

# **Areas of application and variants of double hose systems**

**Innovation for more safety when moving water-polluting, toxic, combustible and other critical media**

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## 1. Area of application

Hose assemblies are used everywhere in industry. Whether for simple fuels or highly aggressive chemical media, with the proper hose materials any fluid can be transported through hose assemblies.

Regular inspection of hose assemblies is a must. German regulations require that hose assemblies that are part of systems requiring monitoring must be regularly inspected. As a rule, this means that hose assemblies are subject to repeat inspection at least once annually.

For this repeat inspection, the hose assembly must be tested on a test stand. This requires removing the hose from the system.

But what if special system features make this difficult or impossible?

What if even the smallest leaks can have devastating consequences for people, the environment and the system?

In such cases, double hose systems are the right solution, because with these the fluid-conducting hose can be additionally secured and/or monitored.

Therefore, double hose systems are often used when transporting water-polluting, toxic, combustible and other critical media.

Frequent applications are transporting:

- Aggressive media such as hydrochloric acid, caustic soda, sulfuric acid and hydrofluoric acid
- Combustible fluids and gases such as ethanol, petrol, kerosine, diesel and heavy oil
- Other media such as transformer oil and basic chemicals

This White Paper explains how double hose systems work. It also provides an overview of monitoring technology possibilities. Finally, it covers possible application areas and the respective solutions for them, since double hose systems are typically tailored to their applications. For this reason, Markert has decided not to conduct a general type examination, but instead inspects each double hose system individually as per the Pressure Equipment Directive, with permitting by individual approval, for example by TÜV. Only in this way can double hose systems be configured entirely for their system conditions.

## 2. Function

Markert Marsoflex Double hose systems consist of two integrated hose lines. The inner hose is completely monitored, providing ideal conditions for safe use as a media transport line.

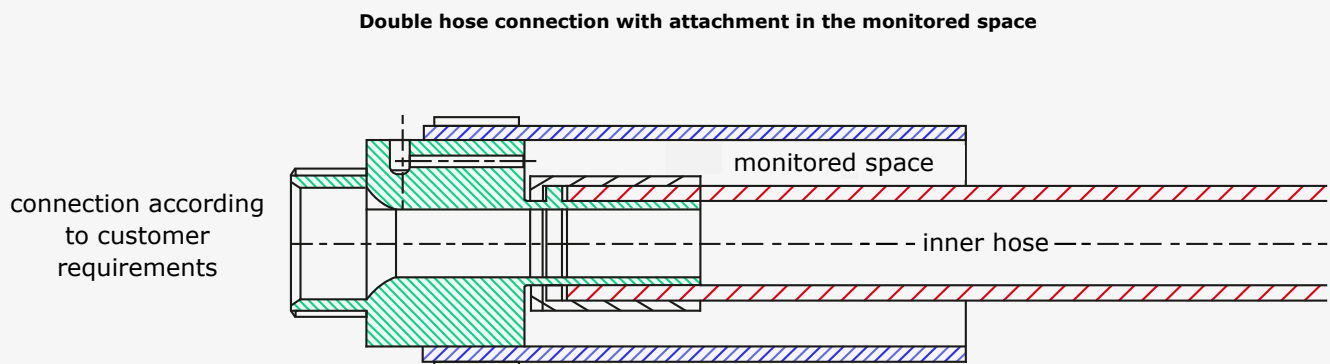
The inner and outer hoses are individually designed for the properties of the medium being transported. The connections are also specifically designed for the geometry required on the system side. A special connector is made to customer specifications for assembling the double hose system.

The monitored space is located between the inner and outer hose. Monitoring devices on the outside hose can detect pressure increases caused by leakage of the inner hose, which carries the media, and trigger a visual or acoustic signal. The necessary safety measures can thus be taken immediately.

If the connection is designed so as to fit within the monitored space (see figure below), the signalling device can also indicate a leak at the connection.

With regard to the selection and configuration of hose materials, the following criteria and parameters apply as a rule:

- Flexibility of the hose (bending radius)
- Abrasion resistance of the outer cover
- Fire resistance of the system
- Pressure resistance
- Vacuum resistance
- Surface characteristics (cleanability)



### 3. Possible monitoring techniques

Often, the safety provided by the double hose system is sufficient in and of itself. Detectors can be used in addition to provide ongoing monitoring. The following systems are commonly used:

- Monitoring of the non-pressurised interior by lateral measurement connections (recommended variant)
- Monitoring of the vacuum interior by lateral measurement connections in combination with a vacuum pump
- Monitoring of the pressurised interior by lateral measurement connections in combination with a pressure pump

### 4. Examples of monitoring with signallers

As a rule, the following kinds of sensors are used for monitoring:

- Transparent outer hose: no sensor necessary, damage is identified by visual check.
- Pressure gauge mounted on the measurement connection: value is read.
- Mechanical or electrical sensor: visual or acoustic signal is given.



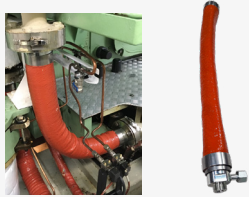
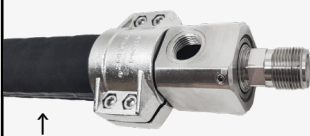
## 5. Sizes and versions

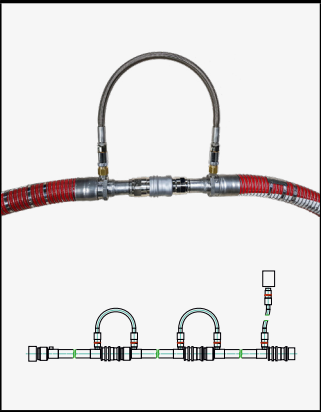

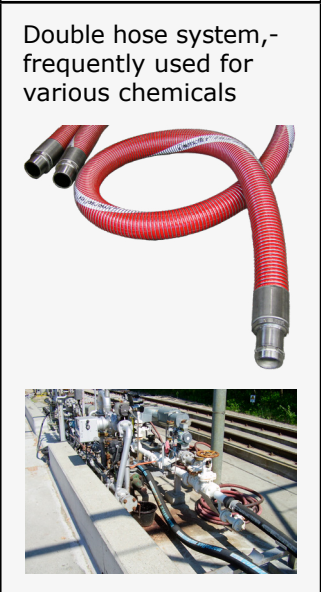
Double hose systems from Markert Marsoflex are available in the following sizes and materials. Since the system is modular, other configurations in addition to the variants shown here are available at the request of the customer.

DN	Media contact Inner hose	Outer hose	Special configura- tion
8	EPDM NBR UPE FEP PTFE, smooth PTFE, corrugated PFA Silicone ...	EPDM NBR UPE PTFE FEP Polypropylene Silicone Stainless-steel braid ...	Heat protection Abrasion protection (stainless steel or synthetic coil)
10			
15			
25			
32			
38			
50			
65			
80			
100			

## 6. References / application examples

Double hose systems from Markert Marsoflex have been used successfully for decades in many applications. Below are some unusual and demanding projects that give an idea of the versatility of the product.

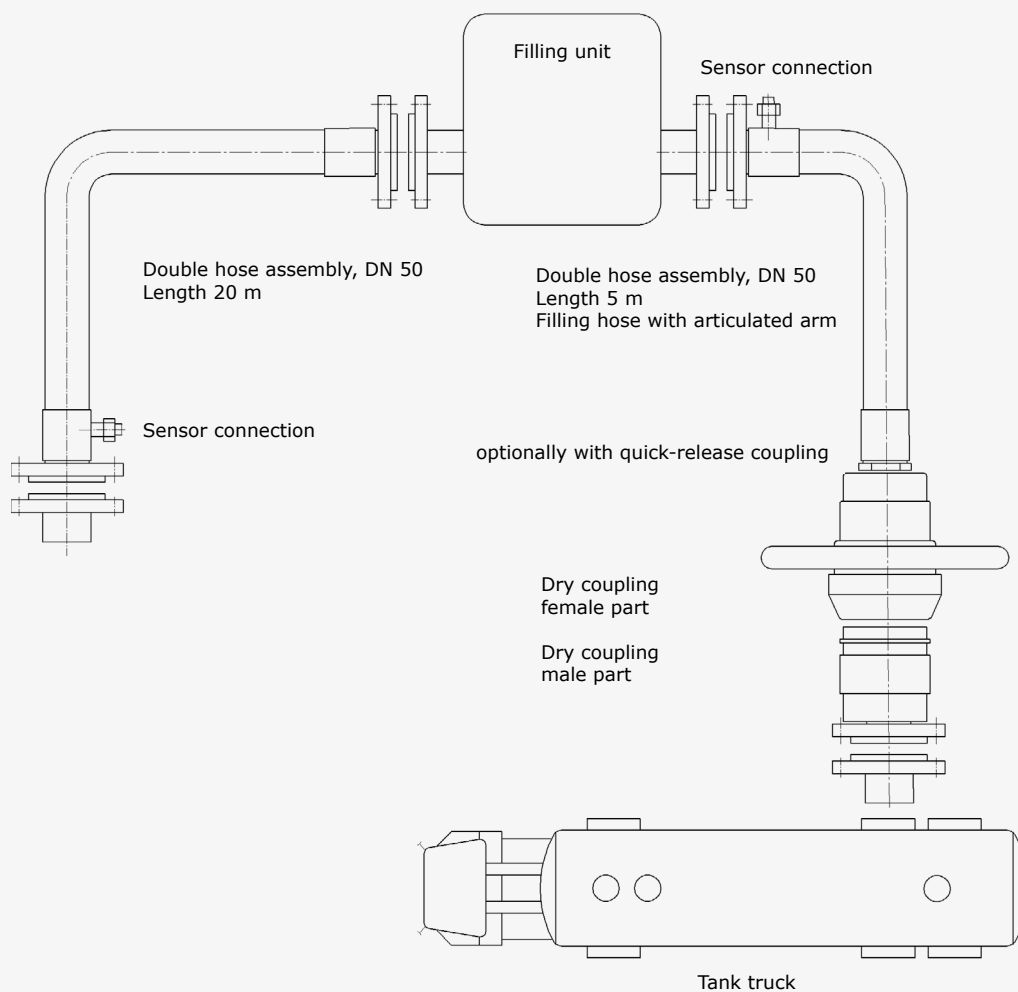
Application area	Special feature	Product variant
<p>Fuel hose for conventional marine engines</p> 	<p>Prevention of machine-room fire in the event of hose leakage</p>	<p>→ Markert Marsoflex Double hose system for heavy fuel oil (HFO) (inside: PTFE/metal braid/heat protection/ outside: PTFE/syntheticbraid/heat protection)</p> <p>→ Markert Marsoflex Double hose system for diesel (MDO) (inside: PTFE/metal braid/ outside: rubberised textile fabric hose/heat protection)</p>
<p>Fuel hose at high pressure for dual-fuel methanol marine engines</p>	<p>Detection of possible hose leakage with immediate emergency shut-off</p>	<p>→ Markert Marsoflex Double hose system (inside: high-pressure hydraulic hose NBR / outside: PTFE/metal braid/heat protection for methanol)</p> <p>→ Markert Marsoflex Double hose system for diesel (MDO) (inside: PTFE/metal braid/ outside: rubberised textile fabric hose/heat protection)</p>
 <p>↑ with abrasion protection</p>	<p>Automatic filling of engines with consumables such as coolant, engine oil, transmission fluid, brake fluid, air conditioner coolant or windshield cleaner</p>	<p>→ Markert Marsoflex Double hose system Inside: DN 6 / Outside: DN 25 Inside: DN 19 / Outside: DN 38</p>

Application area	Special feature	Product variant
	<p>Transport of hazardous fluids, in this case transformer oil, from 0°C to 100°C, multiple hoses can be linked and the monitored spaces connected with each other.</p> <p>Main application: Filling and draining transformers with transformer oil for protecting people and the environment in the event of a hose break</p>	<p>Design: Inside: NBR elastomer hose / Outside: Composite hose, blue polypropylene, max. 80°C</p> <p>Alternative: Inside: Smooth PTFE hose / Outside: Composite hose, red PTFE/FEP, max. 100°C</p>
	<p>With the transparent outer hose, defects and any media leakage from the inner hose become visible.</p>	
<p>Double hose system, - frequently used for various chemicals</p> 	<p>Product delivery when loading and unloading stations do not have a collecting basin with separator.</p> <p>Tip: Building a collecting basin for the use of simple hoses including permitting is many times more expensive than an intelligent double hose system!</p>	<p>Inside: Elastomer hose with different hose cores or PTFE hose</p> <p>Outside: Composite red PTFE/FEP or composite blue polypropylene</p>



## 7. Sample application: tanker truck offloading

### Double hose connection with attachment in the monitored space



**Left:** System side with double hose clamp and flexible double hose connection to the filling unit (buffer tank). Double hose assembly monitoring by sensor connection.

**Right:** Filling side with double hose swivel-mounted on articulated arm. Connection to tank truck by dry couplings (optionally fitted with quick-release coupling). Monitoring likewise by sensor connection.

## 8. Why Markert Marsoflex

The Markert Group endeavours to be the number one in filter and hose technology, with leadership in quality and innovation. These two pillars of our company vision make us who we are.

For us, innovation means offering the broadest range of approved products on the market and extensive product features for hose assemblies.

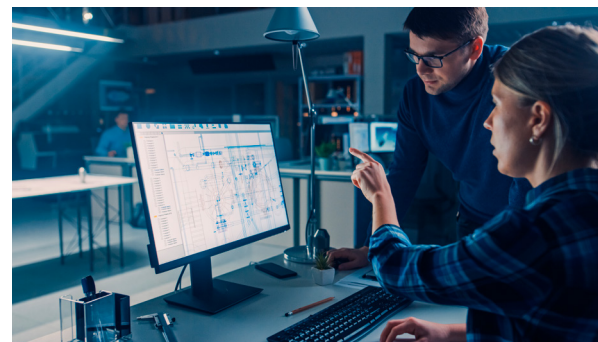
Quality is reflected in the materials we use for hoses, their design, their connections and our comprehensive testing of the final product.

### Markert Marsoflex in this context stands for:

#### Expertise

Experienced specialists with comprehensive product and applications knowledge ensure technically outstanding products. In the jungle of extractables studies and standards such as EN1761/EN12115, EN10204 3.1, DNV, TRbF-131/2, USP XXXVI class VI, FDA 21 CFR 177 and 3a Sanitary Standard and platinum cross-linked silicone, we provide clarity. And we draw up the best solution for you.

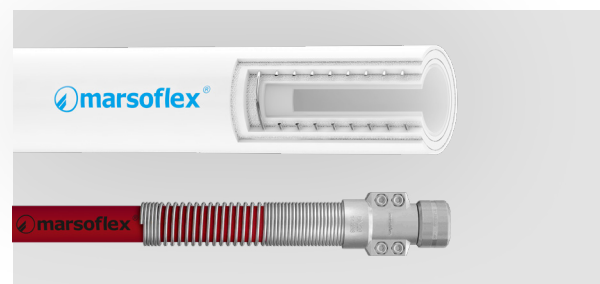
**Your advantage:** all the answers on industrial hose lines from a single source



#### Flexibility

From dry coupling and special materials to custom hose assemblies, we offer a comprehensive product range, engineered for your application by competent specialists.

**Your advantage:** flexible and fast product solutions



### Stock availability

With several million euros worth of product in stock, multiple decentral PTFE lining warehouses close to customers and automated forming facilities, we combine our high quality with short delivery times.

**Your advantage:** rapid availability

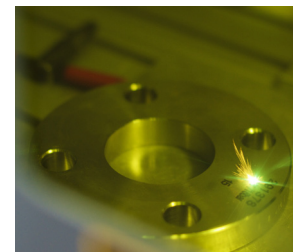


### Quality

The hazard potential of hose assemblies is frequently underestimated. To ensure our hoses meet all relevant requirements such as the PED Pressure Equipment Directive, leave our plant with all technical properties inspected, and provide reliable service in their intended applications, we provide:

- Our own pressing, tightness and laser technology
- 100% pressure and seal testing
- 100% material traceability

**Your advantage:** quality you can rely on



### Customer proximity

Whether for examining your system, working out technical solutions or the regular inspection of your installed hose assemblies:

We are close by, either through our regional sales and applications specialists or with our own service team.

**Your advantage:** specialists in your area



## 9. Contacts

Do you have any questions about these topics or are you looking for specialist advice on hoses and fittings? Contact our field representatives at any time.

### Germany



Bavaria

**Frank Siemering**  
+491703594801  
f.siemering@markert-group.com



Northrhine-Westphalia

**Sönke Schmalfeld**  
+491718901704  
s.schmalfeld@markert-group.com



Northrhine-Westphalia |  
Rhineland-Palatinate | Hesse |  
Thuringia | Saxony-Anhalt |  
Saxony

**David Katholy**  
+491718901715  
d.katholy@markert-group.com



Bremen | Hamburg |  
Lower Saxony | Schleswig-  
Holstein | Mecklenburg-Western  
Pomerania | Berlin |  
Brandenburg | Saxony-Anhalt

**Jan-Phillip Matthies**  
+491718901710  
j.matthies@markert-group.com



Baden-Württemberg | Saarland |  
Rhineland-Palatinate

**Claus Mehner**  
+491758529810  
c.mehner@markert-group.com

### Austria | Switzerland



**Markus Simhandl**  
+436645351600  
m.simhandl@markert-group.com

### Export



**Tobias Stoltz**  
+491718901709  
t.stoltz@markert-group.com