Bele High Expansion Generator - UL Variant

Discharge Devices | Model KGH10000

1 General description

Aspirated-type high expansion foam generators (HEGs) are designed to expand foam into a large volume of stable bubbles. Expansion rates up to 856:1 are possible due to jet streams of foam solution that aspirate a sufficient amount of air, which is then entrained onto perforated screens to produce high expansion foam. This high performance is achieved without any external power source or moving parts, which gives advantages for installation and reduces ongoing maintenance requirements.

High expansion generators are usually part of a fixed deluge or flow control system and shall be used in combination with a suitable foam proportioning system. Foam concentrates developed and tested to work in high expansion systems shall be used. It is critical to select a combination of generator and foam concentrate that have been developed and tested together to ensure critical parameters are achieved such as expansion, submergence height and fire performance.

High expansion foam systems are commonly used on hazards such as ordinary combustibles, flammable and combustible liquids or liquefied natural gas (LNG) for example. Such hazards are commonly found in applications such as aircraft hangars, warehouses, LNG facilities, cable tunnels, underground storage or recycling plants. High expansion foam systems should be brought into operation very quickly after the onset of fire so suitable detection and actuation systems should be provided.

This technical data is intended for trained experts.
Technical data can be found on the Fomtec website at

For further information, please contact Fomtec or refer to the technical documentation. The contents of this publication are subject to modifications without notice.

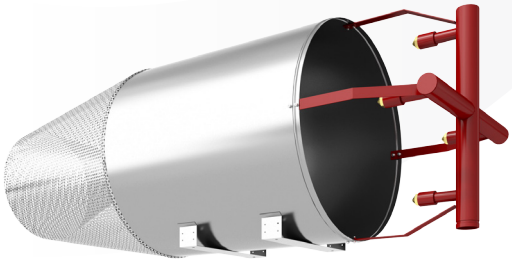


Fig 1.1 Model KGH10000 Single

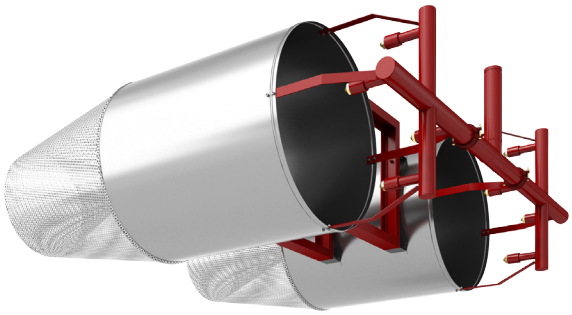


Fig 1.2 Model KGH10000 Paired

Images for illustration purposes only

2 Listings and approvals

The high expansion generator is UL Listed (UL139) as part of a fire extinguishing system combining designated foam concentrate, proportioning devices and bladder tanks.

Listed system components can be found at https://iq.ulprospector.com

UL Listed GLHZ EX28465 – Generators, High expansion Foam

UL Listed GLKX EX27989 – Liquid Concentrates, High expansion Foam

Tested in accordance with EN13565-1

3 Technical data

3.1 Construction features

- 2 size options for design flexibility
- No moving parts and no external power requirements
- Reduced/no generator maintenance which mitigates associated costs of testing
- Listed with Fomtec LS xMAX 3% Synthetic Fluorine Free Foam (SFFF)
- Vertical or horizontal installation
- Stainless steel body with carbon steel or stainless steel flow manifold
- Fixing points included
- Heat and fire resistant to UL139
- Foam expansion up to 856:1 (depending on model and supply conditions)
- Grooved inlet connection
- Suitable for the protection of Class A and Class B commodities according to recognised design and installation standards such as NFPA11, NFPA409, UFC 4_211 and EN13565-2
- Innovative nozzle design to maximize performance and minimize clogging

3.2 Standard materials

KGH10000 – High expansion generator	
Generator inlet connection	KGH10000 - 3" (88.9 mm) Grooved (Single and Paired version)
Nozzle manifold	Carbon steel ASME SA106 Gr.B or stainless steel ASME SA312 Tp.316
Nozzle manifold support arm	SA516 Gr.70
Nozzle	Brass EN CW614N
Body	Stainless steel AISI-430
Support arm nuts, bolts & washers	AISI-304
Finish – Nozzle manifold	RAL3000 Flame red
Finish - Body	Natural

Table 3.2.1 - Standard materials

3.3 Standard design specifications

Model	Inlet size	Working pressure[1]				Flow range[1]				Nozzle qty	Weight	
		Minimum		Maximum		Minimum		Maximum				
		psi	bar	psi	bar	GPM	LPM	GPM	LPM		lbs	kg
KGH10000 Single	3" [2]	40	2.8	103	7.1	77	291	118	447	4	159	72
KGH10000 Paired	3"	40	2.8	103	7.1	154	582	236	894	8	411	186

[1] UL Listed parameters
[2] Supply pipework can be a smaller diameter according to hydraulic calculation.
GPM = Gallons per minute, LPM = Litres per minute

Table 3.3.1 - Standard design specifications

3.4 Ordering Information

1) Select the required generator model based on project requirements and performance data in ***Section 7***.

2) The Paired generator consists of two single units combined with a fixing bracket and flow manifold. (see ***Fig 3.4.3***)

3) Select the flow manifold pipe material

Part number	Description	Material / Finish	Finish	Inlet connection	Drawing
KGH10000V	KGH10000 Single HEG	Body - Stainless steel Flow manifold - Carbon steel	Natural Painted RAL3000	3" (88.9 mm) Grooved	***Fig 3.4.2***
KGH10000VS	KGH10000 Single HEG	Body - Stainless steel Flow manifold - Stainless steel	Natural Painted RAL3000	3" (88.9 mm) Grooved	***Fig 3.4.2***
KGH10000V-P	KGH10000 Paired HEG[1]	Body - Stainless steel Flow manifold - Carbon steel	Natural Painted RAL3000	3" (88.9 mm) Grooved	***Fig 3.4.3***
KGH10000VS-P	KGH10000 Paired HEG[1]	Body - Stainless steel Flow manifold - Stainless steel	Natural Painted RAL3000	3" (88.9 mm) Grooved	***Fig 3.4.3***

Note:
[1] The paired high expansion generator (HEG) comes complete with centre bracket and feeding manifold

Table 3.4.1 – Ordering information

Figure 3.4.2 Single HEG

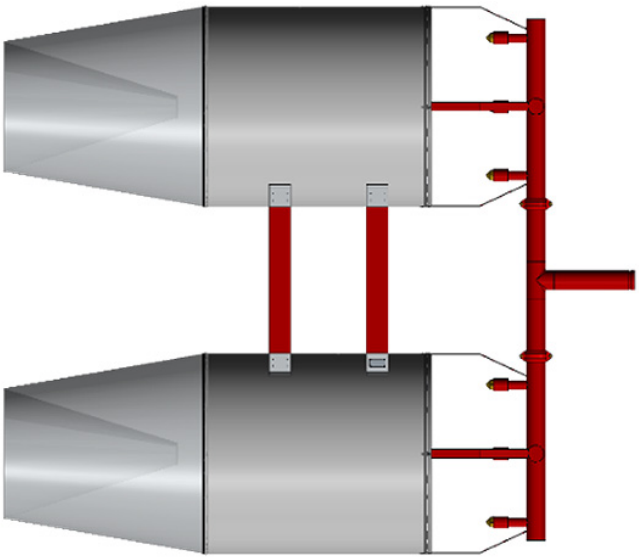


Figure 3.4.3 Paired HEG

4 Scope of delivery

Ensure that all components are complete and in good condition.
Note: Due to the size of the high expansion generator, logistics planning is recommended at initial order stage.

Included

Unit is supplied with nozzles pre-installed into flow manifold pipework.
Main body supplied with fixing bracket.
To enable manageable handling and reduce logistics costs the flow manifold is shipped inverted inside the generator body.
Site assembly of the body to the flow manifold is required. The paired version requires the 2 single generators to be site assembled to the centre bracket. Nuts, bolts and washers are supplied.
For additional information, please refer to ***Operation & Maintenance Manual TM2.3.4.25.***

Not Included

Fixing material, inlet connection coupling & optional strainer.

5 Availability

Please contact Fomtec for further information.

6 Product variants

6.1 Options

- Non-standard connections may be available on request
- Strainer (see section 13)
- Different packaging options according to project volume and location

6.2 Dimensions: Foam Generator

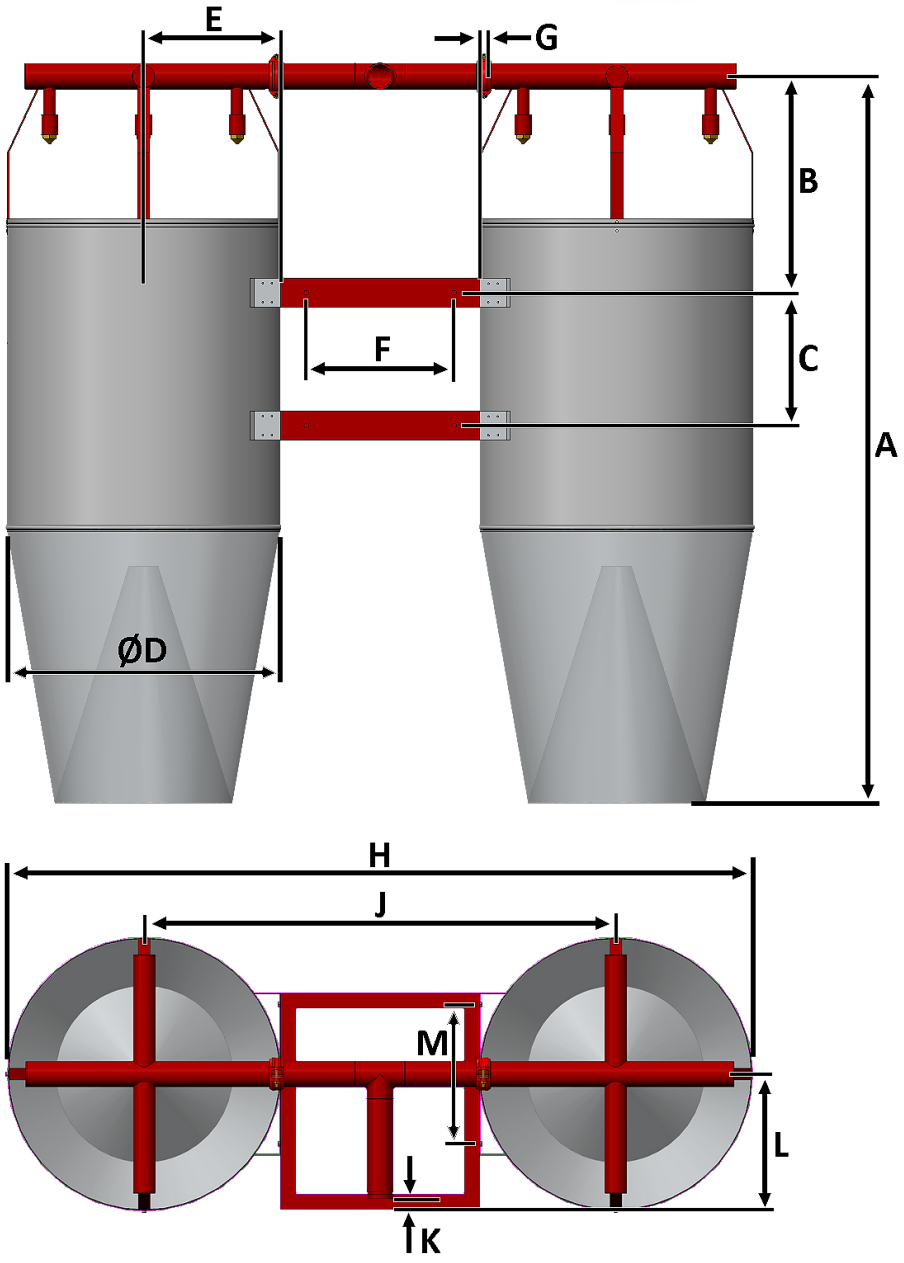


Figure 6.2.1 KGH10000 Single & KH10000 Paired dimensions

Dimension	KGH10000 Single		KGH10000 Paired	
	Inches	mm	Inches	mm
A	97.0	2,464	97.0	2,464
B	29.0	737	29.0	737
C	17.0	432	17.0	432
ØD	36.4	925	36.4	925
E	18.3	464	18.3	464
F	-	-	19.7	500
G	0.55	14	0.55	14
H	-	-	99.4	2,525
J	-	-	63.0	1,600
K	-	-	0.59	15
L	18.2	462	18.2	462
M	18.7	475	18.7	475
Nozzle quantity	4		8	
Note: The KGH10000 Single and KGH10000 Paired variants have body and nozzle manifolds with the same base dimensions.				

Table 6.2.2 – Generator dimensions

7 Performance data

When planning, installing and commissioning high expansion foam systems it is extremely important to use system components that have been tested together. The link between the high expansion generator and foam concentrate is very important as the resulting data is essential in the design calculations of the system. Foam concentrate should also be compatible with the selected proportioning system and foam storage tank.

NOTICE
The following data is based on the high expansion generators referenced in this data page working together with specific foam concentrates at their tested flow rates and pressures. Actual site conditions may produce different results.

7.1 Submergence height

The height of the building and storage is an important factor to consider during design. The LS xMAX 3% foam concentrate has been tested at heights in excess of 25 metres. Consideration shall be given in the system design calculation that the higher the submergence height then the higher the correction factor for foam collapse might be. Test data obtained independently of the UL Listing.

Please contact your local Viking office for further information.

7.2 High expansion foam concentrate

The following foam concentrate is Listed and certificated with the KGH series of aspirated high expansion foam generators detailed in this data page.

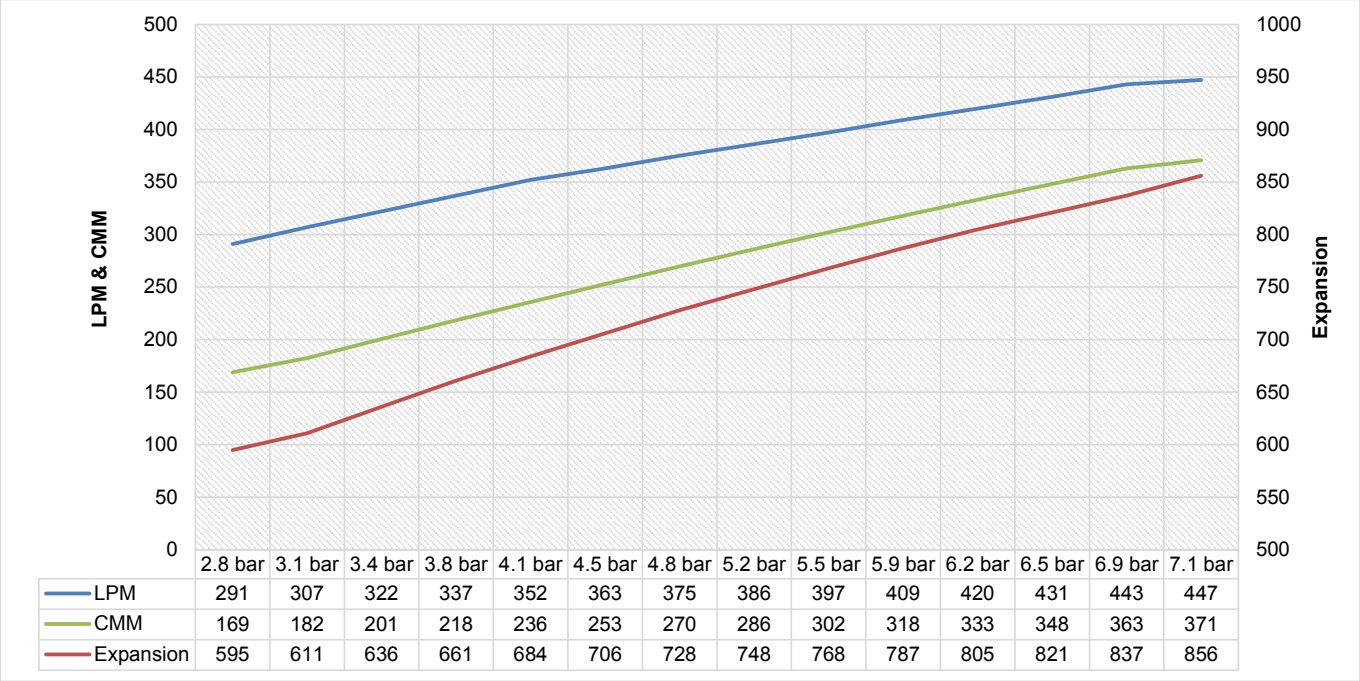
Foam concentrate[7]	Type	UL[1]	EN13565-1[2]	EN1568 Certification			
				Part1[3]	Part2[4]	Part3[5]	Part4[6]
Fomtec LS xMAX 3%	Synthetic SFFF	yes	yes	yes	yes	yes	no

[1] UL Listed as a system comprising foam concentrate, high expansion generator, proportioning devices and bladder tank
[2] Tested to the requirements of EN13565-1:2019 including Annex D (Heat and fire resistance test)
[3] Part 1 = Medium expansion foam concentrates for surface application to water-immiscible liquids (hydrocarbons)
[4] Part 2 = High expansion foam concentrates for surface application to water-immiscible liquids (hydrocarbons)
[5] Part 3 = Low expansion foam concentrates for surface application to water-immiscible liquids (hydrocarbons)
[6] Part 4 = Low expansion foam concentrates for surface application to water-immiscible liquids (polar solvents)
[7] Please refer to foam concentrate data page or product sheet for detailed technical information

Table 7.2.1 – High expansion generators approved for use with specific foam concentrates

7.3 Expansion performance

During system design and planning the following performance data will be required to select the most suitable generator size, discharge pressure and generator quantity.



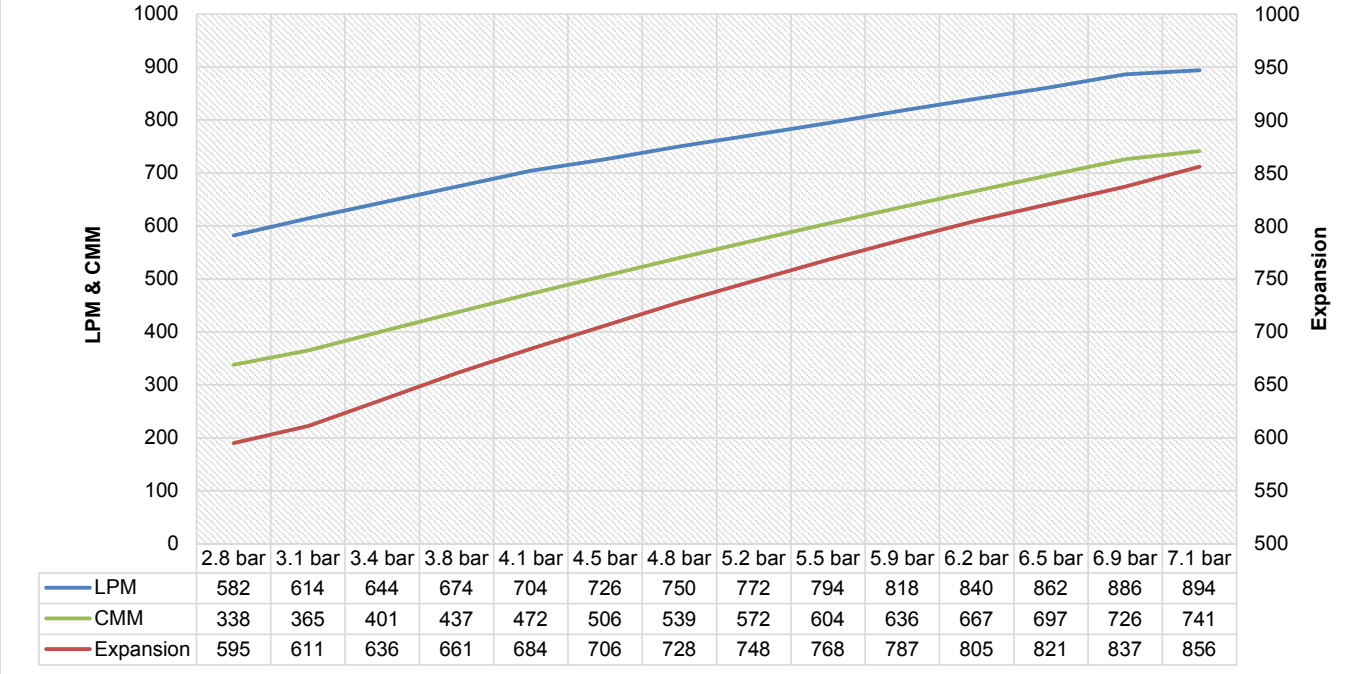
	2.8 bar	3.1 bar	3.4 bar	3.8 bar	4.1 bar	4.5 bar	4.8 bar	5.2 bar	5.5 bar	5.9 bar	6.2 bar	6.5 bar	6.9 bar	7.1 bar
LPM	291	307	322	337	352	363	375	386	397	409	420	431	443	447
CMM	169	182	201	218	236	253	270	286	302	318	333	348	363	371
Expansion	595	611	636	661	684	706	728	748	768	787	805	821	837	856

Glossary of terms.
LPM=litres per minute, GPM=gallons per minute, CMM=cubic metres per minute, CFM=cubic feet per minute, Expansion = The ratio of final foam volume compared to the original foam solution volume.

Graph 7.3.1 - KGH10000 Single with Fomtec LS xMAX 3% foam

Model	Expansion ratio	Pressure	Solution flow	Volume	Pressure	Solution flow	Volume
		bar	LPM	CMM	psi	GPM	CFM
KGH10000 Single	595	2.8	291	169	40	77	5,970
	611	3.1	307	182	45	81	6,447
	636	3.4	322	201	50	85	7,089
	661	3.8	337	218	55	89	7,718
	684	4.1	352	236	60	93	8,334
	706	4.5	363	253	65	96	8,939
	728	4.8	375	270	70	99	9,531
	748	5.2	386	286	75	102	10,111
	768	5.5	397	302	80	105	10,678
	787	5.9	409	318	85	108	11,233
	805	6.2	420	333	90	111	11,776
	821	6.5	431	348	95	114	12,307
	837	6.9	443	363	100	117	12,825
	856	7.1	447	371	103	118	13,098

Table 7.3.2 - Performance data - KGH10000 Single with Fomtec LS xMAX 3%



	2.8 bar	3.1 bar	3.4 bar	3.8 bar	4.1 bar	4.5 bar	4.8 bar	5.2 bar	5.5 bar	5.9 bar	6.2 bar	6.5 bar	6.9 bar	7.1 bar
LPM	582	614	644	674	704	726	750	772	794	818	840	862	886	894
CMM	338	365	401	437	472	506	539	572	604	636	667	697	726	741
Expansion	595	611	636	661	684	706	728	748	768	787	805	821	837	856

Glossary of terms.
LPM=litres per minute, GPM=gallons per minute, CMM=cubic metres per minute, CFM=cubic feet per minute, Expansion = The ratio of final foam volume compared to the original foam solution volume.

Graph 7.3.3 - KGH10000 Paired with Fomtec LS xMAX 3% foam

Model	Expansion ratio	Pressure	Solution flow	Volume	Pressure	Solution flow	Volume
		bar	LPM	CMM	psi	GPM	CFM
KGH10000 Paired	595	2.8	582	338	40	154	11,940
	611	3.1	614	365	45	162	12,894
	636	3.4	644	401	50	170	14,178
	661	3.8	674	437	55	178	15,436
	684	4.1	704	472	60	186	16,668
	706	4.5	726	506	65	192	17,878
	728	4.8	750	539	70	198	19,062
	748	5.2	772	572	75	204	20,222
	768	5.5	794	604	80	210	21,356
	787	5.9	818	636	85	216	22,466
	805	6.2	840	667	90	222	23,552
	821	6.5	862	697	95	228	24,614
	837	6.9	886	726	100	234	25,650
	856	7.1	894	741	103	236	26,196

Table 7.3.4 - Performance data - KGH10000 Paired with Fomtec LS xMAX 3%

8 Installation

Refer to appropriate installation standards (i.e. NFPA, EN13565-2 etc.) In addition, the "Authority Having Jurisdiction" (AHJ) may have additional installation requirements that must be followed.

Some key system related requirements are detailed in this section.

For detailed information on the high expansion generators installation, please refer to ***Operation & Maintenance Manual TM2.3.4.25.***

8.1 Position

The high expansion generator can be installed in the vertical or horizontal position with a comparable performance.

8.2 Strainer

It is good practice to ensure the water foam solution fed into the nozzle manifold during operation is free of debris. For this reason, we recommend a main system or individual generator strainer with screen size of 4-5 mm.

8.3 Detection

High expansion foam systems should be activated quickly after the onset of fire, so suitable detection and release systems need to be provided, e.g. e.g. Viking UniVario Industrial Detectors and/or Viking control and release panels. Detection via heat activated bulbs or links such as sprinklers shall not be used due to the inherent delay of operation.

8.4 Proportioning equipment

The Listed high expansion generator and foam concentrate are approved and compatible with bladder tanks and ratio controllers detailed in the UL system Listing. Other listed and/or approved proportioning technologies such as pump skids with Listed ILBP's or water driven pumps can also be used.

8.5 Single unit connection

Both the single and paired generators have a 3" grooved connection. The single generator configuration can be fed with smaller diameter pipework according to hydraulic calculations.

9 Operation

High expansion foam generators are part of a fixed fire protection system incorporating a water supply, system pipework, foam concentrate, foam storage tank and proportioning / admixing system.

In a fire condition, the detection system will activate and sound the warning alarms. The deluge or flow control system(s) will then be opened via a releasing panel working in conjunction with the detection system. It is generally accepted that this delay will be around 30 seconds, giving time for activation before the discharge begins. Once the deluge or flow control valve is in operation, the incoming water supply is mixed with the foam concentrate using a proportioning / admixing system thereby creating foam solution. Once the system pipework has filled and is up to the required pressure – high expansion foam discharge will begin.

The protected area will be filled within a certain submergence time which is defined during the planning/design phase. The high volume of foam is design to suffocate the fire resulting in suppression or extinguishment. The submergence volume should be maintained as per the applicable design rules applied.

Once the fire is extinguished, the high expansion foam can be left to break down naturally or for a quicker cleanup, a fine hose spray can be employed to break down the bubbles. It is recommended to add an "Anti-Foam" compound to the resulting foam solution to assist with the collection and transfer of the foam solution to prevent agitation and re-foaming.

10 Guarantee

For details of warranty, contact Fomtec directly.

11 Inspection, tests and maintenance

Refer to respective requirements of NFPA and/or EN13565-2. In addition, the "Authority Having Jurisdiction" (AHJ) may have additional maintenance, testing and inspection requirements that must be followed.

For manufacturer's additional recommendations and requirements, please refer to ***Operation & Maintenance Manual TM***

NOTICE
The owner is responsible for maintaining the fire protection system and devices in proper operating condition.

⚠ WARNING
Any system maintenance or testing that involves placing a control valve or detection system out of service may eliminate the fire protection capabilities of that system. Prior to proceeding, notify all Authorities Having Jurisdiction. Consideration should be given to employment of a fire patrol in the affected area

12 Disposal

At end of use the product described here should be disposed of via the national recycling system. Upon request the manufacturer can take back and properly dispose of the electrical equipment and electronic devices.

13 Accessories and spare parts

Part number	Description	Size
F-DEFOAM/SB/25	Anti-Foam	25 litre
F-DEFOAM/SB/200	Anti-Foam	200 litre
F-DEFOAM/SB/1000	Anti-Foam	1,000 litre
YSG-0300	Generator grooved strainer	3" (88.9 mm) grooved

Table 13.1.1 - Accessories

14 Declaration of conformity

If required. Contact Fomtec for further information.