COMPOSITE HOSE INSTALLATION BOOKLET

GUTTELING B.V.

ROTTERDAM, THE NETHERLANDS

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1. BASIC INFORMATION

This handling and maintenance booklet is a guideline for the handling and maintenance of Gutteling Composite Hose assemblies. This guideline can only be used as a guideline. The user of this guideline shall take into account all rules for safety, the environments and other aspects, whether or not given by the government of the country where the hose assemblies are in use. The use of this guideline shall be entirely at the user’s risk. Any liability from Gutteling’s part for damage, irrespective of its nature and/or extent, is herewith excluded.

2. IDENTIFICATION AND MARKING

Gutteling Composite hoses can be identified as described hereunder

Color identification:

<table>
<thead>
<tr>
<th>Color</th>
<th>Hose Description</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td>Multi-Oil Blue Hose</td>
<td>designed for conveying hydrocarbons, solvents, aromatics</td>
</tr>
<tr>
<td>Black</td>
<td>Multi-Chem Black Hose</td>
<td>designed for chemicals which do not affect polypropylene</td>
</tr>
<tr>
<td>Green</td>
<td>Multi-Chem Green Hose</td>
<td>special designed for chemicals</td>
</tr>
<tr>
<td>Red</td>
<td>Multi-Chem Red Hose</td>
<td>designed for acids and heavy chemicals</td>
</tr>
<tr>
<td>Yellow</td>
<td>Multi-Vapor Yellow</td>
<td>designed for chemical and hydrocarbon vapor recovery service</td>
</tr>
<tr>
<td>White Polyamide</td>
<td>Multi-LPG White</td>
<td>designed for fully refrigerated conveyants down to –50°C, also suitable for Liquid Ethylene at –105°C and Liquid Ethane at –88°C.</td>
</tr>
<tr>
<td>White Polyamide</td>
<td>Multi-LNG White</td>
<td>designed for fully refrigerated conveyants down to –196°C</td>
</tr>
<tr>
<td>White Polypropylene</td>
<td>Multi-Chem White</td>
<td>designed for submerged applications</td>
</tr>
</tbody>
</table>

Due to customer requests, colors can be different than described here above and therefore the above listed colors can only be used as an indication.
Marking identification:
Each type of Gutteling Composite Hose has been marked to identify the type and maximum design limitations.

Each hose*¹ shall be permanently marked at an interval of not greater than 1,00 mtr with lettering of a minimum height of 10 mm and with at least the following information:

**Hose**
- Manufacturers identification: GCH (Gutteling Composite Hoses)
- Number of European standard: EN 13765
- Hose identification: Type 2 or Type 3
- Max. working pressure: 7 bar or 10,5 bar or 14 bar
- Max. working temperature: -30°C up to +80°C or -30° up to +100°C
- Material of hose inner lining: PP or PTFE or Hostaflon
- Date of fabrication: 1 quarter 2009

**Hose assembly**
- Manufacturers identification: GCH (Gutteling Composite Hoses)
- Diameter of Hose: 2” / 3” etc.
- Test serial number: 22222-02-02
- PED Conformity *²: CE
- Number of Notified Body *²: 0427

*¹ Multi-LPG White, Multi-LNG White will be complete marked in the coupling as mentioned above.

*² Only for hoses which are delivered under restrictions of Pressure Equipment Directive (PED 97/23/EC)

Marking on Multi-LPG White is as hereunder mentioned:

3. **SAFETY EQUIPMENT**

During handling and installation of Gutteling Composite Hoses, staff should use all available personal protection equipment. As a minimum staff should use:
- Hard hat
- Safety glasses and or safety goggles
- Gloves
- Protection shoes
- Other equipment required by management

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4. TRANSPORT COMPOSITE HOSE

Gutteling Composite Hoses can be transferred from a storage facility to the place of operation or a test location by following the next steps:

- Use rollers of hose carriers during transport over the floor
- **DO NOT** kink the hose
- **DO NOT** drag the hose
- **DO NOT** lift the hose by its flange
- **DO NOT** use ropes or chains to lift Gutteling Composite Hoses
- Use lifting devices (like hose buns) when lifting of the hose assembly is necessary
- Make sure that there are no sharp edges or other sharp obstacles in the close area during transport or lifting

5. CONNECTION TO MANIFOLD

To make sure that Gutteling Composite Hoses have been connected well to the manifold following steps should taken. Gutteling Composite Hoses should always visual inspected before connection to the manifold, see for inspection procedures chapter 7. See also Attachment A.

**CONNECTING WITH FLANGE COUPLINGS**

- Connection should always be done by well trained and classified staff
- Don’t put the hose assemblies on metal grids or abrasive material
- But first hose assembly to pipe
- Line up bolt holes, insert a new gasket, torque bolts with nuts (use washers between nut and flange) until snug and then a quarter turn, between min. 30 N/mm² and max. 150 N/mm², bolts should be fixed cross-wise.
- Support flange/hose connection if hose is bend directly after the flange hose connection
- If hose assembly should be brought to the ship manifold use a crane for transport. Hook up the hose with a hose bun or hose sling behind the end fitting
- Support the hose assembly with an hose sling or hose bun
- Do not exceed the minimum bend radius of the hose
- Route ground traffic away from the hose assembly
- Do not use the hose assemblies as tow or mooring lines
- Do not use ropes, chains or slings to keep the hose assembly on its place
- If the hose assembly lay done on the ground, be sure that all obstacles or sharp parts will be moved away from the area

**CONNECTING WITH THREAD COUPLINGS**

- Connection should always be done by well trained and classified staff
- Don’t put the hose assemblies on metal grids or abrasive material
- Clean the thread with a non-metallic brush
• But first hose assembly to pipe
• Check the type of thread both side of the connection, when the thread is not similar, do not force the connection, but use a different type.
• Line up the thread with the manifold, make sure that the thread is in a straight position to the connection
• Turn the thread towards the gaskets or other seal part, use when necessary special torque equipment
• Do not use extra force when the thread is not fitted well
• Support coupling/hose connection if hose is bend directly after the flange hose connection
• If hose assembly should be brought to the ship manifold use a crane for transport. Hook up the hose with a hose bun or hose sling behind the end fitting
• Support the hose assembly with an hose sling or hose bun
• Do not exceed the minimum bend radius of the hose
• Route ground traffic away from the hose assembly
• Do not use the hose assemblies as tow or mooring lines
• Do not use ropes, chains or slings to keep the hose assembly on its place
• If the hose assembly lay done on the ground, be sure that all obstacles or sharp parts will be moved away from the area

6. STORAGE PROCEDURES

When storage of Gutteling Composite Hoses is necessary, please follow hereunder mentioned steps. During transport to or from the storage facility follow the transport instructions mentioned under chapter 4.
• When possible store Gutteling Composite Hoses in a straight position and free from stresses or kinking
• Hose assembly should be dry and clean (internal and external)
• Hoses should be closed with plastic end caps (delivered together with goods), make sure that the caps has a small gap for ventilation
• Hose assembly stored indoors if possible
• Hose assembly should be kept away from ozone generating sources
• If stored outdoors, cover the hose with tarps
• Hose assembly should be stored in a cool, dry location, with low dust levels
• When stored in rings respect the minimum bend radius of the hose

7. COMPOSITE HOSE INSPECTION

Before connecting, it is recommended to have a visual inspection on damage (internal, where possible and external)
• Check for kinks (crushed) and/or displaced outer wire(s)
• Check on surface cracks, dents or other surface damage
• Check for weeping
  Wipe the hose with a clean cloth, if rain water is coming out, keep the hose in service, if medium is coming out, remove the hose from service
• Check the lining of the hose assembly (where possible) on cracks wear or other damage
  Take the hose assembly out of service if any of above-mentioned points has been observed. Always contact an expert for further examination of the hose assembly.

After connecting, but before operation, the complete hose line should be checked on following:
• The hose shall lay free on the ground, without any support (wires, ropes, etc), unless this is necessary because of a part of the hose line is hanging overboard or in vertical position, use in that case special designed hose slings.
• Check if all bolds are screwed tied and if the gaskets are centered in the middle
• Check if there are no obstacles, sharp points or other objects, which can cause any damage to the hose in the direct area of the hose line
• Check if over the complete line the minimum bend radius of the hose assembly is respected

8. PERIODIC TESTING

If the hose assemblies are used more than one time, for a period of more than 1 year, it is recommended to test hose assemblies each year again. According hereunder mentioned steps. Make sure that after testing the hoses will be clean and dry (internal and external) before using end caps to blind the hose assemblies. See also Gutteling test procedures for used Composite Hoses.

• Hose is straight, horizontal and supported
• Measure hose assembly length and register
• Water should be used as test liquid
• Remove all air out of the hose assembly, by purging with water (do not stand in front of the hose assembly during testing)
• Raise pressure to 1,7 bar, hold 2 minutes
• Measure hose assembly length and register
• Raise pressure to 1,5x design pressure
• Hold the pressure for 15 minutes, check the hose on leakage
• Measure hose assembly length and register
• Release pressure to 1,7 bar, measure hose assembly length and register
• Drain water out of the hose
• Measure electrical conductivity
To approve hose assemblies, following criteria shall be followed:
- Elongation: not more than 10%
- Electrical conductivity:
  - ≤ 2,5ohm/m for sizes less than 50mm
  - ≤ 1,0ohm/m for sizes 50mm and above
- Leakage: no leakage allowed
- Pressure increase: not more than 1,7 bar/min.

9. STANDARDS AND RULES

Above mentioned standards are according to following International standards:

- NEN-EN 13765 & NEN EN 13766
- IMO-IGC CODE CHAPTER 5.7.3
- NPR 5527
- ISO 1402
- PED 97/23/EC