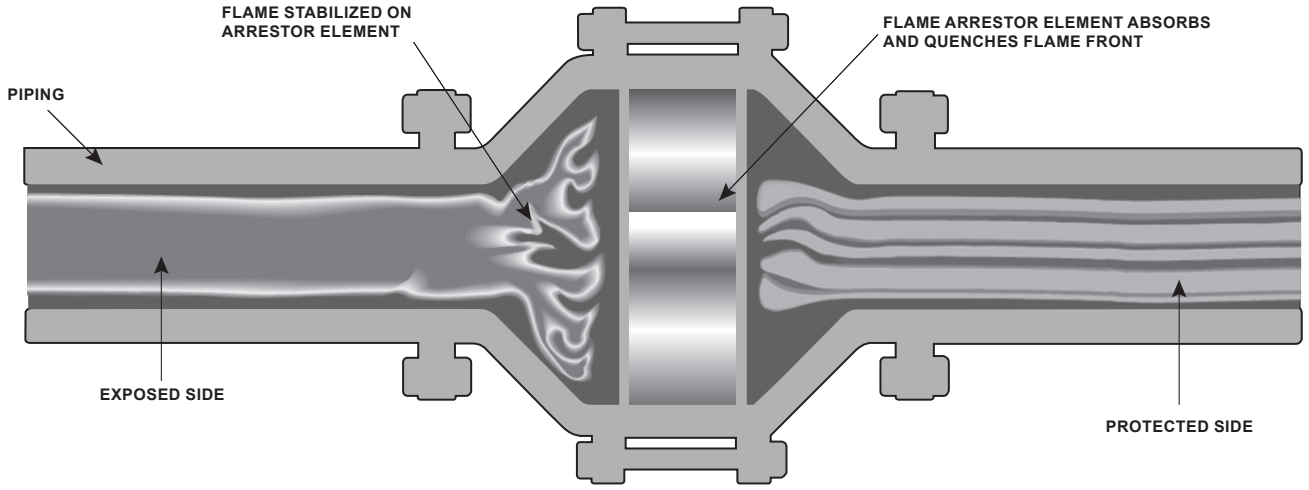


Figure 3. *Flame Arrestor Operation*

Product Description

Enardo™ EN-7 Series flame arrestors are designed to stop the propagation of confined low pressure deflagrations. The Enardo EN-7 Series is 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.

Designed with flanged connections, this arrestor allows removal of the flame cell element for easy cleaning and replacement without removing the arrestor body from the pipe connection. Standard housing construction is Carbon steel or Stainless steel. The element is available in stainless steel. Special material and protective coating are available on request.

Principle of Operation

Bi-directional in-line deflagration flame arrestors for short time burning, Model EN-7-*/*-***-*** (nominal sizes of connection: 2, 3, 4, 6, 8, 10 and 12 in. / DN 50, 75, 100, 150, 200, 250 and 300) are classified as DEF with a ratio L_u/D per Table 5. The flame arrestor is used to prevent deflagration flame transmission of flammable gas and/or vapor/air-mixtures of the explosion Group IIA or IIB3.

The bi-directional in-line deflagration flame arrestor for short time burning, Model EN-7-*/*-***-*** is designed as bi-directional with short time burning t_{BT}=1 min. The stabilized burning was not tested on the flame arrestor. Bi-directional in-line deflagration flame arrestor for short time burning, Model EN-7-*/*-***-*** also fulfills the requirement of standard EN ISO/IEC 80079-49:2024.

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.

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

Limits for Use

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

$$-20°C \le T_0 \le 60°C, -4°F \le T_0 \le 140°F$$

The operation pressure, p_0, shall be limited to 0.08 to 0.11 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

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.

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WARNING			
Flame Arrestors have installation and application limits In-line Deflagration Flame Arrester (DEF)			
DEF	L_u/D = (See Table 5)	BC: b; t_{BT} = 1 min	
	IIA	T_o = 60°C	P_o = 0.10 MPa (absolute)

WARNING LABEL (SEE TABLE 2)



HAZARDOUS LOCATIONS

Figure 4. *Product Identification and Marking*

Table 2. *Warning Label Information (See Figure 4)*

INFORMATION	DESCRIPTION
DEF	Indicates product is a Deflagration Flame Arrestor
L_u/D	The ratio of pipe length (between the potential ignition source and the flame arrestor) and pipe diameter. See Bends and/or Flow Obstruction under Factors Affecting Flame Arrestor Performance section.
BC: b	Indicates the flame arrestor is for short-time burning, not to exceed 1 minute
IIA	Indicates the arrestor is rated for use in Explosion Group IIA vapors
T_o	Indicates maximum operational temperature of flame arrestor
Maximum Operating Pressure (P_o)	Indicates maximum operational pressure of flame arrestor

Table 3. *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

Maximum Initial Operating Pressure, p_0

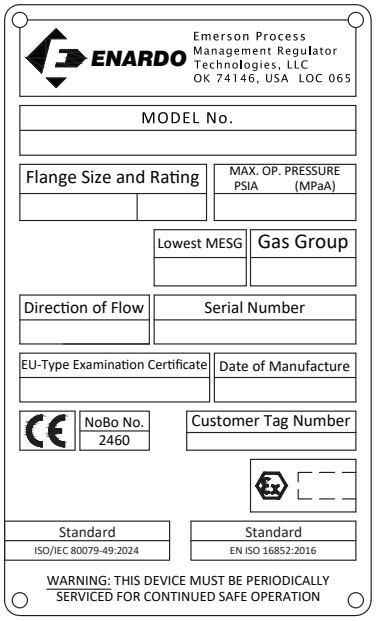
Deflagration flame arrestors tested at p_{TB} (pressure before ignition) are suitable for operational pressures $p_0 \leq p_{TB}$ in the same or smaller pipe size when the application is limited to mixtures with an MESG equal to or greater than that tested. Enardo™ EN-7 Series deflagration flame arrestors have a maximum initial operating pressure limit, p_0, of 0.11 MPa (atmospheric pressure). If p_0 is exceeded at the time of ignition, there is a risk of the flame arrestor being unable to stop the flame front and flame transmission through the flame arrestor is possible.

Burn Time Rating

⚠ WARNING

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 30 seconds to protect the system if an abnormal temperature is detected. Never disconnect or remove these devices in active process systems.

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NOTE: THIS IS AN EXAMPLE NAMEPLATE. LOCATION CAN CHANGE BASED ON THE MANUFACTURING LOCATION. ALL OTHER MARKINGS ARE THE SAME REGARDLESS OF MANUFACTURING LOCATION.

Figure 5. *Marking Plate*

Table 4. *Marking Plate Information*

MARKING PLATE FIELD	MARKING
Model Number	Per order, ex. EN-71206/IIA-C4R-2
Flange Size and Rating	Per order, ex. 3 in CL150
Max Pressure (P_O)	0.1 MPa (atmospheric pressure)
Lowest MESG	Appropriate value from Table 3
Gas Group	IIA or IIB3, per order
Direction of Flow	Bi-directional
	If product ordered with (1) temperature sensor, flow arrow will be added to unit
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

All Enardo™ EN-7 Series deflagration flame arrestors are rated for short time burning, t_{BT} not to exceed one minute in accordance with EN ISO 16852:2016. This burn time was determined at atmospheric pressure. If there are operating conditions which can lead to a stabilized burning event, additional safety measures are required. Depending on the operating conditions, the devices shall be equipped with temperature sensors on one or both sides of the flame arrestor element. 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.

Threaded instrumentation ports, with standard 3/4 NPT threads, are integrated into each end section. 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 ports in the flame arrestor end sections 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 on the flame arrestor end sections making sure to follow temperature sensor manufacturer's instructions, particularly for wiring.

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Table 5. *Pipe Length and L_U/D*

CONNECTION SIZE		GAS GROUP IIA MODELS			GAS GROUP IIB3 MODELS		
		Length-to-Diameter Ratio	Length (L)		Length-to-Diameter Ratio	Length (L)	
In.	mm	(L_U/D)	Ft	m	(L_U/D)	Ft	m
2	50	≤ 40	6.56	2.00	≤ 50	8.20	2.50
3	75	≤ 30	7.22	2.20	≤ 50	12.4	3.78
4	100	≤ 30	9.83	3.00	≤ 50	16.3	4.97
6	150	≤ 26.7	13.1	3.99	≤ 50	22.9	6.98
8	200	≤ 20	13.1	3.99	≤ 50	33.4	10.2
10	250	≤ 20	16.3	4.97	≤ 47.2	39.3	12.0
12	300	≤ 20	19.7	6.00	≤ 40	40.0	12.2

Table 6*. Torque Values for Raised Face Connection Flanges (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

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 7*. Torque Values for Flat Face Connection Flanges (Steel)*

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

Assumptions: Use of SAE grade 5 bolts or studs or stronger.
No lubricant.
Elastomer <70 Durometer Shore A.
Notes: Flat faced flanges should never be mated to a raised face flange for installation.
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 8. *Torque Correction Factors for Common Lubricants*

DESCRIPTION	COEFFICIENT OF FRICTION	MULTIPLY TORQUE VALUE IN TABLE 6 BY
Machine Oil	f = 0.15	0.75
API SA2 Grease	f = 0.12	0.60
Nickel-based Lubricant	f = 0.11	0.55
Copper-based Lubricant	f = 0.10	0.50
Heavy-Duty Lubricating Paste	f = 0.06	0.30

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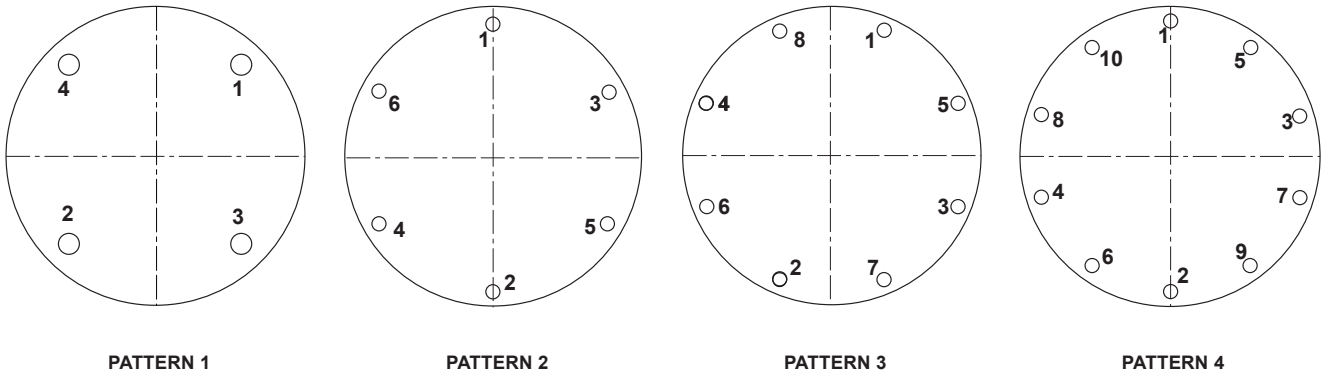


Figure 6. *Flange Pattern Tightening Sequence*

Table 9. *Tightening Steps and Torque Values*[1]

ENARDO™ EN-7 SERIES FLAME ARRESTORS WITH STEEL OR STAINLESS STEEL END SECTIONS ONLY		TIGHTENING STEPS AND TORQUE (lbf-ft / N•m)				
Model	**Pattern**[3]	**Step 1**	**Step 2**	**Step 3**	**Step 4**	**Step 5**
Enardo EN-70402, Enardo EN-70602, Enardo EN-70603, Enardo EN-70802, Enardo EN-70803 and Enardo EN-70804	1	Snug	20 / 27	50 / 68		
Enardo EN-71204 and Enardo EN-71206	2	Snug	20 / 27	50 / 68		
Enardo EN-71606 and Enardo EN-71608	3	Snug	25 / 34	50 / 68	80 / 108	
Enardo EN-72008 and Enardo EN-72010	3	Snug	25 / 34	50 / 68	75 / 102	100 / 135
Enardo EN-72410 and Enardo EN-72412	4	Snug	35 / 47	70 / 95	100 / 135	130 / 176

1. Using machine oil as lubricant. See Bolt Lubrication section on page 11 and torque correction factors for other lubricants in Table 8.
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 6.

In the case where only one temperature sensor was requested from Emerson, the flame arrestor will be marked with a flow arrow to indicate flow direction and the temperature sensor will be installed on the downstream or unprotected (“hot”) side of the flame arrestor. This is the side of the flame arrestor closest to the source of ignition. If the temperature sensor is shipped separately, the user shall be responsible for installing the temperature sensor in the appropriate instrumentation port on the downstream or unprotected (“hot”) side of the flame arrestor. Enardo EN-7 Series deflagration flame arrestors are bi-directional, so if a temperature sensor is not requested with the flame arrestor, then no flow arrow will be installed on the unit, and 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.

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 Emerson or installed by the user shall follow the specifications provided in Table 10. Different temperature sensors may be installed by the end user, however these must comply with the safety specifications in Table 10. The use of alternate temperature sensors must include evidence of equivalent response rates to the specified sensors in Table 10, particularly as the Enardo EN-7 Series deflagration flame arrestor is rated for short time burning.

The temperature sensor installed in the arrestor body must be protected by an explosion-proof enclosure or connected in an intrinsically safe circuit in accordance with the classification of the hazardous area.

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.

Outside North America Only

Table 10. *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.

Outside North America Only

Pipe Lengths

Extended lengths of pipe allow the flame to advance into more severe states of flame propagation such as high pressure deflagrations and detonations. The pipe length between the actual ignition source and the flame arrestor shall not exceed the values in Table 5.

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 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

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.

Connection

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

Standard compressed fiber gaskets that will withstand temperatures of 450°F / 232°C are standard. Graphite gaskets with higher temperature ratings are available as an option.

For proper bolt torquing of the flame arrestor flange to the piping, please refer to Tables 6, 7 and 8.

Positioning

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 flame arrestor should be positioned such that the element is accessible for removal. The tension studs are supplied with jacking nuts on one half of the bolting circumference. Install the unit so that the jacking nuts (on the inside of the studs) are positioned on the opposite side from the direction that the element assembly will be removed.

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. Units that are equipped with optional internal cleaning systems should be connected to a source of cleaning media such as water, steam or other suitable solvent.

Flow Direction

This Fisher™ flame arrestor is bi-directional and can be installed either vertically or horizontally. Consideration should be given to non-symmetrical assemblies that include features such as clean-out ports, temperature sensors or other devices that might have a preferred installation direction to suit the needs of the customer. Compliance with warning associated with temperature sensors is essential. See Burning Time Rating Section, page 4.

Piping Expansions and Reductions Adjacent to Flame Arrestors

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.

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For an in-line flame arrestor, the pipe diameter on the protected (“cold”) side shall be no less than the pipe diameter on the unprotected (“hot”) side. For an in-line flame arrestor, the pipe diameter on the unprotected (“hot) side shall be no greater than the flame arrestor connection.

When it is necessary to increase the diameter of the piping on the downstream side 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 flame arrestor’s connecting flanges.

Maintenance

1. Inspect flame cells for damage immediately following a deflagration and/or stabilized burn.
2. Carefully remove the element assembly from the arrestor and place it on a soft surface such as plywood.
3. Inspect the flame cell visually for any signs of corrosion or other damage.
4. Inspect the flame cell with a calibrated pin gauge to ensure maximum crimp size openings do not exceed the following values for their respective gas group:

   • Explosion Group IIA – 0.038 in. / 0.965 mm
   • Explosion Group IIB3 – 0.017 in. / 0.432 mm

   If any damage is noted, or crimp openings exceed maximum size allowable, replace the element assembly and gaskets.
5. Clean the entire element surface. For best cleaning results, use 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.

   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.
6. After cleaning, thoroughly inspect the element for damage. If damaged, replace the element. Replace gaskets regardless of element damage.

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.

1. Loosen all jacking (inside) nuts on tension studs between conical sections of the flame arrestor.
2. Tighten the inside jacking nuts on the tension studs forcing the two conical sections apart. When the two flange faces have separated, remove the tension studs that do not have inside jacking nuts, so that the element assembly can be removed. The inside jacking nuts are installed on all tension studs that facilitate jacking the unit apart. The inside jacking nuts are not installed on tension studs that are taken out, for ease of removal.

CAUTION

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

3. Thoroughly clean the gasket sealing faces being careful not to damage the sealing surface. For reassembly, lightly grease one side of a new gasket and place it in the machined recess of each interior flange on the two conical sections.
4. Replace the flame element assembly with a new assembly or properly cleaned and inspected existing unit.
5. Loosen the jacking nuts on the tension rods until the flame cell assembly seats onto the new gaskets.
6. Replace all tensioning studs and hand tighten the outer nuts. Check to be sure that all the jacking nuts are completely loose and not making contact with the flange face.

Outside North America Only

Torquing Instruction

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 torque values shown in Table 9 following the designated sequence, repeating the sequence as shown. Flange pattern tightening sequences are shown in Figure 6.

Bolt Lubrication

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 8 shows a list of 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. Table 8 assumes that only factory polymer coating is used for alloy steel fasteners and machine oil is used for stainless steel fasteners as a lubricant.

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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