

# Fire suppression system for engine compartment

Issued to

**Fogmaker International AB**

Box 8005, 350 08 Växjö, Sweden

## Product and product name

Fire suppression system, Fogmaker

## Type

Water based fire suppression system

Extinguishing agents:

- Temper S and 3% AFFF

- H2O and 1% AFFF

## Technical data/Performance/Classification

See appendix to this certificate.

## Certificate

The product described above fulfils the requirements in RISE Certification rules regarding Fire suppression systems in engine compartments of buses and coaches, SPCR 183 edition 2017-09-08. The certification is based on the manufacturer's technical file and type tests performed in accordance with standards specified in the appendix to this certificate.

## Marking

Marking shall show SPCR 183, RISE logo, manufacturer's logo, the number of this certificate, the name of the product, its serial number, the name of the manufacturer and RISE P-symbol. See appendix for details.

## Validity

This certificate is valid until not longer than 26<sup>th</sup> May 2024.

## Miscellaneous

The manufacturer's in-house inspection is under surveillance by RISE in accordance with section 4 and 5 of SPCR 183. Other terms and conditions are set out in section 6 of SPCR 183.

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2017-08-24



9P05741



### Product information

#### Technical data of the tested suppression system

Table 1a-1e shows technical data of the suppression system tested for 4 m<sup>3</sup> engine compartment volumes. The system may be scaled to fit the size of a specific engine compartment according to the scaling rules in SPCR 183.

**Table 1a**, Technical data of the tested Fogmaker fire suppression system with 13 nozzles and an agent container pressurized to 105 bar

Manufacturer	Fogmaker International AB
Fire suppression system name	Fogmaker
Extinguishing agent name	Temper S and 3% AFFF
Extinguishing agent type	Water based
Extinguishing agent mass	12,2 kg
Extinguishing agent container	6,5L + 4,0L
Extinguishing agent container article number	1062-02-020 + 1042-02-020
Propellant gas	Nitrogen
Mass of propellant gas	262 g
Extinguishing agent container pressure	105 bar (at +20°C)
Extinguishing agent delivery hose	Two (2) ¼" hoses of 2.3 m and 1.0 m
Extinguishing agent delivery pipes	Steel pipes. Inner diameter 6 mm
Type of nozzles	10 pcs hollow cone nozzles (1.2 litre/min) 3 pcs hollow cone nozzles (3.5 litre/min)
Number of nozzles	13
Distance to the most remote nozzle	3,75 m
Total length of agent delivery system	10,5 m
Number of fittings	12 pcs. Straight fittings 17 pcs. Tee fittings



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**Table 1b**, Technical data of the tested Fogmaker fire suppression system with 14 nozzles and an agent container pressurized to 65 bar

<b>Manufacturer</b>	<b>Fogmaker International AB</b>
<b>Fire suppression system name</b>	Fogmaker
<b>Extinguishing agent name</b>	Temper S and 3% AFFF
<b>Extinguishing agent type</b>	Water based
<b>Extinguishing agent mass</b>	11,3 kg
<b>Extinguishing agent container</b>	6,5L + 4,0L
<b>Extinguishing agent container article number</b>	1062-02-020 + 1042-02-020
<b>Propellant gas</b>	Nitrogen
<b>Mass of propellant gas</b>	238 g
<b>Extinguishing agent container pressure</b>	65 bar (at +20°C)
<b>Extinguishing agent delivery hose</b>	Two (2) ¼" hoses of 2.3 m and 1.0 m
<b>Extinguishing agent delivery pipes</b>	Steel pipes. Inner diameter 6 mm
<b>Type of nozzles</b>	10 pcs hollow cone nozzles (1.2 litre/min) 4 pcs hollow cone nozzles (3.5 litre/min)
<b>Number of nozzles</b>	14
<b>Distance to the most remote nozzle</b>	3,75 m
<b>Total length of agent delivery system</b>	10,5 m
<b>Number of fittings</b>	14 pcs. Straight fittings 16 pcs. Tee fittings



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**Table 1c**, Technical data of the tested Fogmaker fire suppression system with 13 nozzles and an agent container pressurized to 65 bar

<b>Manufacturer</b>	<b>Fogmaker International AB</b>
<b>Fire suppression system name</b>	Fogmaker
<b>Extinguishing agent name</b>	Temper S and 3% AFFF
<b>Extinguishing agent type</b>	Water based
<b>Extinguishing agent mass</b>	11,3 kg
<b>Extinguishing agent container</b>	6,5L + 4,0L
<b>Extinguishing agent container article number</b>	1062-02-020 + 1042-02-020
<b>Propellant gas</b>	Nitrogen
<b>Mass of propellant gas</b>	238 g
<b>Extinguishing agent container pressure</b>	65 bar (at +20°C)
<b>Extinguishing agent delivery hose</b>	Two (2) ¼" hoses of 2.3 m and 1.0 m
<b>Extinguishing agent delivery pipes</b>	Steel pipes. Inner diameter 6 mm
<b>Type of nozzles</b>	9 pcs hollow cone nozzles (1.2 litre/min) 4 pcs hollow cone nozzles (3.5 litre/min)
<b>Number of nozzles</b>	13
<b>Distance to the most remote nozzle</b>	3,75 m
<b>Total length of agent delivery system</b>	10,5 m
<b>Number of fittings</b>	14 pcs. Straight fittings 16 pcs. Tee fittings



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**Table 1d**, Technical data of the tested Fogmaker fire suppression system with 15 nozzles and an agent container pressurized to 105 bar

<b>Manufacturer</b>	<b>Fogmaker International AB</b>
<b>Fire suppression system name</b>	Fogmaker
<b>Extinguishing agent name</b>	H <sub>2</sub> O and 1% AFFF
<b>Extinguishing agent type</b>	Water based
<b>Extinguishing agent mass</b>	12,2 kg
<b>Extinguishing agent container</b>	2 x 6,5L
<b>Extinguishing agent container article number</b>	1062-02-0AS-020
<b>Propellant gas</b>	Nitrogen
<b>Mass of propellant gas</b>	262 g
<b>Extinguishing agent container pressure</b>	105 bar (at +20°C)
<b>Extinguishing agent delivery hose</b>	Two (2) ¼" hoses of 2 m each
<b>Extinguishing agent delivery pipes</b>	Steel pipes. Inner diameter 6 mm
<b>Type of nozzles</b>	9 pcs hollow cone nozzles (1.2 litre/min) 6 pcs hollow cone nozzles (3.5 litre/min)
<b>Number of nozzles</b>	15
<b>Distance to the most remote nozzle</b>	4,0 m
<b>Total length of agent delivery system</b>	11,8 m
<b>Number of fittings</b>	14 pcs. Straight fittings 17 pcs. Tee fittings



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**Table 1e**, Technical data of the tested Fogmaker fire suppression system with 16 nozzles and an agent container pressurized to 105 bar

<b>Manufacturer</b>	<b>Fogmaker International AB</b>
<b>Fire suppression system name</b>	Fogmaker
<b>Extinguishing agent name</b>	H <sub>2</sub> O and 1% AFFF
<b>Extinguishing agent type</b>	Water based
<b>Extinguishing agent mass</b>	13,1 kg
<b>Extinguishing agent container</b>	2 x 6,5L
<b>Extinguishing agent container article number</b>	1062-02-0AS-020
<b>Propellant gas</b>	Nitrogen
<b>Mass of propellant gas</b>	259 g
<b>Extinguishing agent container pressure</b>	105 bar (at +20°C)
<b>Extinguishing agent delivery hose</b>	Two (2) ¼" hoses of 4 m each
<b>Extinguishing agent delivery pipes</b>	Steel pipes. Inner diameter 6 mm
<b>Type of nozzles</b>	12 pcs hollow cone nozzles (1.2 litre/min) 4 pcs hollow cone nozzles (3.5 litre/min)
<b>Number of nozzles</b>	16
<b>Distance to the most remote nozzle</b>	11,8 m
<b>Total length of agent delivery system</b>	21,8 m
<b>Number of fittings</b>	6 pcs. Straight fittings 18 pcs. Tee fittings 1 pcs. Elbow fittings



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### Performance - Tested fire scenarios according to SP Method 4912

A summary of the results can be found in Table 2a-2e. The test numbers refer to SP Method 4912. More information about the tests is shown in the test report. The sign (-) indicates that the test has not been used as a basis for this approval.

**Table 2a**, Fogmaker fire suppression system with 13 nozzles and an agent container pressurized 105 bar. Suppression agent: Temper S and 3% AFFF.

Test	Air flow	Test scenario category	Results
1	0 m <sup>3</sup> /s	High fire load test Minimum operating temp. test T <sub>min</sub> = -30 °C	Pass Pass
2	0 m <sup>3</sup> /s	Low fire load test	Pass*
3	0 m <sup>3</sup> /s	Hidden fire test	-
4	0.5 m <sup>3</sup> /s	Class A-fire test	Pass
5	1.5 m <sup>3</sup> /s	High fire load test	Pass
6	1.5 m <sup>3</sup> /s	Low fire load test	Pass*
7	1.5 m <sup>3</sup> /s	Hidden fire test	-
8	3 m <sup>3</sup> /s	High fire load test	-
9	3 m <sup>3</sup> /s	Low fire load test	Pass*
10	3 m <sup>3</sup> /s	Hidden fire test	-
11	0 m <sup>3</sup> /s	Hot surface re-ignition	No re-ignition

\* Passed with an amount of agent reduced by 20% compared to the ordinary amount of agent.

**Table 2b**, Fogmaker fire suppression system with 14 nozzles and an agent container pressurized 65 bar. Suppression agent: Temper S and 3% AFFF.

Test	Air flow	Test scenario category	Results
1	0 m <sup>3</sup> /s	High fire load test Minimum operating temp. test T <sub>min</sub> = -30 °C	Pass Pass
2	0 m <sup>3</sup> /s	Low fire load test	Pass*
3	0 m <sup>3</sup> /s	Hidden fire test	Pass
4	0.5 m <sup>3</sup> /s	Class A-fire test	Pass
5	1.5 m <sup>3</sup> /s	High fire load test	Pass
6	1.5 m <sup>3</sup> /s	Low fire load test	Pass*
7	1.5 m <sup>3</sup> /s	Hidden fire test	-
8	3 m <sup>3</sup> /s	High fire load test	-
9	3 m <sup>3</sup> /s	Low fire load test	Pass*
10	3 m <sup>3</sup> /s	Hidden fire test	-
11	0 m <sup>3</sup> /s	Hot surface re-ignition	No re-ignition

\* Passed with an amount of agent reduced by 20% compared to the ordinary amount of agent.

**Table 2c**, Fogmaker fire suppression system with 13 nozzles and an agent container pressurized to 65 bar. Suppression agent: Temper S and 3% AFFF.

Test	Air flow	Test scenario category	Results
1	0 m <sup>3</sup> /s	High fire load test Minimum operating temp. test T <sub>min</sub> = -30 °C	Pass Pass
2	0 m <sup>3</sup> /s	Low fire load test	Pass*
3	0 m <sup>3</sup> /s	Hidden fire test	-
4	0.5 m <sup>3</sup> /s	Class A-fire test	Pass
5	1.5 m <sup>3</sup> /s	High fire load test	Pass
6	1.5 m <sup>3</sup> /s	Low fire load test	Pass*
7	1.5 m <sup>3</sup> /s	Hidden fire test	-
8	3 m <sup>3</sup> /s	High fire load test	-
9	3 m <sup>3</sup> /s	Low fire load test	Pass*
10	3 m <sup>3</sup> /s	Hidden fire test	-
11	0 m <sup>3</sup> /s	Hot surface re-ignition	No re-ignition

\* Passed with an amount of agent reduced by 20% compared to the ordinary amount of agent.

**Table 2d**, Fogmaker fire suppression system with 15 nozzles and an agent container pressurized to 105 bar. Suppression agent: H<sub>2</sub>O and 1% AFFF.

Test	Air flow	Test scenario category	Results
1	0 m <sup>3</sup> /s	High fire load test Minimum operating temp. test T <sub>min</sub> = 0 °C	Pass Pass
2	0 m <sup>3</sup> /s	Low fire load test	Pass*
3	0 m <sup>3</sup> /s	Hidden fire test	-
4	0.5 m <sup>3</sup> /s	Class A-fire test	Pass
5	1.5 m <sup>3</sup> /s	High fire load test	Pass
6	1.5 m <sup>3</sup> /s	Low fire load test	Pass*
7	1.5 m <sup>3</sup> /s	Hidden fire test	-
8	3 m <sup>3</sup> /s	High fire load test	-
9	3 m <sup>3</sup> /s	Low fire load test	Pass*
10	3 m <sup>3</sup> /s	Hidden fire test	-
11	0 m <sup>3</sup> /s	Hot surface re-ignition	No re-ignition

\* Passed with an amount of agent reduced by 20% compared to the ordinary amount of agent.



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**Table 2e**, Fogmaker fire suppression system with 16 nozzles and an agent container pressurized to 105 bar. Suppression agent: H<sub>2</sub>O and 1% AFFF.

Test	Air flow	Test scenario category	Results
1	0 m <sup>3</sup> /s	High fire load test Minimum operating temp. test T <sub>min</sub> = 0 °C	Pass Pass
2	0 m <sup>3</sup> /s	Low fire load test	Pass*
3	0 m <sup>3</sup> /s	Hidden fire test	-
4	0.5 m <sup>3</sup> /s	Class A-fire test	Pass
5	1.5 m <sup>3</sup> /s	High fire load test	Pass
6	1.5 m <sup>3</sup> /s	Low fire load test	Pass*
7	1.5 m <sup>3</sup> /s	Hidden fire test	-
8	3 m <sup>3</sup> /s	High fire load test	-
9	3 m <sup>3</sup> /s	Low fire load test	Pass*
10	3 m <sup>3</sup> /s	Hidden fire test	-
11	0 m <sup>3</sup> /s	Hot surface re-ignition	No re-ignition

\* Passed with an amount of agent reduced by 20% compared to the ordinary amount of agent.



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### Assessment - Rating according to SP Method 4912

A summary of the results can be found in Table 3a-3c. The rating numbers refer to SP Method 4912. More information about the tests is shown in the test report.

**Table 3a**, Rating according to SP Method 4912. Fogmaker fire suppression system with 13 nozzles and an agent container pressurized to 105 bar. Suppression agent: Temper S and 3% AFFF.

Category	Category Rating
1 High fire load	2
2 Low fire load	3
3 Class A-fire	1
4 Hidden fire	0
5 Hot surface re-ignition protection	No re-ignition
<b>Total Rating</b>	<b>6</b>

**Table 3b**, Rating according to SP Method 4912. Fogmaker fire suppression system with 14 nozzles and an agent container pressurized 65 to bar. Suppression agent: Temper S and 3% AFFF.

Category	Category Rating
1 High fire load	2
2 Low fire load	3
3 Class A-fire	1
4 Hidden fire	1
5 Hot surface re-ignition protection	No re-ignition
<b>Total Rating</b>	<b>7</b>

**Table 3c**, Rating according to SP Method 4912. Fogmaker fire suppression system with 13 nozzles and an agent container pressurized to 65 bar. Suppression agent: Temper S and 3% AFFF.

Category	Category Rating
1 High fire load	2
2 Low fire load	3
3 Class A-fire	1
4 Hidden fire	0
5 Hot surface re-ignition protection	No re-ignition
<b>Total Rating</b>	<b>6</b>



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**Table 3d**, Rating according to SP Method 4912. Fogmaker fire suppression system with 15 nozzles and an agent container pressurized to 105 bar. Suppression agent: H<sub>2</sub>O and 1% AFFF.

Category	Category Rating
1 High fire load	2
2 Low fire load	3
3 Class A-fire	1
4 Hidden fire	0
5 Hot surface re-ignition protection	No re-ignition
<b>Total Rating</b>	<b>6</b>

**Table 3e**, Rating according to SP Method 4912. Fogmaker fire suppression system with 16 nozzles and an agent container pressurized to 105 bar. Suppression agent: H<sub>2</sub>O and 1% AFFF.

Category	Category Rating
1 High fire load	2
2 Low fire load	3
3 Class A-fire	1
4 Hidden fire	0
5 Hot surface re-ignition protection	No re-ignition
<b>Total Rating</b>	<b>6</b>

### Component tests

In addition to fire tests components in the fire suppression system need to be verified and tested through international standards as specified below.

**Table 4**

Property	Standard	Result
Mechanical stress resistance (vibration and shock)	ISO 16750-3:2007 (Test VII)	Pass
Corrosion resistance	ISO 21207, test method B (3 cycles)	Pass



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### Conditions

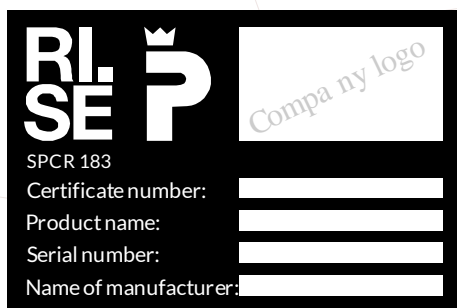
Electrical equipment included in the system shall have a classification of at least IP65, and tested in accordance with IEC 60529:1989/A1:2009/COR3:2009.

A risk assessment in accordance with SPCR 183 section 3.2 shall be made prior to equipment being placed into service. The risk assessment shall be made by personnel having documented experience for the task.

It is the responsibility of the suppression system manufacturer to assure compliance of its suppression system components with legal requirements and vehicle manufacturer requirements.

The marking of the product shall be legible and durable and be placed adjacent to the engine compartment and be designed as below. The size of the sign shall be 40 x 60 mm.

Marking plate template:



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