

# LNG TRANSFER SYSTEM

DCC – Dry Cryogenic Couplings

CBC – Cryogenic Break-away Couplings

**PERC – Powered Emergency Release Coupling**

HPN2 – High Pressure Nitrogen System

VSD – Vessel Separation Device

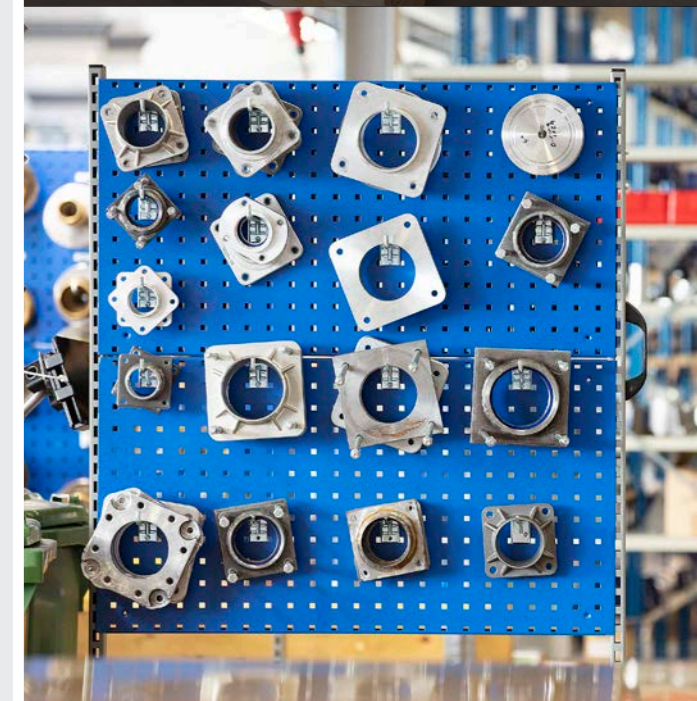
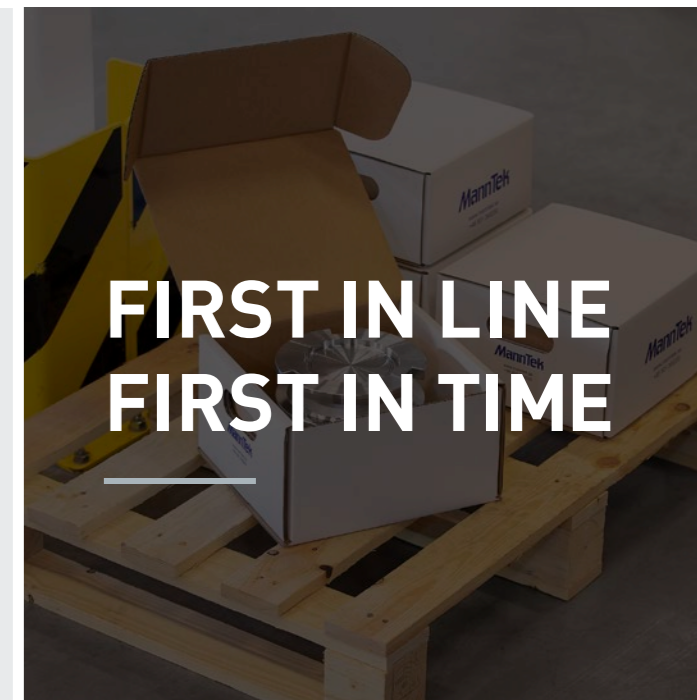
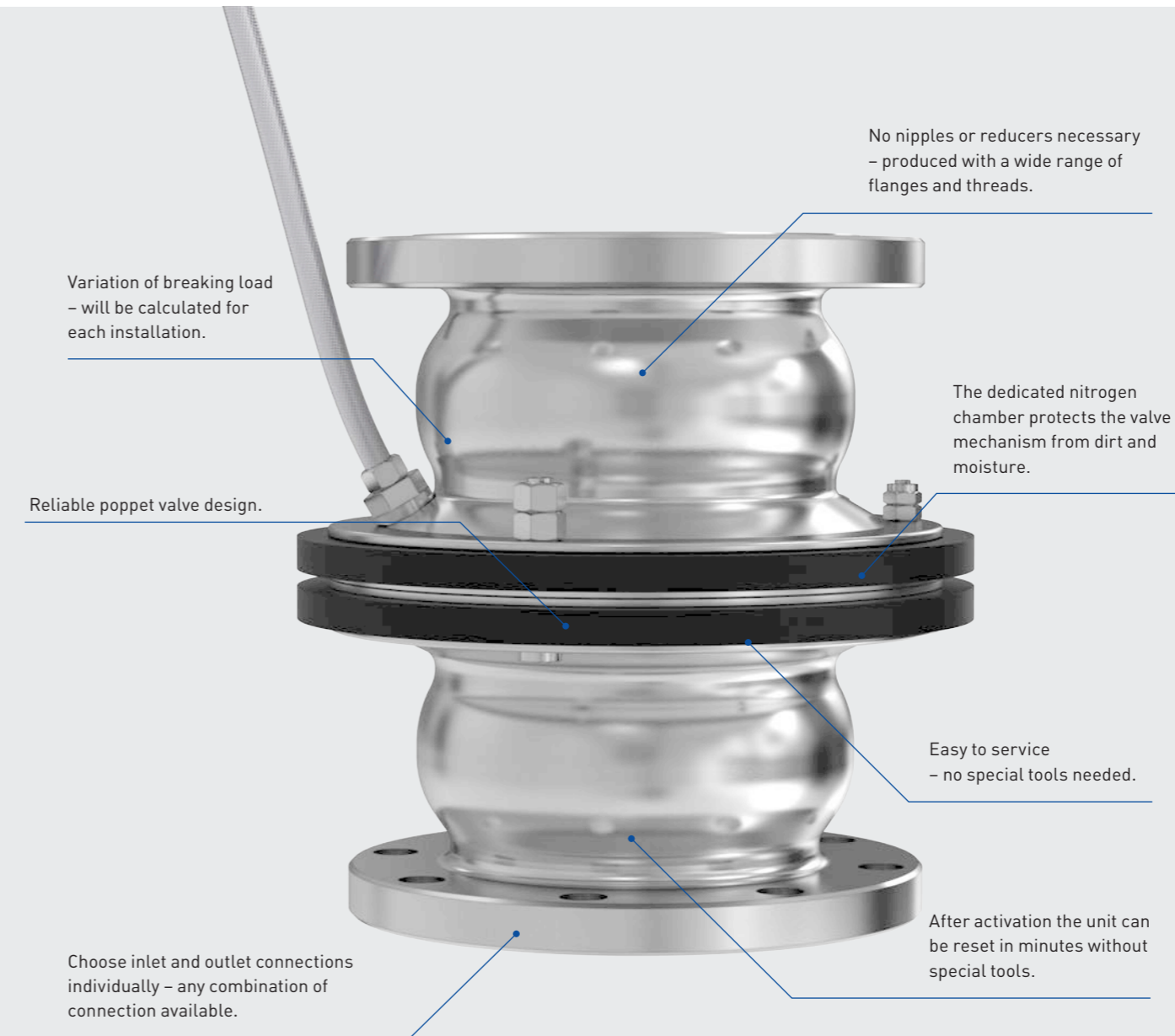
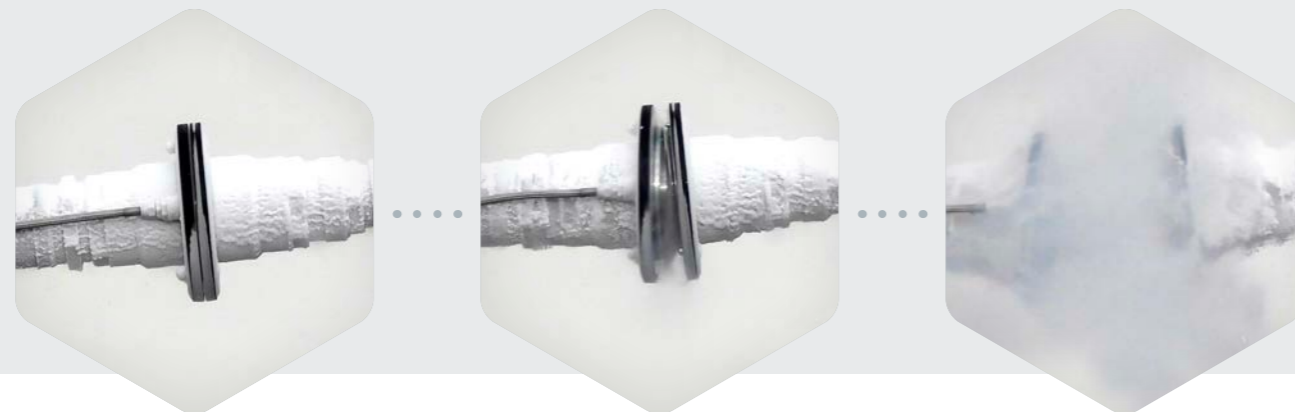
LNG TRANSFER HOSES

## PERC Powered Emergency Release Coupling

**PERC (Powered Emergency Release Coupling)**, uses the well proven technology from breaking pin design breakaways. These couplings provide 100-percent shut-off of the valves in each half of the PERC and the ability to actively and remotely release the coupling automatically without strain on the transfer system or manifolds. The activated release of the coupling is achieved by injecting high pressure nitrogen into a dedicated chamber isolated from the transferred media in the coupling body resulting in instantaneous release of the PERC. The PERC is designed to be both lightweight and compact. It is designed with redundancy.

### HIGHEST SAFETY LEVEL, THREE WAYS OF RELEASE

1. Release by ESD-signal.
2. Release by manual override, independent of electrical signal.
3. Reverting from nitrogen activated to passive breaking pin. Breaking pins designed to be the weakest point of hose or manifold.



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## **VESSEL SEPERATION DEVICE (VSD)**

is designed as a vessel separation system utilising two robust wires of different lengths both shorter than the hose. When sudden movement occurs (vessel drift-off), the wires will be stretched and when reaching a pre-set pull/load the wires will activate the VSD switches.

The first VSD 1 will create an ESD 1 signal, and then with continued movement the VSD 2 will create an ESD 2 signal. Output from the VSD 1&2 control device via a terminal block are standard electrical signals that are taken into the ship or shore ESD system enabling pumps to be shut down and manifold ESD valves to be closed (ESD1). ESD2 sends a signal to the ship or shore ESD system to the MannTek HPN2 (High Pressure N2) PERC release system to activate separation of the PERC.



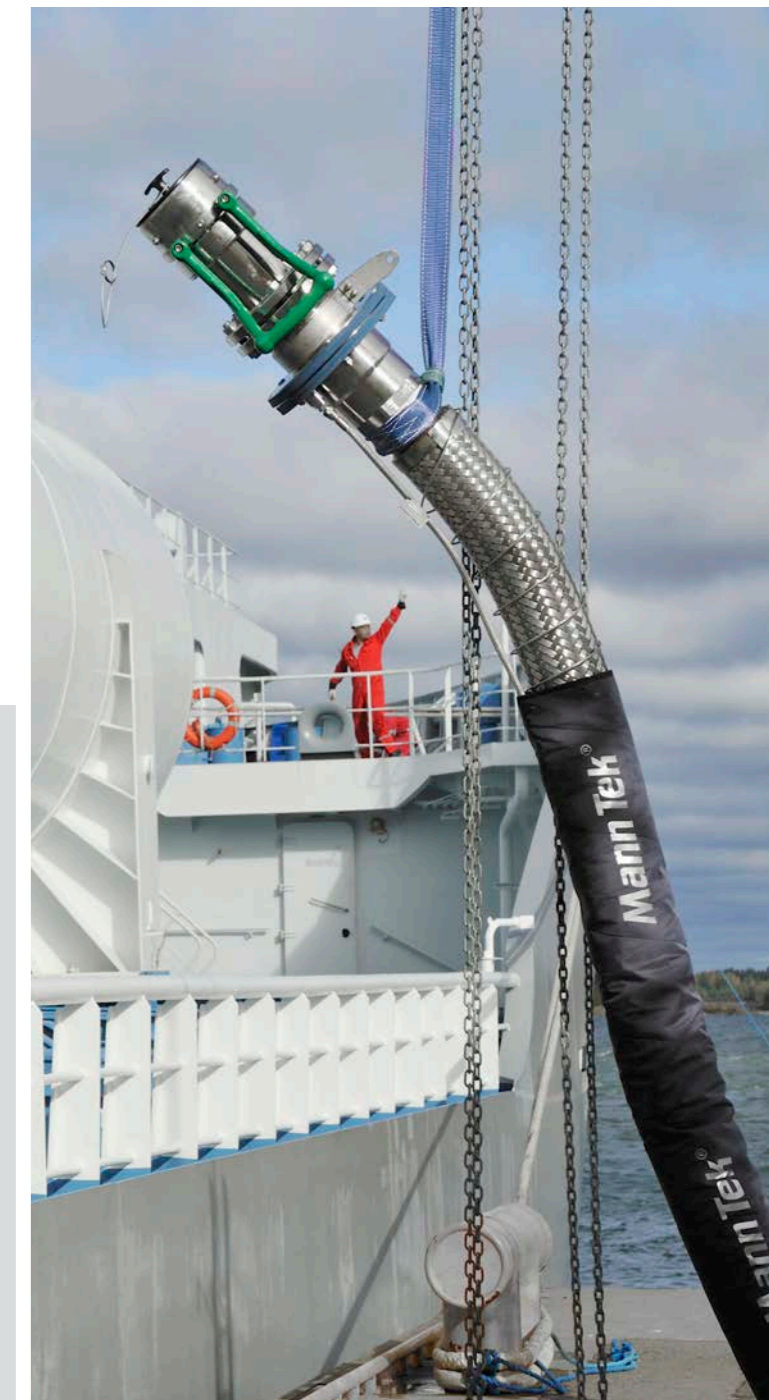
## **HIGH PRESSURE NITROGEN SYSTEM, HPN2 – SIL1 SIL2**

power unit is the dedicated release and monitoring system for the MannTek PERC coupling. It includes the complete control, monitoring and release system, which uses high pressure Nitrogen in the release mechanism. The system also features a pilot pressure regulator to constantly monitor the system and keep the system free from moisture and ice.



## **LNG TRANSFER HOSES**

are offered for various applications and requirements. MannTek offers two different hose technologies, either a composite hose or a stainless steel design. No matter which hose technology you choose, MannTek makes sure that safety is the highest priority and offers the highest level of certifications and approvals. Available in sizes 1" to 10" and WP 10-25 bar.



# ACCESSORIES

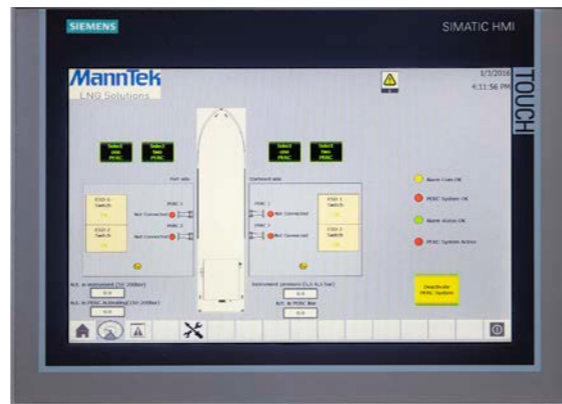
MannTek offers a large variety of options to help customise transfer systems according to the operator's needs, including remote controls for CCR, Y-piece reducers, conical reducers etc.

## SIL2 (SAFETY INTEGRITY LEVEL 2)

MannTek SIL2 PLC LNG transfer systems have been assessed by DNV-GL and certified compliant to SIL2. This extra safety feature has been developed in accordance with IEC 61508 and IEC 61511 with input data from the PDS Data Handbook 2010.

Identifying the mean time between failure (MTBF), probability of failure on demand (PDF), all safety instrumented functions (SIF) and achieving a minimum probability of failure on demand is compliant with safety integrity level SIL2.

Safety functions of the LNG Transfer System is SIL2 compliant, including the PERC, HPN2 PLC control system, the ESD1&2 functionality, the logic solver (Siemens PLC controller) as well as the software, sensor elements and final elements.



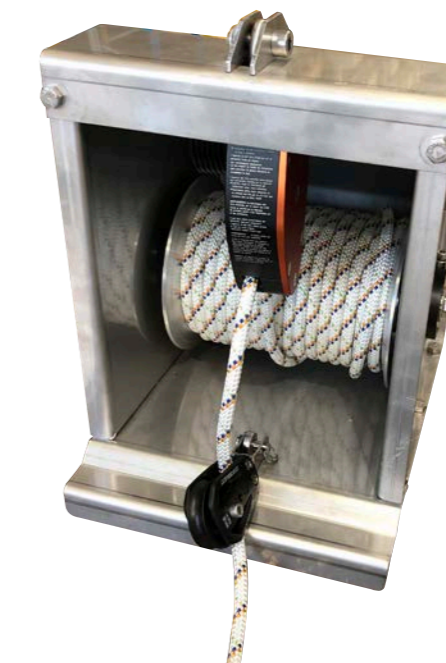
## HOSE SADDLE

A single or double hose saddle can be used to hold the hose in position on both vessels and maintain the correct bend radius. Can be supplied with or without integrated hose break/fall arrest, with an option for adjustable height.



## HOSE BREAK SYSTEM/FALL ARREST

This friction device will maintain a constant rate of descent of the hose following activation of the PERC following an ESD2. Once it has reached its full extent, the rope will 'break-away' from the friction device.



## HEATED PARKING DEVICE

Heated parking device is used to easily defrost and dry the hose unit after LNG transfer operation. The heated parking device ensures that the hose unit will be ready for transfer operations again within minutes.



## OTHER ACCESSORIES

MannTek offers a variety of other extra features, such as:

- Hose Lifting Device
- Hose Protection Covering
- Insulation Flanges
- Hose Reels
- Adjustable N2 Trigger Hoses
- N2 Purge Lines

**APPROVALS** MannTek complies with all applicable industrial standards and regulations as below.  
Transfer systems can be supplied with class approval from any major classification society.

DESIGNATION	DOCUMENT NUMBER	MANNTEK COMPLY
SIL compliance	SIL1/SIL2	✓
Installation and equipment for liquefied natural gas Shore to Ship	EN1473	✓
Installation and equipment for liquefied natural gas Ship to Ship – design (no longer valid)	EN1474 - 1	✓
Installation and equipment for liquefied natural gas Ship to Ship – design/functionality of whole LNG Transfer system)	EN1474 - 3	✓
Petroleum and natural gas industries – Design and testing of LNG marine transfer arms for conventional onshore terminals (superseded EN1474-1)	ISO 16904:2016	✓
Guidelines for systems and installations for supply of LNG as fuel to ships	ISO 18683	✓
Cryogenic vessels. Cryogenic flexible hoses.	EN12434	✓
Safety of Machinery – Safety-related parts of controls systems	ISO 13849	✓
Petroleum and natural gas industries – Installation and equipment for liquefied natural gas – Ship-to-shore interface and port operations	ISO 28460	✓
Ships and marine technology – specification for bunkering of liquefied natural gas fuelled vessels	ISO 20519	✓

DESIGNATION	DOCUMENT NUMBER	MANNTEK COMPLY
Degrees of Protection provided by enclosures (IP Code)	IEC 60529	✓
Electrical and electronic installations in ships – Electromagnetic compatibility (EMC) – Ships with a metallic hull	IEC 60533	✓
Electrical installations in ships – including Parts: 201, 350, 351, 376, 502, 504	IEC 60092	✓
Functional safety – Safety instrumented systems for the process industry sector	IEC 61511 (all parts)	✓
Functional safety of electrical/electronic/programmable electronic safety-related systems	IEC 61508 (all parts)	✓
International Code for the Construction and Equipment of Ships Carrying Liquefied Gasses in Bulk	IMO IGC Code	✓
Manifold Arrangements for gas fuelled vessels	SGMF Publication	✓
Gas as a Marine Fuel Safety Guidelines	SGMF Publication	✓
Preview Ships and marine technology – Technical requirements for dry-disconnect/connect couplings for bunkering liquefied natural gas	ISO 21593:2019	✓
LNG STS Guidelines	SIGTTO	✓