

WHESOE

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Preface

This Installation and Maintenance Manual has been produced for Whessoe-Varec Limited in order to provide Engineering personnel with sufficient general information to enable the Installation, configuration and effective maintenance of the Figures 4301 and 4319 Flame Arresters manufactured by Whessoe-Varec Limited.

Whessoe-Varec reserves the right to make changes to the information contained in this Manual without notice.

In the interest of product development, the designs and materials used for our products are constantly under review, and we therefore reserve the right to make changes and improvements without notice.

Do not reproduce, transcribe, store in a retrieval system or translate into any human or computer language any part of this Manual without the prior permission of Whessoe-Varec Limited.

Safety information



Important

Ensure that the appropriate Permits are obtained before any work is undertaken on the Figures 4301 or 4319 Flame Arresters.

Engineers must read all Warnings, Cautions and Notes contained in this Installation and Maintenance Manual, and must follow all Safety instructions and Hazard Warnings which are applicable to the area in which the flame arrester is installed.

These arresters should not be used for oxygen enriched gaseous mixtures or for acetylene, Unsaturated hydrocarbons or for hydrogen service.

Lifting heavy equipment

Before attempting to lift any bulky or heavy items (for example, packing cases or equipment), ensure that all necessary Safety precautions are taken (i.e., adopt the correct body position and/or use appropriate lifting equipment).

1. Introduction

1.1 This Manual

This Installation and Maintenance Manual provides detailed information which will facilitate the installation, commissioning and on-site maintenance of the Whessoe-Varec Figures 4301 and 4319 Flame Arresters.

The Manual is broken down into separate Sections:

- Introduction : which introduces the Manual itself and provides a hardware description of the Flame Arresters, and which outlines the Operating principle.
- Functional Description : this Section covers the functional description.
- Installation : which details the methods of installing the equipment at a Site, and includes information on storage, unpacking and initial checks.
- Commissioning : shows how the Engineer should bring the installed equipment into operation.
- Maintenance : provides information relating to the on-site maintenance of the Flame Arresters, and also advises how the Engineer can obtain spares.
- Troubleshooting : covers the troubleshooting routines applicable to the equipment.
- Specifications : details the technical specifications and provides ordering information.
- Index : covers the recommended spares and contains a list of illustrations.

1.2 Hardware description

The Figure 4301 Flame Arrester consists of a tube bank made up of spirally wound alternate layers of flat and corrugated stainless steel sheets built around a solid core.

The tube bank offers a multiplicity of small holes parallel to the line of flow (this configuration provides maximum flame stopping capability consistent with minimum back pressure). The tube element is retained between two flanged end sections and contained within a steel outer shell.

The arrester assembly can be fitted with an optional weather hood for use where the Figure 4301 is mounted in an exposed position (e.g., on a vessel roof).

The corrugated 'crimped ribbon' design of the Figure 4301 flame arrester enables the unit to be manufactured to very close tolerances, and hence it can be efficiently size-selected to suit the widest range of applications.

Note: The pressure drop across the arrester is very low, and hence the unit is suitable for high gas flow rates.

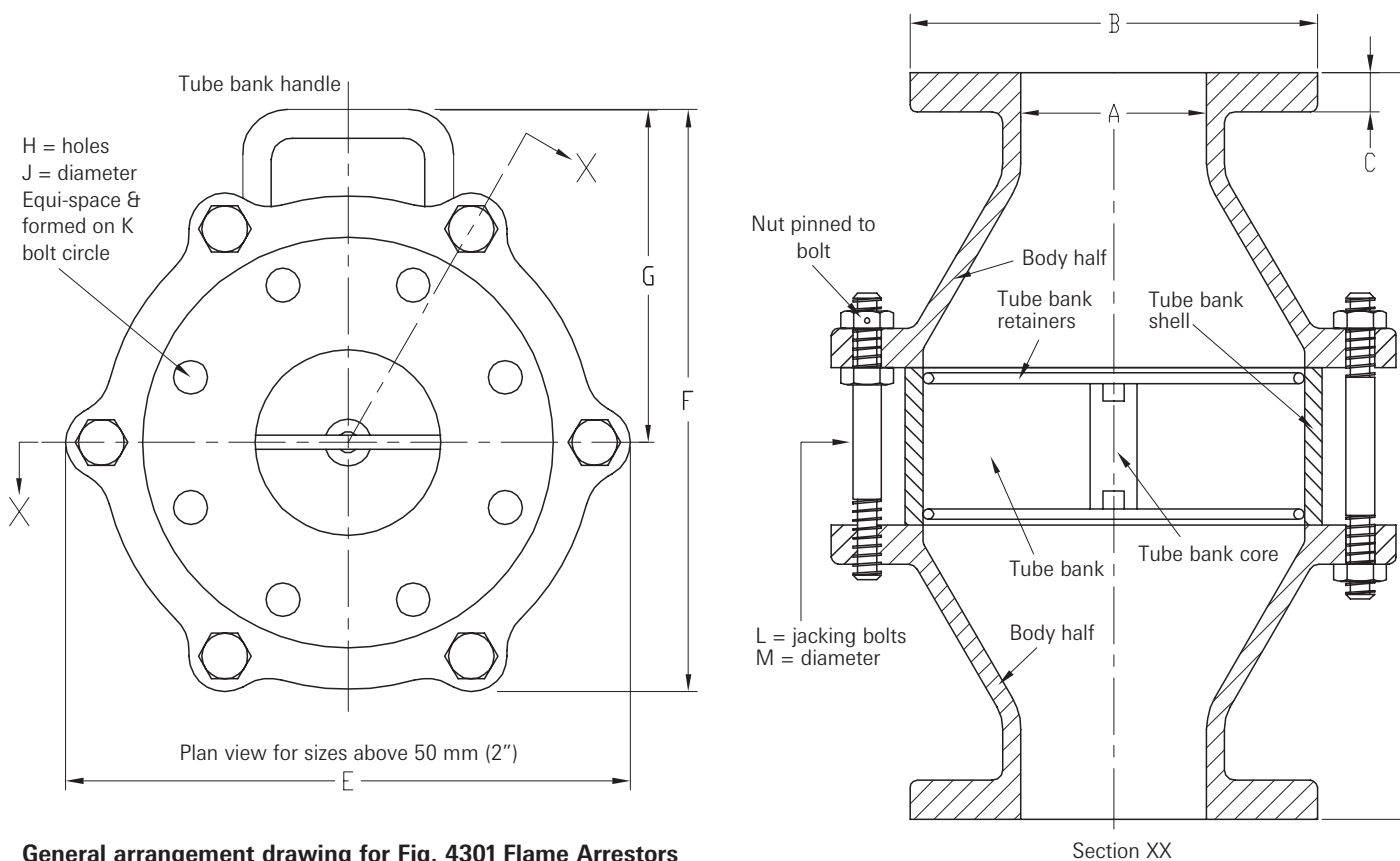
The Figure 4319 arrester is designed for fitting to the downward turned end of free vent pipes, and consists of a cast iron body with the tapered end having a 2" or 3" API thread. The aluminium or stainless steel tube bank is secured in the cylindrical section with a stainless steel pin which passes through the cores.

1.3. Operating Principle

Flame arresters prevent the spread (or propagation) of a flame front generated by ignited gas on one side of an element by absorbing and dissipating heat (this is effected through extinguishing the flame by lowering its temperature below the ignition point).

The operational description of a flame arrester is quite complex, and a more complete explanation can be obtained from Whessoe-Varec if required (ref: Flame Arrester Paper by PB Watson).

Figures 4301 or 4319 Flame Arresters Installation and Maintenance Instructions



General arrangement drawing for Fig. 4301 Flame Arrestors

Dimensions

Nom. size	A		B		C		D		E		F		
	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	
50	2	57	2 1/4	165	6 1/2	22	7/8	333	13 1/8	184	7 1/4	219	8 5/8
80	3	79	3 1/8	200	7 7/8	22	7/8	406	16	267	10 1/2	248	9 1/4
100	4	105	4 1/8	229	9	22	7/8	455	18 1/2	318	12 1/2	300	11 7/8
150	6	159	6 1/4	286	11 1/4	25	1	521	20 1/2	410	16 1/8	406	16
200	8	210	8 1/4	340	13 3/8	25	1	641	25 1/4	508	20	495	19 1/2
250	10	260	10 1/4	432	17	35	1 3/8	772	30 7/8	641	25 1/4	638	25 1/8
300	12	305	12	486	19 1/8	35	1 3/8	940	37	762	30	762	30

Dimensions

Nom. size	G		H	J		K		L	M	N	P	
	mm	in.	No. of holes	mm	in.	mm	in.	No.	mm	No.	mm	
50	2	111	10 3/8	4	19	3/4	121	4 3/4	2	16	1	16
80	3	146	5 3/4	4	19	3/4	152	6	2	16	2	16
100	4	165	6 1/2	8	19	3/4	191	7 1/2	2	16	4	16
150	6	229	9	8	22	7/8	241	9 1/2	2	20	4	20
200	8	276	10 7/8	8	22	7/8	298	11 3/4	2	20	4	20
250	10	330	13	12	24	15/16	362	14 1/4	2	24	6	24
300	12	391	15 3/8	12	24	15/16	432	17	2	24	6	24

2. Functional description

Flame Arresters prevent the passage of flames in storage vessels and along associated pipework systems, and have applications in a wide range of industries including petroleum and petrochemicals, gas, marine and sewage treatment.

A flame arrester cannot prevent the initial ignition of flammable gases, but is designed to prevent the spread of a flame when used within its design limitations.

Due to varying degrees of hazard, it is necessary to very carefully assess the type, capacity and method of installation of the flame arrester to ensure safe operation.

Whessoe-Varec require Customers to complete the detailed application form contained in the Flame Arrester Sales leaflet (a sample is also provided in paragraph 7.2 in this Manual); any enquiries without this application form cannot be processed.

A more detailed explanation of the flame arrester can be obtained from Whessoe-Varec (ref: Flame Arrester Paper by PB Watson).

3. Installation

3.1 Installation overview

The quality of performance in service is a function of the care taken to ensure good installation. A careful study of these installation instructions is therefore recommended, as properly installed equipment will normally operate for long periods without problems.

The Figure 4301 is not a 'detonation' type of arrester, and therefore is not suitable for installation in long piping systems on the 'source of ignition' side of the flame arrester. The Figure 4301 is typically used in vertical position at, or very near to, the end of pipelines discharging to atmosphere (and is particularly suitable for Group IIA gases).

The Figure 4319 flame arrester has been designed for fitting to the downturned end of free vent pipes .

The arrester should be mounted as close as possible to the anticipated source of ignition at an installation site (refer to paragraph 3.5).



Important

These arresters should not be used for oxygen enriched gaseous mixtures, or for acetylene, unsaturated hydrocarbons or for hydrogen service.

3.2 Storage



Important

The equipment packing cases are NOT waterproof and should be stored before use in an area which is protected from the elements.

3.3 Unpacking

The Whessoe-Varec flame arresters and any ancillary equipment required at the installation site will be packed in heavy duty cartons.

It is recommended that before any item is unpacked from its container, it should be moved as close as possible to its installed position. This will minimize the possibility of damage through handling.

It is further recommended that each item should only be unpacked immediately before it is required. The Installation Engineer should check the delivered items of equipment against the Delivery Note. Before installing any unit the Engineer should check for:

- bent or distorted items.
- scratches or dents.

3.4 Tools required

The standard Engineer's tool kit will be sufficient for the installation of this equipment.

3.5 Mounting

The Figure 4301 should be mounted with the axis vertical, and as close as possible to the potential source of ignition.

The Figure 4319 should be fitted to the downturned end of free vent pipes.

4. Commissioning

4.1 Introduction

It is essential that all applicable elements of the Installation Phase are completed before the Commissioning Phase is commenced.

Commissioning of the installed equipment involves the preliminary checking of the installation (refer to paragraph 4.2).

4.2 Preliminary checking of the installation

Ensure that all equipment is securely installed.

4.3 Handover to client

Once the Engineer is satisfied that the installed equipment has been properly configured and is functioning correctly, then it should be handed over to the Customer as follows:

Describe the flame arrester installation to the Customer's staff, and provide a thorough demonstration of the installed equipment (as required).

Ensure that a copy of the installation and Maintenance Manual is available at the Site for use by the Customer's Engineers (as applicable).

Brief the Customer's staff on the importance of maintaining Site Records (refer to paragraph 5.4).

Complete the Commissioning Sheet, and obtain the signature of Client's representative.

5. Maintenance

5.1 Introduction

This part of the Installation and Maintenance Manual describes those maintenance requirements and techniques which should be followed with regard to the equipment.

5.2 Maintenance policy

The proper maintenance of flame arresters is extremely important and should only be carried out by approved Engineers.

On-site maintenance of the flame arresters is limited to Routine Maintenance tasks (refer paragraph 5.5) or to Major Maintenance tasks (refer to paragraph 5.6).

It is only necessary that the Maintenance Engineer should locate the fault and replace the defective equipment unit. All defective units should be returned to Whessoe Varec for repair.

5.3. Safety

Refer to the Safety Information at the front of this Manual.

5.4. Site records

All Maintenance activity relating to the Flame arresters should be entered in the Site Fault Report in order to provide an historical record of the installed equipment, and to give a guide in the event of any future faults which may develop on the equipment.

Any report of a fault should be carefully studied, as such reports will often provide a lead to the fault condition, thus eliminating wastage of manpower and time.

5.5 Routine maintenance tasks

There is only a small element of routine maintenance that is applicable to flame arresters, and the maintenance interval is dependent upon site conditions.

Regular inspection of the installed equipment is essential, when particular attention must be given to checking for the following:

Any signs of element blocking, which will greatly increase the pressure drop across the element.

Signs of explosion damage to the individual tubular passages (their size should be consistent, and without any evidence of enlargement).

There should be NO visible gaps around the periphery of the element or at its core.

Evidence of flame damage (this could be in the form of sooty deposits, metal discolouration or element distortion).

5.6 Major maintenance tasks

After any explosion or fire, the flame arrester must closely be inspected for damage (see also paragraph 5.5 above).

It is strongly recommended that a spare element of each size should be held at an installation site. Major maintenance will then simply consist of inspecting and then replacing the suspect element, which can then be cleaned and made ready as a spare.

The tube bank is removed easing the ends apart with the jacking bolts, and then withdrawing the element using the handle provided.

The recommended method of cleaning is to place the element in a solvent bath for several hours, then remove from the bath and blow compressed air through the element to remove moisture and any deposits (this should be done at regular intervals, based on operational experience).



Important

NEVER attempt to push thin rods through the element apertures as this can increase the aperture dimensions, and the flame arrester will then be rendered useless. All Whessoe-Varec tank fittings can be supported by our Service Department who provide a complete installation and commissioning service for new and retro-fittings as well as both routine and emergency maintenance and servicing facilities for equipment in service (contact Whessoe-Varec).

Should the flame arrester fail to operate correctly, then replacement of the complete unit is recommended.

5.7 Ordering spares

Refer to paragraphs 7.2 and 8.1 in this Manual.

When spare parts are required for the Customer's installed equipment, the Engineer should contact Whessoe-Varec for the appropriate part numbers.

Complete the Whessoe-Varec FAXBACK spares Order Form and dispatch to Whessoe-Varec in accordance with the instructions detailed on the Order Form.

6. Troubleshooting

The Troubleshooting techniques which are recommended to the Engineer by Whessoe Varec are to simply confirm the correct operation of the installed equipment. Where problems arise, the Engineer should follow the maintenance routines covered in Section 5.

The total equipment which makes up a Figure 4301 or 4319 installation is very compact, with its many elements located within areas of limited access. To avoid unnecessary work involving major periods of equipment downtime, the careful and accurate diagnosis of faults is essential.

A full and detailed knowledge of the equipment will greatly assist in the efficient diagnosis of equipment faults, and individual Engineers who are fully conversant with the equipment and with the appropriate maintenance tools will assure continuity of operation with minimum equipment downtime.

7. Specifications

7.1. Technical specifications

Because of the varying degrees of hazard that the equipment can be subjected to, it is necessary to carefully assess the type and capacity of the flame arrester required to assure safe operation (refer to the Table below).

7.2. Ordering information

The equipment installed at the Site carries identifying numbers.

For ordering purposes, the Engineer should check the Site requirements and then complete the Whessoe-Varec FAXBACK Spares Order Form. This order Form should then be dispatched to Whessoe-Varec.

Due to varying degrees of hazard it is necessary to assess very carefully the arrester type and capacity required for safe operation.

A detailed application (as required BS7244:1990 and outlined in this paragraph) is available from Whessoe-Varec.

This form should be completed for every proposed Flame Arrester application and returned to Whessoe-Varec in order to assist in the correct sizing of the unit required to suit each situation.



Important

Any Customer enquiries without this form CANNOT be considered.

8. Index

8.1 Parts list

8.1.1. Recommended Spares

Whessoe-Varec recommend that spare tube banks should be held at the Site (refer to paragraphs 5.5 and 5.6).