

# **GENERAL GUIDELINES**

---

## **General Guidelines for Safe Use and Storage of Mandals Lay-Flat Hoses**

**mandals**  
since 1775

A Michelin Group Company

## About this Document

These guidelines and safety recommendations have been compiled to the best of our knowledge. Check to make sure that local safety regulations are also followed. The hose may only be used for its intended purpose.

### Caution

This document describes the guidelines for safe use and storage of lay-flat hoses used for non-compressible and non-flammable fluids. See additional safety instructions for compressed air hoses.

## Contents

SAFETY INSTRUCTIONS.....	2
Safety symbols used.....	2
Modification hazard.....	2
Additional safety instructions .....	2
Protective equipment.....	2
Actions before starting and stopping.....	2
 Guidelines for Use .....	 3
Guidelines for Storage.....	4
Contact Information .....	4

## SAFETY INSTRUCTIONS




To reduce risk of serious injury to yourself or others, read these safety instructions before operating.

Post these safety instructions at work locations, provide copies to employees, and make sure that everyone reads the safety instructions before operating or servicing.

Note that hoses are supplied with and without couplings. The safety instructions are applicable for the use of both.

### Safety symbols used

The indications **Danger**, **Warning** and **Caution** have the following meanings:

-  **Danger**      Indicates an imminently hazardous situation, which if not avoided, will result in death or serious injury.
-  **Warning**      Indicates a potentially hazardous situation, which if not avoided, could result in death or serious injury.
-  **Caution**      Indicates a potentially hazardous situation, which if not avoided, may result in minor or moderate injury.

## Modification hazard

### Warning

Any modification not approved by Mandals may result in serious injuries to yourself or others.

- ▶ For reasons of product safety, the hose must not be modified and when repairing of the hose is needed Mandals AS should be consulted.
- ▶ Any damage or malfunction caused by the use of third-party parts is not covered by the warranty or by Product Liability.

## Additional safety instructions

- ▶ Machines and accessories must only be used for their intended purpose.
- ▶ The maximum permissible pressure for the hose must not be exceeded.
- ▶ Always inspect the equipment prior to use. Do not use the equipment if you suspect that it is damaged.
- ▶ Always use your common sense and good judgment.
- ▶ Pay attention and look at what you are doing.
- ▶ Do not use any machines or accessories when you are tired or under the influence of drugs, alcohol or anything else that may affect your vision, reactions or judgment.
- ▶ Participate in safety and training courses.
- ▶ Never strike or abuse any equipment.
- ▶ Keep the equipment in a safe place, out of reach of children and locked up.
- ▶ Make sure that all the attached and related equipment is properly maintained.
- ▶ Make sure that no unauthorized personnel trespass into the working zone.
- ▶ Keep the workplace clean and free from foreign objects.

## Protective equipment

Always use approved protective equipment. Operators in the working area are recommended to do a risk analysis and use appropriate protective equipment.

## Actions before starting and stopping

- ▶ Before pressurizing the hose, check and make sure that the hose and couplings are undamaged.
- ▶ Use hoses with suitable pressure rating and fit for the environmental conditions. Inspect hoses and connections daily.
- ▶ Ensure that the hose is not kinked or tightly bended (squeezed) at any place when pressurized.
- ▶ Ensure that the hose can expand freely when pressurized.

## Warning

To avoid personal injury, make sure no external force is applied to the outlet valves, for example by pulling hoses or by connecting equipment directly to the valves.

## Guidelines for Use

To reduce risk of serious injury to yourself or others, read these safety instructions before operating. Make sure you understand the recommendations for use of Mandals lay-flat hoses.

- ▶ **Handling**  
Mandals hoses and hose assemblies should always be handled with care. Hoses and hose assemblies should not be dragged over abrasive or sharp surfaces. Hoses should not be subjected to flattening or kinking.
- ▶ **Pressure**  
Mandals lay-flat hoses should not be subjected to pressures exceeding specified maximum working pressure.
- ▶ **Temperature**  
Mandals lay-flat hoses should not be used at environmental temperatures beyond specified range recommended by Mandals AS. The conveyed medium should not exceed specified range recommended by Mandals AS.
- ▶ **Fluid conveyed**  
Hoses and hose assemblies should only convey fluids for which they are designed. Consult Mandals AS when in doubt. When dangerous fluids (toxic, flammable or explosive) are conveyed take precautions to minimize the effects of spillages due to leakage. When not in use, hose and hose assemblies should not remain filled.
- ▶ **Bending radii**  
Hoses and hose assemblies should not be used with bends less than the minimum bend radius specified or recommended by Mandals AS. Continued kink or bends near the end fittings should be avoided due to fatigue on the reinforcement and may lead to premature failure and/or straight-off breakage of the hose.
- ▶ **Torsional stress**  
Hoses and hose assemblies are not designed to operate in torsion. A free-standing hose can twist when pressurized. Installations creating extra angular torsion or twist to the hose should be avoided.
- ▶ **Tensile stress**  
Hoses and hose assemblies may be subjected to tensile stress if they are designed to do so. Consult Mandals AS if the hose standard does not address suitability.
- ▶ **Vibration**  
Vibration may cause fatigue and heating of hose and hose assemblies, especially around the end fittings, which may lead to premature failure
- ▶ **Assembly of end fittings/couplings**  
Before starting to assemble the end fitting, determine the compatibility of the fitting, hose and method of installation. Consult Mandals AS in case of doubt.  
  
To ensure correct assembly, fittings should be free from sharp edges and the dimensions of hose inserts, ferrules, etc., should be such as to secure an effective and safe seal. Swage dimensions and clip torque should be monitored due to premature failure if swage dimensions are insufficient or excessive. To insert the fitting/shank into the hose it is recommended to use soapy water. Do not use products containing oil, solvent or grease unless specified by Mandals AS. Avoid twist or kink to the hose while inserting the fitting.
- ▶ **Leakage**  
After attaching the end fittings, it is recommended that the assembly undergo a hydrostatic proof test. This is to verify the hose fitting installation, that is free of leaks, and no slip between fittings and hose. When required regulations or other standards are absent, do testing in accordance with ISO 1402.
- ▶ **Electrical properties**  
Hose and hose assemblies may have requirements regarding antistatic properties/el.conductivity as transfer hoses for fuels or other inflammable fluids. Ensure that the hose complies with any national legislation and is suitable for conveying the fluid, both from a chemically and hydro-mechanically- as well as HSE perspective. It is recommended to check the antistatic properties of the hose on a regular basis.
- ▶ **Fixed installations**  
Hoses and hose assemblies applied in fixed installations should be supported by adequate clamping when possible. Pay attention so that the clamps do not create excessive hose distortion during pressure, pulsations, e.g diameter expansion, or change in length.
- ▶ **Moving parts**  
When hose or hose assemblies is used to convey fluid between moving components or parts, the installation must ensure that the length is adequate while not being excessive. In addition, make sure that any movement does not result in the hose being subjected to shock loading, pinching, abrasion, bending exceeding minimum bend radius or twisting/tensile stress.
- ▶ **Maintenance**  
Hose and hos assemblies should be subjected to periodic inspection/testing to establish their suitability for continued use, except for those which there are regulation, standards or contractual requirements. Extra attention should be paid to the condition of the connections, adjacent areas and to the appearance of deterioration of the hose to ageing or to damage to abnormal service conditions, accident during use or maltreatment.

For withdrawal of hose from service, the following defects are sufficient justification:

- Splits, tears, punctures and exposure of reinforcement.
- Ozone cracking.
- Blisters, swelling under pressure and deformation.
- Sticky or soft patches.

## Guidelines for Storage

To reduce risk of serious injury to yourself or others, read these safety instructions before operating.

### ▶ General

Hose and hose assemblies may undergo physical properties changes when stored for a long period of time, if they are exposed to certain adverse influences. This may result in the hose no longer have the optimum characteristics corresponding to their application when they are put into service. While storing hoses and hose assemblies make sure that the storage conditions offer maximum protection to minimize deterioration of articles. We recommend storing the hose in-doors, under conditions described below.

### ▶ Storage period

Keep storage period to a minimum. Rotate the stock, the "first-in first-out" rule applies. Recommended long-term storage is as follows:

- Bulk hoses (without fittings attached) maximum of 4 years.
- For hose assemblies, maximum of 2 years.

Maximum storage duration is 6 years (4 years as bulk hose + 2 years as hose assembly).

### ▶ Temperature

Articles should be stored away from direct heat sources and the storage temperature should be below 25°C. Hose and hose assemblies' life expectancy are shortened with storage temperature above 25°C. Do not subject articles to temperature over 50°C, below -30°C or abnormal temperature fluctuations during the storage period. See ISO 2230 for temperature effects during storage.

### ▶ Humidity

The relative humidity should be kept under 70% (65% for polyurethane hose products).

### ▶ Light

Hose and hose assemblies should be stored in a manner to avoid direct sunlight or exposed to high UV radiation. If they are stored close to openings or windows, use red, orange or white coverings to protect articles.

### ▶ Ozone

When storing rubber based hoses, the hoses should be stored away from equipment capable of generating ozone. Mercury vapor lamps or tubes, high-voltage electrical equipment, electric motors or other equipment likely to cause sparks or electrical discharges should be distanced to the stored rubber hoses. When stored underground make sure to have sufficient outlets/vents.

### ▶ Environment

Rubber hoses should not be placed in contact with copper, iron or manganese due to harmful effects. Hoses should not be placed in contact to certain products or be exposed to their vapors, such as solvents, acid, oils, grease disinfectants etc.

### ▶ Sources of heat

Heat sources should be kept at a distance to stored hoses.

### ▶ Method of storing

Storage rack should be provided whenever possible to avoid contact with sharp, pointed or abrasive objects or surfaces. Articles should be stored so they are not subjected to excessive stress, elongation or deformation. Coiled hoses and hose assemblies should be stored flat, and it is not recommended to store them stacked. If stacking is necessary, avoid stacking so the bottom articles suffer permanent deformation. It is not recommended to hang coils on pegs. End caps should be kept on if hoses are supplied with them.

### ▶ Rodents

Protection should be provided to secure articles from attack by rodents if there are any risks.

### ▶ Issue from storage

Take care to ensure that the articles issued from stock comply to their intended application and are in correct condition. Hose assemblies with fittings that can be adjusted should be checked to ensure that the end fittings are secure.

### ▶ Return to storage

Make sure to drain the hose for the fluid they have been conveying, before returning the articles to storage. If the hose has been used to convey chemicals, explosives, flammable or corrosive materials - take special care. Examine the articles to ensure the suitability for continued use after cleaning and before returning to storage. Consult Mandals if necessary.

## Contact Information

For more information please visit:  
[www.mandals.com](http://www.mandals.com).

Mandals AS  
Nordre Banegate 26  
4515 Mandal  
Norway