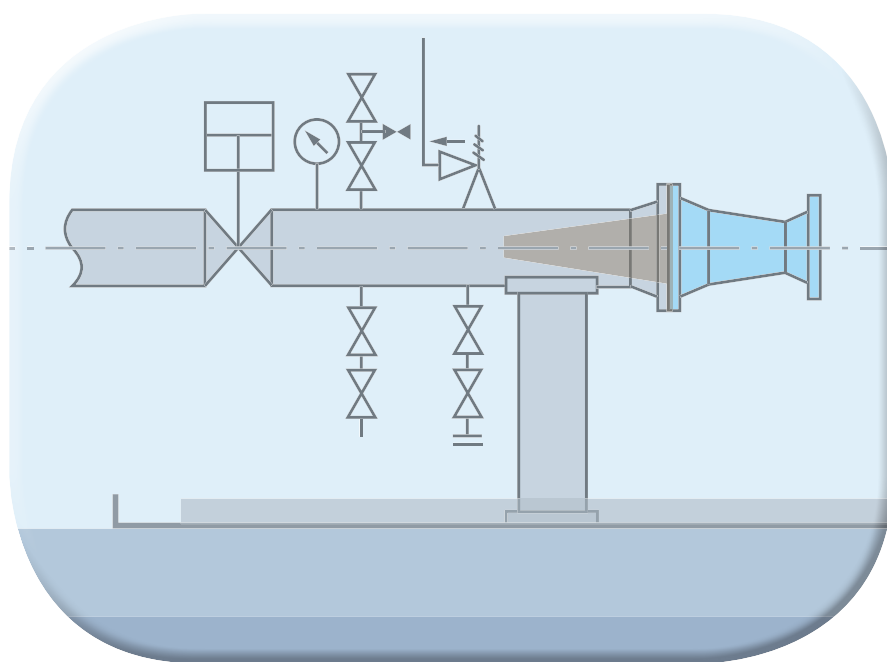


# gas as a marine fuel

## manifold arrangements for gas-fuelled vessels





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## The Society for Gas as a Marine Fuel (SGMF)

The Society for Gas as a Marine Fuel (SGMF) is a non-governmental organisation (NGO) established to promote safety and industry good practice in the use of gas as a marine fuel. The society supports the wider use of gas as marine fuel by developing technical guidelines that encourage safe and responsible operations. More information on the society is available at: <https://www.sgmf.info>

## Disclaimer

While the advice given in this TGN is based on current good industry practices and available information, it is intended solely for guidance and use at the owner's/operator's own risk.

## Acknowledgements

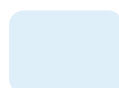
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## Reader key



Clarifications and  
qualifications:



Vessel Specific Data  
(dimension, force, load  
and so on):

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# Foreword

This new issue of the SGMF manifold guidelines highlights the important role that SGMF plays as a guiding force within the gas as a marine fuel application space. The original document was produced in consultation with industry experts from many different sectors, and the content they produced at the time has since served as a reference material for the early adopters of gas fuelled vessels. There however comes a point at which the learnings from those early adopters needs feeding back into the system to produce updated and improved guidelines which can form the new guidance moving forwards. If what was done in the past doesn't work for the industry, it has to be changed; change made for the right reasons whilst maintaining safety can only benefit this industry.

No publication is ever 100% complete, and it is important that as new challenges are encountered, they are adequately dealt with by industry bodies be they Class societies, NGO's, National or international standards bodies.

In coming up with the revised guidelines, the original document has been distributed, reviewed by the society's membership, with the important feedback being incorporated into these updated guidelines to ensure enhanced compatibility of vessel types, and the updated to include use of common industry reference dimensions going forward.

Unfortunately, there can never be a single manifold design applicable to all vessel types, so guidelines like this are written to highlight key points that should be considered to ensure that manifolds are both safe and ergonomic enough to ensure that the crew makes all the important connections correctly.

We must remember there is of course a human interface in the connection, so the dimensions referenced in this document take this into account to ensure the manifold is as accessible as possible in all situations, and the positions allow for safe equipment handling.

Adoption of these guidelines can only be a positive to this industry. There are many people from a variety of backgrounds who will be reliant on these guidelines to assist in making their projects happen, proving to their stakeholders their business case is solid and based on the best industry guidance available. It's been a pleasure to work on this document and I hope it fulfils its mandate of enhancing compatibility within the gas as a marine fuel.

**Andrew Stafford**

Trelleborg / Chair of SGMF WG6, Essential Functional Requirements for LNG Bunkering

# 1 Purpose

This document is intended to facilitate focused discussion and industry alignment on the manifold arrangement fitted on board gas-fuelled vessels. It is important to note that numerous other factors can impact the ability of a gas-fuelled vessel to interface with bunkering facilities.

This document promotes safety and compatibility through the standardisation of the manifold arrangement and the layout of bunkering stations on board gas-fuelled vessels. It has been prepared with the aid of operators of LNG-fuelled vessels, designers and operators of bunkering facilities, naval architects, builders of gas-fuelled vessels, and manufacturers of bunker transfer equipment.

Before the design of a gas-fuelled vessel is finalised, a compatibility assessment should be conducted. Ideally, this should consider a range of potential fuelling locations and bunker transfer solutions. Ensuring compatibility with bunkering facilities is key to reducing risk and improving efficiency.

## *Notes:*

1. This document provides recommendations only. They are not intended to constitute a detailed technical specification and apply only to the use of Liquefied Natural Gas (LNG) on board gas-fuelled vessels.
2. Vessel builders and owners may consider alternative designs and arrangements more appropriate to the operation of a particular gas-fuelled vessel. Where these deviate from the recommendations in this document – and especially where a gas-fuelled vessel is expected to receive bunkers from unknown bunkering facilities – a compatibility study specific to the vessel is strongly recommended.

## 2 Introduction

The wide variety of vessels that may utilise gas as a marine fuel, combined with differing manifold sizes – situated within open-deck, semi-enclosed or enclosed bunker stations – and the varied location of the bunker stations within gas-fuelled vessels, results in an almost infinite range of possible combinations.

This Technical Guidance Note makes recommendations regarding the location of bunker stations within a gas-fuelled vessel and for the standardisation of the manifold. The document refers to:

- the **Manifold Arrangement**: the physical spacing and sizing of the bunker manifolds
- the **Bunker Station Layout**: the arrangement of the manifolds within an open-deck, semi-enclosed or enclosed bunker station
- the **Bunker Station Location**: the actual position of the bunker station on the gas-fuelled vessel

### *In this document:*

Section 3 outlines the basic SGMF design recommendations for open-deck, semi-enclosed or enclosed bunker stations installed on board gas-fuelled vessels

Section 4 provides guidance regarding the location of bunker stations on board a gas-fuelled vessel

Section 5 outlines the basic design recommendations for typical bunker manifold mechanical and structural interfaces with bunkering facilities on a gas-fuelled vessel

Section 6 outlines specific recommendations relating to the bunkering systems on board gas-fuelled vessels

Appendix A provides a standardised form for a compatibility assessment to assist gas fuelled vessel owners applying this Technical Guidance Note when discussing with their LNG supplier.

### 2.1 Applicability and Limitations

It may be impractical or undesirable for certain types and sizes of gas-fuelled vessels to achieve all the design recommendations in this TGN because of their design. In such cases, differences and deviations from the design, should be discussed, especially in the arrangement of the manifold.

Where gas-fuelled vessels do not meet all the design recommendations, operational restrictions or complications may arise in certain circumstances. In such cases, differences and deviations should be discussed by the relevant parties well in advance of any bunkering operation.

This document provides recommendations only for gas-fuelled vessels using Liquefied Natural Gas (LNG).

This guidance has been based on information made available to the SGMF. No responsibility is accepted by SGMF – nor by any person, company or organisation related to the SGMF – for any consequences resulting directly or indirectly from compliance with or adoption of any of recommendations or guidance contained herein.

### 2.2 References and Further Reading

**ASME B16.5** – Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard

**IGC** – International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk

**IGF** – International Code of Safety for Ship Using Gases or Other Low-flashpoint Fuels

**ISO 14726:2008** – Ships and Marine Technology – Identification Colours for the Content of Piping Systems

**ISO/TS 18683:2015** – Guidelines for Systems and Installations for Supply of LNG as Fuel to Ships

**ISO 28460:2010** – Petroleum and Natural Gas Industries – Installation and Equipment for Liquefied Natural Gas – Ship-to-Shore Interface and Port Operations

**ISO 21593** – Ships and marine technology — Technical requirements for dry-disconnect/connect couplings for bunkering liquefied natural gas

**SIGTTO/OCIMF** – Manifold Recommendations for Liquefied Gas Carriers

## 2.3 Definitions

The following definitions are used in this document:

**Bunkering Facility/Supplier** – The bunkering facility – also referred as the “supplier” – is any technology or system designed to be used to transfer/bunker liquefied gas as fuel to a gas-fuelled vessel. It may consist of a floating, shore-based, fixed or mobile fuel supply facility, such as a bunker vessel, road tanker or terminal (see Figure 1).

**Bunkering Safety Link (BSL)** – The Bunkering Safety Link (BSL) is the link connecting the gas-fuelled vessel and the bunkering facility Emergency Shut-Down (ESD) systems. It may be pneumatic, electric, fibre-optic or wireless. Note that the BSL is sometimes referred to as the “ESD link” or “Ship-to-Shore Link” (SSL). This terminology was adopted from large-scale LNG transfer applications; this document uses the term BSL to clearly define the bunkering application of the link.

**Bunker Station** – The location(s) onboard a vessel where non-cargo fluids are loaded from and discharged to a bunkering facility.

**Coupling Nozzle** – The half part of the dry-disconnect/connect coupling, bolted to the bunkering facility's transfer system, which permits quick connection and disconnection to the receptacle installed on gas-fuelled vessel's manifold. It includes an internal valve to seal the nozzle/transfer system when disconnected and will be opened by manual operation after connection.

**Coupling Receptacle** – The half part of the dry-disconnect/connect coupling, bolted to the gas-fuelled vessel's manifold, to which the nozzle installed on the transfer system will be connected. It includes an internal valve to seal the receptacle/manifold when disconnected and will be opened by manual operation of the nozzle after connection.

**Distance Piece** – A short section of pipe, fitted outboard of the manifold valve(s), secured to a deck-mounted manifold support.

**Dry-Disconnect/Connect Coupling** – A mechanical device enabling quick and safe connection and disconnection of the hose bunkering system of a bunkering facility to the manifold of the receiving vessel without employing bolts. The coupling consists of a nozzle and a receptacle. These couplings are also known as “Dry-Disconnect Couplings” or “Dry-Break Couplings”.

**Emergency Release Coupler (ERC)** – A coupling installed on LNG and vapour lines, as a component of the Emergency Release System (ERS), enabling quick physical disconnection of the transfer system from the unit to which it is connected. It is designed to prevent leakage and damage to loading/unloading equipment if the transfer system's operational envelope and/or parameters are exceeded.

**Free Space** – The space around the manifold clear of permanent obstruction to give access to operators.

**Gas-Fuelled Vessel/Receiver** – The gas-fuelled vessel – also referred to as the “receiver” – is an IGF-compliant vessel using gas as marine fuel.

**Hazardous Area/Zone** – A three-dimensional space in which there is a defined probability that a flammable atmosphere may be present. It is defined by national regulation and by the IGF and IGC codes.

**Liquid** – Liquefied gas in the liquid phase.

**LNG Bunkering/LNG Bunker** – The process of re-fuelling an LNG-powered vessel from a trailer, bunker vessel or terminal.

**Manifold Fixed Support** – The rigid support of a cantilevered vessel manifold.

**Manifold flange** – The flange permanently located at the extremity of the gas-fuelled vessel's manifold, to which should be connected the reducer or spool piece.

**Mobile-to-Ship** – An LNG bunkering operation to a gas-fuelled vessel from a mobile bunkering facility located onshore. Mobile bunkering facilities can consist of a truck, rail car or other mobile device (including portable tanks) used to bunker LNG. (see Figure 1)

**Presentation Flange** – The part of the gas-fuelled vessel's manifold to which the transfer system is connected. It can be a flange type or a dry-disconnect/connect coupling receptacle.

**Quick Connect Disconnect Coupler (QC/DC)** – Mechanical device, typically manually or hydraulically operated, used to connect the transfer system (e.g. loading arm) to the bunkering manifold presentation flange without employing bolts.

**Reducer or Spool Piece** – A spool piece installed at manifold flange, to which the transfer system is connected, that can be easily replaced in case of damage. It can also serve to adapt the type and the diameter of the connection to the transfer system diameter.

**Shore-to-Ship** – An LNG bunkering operation to a gas-fuelled vessel from a fixed bunkering facility or terminal (see Figure 1).

**Ship-to-Ship** – An LNG bunkering operation to a gas-fuelled vessel from a floating storage or bunker vessel (see Figure 1).

**Transfer System/Bunkering Transfer System** – A loading arm made of articulated piping or transfer hose solution, or a combination of articulated piping and hose, enabling the transfer of liquefied gas between a fuel supplier and a gas-fuelled vessel. It comprises all the equipment between the bunkering manifold flanges of the bunker facility and the receiving gas-fuelled vessel, including, but not limited to: transfer arms or hoses; Emergency Release System (ERS); insulation flanges; dry-disconnect/connect coupling; and the bunkering safety link used to connect the supplying and receiving ESD systems.

**Truck-to-Ship** – See Mobile-to-Ship

**Vapour** – The gas phase of liquefied gas.

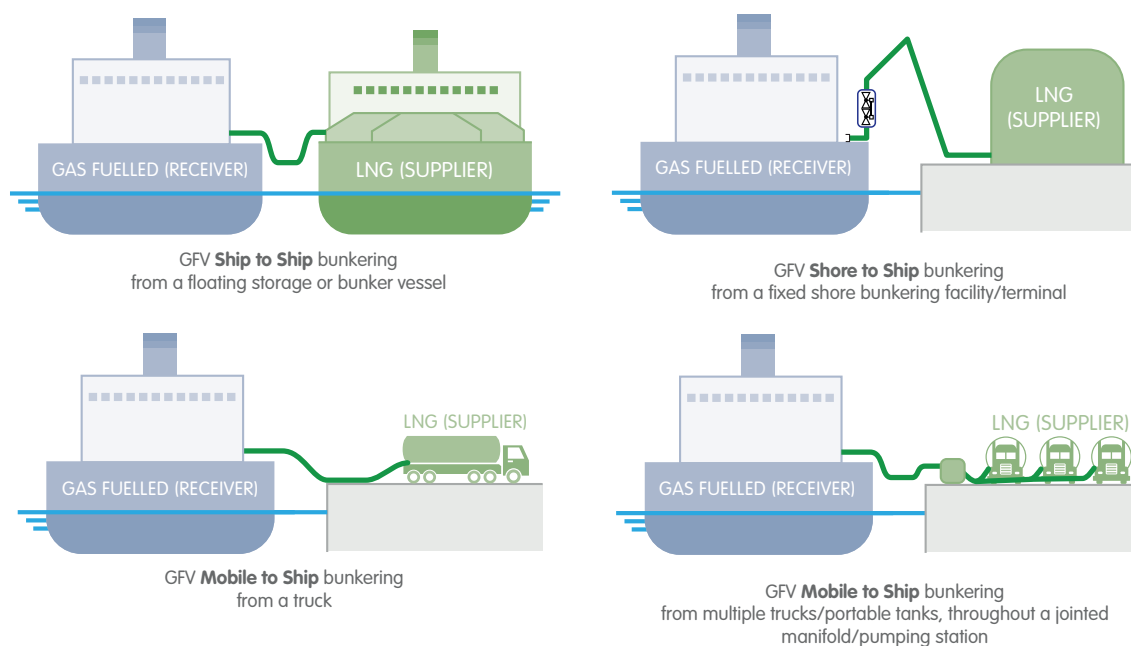


Figure 1 – Bunkering Supply Scenarios





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