



CO2 High Pressure Fire Suppression System



Single area, pneumatic Maintenance Instruction

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Amendments

AMENDMENT INCORPORATION RECORD		
Amendment Number	Brief Description of Content	Name of Person Incorporating Amendment
1 2005-10-06	Updated to AFS standard	L. Elsrud
2 2009-09-10	Updated, split users manual into separate booklets.	L. Elsrud
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1 FOREWORD

This manual is written for those who design, install and maintain Heien-Larsen CO2 high pressure fire suppression systems.

IMPORTANT

Autronica Fire and Security AS assumes no responsibility for application of any system other than those addressed in this manual. The technical data Autronica Fire and Security AS believes this data to be accurate, but it is published and presented without any guarantee or warranty whatsoever. Autronica Fire and Security AS disclaims any liability for any use that may be made of the data and information contained herein by any and all other parties.

The Heien-Larsen CO2 high pressure fire suppression systems are to be designed, installed, inspected, tested and recharged by qualified and trained personnel in accordance with the following.

- All instructions, limitations, etc. contained in this manual.
- Storage, handling, transportation, service, maintenance, recharge and test of agent storage containers shall be performed only by qualified and trained personnel in accordance with the information in this manual and the relevant compressed gas standard.
- Regulations imposed by the class, flag state or Authorities Having Jurisdiction for the hazard to be protected.

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2 MAINTENANCE INSTRUCTION

2.1 Introduction.

Procedures laid down in this manual should be followed strictly. If deviations from this procedures are made H-L should be informed as this may result in system failure.

2.2 Precautions.

Make sure that all personnel are informed that the CO₂ - system shall be tested, and the none are left in the protected space as an accidental release of CO₂ will be life threatening to personnel in the flooded area.

Check that the ventilation is running.

2.3 Periodical control of the CO₂ - system.

The CO₂ - system shall be tested and certified by the manufacturer or by representative authorised by him as follows.

Passenger ships / Onshore installations.	:	Every year
Commercial ships	:	Every second year

2.3.1 CO₂ - gas content.

Using a liquid level indicator can check liquid level on the cylinders, if available on board. If liquid level is below required level according to bar chart the cylinder must be weighed. Please note that level varies with temperature.

If a liquid level indicator is not available the cylinders has to be weighed. The total weight shall be as stamped on the cylinders. The total content of CO₂ - gas in the system shall be within a limit of +/- 10%.

If the weight is to low the cylinder must be sent to for recharging.

Bar chart for liquid level, reference is made chapter 2.7

2.3.2 CO₂ - Cylinder valves.

Check cylinder valves for damages. If a damage is observed the cylinder has to be taken on-shore for repair.

2.3.3 CO₂ - discharge hose.

The connections between the CO₂ - cylinder valve and the manifold shall be checked for leakage as follows.

Pressurise the manifold by compressed air, 6 - 10 Bar. Check for leakage. If a leakage is observed try to tighten the coupling, or if necessary replace the hose with one from the spare stored on board.

If all connections are tight, continue as follows.

Open and close quickly each CO₂ - cylinder valve manually by using the handle. The pressure gauge will indicate 50 - 55 Bar. Check again for possible leakage and tighten if necessary.

2.3.4 CO₂ - Manifold.

Check all connection on the CO₂ - manifold for leakage. All leaks has to be tightened.

2.3.5 CO₂ - master valve.

Open the CO₂ - master valve by hand. CO₂ - gas from the manifold will be blown through the piping to the protected space. The alarm siren will start and the ventilation will stop.

2.3.6 Ventilation.

Re-start the ventilation to the area protected.

NOTE: The CO₂ - Content shall be checked before the area is entered.

2.3.7 CO₂ - Pilot hose.

The following action has to be executed before the pilot manifold / flexible hoses are pressure tested.

Remove all CO₂ - Discharge hoses and install the blind cap on all the CO₂ - cylinder valves.

Remove the flexible hose to the pneumatic operated master valve and blind the hose.

Apply nitrogen pressure to the pilot manifold using nitrogen. Test pressure to be 100 Bar. Check for leakage. All leakage shall be tightened and damaged flexible hoses shall be replaced.

2.3.8 Instruction signs and operating instructions.

Check that all instruction signs and operating instructions are in good condition and properly fastened.

2.3.9 CO₂ - Cylinder clamps.

Check that all cylinders are properly secured and that all clamps are tightened.

2.3.10 CO₂ - Pilot cylinders.

The CO₂ - pilot cylinders shall be removed from the release cabinet and weighed. The gross weight shall be as stamped on the cylinder neck. The pilot cylinder shall be refilled if 10 % or more of the gas has leaked out.

2.3.11 CO₂ - pipes / CO₂ – nozzles

All CO₂ – pipes shall be tested using instrument air or equal from the master valve to the protected areas. Pressure to be 6 - 10 Bar.

A piece of tape to be fitted to all nozzle openings. Connect air source to the air blowing through valve. Open the master valve to the protected area and pressurise the piping. Check that the tape has been blown off from all the nozzles.

2.4 Monthly check.

The CO₂ - system should be checked once a month as follows.

2.4.1 CO₂ - discharge hose / pilot hoses.

All flexible hoses should be checked visually that they are free from wear and tear.

2.4.2 CO₂ - cylinder valves.

All CO₂ - valves should be checked visually that they are closed and that they are in proper condition.

2.4.3 CO₂ - piping / master valves.

Check that the manifold pressure is zero and that the master valves are closed.

2.4.4 CO₂ - cylinders.

Check that the CO₂ - cylinders are securely clamped and that they are in proper condition with respect to surface finish.

2.4.5 CO₂ - alarms / ventilation stop.

Check the alarm sirens and the ventilation stop by opening the release cabinet door(s) and the Master valve(s).

2.4.6 Improper function / damaged items.

Any item which has an improper function or is damaged shall be repaired or replaced immediately.

2.5 System testing.

The installation is intended for CO₂ "Total flooding" Fire extinguishing system in Machinery spaces category A and Cargo spaces. In addition local systems can be installed for Paint stores and for Galley hoods among others.

WARNING!

All CO₂ - cylinder valves shall be sealed with the cap supplied with the CO₂ - cylinders from the filling station. This to secure that no CO₂ - gas will leak out by an accidental release.

2.5.1 Hydraulic pressure test of pipes inside the CO₂ - room.

All pre-welded manifolds from CO₂ - cylinders to the CO₂ - master valves shall be hydraulic pressure tested in accordance with table 4.2.1-2. The pressure test should be carried out using fresh water.

Make sure that all the water has been properly dried out after the test and then be sure that the pipes are dry before installation on board. This is important as any water left in the pipe will freeze upon an CO₂ - discharge and the ice can clog the CO₂ - nozzles.

NOTE:

All pre-welded manifolds supplied by Autronica Fire and Security AS are pressure tested to the pressure required by the various class authorities. The authorities supply a certificate in question for the specific project.

2.5.2 Leakage test, CO₂ - pipes downstream master valves.

1. Blank off all nozzle outlets with pipe caps in the protected space.
2. Connect an air source with 7 - 10 Bar pressure to the air blowing through valve in the CO₂ - room and keep the master valves shut. (Note some authorities requires 50 Bar hydraulic pressure test of this pipe, see table 4.2.1-2).
3. Open the air blowing through valve and pressurise the manifold inside the CO₂ - room.. Check for leakage.
4. Open the master valve to the protected space. This will pressurise the piping to the machinery space. Check for leakage.
5. After completion of the test re-install all the CO₂ - nozzles.
6. When the installation of the CO₂ - nozzles are completed, put a small piece of tape on each CO₂ - nozzle. Pressurise the CO₂ - manifold with air, 7 - 10 Bar and open the CO₂ - master valve. Continue to the protected space and check that all the tape has been blown off.
7. Check that the nameplates on the master valves for the protected spaces are correct by opening the valves one by one and blow through the CO₂ - pipeline by compressed air.

NOTE! If the pipe is pressure tested with 50 Bar water, all water must be drained out and the pipe must be blown through with compressed air and dried.

2.5.3 Release test.

All the CO₂ - cylinder valves shall be kept with the blind cap installed.

1. Open and close each CO₂ - cylinder valve manually and check that all caps are tight.
2. Connect a nitrogen cylinder fitted with a pressure reducing valve to the flexible hose inside the supply cabinet/release cabinet.. The flexible hose shall be disconnected from the CO₂ - pilot cylinder.
3. Open the nitrogen cylinder valve and adjust the outlet pressure to 50 Bar.
4. Open both valves in the valve release cabinet or the release cabinet.
5. CO₂ - cylinders and the CO₂ - master valve for the actual area will be activated after a time delay of 20 - 30 seconds.
6. Check that the required number of CO₂ - cylinders has been activated and that the correct Master valve has operated.
7. Reset the timer valve by disconnecting the flexible hose from the accumulator cylinder and open the N₂ pressure in 1 – 2 seconds. The piston in the timer valve will then be pressed to correct position. Close the N₂ valve again and connect the flexible hose to the accumulator again.
8. Disconnect the Nitrogen test cylinder and reconnect the CO₂ start cylinders in the release locker. Make sure that all the pilot pressure has been relieved.
9. Close all the CO₂ - cylinder valve.

2.5.4 Leakage test of CO₂ - cylinder valves.

1. When the above tests has been completed the caps on the CO₂ - cylinder valves shall be turned one turn. This to evacuate the pressure behind.
2. Tighten up the cap and wait for 5 minutes.
3. Remove the cap.
4. If the CO₂ - valve is leaking a small hiss will sound. If a leakage is detected install the cap again and open the CO₂ - cylinder valve. Turn the hex nut on top of the CO₂ - cylinder valve a 1/4 turn clockwise and close the valve. Repeat the test.

Do not tight the valve so hard that it get destroyed or invalidate the pneumatic operation.

2.5.5 Leakage test of connection between the CO₂ - cylinder valve and the manifolds.**Warning!**

Keep the CO₂ - master valves secured and the valve release cabinets / Release cabinets locked. The yard is responsible for warning all personnel that the CO₂ - system is being commissioned.

1. Connect all CO₂ - discharge hoses.
2. Pressurise the CO₂ - Manifold through the CO₂ - shore connection valve using Nitrogen cylinder with pressure reducing valve adjusted to 50 Barg outlet pressure.
3. Open and close each CO₂ - cylinder valve and check for leakage.
4. Upon completion of the test close the Nitrogen cylinder valve. Discharge the pressure to an unmanned area by opening the master valve.

Do not keep the pressure in the manifold for more than 5 minutes as there is a diffusion in the flexible hoses. If they are pressurised for a longer period they may be destroyed.

2.5.6 Test of ventilation shut down.

The ventilation shut down will be activated by either of the below mentioned systems.
Make sure that the ventilation is running.

Activated by the CO₂ - release cabinet.

1. Open the release cabinet door.
2. Check that the ventilation fans has stopped.
3. Close the release cabinet door.

Activated by the CO₂ - master valve.

1. Open the CO₂ - master valve manually.
2. Check that the ventilation fans has stopped.
3. Close the CO₂ - master valve.

NOTE!

This test shall be carried out for all area's protected which has a shut down signal connected.

2.5.7 Test of alarm sirens.

The alarm sirens will be activated by either of the below mentioned systems.

Activated by the CO₂ - release cabinet.

1. Open the release cabinet door.
2. Check that the alarm sirens are sounding.
3. Close the release cabinet door.

Activated by the CO₂ - master valve.

1. Open the CO₂ - master valve manually.
2. Check that the alarm sirens are sounding.
3. Close the CO₂ - master valve.

NOTE!

This test shall be carried out for all areas protected which has a shut down signal connected.

Important note!

All the alarm sirens should be tested during the sea trial to verify that the sound level is acceptable for the area they are installed in, when all the machinery's are in normal operation.

2.5.8 Test of pressure switch.

Some systems may have a pressure switch installed on the CO₂ - manifold. It can also be one pressure switch for each of the protected areas installed downstream of the CO₂ - master valves. The pressure switch (s) may be connected to several different functions. This can be as follows.

1. Start of alarm sirens warning personnel that the CO₂ - manifold is pressurised.
2. Giving an alarm to the main control system that the CO₂ - system has been activated.

These functions should be checked upon execution of the release test as described in chapter 2.5.5.

2.5.9 Final check before leaving the CO₂ system in normal operation.

The following shall be checked before the system is left in normal operation.

- * CO₂ - cylinder caps are stored in a box inside the CO₂ - room.
- * Operating instruction is installed in the CO₂ - room.
- * Operating instruction is installed in the wheel house.
- * Operating instruction is installed in the engine control room or fire station.
- * All entrances to the protected areas are equipped with warning signs.
- * All release lockers are equipped with engraved instruction signs.
- * Pilot cylinders in the release lockers are connected.
- * Release locker doors are closed and secured.
- * CO₂ - master valves are unsecured and closed.
- * Time delay valve is reset.
- * The key for the CO₂ - release locker are handed over to the officer in charge.
- * CO₂ - valves are unsecured and in closed position.

2.6 Refilling of CO₂ - Cylinders.

2.6.1 General.

Upon a discharge of the system, the CO₂ - cylinders should be refilled immediately. This should be carried out as follows.

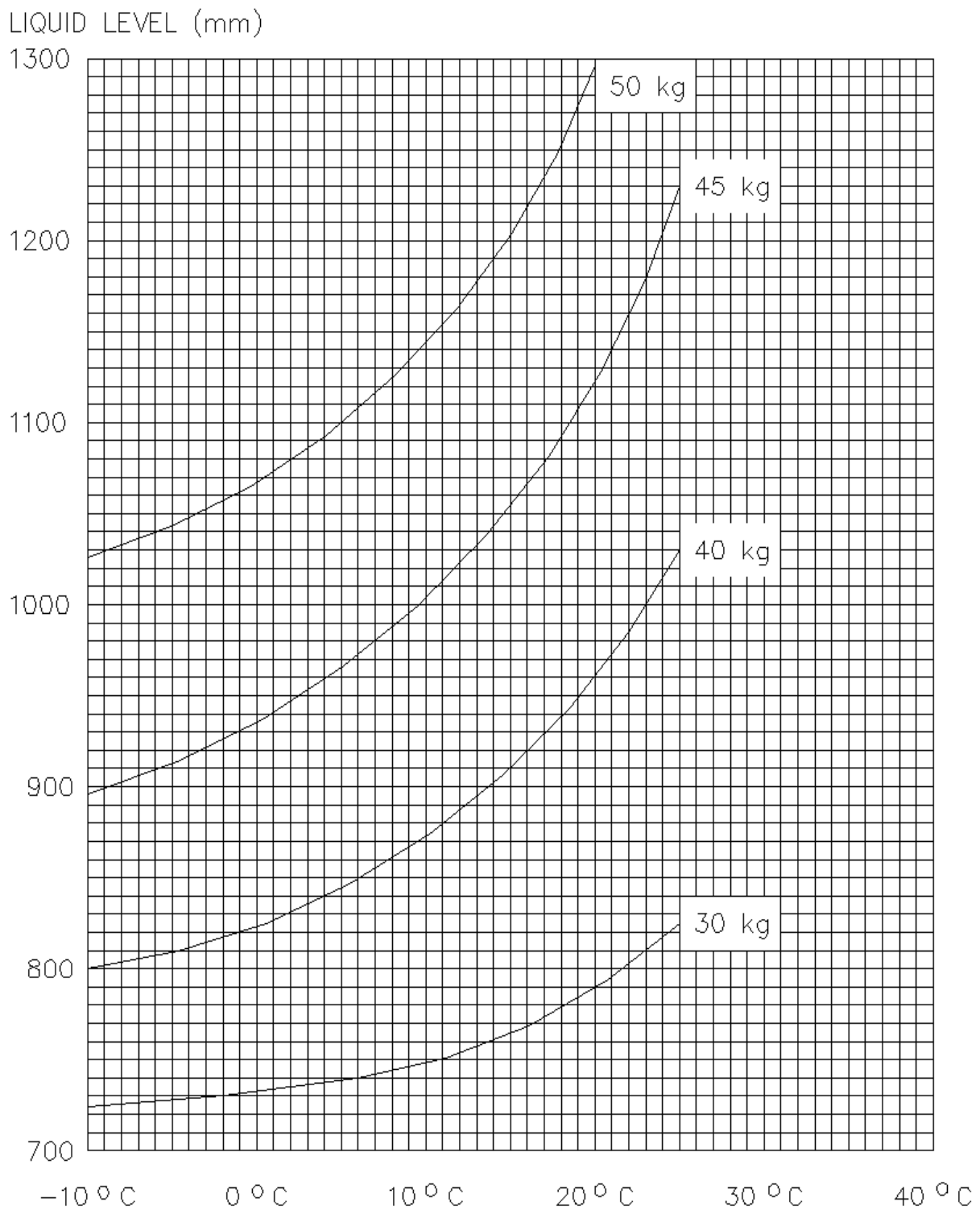
2.6.2 Removal of cylinders.

1. Disconnect the 1/2" Discharge hose.
2. Plug the CO₂ - valve outlet.
3. Disconnect the pilot manifold.
4. Install the cylinder valve protection cap.
5. Remove the cylinder clamping.
6. Ship the cylinder to an authorised gas filling station.

2.6.3 Installation of refilled cylinders.

1. Fasten the cylinder with the cylinder clamps.
2. Re - connect the pilot manifold.
3. Remove the CO₂ - valve outlet plug.
4. Re - connect the 1/2" Discharge hose.

2.7 Liquid level bar chart



67,5 L CO² - CYLINDER - OUTSIDE DIAMETER 267 mm