

**HI-FOG[®] 1900 SPRINKLER
WITH
A1000 TYPE ASSEMBLY BODY WITH STOP VALVE
IDENTIFICATION AND CORRECTION PROCEDURE**

The purpose of this document is to provide guidance and instructions for corrective actions required to mitigate the risk of HI-FOG 1900 sprinkler installed in some A1000 type assembly bodies with an internal stop valve as referred to in *Safety Bulletin 2017\004*.

The information in this document is in the following order:

Introduction and General Work Instructions

1. Background information
2. Affected and other HI-FOG sprinkler types
3. Affected and other Assembly Bodies
4. Corrective Actions
5. Troubleshooting

Appendix A: Follow-Up form

Appendix B: Summary of Product Types Differences

CAUTION

HI-FOG Systems comprise mechanical components and employ high-pressure for water pressurization.

System installation embraces high-pressure testing of discharge tubing.

Care must be taken to ensure that in the installation all relevant procedures are followed to the satisfaction of the authority having jurisdiction and that only competent personnel, appropriately trained, are permitted to install, test, commission and service the system.

1. Background information

Installation of HI-FOG sprinklers consists of HI-FOG sprinkler inserted into a specifically built Assembly Body, also known as 'Mounting Adaptor'.



Figure 01 : HI-FOG sprinkler in Assembly Body

The A1000 Assembly Bodies were built to accommodate the HI-FOG 1000 sprinklers. Some types of this Assembly Body include an internal stop valve that prevents the flow through the Assembly Body if the sprinkler is removed.

The HI-FOG 1900 sprinklers have been developed as replacement of HI-FOG 1000 sprinklers using some of the improvements presented in the HI-FOG 2000 sprinklers.

For some of the Assembly Body type A1000, there is a risk that a HI-FOG 1900 sprinkler will press the internal stop valve beyond the intended range and thus may diminish or in the worst case prevent the water flow to the sprinkler in case of discharge.

The risk is limited to the specific Assembly Body types, used in combination with HI-FOG 1900 sprinklers.

The risk does not extend to other Assembly Body types, to Assembly Bodies without internal stop valve or to any other HI-FOG sprinklers with any Assembly Body.

See details in the following sections to identify the affected components.

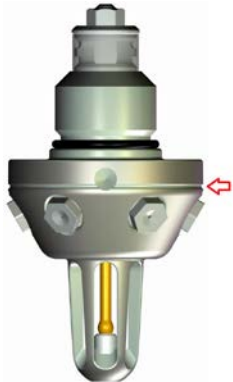



2. Affected and other HI-FOG sprinkler types

The risk and the related corrective action required are relevant for HI-FOG 1900 sprinklers only.

Other HI-FOG sprinkler types require none of the actions referred to by this document.

To differentiate the HI-FOG 1900 sprinkler from other HI-FOG sprinkler types note the following features:

- a. HI-FOG 1000 sprinkler have a similar conical shape as the HI-FOG 1900, but the **HI-FOG 1900 has a groove above the conical section** while the HI-FOG 1000 does not.
- b. HI-FOG 2000 and HI-FOG 3000 sprinklers do not have a conical section
- c. Other types, such as pop-up or machinery-space open spray-heads, that are not included in the illustration below, do not have a glass bulb.

			
<p>HI-FOG 1900</p> <p>Appearance:</p> <ul style="list-style-type: none"> - Cone shape - Groove above the cone 	<p>HI-FOG 1000</p> <p>Appearance:</p> <ul style="list-style-type: none"> - Cone shape - No groove 	<p>HI-FOG 2000</p> <p>Appearance:</p> <ul style="list-style-type: none"> - No cone - No groove 	<p>HI-FOG 3000</p> <p>Appearance:</p> <ul style="list-style-type: none"> - No cone - No groove
<p>Action Required</p>	<p>No Action Required</p>		
<p>Figure 02 : HI-FOG sprinkler types</p>			

3. Affected and other Assembly Bodies

The risk and the related corrective action required are relevant only for HI-FOG 1900 sprinklers (see Chapter 2 to identify) when installed in some A1000 types Assembly Body, which contain an internal stop valve.

HI-FOG sprinkler installed in other types of Assembly Body require none of the actions referred to by this document.

To differentiate the A1000 Assembly Body from other Assembly Body types note the following:

- a. **With the A1000** type Assembly body there is no gap between the HI-FOG 1900 sprinkler and the cover plate when the HI-FOG 1900 sprinkler is installed (see **Figure 01**). The cover plate (see **Figure 01**) of **A1000 Assembly body** types is held in place by the sprinkler.
- b. The **A2000 Assembly body** type is suitable only for HI-FOG 2000 sprinklers (see **Figure 02** for sprinkler types).
- c. A HI-FOG 1900 sprinkler installed in an **AB** type Assembly body would either leave a 2 – 3 mm gap between the top of the sprinkler and the cover plate, or would have an adaptor ring filling the gap.

See **Figure 03** for AB types below – left half without adaptor ring and right half with adaptor ring. The cover plate of **AB** type is connected to the Mounting Adaptor with a lock ring.

- d. The **C** type the installation with HI-FOG 1900 sprinkler would leave a narrow gap between the top of the sprinkler and the cover plate - The cover plate of **C** type is snapped directly to the Assembly body.

<p>A1000 types</p> <p>Notes:</p> <ul style="list-style-type: none"> - Cover plate supported by the sprinkler : no gap 	<p>A2000 types</p> <p>Notes:</p> <ul style="list-style-type: none"> - Cover plate supported by the sprinkler : not applicable for HF 1900 	<p>AB types</p> <p>Notes:</p> <ul style="list-style-type: none"> - Cover plate supported by lock ring : gap or adaptor ring 	<p>C types</p> <p>Notes:</p> <ul style="list-style-type: none"> - Cover plate snapped to the Assembly Body : gap
<p>Action Required for HI-FOG 1900</p>		<p>No Action Required</p>	
<p>Figure 03 : Assembly Body types</p>			

4. Corrective Actions

As corrective action the O-ring needs to be replaced and a spacer plate needs to be added to each HI-FOG 1900 sprinkler installed in A1000 type assembly body with an internal stop valve.

Note: These instructions are intended for HI-FOG systems with electric powered pump units.
 For **GPU** (Gas-driven Pump Units) please contact Marioff for system specific instructions.

4.1. Required Documents and Tools

To assure all affected sprinklers are addressed, it is recommended to prepare a work plan before starting the work.

The following documents are recommended to be used in the process:

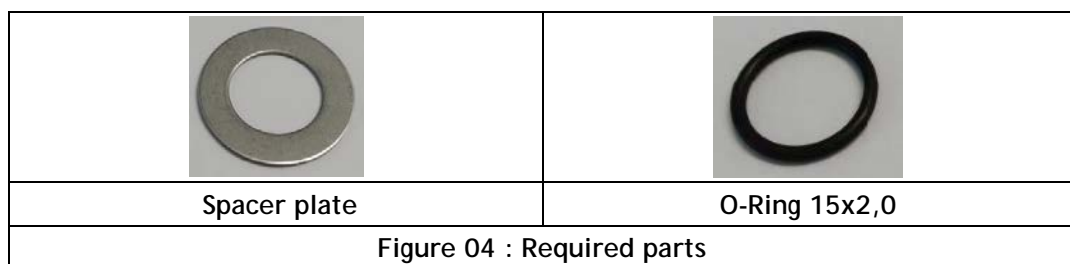
- HI-FOG sprinkler layout drawing to provide the locations of all potentially affected sprinklers, section valves and flushing valves which will be used during the modification process.

Please note that even though the HI-FOG sprinkler layout drawings indicate HI-FOG 1000 sprinklers they may have been replaced by HI-FOG 1900 sprinklers during testing or service.

- **Appendix A** of this document contains a follow-up table for the checking and adjusting of sprinklers.

Required parts:







- Spacer Ring, Marioff item code 2000267114
- O-Ring 15x2,0, Marioff item code 2000297566



Required tools (see Figure 05 for details):

- O-Ring assembly tool; item code 2000297565
- Sprinkler key; item code M11015 or Sprinkler dismounting tool; item code W-0010888
- Flushing hose; item code M14510 or Section valve test hose; item code D23050 or Section valve test hose; item code D23040
- Buckets and rags as some spillage is expected when removing and reinstalling the sprinklers

- Ladder
- Scaffolding where needed

		
Sprinkler key item code M11015	Sprinkler dismounting tool item code W- 0010888	Flushing hose item code M14510
		
Section valve test hose item code D23050	Section valve test hose item code D23040	O-Rings assembly tool item code 2000297565
Figure 05 : Tools		

4.2. Preparations

Note: HI-FOG 1900 sprinklers can also be found as spare parts in storage.
 Make sure that also the spare HI-FOG 1900 sprinklers are included in the work plan.

Identify and log the location of all installed HI-FOG 1900 sprinklers. Use the HI-FOG sprinkler layout drawings as indication of potential locations of HI-FOG 1900 sprinklers (remember that HI-FOG 1900 sprinklers are replacements of HI-FOG 1000 sprinklers) and confirm the type visually (see Chapter 2 for details).

Identify and log the type of assembly body whenever possible by visual inspection (see Chapter 3 for details).

After mapping the location of all potentially affected HI-FOG 1900 sprinklers which are mounted to A1000 type Assembly bodies, prepare a work plan that will assure all affected sprinklers will be taken into account when performing the corrective actions.

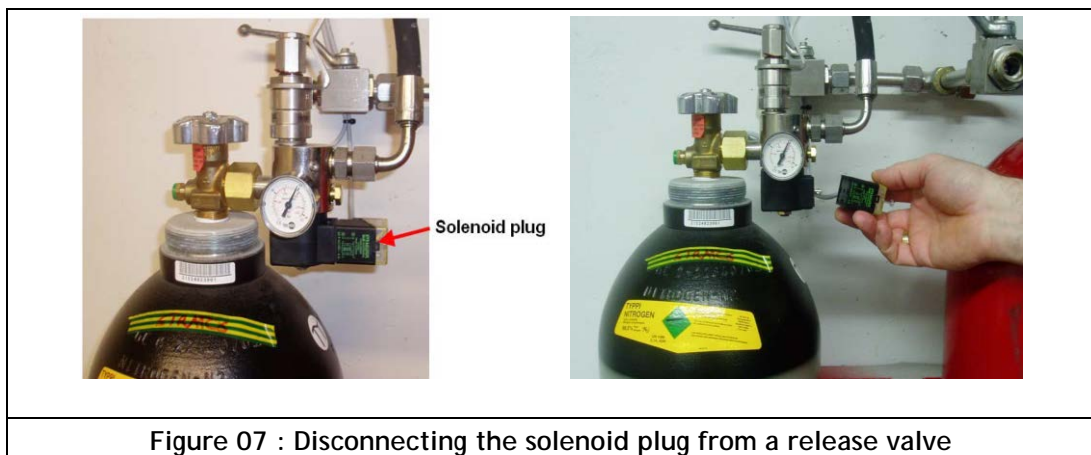
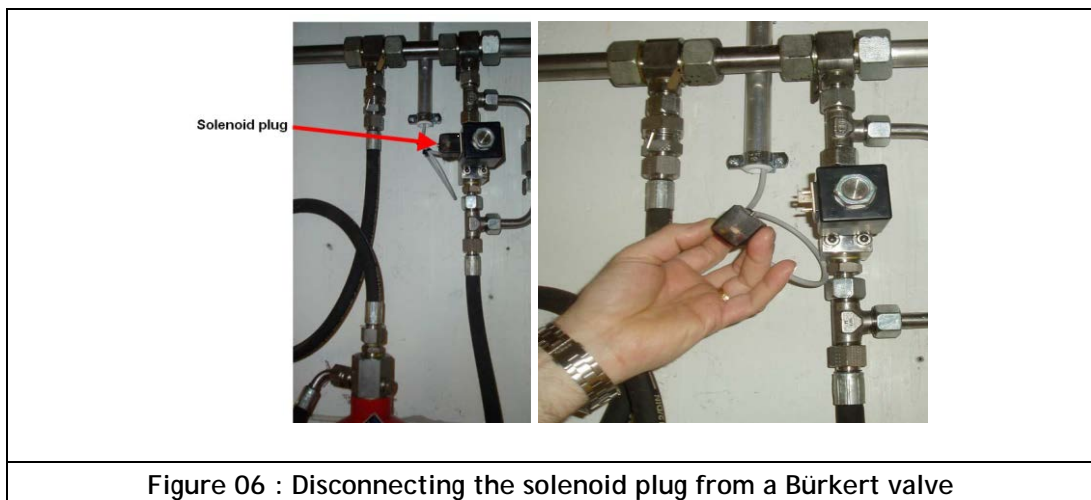
Before starting the work, inform the bridge and ECR that the HI-FOG system is partly out of operation during corrective actions to avoid accidental alarms!

4.3. Performing corrective actions

4.3.1. Isolate the Accumulator Units



Before starting corrective actions, switch on the Nitrogen blocking from the key switch on the control panel or disconnect the nitrogen accumulator unit (if applicable) to avoid the accidental release of nitrogen (see Figure 06 and Figure 07).



4.3.2. Isolate and de-pressurize the section under work

Before removing the sprinklers it is advisable to isolate (see **a** below) and depressurize the section where the HF1900 sprinklers will be modified to minimize the risks of spillage and false starting of the pump unit.

Depressurizing the section can be done either from the Flushing Valve (see **b** below) or from the Section Valve (see **c** below).

Figure 08 illustrates the schematic view of a typical section:

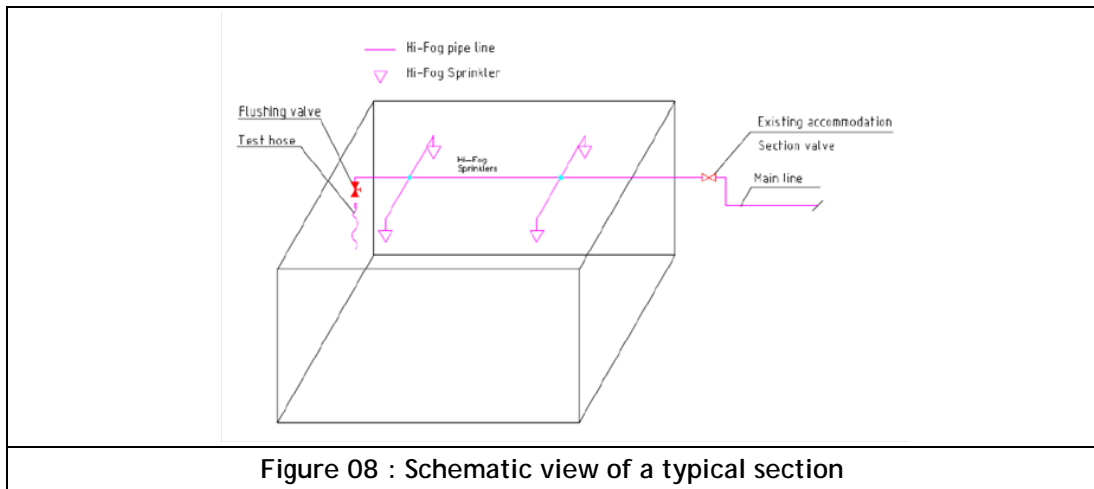


Figure 08 : Schematic view of a typical section

- a. Before depressurizing the section, make sure the section where corrective actions are being carried out is isolated by closing the section valve as illustrated below. (see **Figure 09**).

Note: Use your hands only to manually open or close the valve. Excessive force is not required and should not be used.

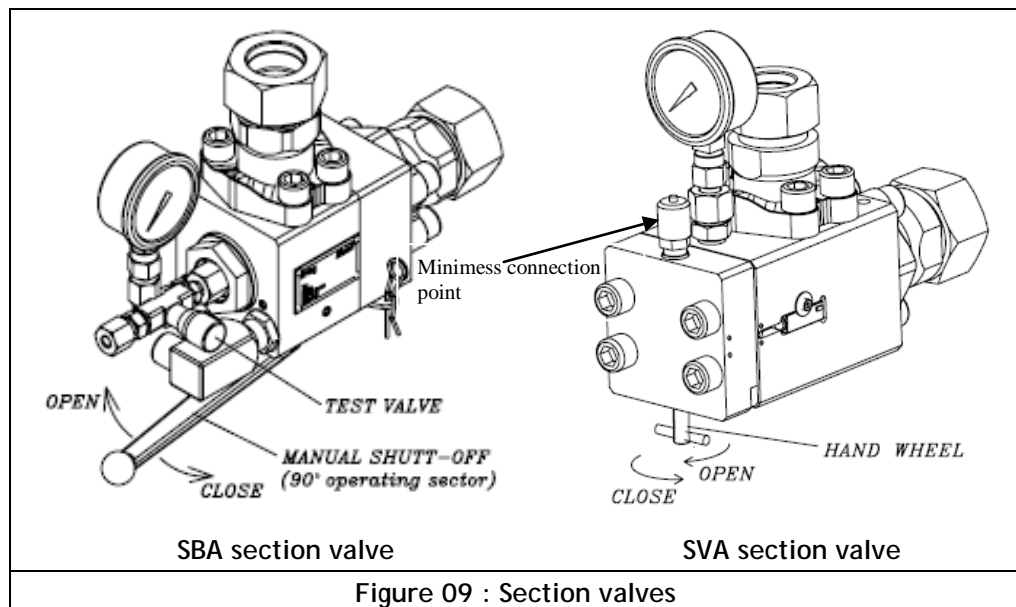


Figure 09 : Section valves

- b. The section can be depressurized from the flushing valve with a flushing hose (see **Figure 05**). The flushing valves of the sections should be marked on the HI-FOG sprinkler layout drawings. Flushing valves are equipped with a flushing valve sign (see **Figure 10**).



Figure 10 : Flushing valve sign

- Connect the flushing hose to the flushing valve.
 - Point the hose towards a sewer or a drain. Hold the hose firmly with both hands.
 - Open the flushing valve.
 - Let the water flow through long enough for the section to depressurize.
 - Close the flushing valve.
 - Disconnect the flushing hose from the flushing valve.
- c. The section can also be depressurized by connecting a test hose (see Figure 05) to the test valve of the section valve (see Figure 09). Hose item code **D23050** is suitable for SBA valves and **D23040** fits to the 'Minimes' connection on SVA valves.
- Connect the test hose to the section valve's test valve connection.
 - Point the hose towards a bucket or drain.
 - Slowly open the test valve connection.
 - Let water flow through long enough for the pressure to fully release.
 - Close the test valve.
 - Disconnect the hose.

4.3.3. Inspect and retrofit potentially affected Sprinklers

- a. Confirm that the Sprinkler is of type HI-FOG 1900 (see Chapter 2)
 Log the type and location of sprinkler in the Follow-Up sheet (Appendix A)

	Sprinkler		Location	
	Code*	Deck	Section	
e.g.	C-0006881	Deck 5	S017	
e.g.	C-0009072	Spare part stock		
1				

Figure 11 : Location and type of sprinkler

- b. Inspect the Assembly Body. If it is visually identified as other type than A1000 (see Chapter 3) then log the type in the follow up sheet (see Figure

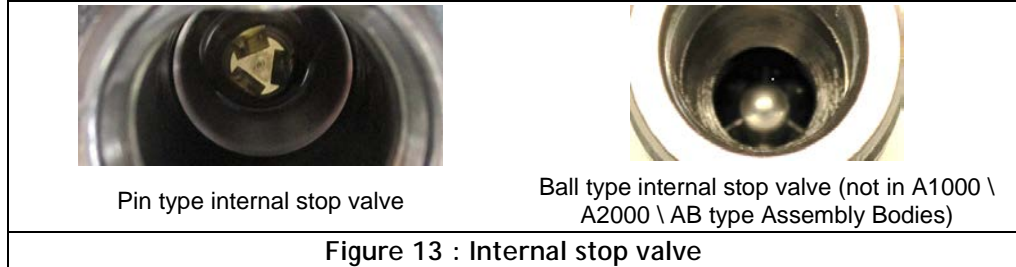
12) and continue to the next sprinkler, there are no corrective actions needed.

Location		Assembly body		
Deck	Section	Type**	stop valve [y/n]	Change Date***
Deck 5	S017	A1000	Y	21.Sep.17
Spare part stock		-	-	22.Sep.17

Figure 12 : Assembly Body type

- c. In case the Assembly Body cannot be visually identified, or is identified as A1000, remove the sprinkler by opening it with the correct sprinkler key or with a sprinkler dismantling tool (see Figure 05).
- Do not use excessive force or you might damage the sprinkler cage.
 - Use a rag or a bucket when removing the sprinkler to catch water collected in the assembly body.
- d. Inspect the Assembly Body. If it is **NOT** type A1000 (see Chapter 3) then log the type in the follow up sheet (see Figure 12) and continue to the next sprinkler.

If the type is A1000 then verify from the inside of the assembly body if there is an internal stop valve (see Figure 13).



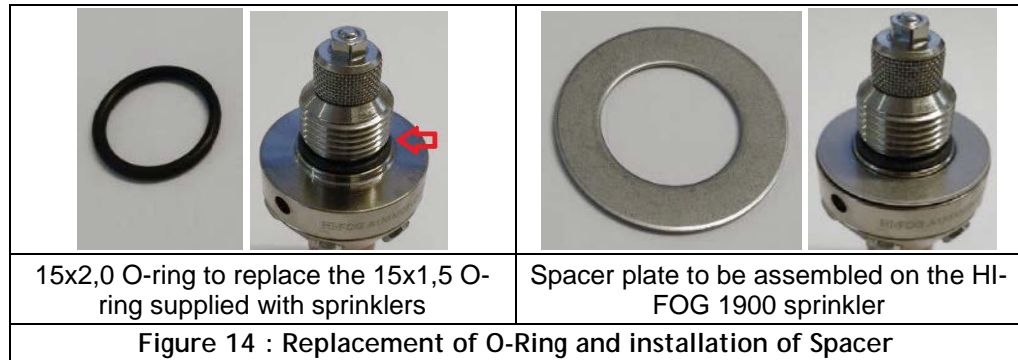
Log the type and existence \ absence of internal stop valve in the follow up sheet (see Figure 12).

If there is **NO** internal stop valve, reinstall the sprinkler (go to step **g** below).
If the type is A1000 AND there IS an internal stop valve then continue:

- e. Remove the 15x1,5 O-ring from the sprinkler (see Figure 14). Do not damage or scratch the sprinkler's sealing surface. Cut the removed O-Ring to assure it does not mix with the new seals.

Note: to avoid damage to the sealing surface do not use any metal tools for removing the O-Ring

- f. Install the new 15x2,0 O-ring to the sprinkler by placing the O-ring installation cone (see Figure 05) over the spindle and rolling the new O-ring onto the sprinkler until you are sure the O-ring sits correctly in its groove (see Figure 14).
- g. Install the spacer to the sprinkler (see Figure 14).



- h. Install the sprinkler and the cover plate back into place. Tighten it with the sprinkler key. Do not use excessive force.

Log in the follow-up sheet:

- Is a cover plate (see Figure 15) present (yes/no)
- Date of changing the O-Ring \ installing the spacer plate

NOTE: Do not use excessive force when tightening the sprinkler to avoid damaging the sprinkler.





- i. Remember to fill the record in the Follow-Up form before proceeding. Repeat the steps above until all potentially affected sprinklers in the section are corrected.

4.3.4. Pressurize and Flush the Section

After all sprinklers in the section have been addressed the section needs to be engaged to the system and the functionality of the section valve should be tested.

- a. Man the testing positions:
- Person A: at the control panel or mimic panel where you can reset the system
 - Person B: in the protected compartment or holding the flushing hose
 - Person C: at the flushing valve or section valve
- b. Open the section valve. The pump unit may start. Wait for it to reach 130 bars and reset the system by pressing the 'reset' button for two seconds. (Person A)

- 
- 
- c. Check that the system stabilizes to stand-by pressure (25 bars if not otherwise indicated). (Person A)
 - d. Check that there are no leaks from the installed sprinklers. (Person B and C)
 - e. Remove the plug from the flushing valve and connect the flushing hose to the flushing valve. Make sure that you can hold the flushing hose firmly with both hands during the system flushing and point it to a place where water can be safely sprayed. (Person B and C)

NOTE: The water exits the hose with high pressure. Be sure that you can hold the hose firmly with both hands!

- f. Open the flushing valve to create flow in the system. (Person C)
- g. The pump unit should activate within 1 minute.
- h. Check from the control / mimic panel or the ship automation system that the pump unit starts and verify that the correct section gives the correct alarm. Reset the audio alarm from the buzzer reset/acknowledge button. (Person A)
- i. Let water flow from the hose for a couple of minutes to flush the section. (Person B and C)
- j. Close the flushing valve. (Person C)
- k. Reset the system from the control panel after the flushing valve has been closed and the system has reached 130 bars pressure. (Person A)
- l. Check that the system stabilizes to stand-by pressure (25 bars if not otherwise indicated). (Person A)
- m. Disconnect the flushing hose from the flushing valve and install the plug back into place. (Person C)

After completing these steps proceed to the next section in the work plan.

4.4. Post Actions

After finalizing the corrective actions in all sections, the system should be put back into normal standby mode and the nitrogen accumulator unit should be switched back on / reconnected. (see Figure 06 and Figure 07).

NOTE: Make sure that there is no activation demand on for the HI-FOG system before reconnecting the nitrogen accumulator units!

- Inform the bridge and ECR that the work is completed and the system is in normal stand-by mode.

Send the filled Follow-Up form to Marioff quality@marioff.fi

5. Troubleshooting

5.1. Leakage of retrofitted or reinstalled sprinkler

Leakage can be caused e.g. when the O-ring is not replaced and the Spacer plate is used, when the O-ring is damaged or misplaced, or when the sealing surface on the sprinkler or the Assembly Body is scratched or contaminated.

Corrective actions:

- Depressurise the system
- Remove the sprinkler and make sure that all the surfaces of the sprinkler and the Assembly Body are clean and undamaged
- Replace the O-Ring and make sure it sits properly in its groove







5.2. Assembly Body type is not visibly like the listed types

The Safety Bulletin and this document focus on the relevant types, which are connected to the ceiling by assembly plates, and to several similar models.

Other types, e.g. models that are wall mounted, or that are bolted directly to the surface, do not require further action.

Exposed A1000 Assembly Bodies, with no cover plate, do require attention.


See **Figure 16** below for more examples.

		
A1000 Assembly body without cover plate Action as other A1000	Grooved Assembly body type No Action Required	Long Assembly body type No Action Required
		
Welded Tube Assembly body type No Action Required	Wall Mounting Assembly body type No Action Required	Surface Assembly body type No Action Required
Figure 16 : more Assembly Bodies		



5.3. Cover plate missing

Assembly Body type A1000 with or without cover plate (see Figure 01) needs to be addressed in the same manner.



Appendix A : Follow-Up form

SITE DATA	
Ship	IMO no.

	Sprinkler	Location		Assembly body		
	Code*	Deck	Section	Type**	stop valve [y/n]	Change Date***
e.g.	C-0006881	Deck 5	S017	A1000	Y	21.Sep.17
e.g.	C-0009072	Spare part stock		-	-	22.Sep.17
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						





* Item Code of a sprinkler is a series of letters and digits, starting with 'C', printed on the side of HI-FOG 1000 \ 1900 sprinklers


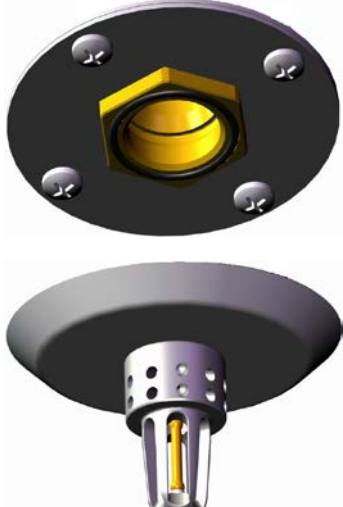


** Type : A1000 \ A2000 \ AB \ C (see Figure 03)

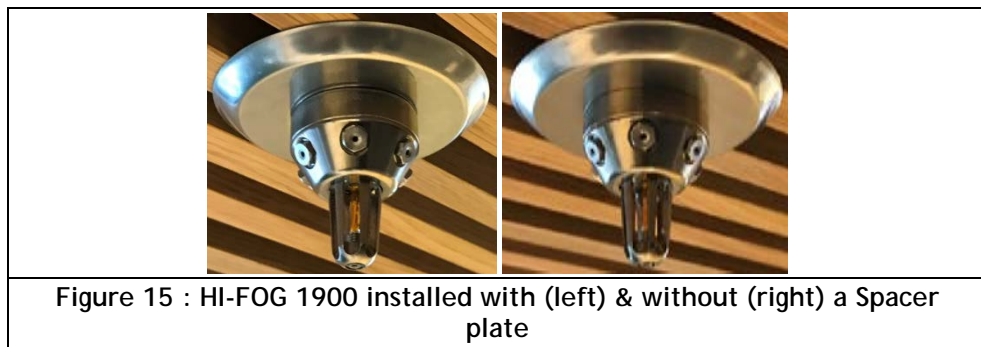
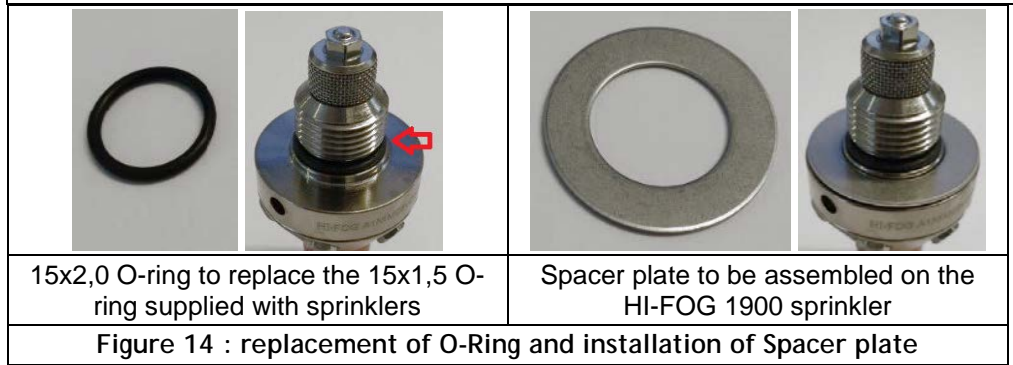
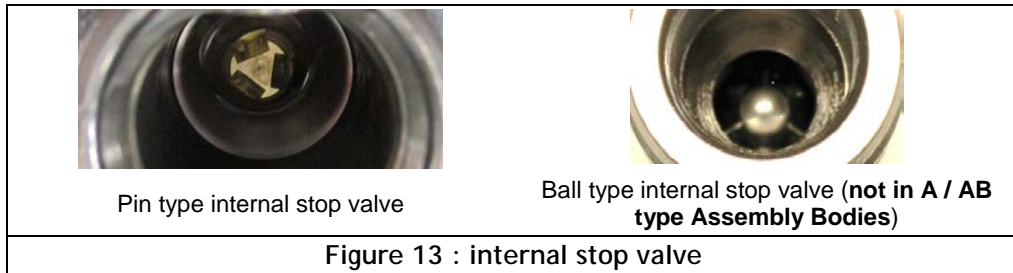
*** date of installing replacement O-Ring and Spacer OR 'X' if replacement not done







	Sprinkler	Location		Assembly body		
	Code*	Deck	Section	Type**	stop valve [y/n]	Change Date***
e.g.	C-0006881	Deck 5	S017	A1000	Y	21.Sep.17
e.g.	C-0009072	Spare part stock		-	-	22.Sep.17
15						
16						
17						
18						
19						
20						
21						
22						
23						
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30						
31						
32						
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...						

Appendix B : Summary of Product Types Differences

			
<p>HI-FOG 1900</p> <p>Appearance:</p> <ul style="list-style-type: none"> - Cone shape - Groove above the cone 	<p>HI-FOG 1000</p> <p>Appearance:</p> <ul style="list-style-type: none"> - Cone shape - No groove 	<p>HI-FOG 2000</p> <p>Appearance:</p> <ul style="list-style-type: none"> - No cone - No groove 	<p>HI-FOG 3000</p> <p>Appearance:</p> <ul style="list-style-type: none"> - No cone - No groove
Action Required	No Action Required		
Figure 02 : HI-FOG sprinkler types			

			
<p>A1000 types</p> <p>Notes:</p> <ul style="list-style-type: none"> - Cover plate supported by the sprinkler : no gap 	<p>A2000 types</p> <p>Notes:</p> <ul style="list-style-type: none"> - Cover plate supported by the sprinkler : not applicable for HF1900 	<p>AB types</p> <p>Notes:</p> <ul style="list-style-type: none"> - Plate supported by snap-ring : gap or spacer 	<p>C types</p> <p>Notes:</p> <ul style="list-style-type: none"> - Cover plate snapped to the Assembly Body with a lock ring : gap
Action Required for HI-FOG 1900	No Action Required		
Figure 03 : Assembly Body types			



		
A1000 Assembly body without cover plate Action as other A1000	Grooved Assembly body type No Action Required	Long Assembly body type No Action Required
		
Welded Tube Assembly body type: No Action Required	Wall Mounting Assembly body type: No Action Required	Surface Assembly body type: No Action Required
Figure 16 : more Assembly Bodies		