

## HIEX High-Expansion Foam Generators

### Features

- UL Listed and CE Marked
- FM Approved models available
- LNG specific models available
- Water-powered so no electrical power is required
- Foam capacities of up to 847 m<sup>3</sup>/min (29,900 cfm)

### Application

SKUM HIEX High-Expansion Foam Generators are intended for use in total flooding or local application high-expansion foam systems. Total flooding high-expansion foam systems are commonly used to protect the following hazards:

- Flammable liquid storage areas
- Hazardous waste storage areas
- Ship holds
- Engine rooms

Local application foam systems are commonly used to protect aircraft hangars. High-expansion foam systems are also frequently used to protect LNG facilities. These systems are typically used to control the vaporization rate of LNG spills or reduce the intensity of LNG fires by controlling the rate of vapor release.

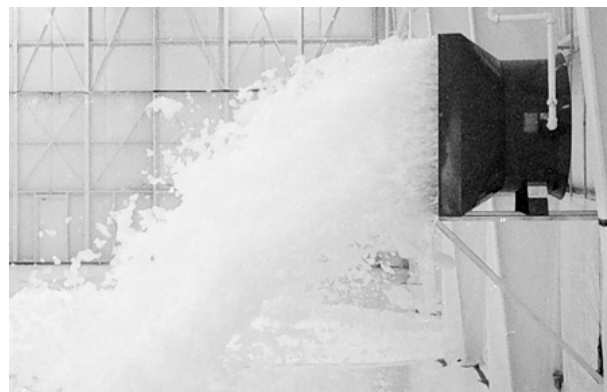
**Note:** High-expansion foam generators used in LNG applications typically require expansion ratios of approximately 500:1.

### Description

SKUM HIEX High-Expansion Foam Generators produce large volumes of foam by coating a stainless steel perforated metal screen with high-expansion foam solution and expanding it with airflow generated by a water-powered fan. When used with SKUM METEOR-X 2% High-Expansion Foam Concentrate, these generators are capable of producing finished foam with expansion ratios from 450:1 up to 987:1, depending on the model and operating pressure.

### Protective Coatings

Standard generator model housings are constructed of galvanized or bare carbon steel base material and are painted using a UL Listed paint system. All fans are painted using a marine grade powder paint system tested to a minimum of 3,000 hours in salt spray corrosion testing to ensure adherence and durability. LNG generator models are constructed of pickled and passivated 316 L stainless steel for corrosion resistance in the most challenging environments. Stainless steel foam screens are not painted to avoid inhibiting foam production.



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### Approvals and Certifications

#### UL Listed

SKUM High-Expansion Foam Generators are UL Listed for use with the SKUM METEOR-X 2% High-Expansion Foam Concentrate.

#### FM Approved

The HIEX-5A, HIEX-15A, and HIEX-27 models are FM Approved for use with SKUM METEOR-X 2% High-Expansion Foam Concentrate.

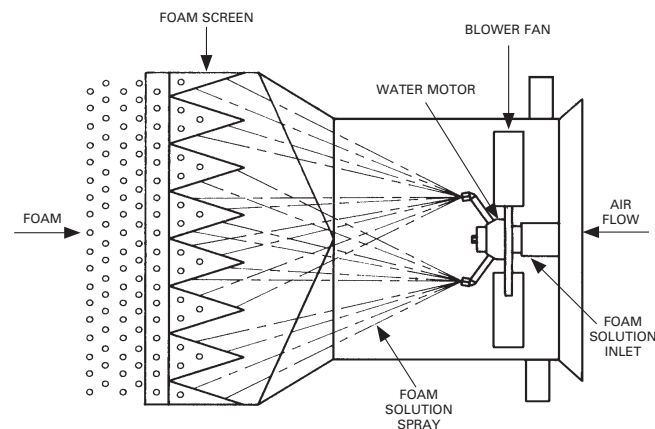
#### CE Marked

All models are CE Marked in conformance with the Machinery Directive 2006/42/EC.

### Operation and Maintenance

Refer to the SKUM HIEX High-Expansion Foam Generator Operation and Maintenance Manual for detailed procedures on installation, operation, and maintenance. A printed copy of this manual is included with every generator.

### Foam Generator Components



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## Materials of Construction

SKUM HIEX High-Expansion Foam Generators are manufactured from a combination of carbon steel, stainless steel, and brass components. For materials of construction of the major components, see the following table:

Component	Material		
<b>Model</b>	Standard Models: HIEX-2A HIEX-5A HIEX-15A HIEX-20	Standard Models: HIEX-27	LNG Models: HIEX-2A LNG HIEX-5A LNG HIEX-20 LNG
<b>Housing</b>	Galvanized Steel	Galvanized Steel	316L SS, Pickled and Passivated
<b>Foam Screen</b>	201, 302, or 304 SS	201, 302, or 304 SS	316 or 316L SS
<b>Fan</b>	Carbon Steel*	Carbon Steel*	Carbon Steel*
<b>Water Motor</b>	Brass	Cast Iron/Bronze	Brass
<b>Nozzles</b>	Brass	Brass	Brass

\*Carbon Steel fans are powder painted with a durable, marine grade paint system for corrosion resistance.

## Performance Data

UL Listed Performance (METEOR-X 2%)										
Generator Model		Part Number	UL Listed Orientation	Inlet Pressure		Flow Rate		Foam Output		Expansion Ratio
				bar	psi	Lpm	gpm	m <sup>3</sup> /min	cfm	
HIEX-2A	Standard	438481	Horizontal or Vertical	3.4	50	132	35	62	2,188	468
				5.2	75	159	42	77	2,727	486
	LNG	438488		6.9	100	189	50	85	3,010	450
HIEX-5A	Standard	438482	Horizontal or Vertical	3.4	50	231	61	189	6,658	816
				5.2	75	284	75	266	9,383	939
	LNG	438489		6.9	100	329	87	302	10,655	916
HIEX-15A	Standard	438483	Horizontal or Vertical	2.8	40	409	108	343	12,121	840
				3.4	50	450	119	410	14,491	911
				5.2	75	549	145	542	19,141	987
				6.9	100	640	169	617	21,796	965
HIEX-20	Standard	438485	Horizontal or Vertical	2.8	40	803	212	383	13,530	477
				3.4	50	901	238	418	14,746	463
	LNG	438492		5.2	75	1,113	294	538	19,007	484
				6.9	100	1,279	338	640	22,598	500
HIEX-27	Standard	438487	Horizontal or Vertical	2.8	40	685	181	575	20,295	839
				3.4	50	768	203	679	23,965	883
				5.2	75	920	243	773	27,303	840
				6.9	100	1,045	276	816	28,802	781

**Note:** METEOR-X 2% concentrate should not be used for salt water applications.

## Performance Data (Continued)

FM Approved Performance (METEOR-X 2%)										
Generator Model		Part Number	FM Approved Orientation	Inlet Pressure		Flow Rate		Foam Output		Expansion Ratio
				bar	psi	Lpm	gpm	m <sup>3</sup> /min	cfm	
HIEX-5A	Standard	438482	Horizontal	2.8	40	208	55	114	4,020	547
				3.4	50	235	62	147	5,184	625
	LNG	438489		5.2	75	288	76	216	7,632	751
				6.9	100	333	88	221	7,794	662
HIEX-15A	Standard	438483	Horizontal	2.8	40	405	107	270	9,540	667
				3.4	50	450	119	344	12,150	764
				5.2	75	562	149	484	17,100	861
				6.9	100	659	174	546	19,296	829
HIEX-27	Standard	438487	Horizontal or Vertical	2.8	40	697	184	554	19,548	795
				3.4	50	765	202	612	21,600	800
				5.2	75	924	244	766	27,036	829
				6.9	100	1060	280	847	29,916	799

**Notes:** METEOR-X 2% concentrate should not be used for salt water applications.

## System Calculation for Total Flooding

### Building

- Light steel construction
- Non-sprinklered

### Hazard

- Low density combustibles

### Fill Time

As stated in NFPA 11, the fill time for a non-sprinklered building of light steel construction and a hazard of low density combustibles is a maximum of 3 minutes (T).

### Building Area

30.5 m (100 ft) × 9.1 m (30 ft) = 278 m<sup>2</sup> (3,000 ft<sup>2</sup>)

### Building Height

3 m (10 ft) = Volume (V) of 850 m<sup>3</sup> (30,000 ft<sup>3</sup>)

### Calculation Without Sprinklers

$$R = (V/T) \times C_N \times C_L$$

$$R = \text{Rate of Discharge in cfm}$$

$$V = \text{Submergence Volume in ft}^3$$

$$T = \text{Submergence Time in minutes}$$

$$C_N = \text{Compensation for normal shrinkage (1.15, constant)}$$

$$C_L = \text{Compensation for leakage}$$

1.0, no leakage  
1.2, moderate leakage

$$R = (30,000 \text{ ft}^3 / 3 \text{ min}) \times 1.15 \times 1 = 10,000 \times 1.15 \times 1 = 11,500 \text{ cfm required}$$

11,500 cfm / 6,658 cfm per HIEX-5A at 50 psi = 1.73 generators

### Metric Calculation

$$R = (850 \text{ m}^3 / 3 \text{ min}) \times 1.15 \times 1 = 283.3 \times 1.15 \times 1 = 326 \text{ m}^3/\text{min required}$$

326 m<sup>3</sup>/min / 189 m<sup>3</sup>/min per Metric HIEX-5A at 3.4 bar = 1.73 generators

**Therefore, use two HIEX-5A generators at 6,658 cfm (189 m<sup>3</sup>/min) each.**

## System Calculation for Local Application

Group II aircraft hangar using outside air to generators.

### Hangar to be protected

- Group II hangar measuring 3066 m<sup>2</sup> (33,000 ft<sup>2</sup>)
- Sprinkler system (wet pipe) for 6.9 Lpm/m<sup>2</sup> over 465 m<sup>2</sup> (0.17 gpm/ft<sup>2</sup> over 5000 ft<sup>2</sup>)

### Fill Time

As stated in NFPA 409, fill depth of 0.9 m (3 ft) within one minute (T) with sufficient foam concentrate for 12 minutes total.

### Building Area

45.7 m × 67.1 m = 3066 m<sup>2</sup> (150 ft × 220 ft = 33,000 ft<sup>2</sup>)

### Foam Volume (V)

3,065.8 m<sup>2</sup> × .9144 m = 2803 m<sup>3</sup> (33,000 ft<sup>2</sup> × 3 ft = 99,000 ft<sup>3</sup>)

### Calculation With Sprinklers

$$R = ([V/T] + R_s) \times C_N \times C_A^* \times C_L$$

$$R_s = \text{Rate of foam breakdown by sprinklers}$$

10 cfm/gpm × sprinkler system discharge in gpm (0.075 m<sup>3</sup>/min/Lpm × sprinkler discharge in Lpm)

$$C_N = \text{Compensation for normal shrinkage (1.15 constant)}$$

$$C_A^* = \text{Compensation for inside air (1.20 constant)}$$

$$C_L = \text{Leakage factor (not required for local application systems)}$$

$$R = ([99,000 \text{ ft}^3 / 1 \text{ min}] + 8500 \text{ cfm}) \times 1.15 = 107,500 \times 1.15 = 123,625 \text{ cfm minimum required}$$

123,625 cfm / 27,303 cfm per HIEX-27 at 75 psi = 4.53 generators

### Metric Calculation

$$R = ([2803 \text{ m}^3 / 1 \text{ min}] + 241 \text{ m}^3/\text{min}) \times 1.15 = 3044 \times 1.15 = 3501 \text{ m}^3/\text{min minimum required}$$

3501 m<sup>3</sup>/min / 773 m<sup>3</sup>/min per HIEX-27 at 5.2 bar = 4.53 generators

**Therefore, use five HIEX-27 generators at 27,303 cfm (773 m<sup>3</sup>/min) each.**

\*Inside air may be used with AHJ approval. When using inside air, Johnson Controls recommends using the 20% compensation factor (C<sub>A</sub><sup>\*</sup>) noted in the calculation for R. Contact Johnson Controls Technical Services with questions on the use of inside air for high-expansion foam systems.

## Ordering Information

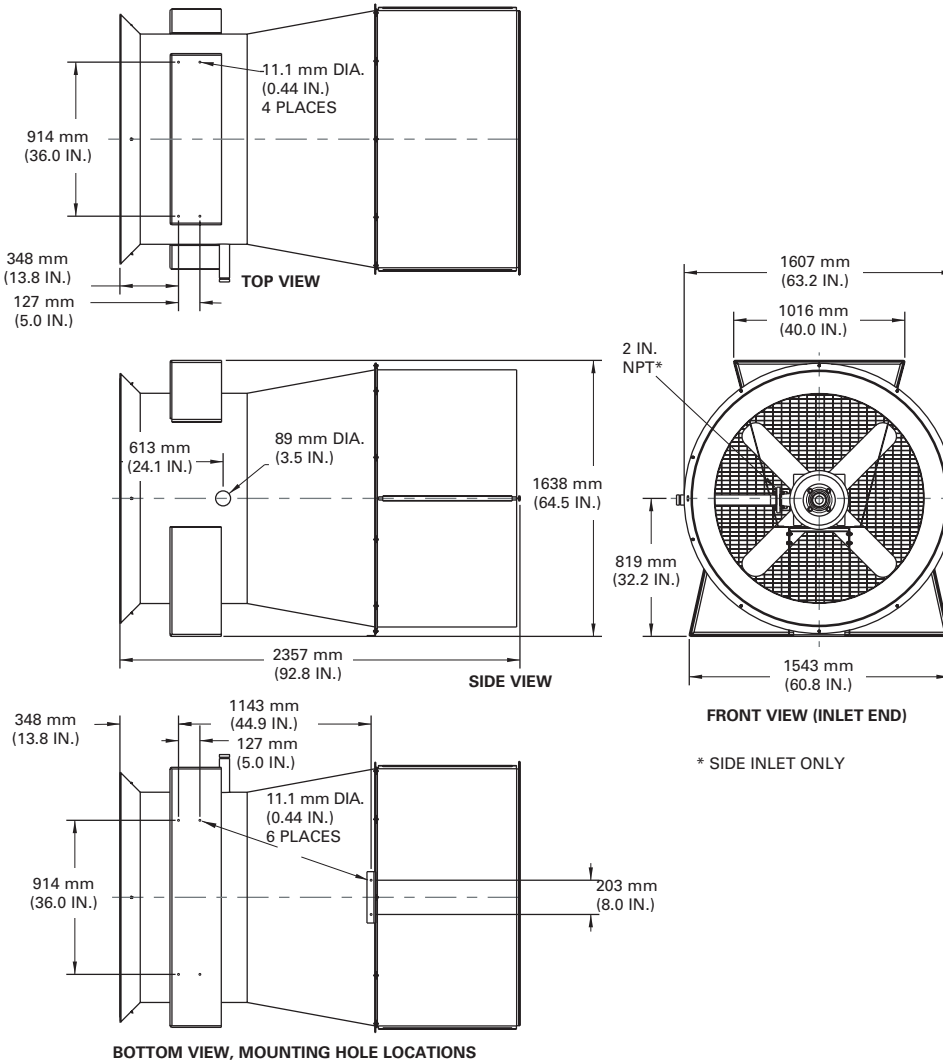
### Standard Models (Carbon Steel Construction)

Part Number	Generator Model	Weight		2% Approvals
		(kg)	(lb)	
438481	HIEX-2A	33	(73)	UL, CE
438482	HIEX-5A	116	(255)	UL, FM, CE
438483	HIEX-15A	180	(397)	UL, FM, CE
438485	HIEX-20	180	(397)	UL, CE
438487	HIEX-27	327	(720)	UL, FM, CE

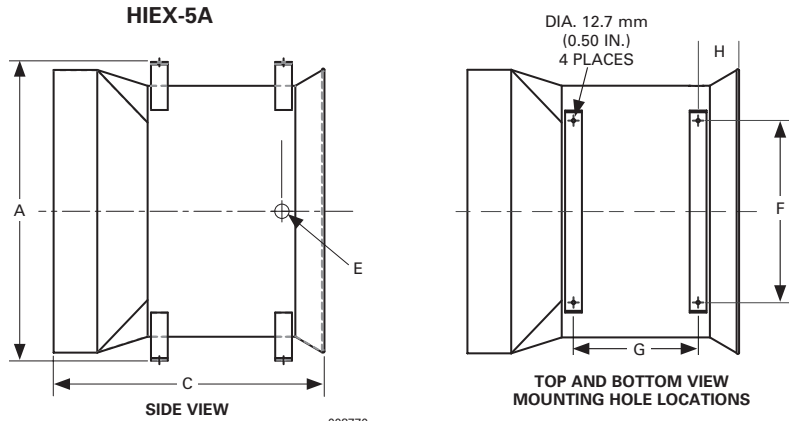
### LNG Models (Stainless Steel Construction)

Part Number	Generator Model	Weight		2% Approvals
		(kg)	(lb)	
438488	HIEX-2A LNG	33	(73)	UL, CE
438489	HIEX-5A LNG	116	(255)	UL, FM, CE
438492	HIEX-20 LNG	180	(397)	UL, CE

## HIEX-27 Dimensions



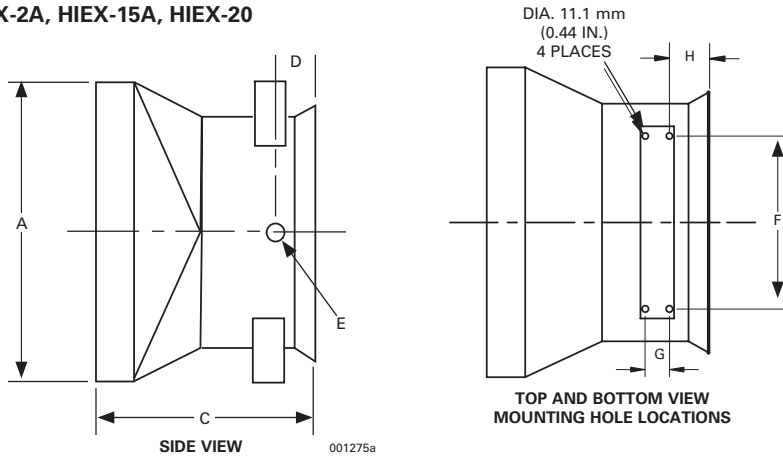
# General Dimensions



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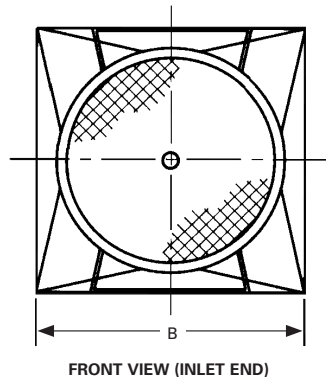
**HIEX-2A, HIEX-15A, HIEX-20**



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**ALL SQUARE OUTLET MODELS**



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Model	A		B		C		D		E	F		G		H	
	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)		NPT – in.	in.	(mm)	in.	(mm)	in.
HIEX-2A	25.0	(635)	25.0	(635)	30.1	(764)	3.9	(99)	1.0	16.0	(406)	–	–	3.3	(83)
HIEX-5A	44.5	(1130)	42.1	(1069)	40.3	(1024)	6.4	(154)	1.5	27.0	(686)	18.5	(470)	6.1	(156)
HIEX-15A	64.0	(1629)	64.0	(1629)	46.0	(1178)	8.5	(219)	2.0	36.0	(914)	5.0	(127)	8.0	(213)
HIEX-20	64.0	(1629)	64.0	(1629)	46.0	(1178)	8.5	(219)	2.0	36.0	(914)	5.0	(127)	8.0	(213)

**Note:** The converted values in this document are provided for dimensional reference only and do not reflect an actual measurement. SKUM and the product names listed in this material are marks and/or registered marks. Unauthorized use is strictly prohibited.