SLOVENSKI STANDARD
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Vozila na zemeljski plin - Polnjenje in delovanje - Polnilne postaje za oskrbo z utekočinjenim zemeljskim plinom - Sistem za zaustavitev raztovarjanja v sili

Natural gas vehicles - Fuelling and operation - Natural gas fuelling stations - LNG unloading stop system

Gasfüllanlagen - Notabschaltsysteme bei der Entladung von LNG

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Gasfüllanlagen - Notabschaltsysteme bei der Entladung von LNG

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (prEN 17922:2022) has been prepared by Technical Committee CEN/TC 326 “Natural gas vehicles - Fuelling and operation”, the secretariat of which is held by TSE.

This document is currently submitted to the CEN Enquiry.

Introduction

The transport of LNG over the road in Europe is organized through ADR regulations. This European Agreement concerning the International Carriage of Dangerous Goods by Road specifies the safety procedures of the road tanker and driver.

The design, construction, operation, maintenance and inspection including equipment safety and control devices for LNG fuelling stations are described in EN ISO 16924 “Natural gas fuelling stations — LNG stations for fuelling vehicles”.

This document describes the interface between the LNG road tanker and LNG fuelling station.

The unloading of LNG at the fuelling station shall be carried out with an unloading stop system which, in the event of an emergency, shall safely stop the transfer process and close the necessary valves.

However, at the moment different fuelling station operators are using different safety systems, some are using electronic safety systems, others are using pneumatic operated safety systems.

The proposed harmonized communication interface between the fuelling station and the LNG Road Tanker is a pneumatic system. Though an electrical interface is also used but for the present it is difficult to propose a harmonized interface connector.

The aim of this document is to describe a harmonized pneumatic operated unloading stop system in such a way that the safety system of LNG road tanker is linking with the safety system of the LNG fuelling station.

The proposed unloading stop system is also applicable to the unloading of LNG to industrial LNG installations and from rail or from ship to the LNG fuelling stations.

1 Scope

This document specifies the minimum requirements for the unloading stop system of the unloading of LNG from an LNG road tanker to the LNG fuelling station. This document consists of two main topics:

— functional description of the unloading stop system;

— technical layout description of the unloading stop system.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6150:2018, *Pneumatic fluid power — Cylindrical quick-action couplings for maximum working pressures of 1 MPa, 1,6 MPa, and 2,5 MPa (10 bar, 16 bar and 25 bar) — Plug connecting dimensions, specifications, application guidelines and testing*

EN ISO 16924:2018, *Natural gas fuelling stations — LNG stations for fuelling vehicles (ISO 16924:2016)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply:

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1
ESD emergency shutdown
control actions undertaken to shut down equipment or processes in response to a hazardous situation

[SOURCE: ISO 13702:2015, 3.1.14]

3.2
unloading stop system
control action to stop the LNG unloading transfer process

3.3
LNG transfer process
LNG unloading is done by using a transfer pump and is driven by LNG road tanker hydraulic system or electrical system through the engine PTO (Power Take Off). Alternatively, the transfer process can be by pressure pecanting where the pressure in the LNG road tanker is raised higher than the LNG fuelling station storage tank pressure, allowing the LNG to flow into the LNG fuelling storage tank by pressure differential.

3.4
unloading stop button
emergency shut down device or button which activates the unloading stop system

3.5
LNG road tanker
LNG road tanker means a cryogenic vacuum insulated tank mounted on a truck or semi-trailer or an ISO container mounted on a truck or trailer designed to carry bulk LNG on the road complying with ADR

4 Functional requirements

4.1 General requirement

A harmonized pneumatic operated unloading stop system shall be installed in such a way that the safety system of LNG road tanker is linking with the safety system of the LNG fuelling station.

A pneumatic operated unloading stop system shall be the minimum requirement.

An electronic operated unloading stop system is permissible provided that the design complies with the electrical safety for ATEX installation.

There are two different activation buttons to stop the transfer between LNG road tanker and LNG fuelling station.

1. Unloading stop system, stops the transfer between LNG road tanker and LNG fuelling station.

— Activation of the unloading stop button will only stops the LNG transfer process and not activate the ESD system of the fuelling station.

2. ESD emergency shut down button at the fuelling station shuts down the LNG fuelling station including the transfer between LNG road tanker and LNG fuelling station as described in EN ISO 16924:2018, Clause 16.

The station PLC is the main controller of the ESD system and the LNG road tanker is the slave.

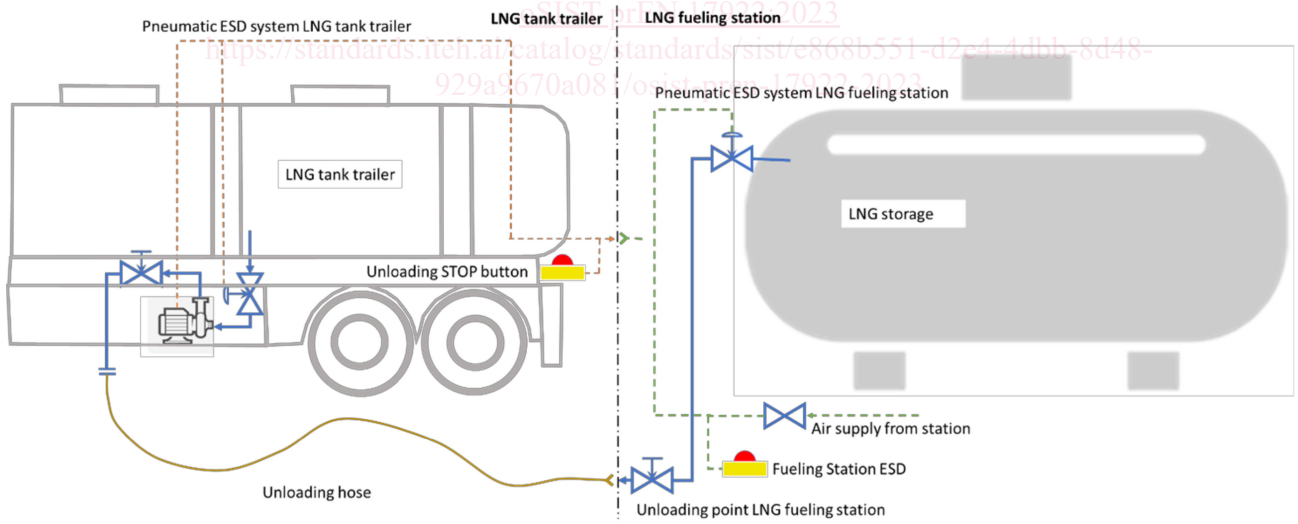

Figure 1 — General layout of unloading stop system

4.2 Functional description of the unloading stop system

The air supply to operate the unloading stop system of the LNG road tanker is supplied by the LNG fuelling station.

Upon activation of the unloading stop system:

— closes the LNG supply valve of the LNG storage tank of the fuelling station (according to EN ISO 16924:2018, 7.4.2);

— closes the LNG unloading valve at the unloading point of the LNG fuelling station (if the storage is larger than 5 ton and according to EN ISO 16924:2018, 8.1.2.3.5);

— stops the LNG transfer pump;

— closes section valve to LNG transfer pump;

— closes he discharge valve on the LNG transfer pump (if applicable).

4.3 Alarms and actions for unloading stop system

4.3.1 Manual triggers for unloading stop

There are 2 types of manual alarms that will shut down the LNG unloading process.

— Manual ESD Activation; The manual activation is a direct action by the driver/operator:

  — Pressing the ESD button at the fuelling station, will trigger the full LNG fuelling station shut down including the transfer process.

  — The ESD of the LNG fuelling station action is described in the EN ISO 16924:2018, 16.4.1.

— Manual Unloading Stop System activation on the LNG Road Tanker:

  — Pressing the unloading stop button at the LNG road tanker will stop the LNG transfer between LNG road tanker and LNG fuelling station process and not activate the ESD system of the fuelling station.

  — Upon unloading stop activation, the unloading LNG transfer system shall be automatically stopped and close the valves according to 4.2.

4.3.2 Automatic triggers for unloading stop

4.3.2.1 General

There are several emergency situations which can trigger an alarm. Some of the alarms are already described in EN ISO 16924. Additional triggers in the unloading stop system are displayed in green in Table 1 and Table 2 below.

Table 1 — ESD actions

Parameter/ Alarm trigger	Action	
Gas and Fire detection	ESD	EN ISO 16924
Low temperature detection	ESD	EN ISO 16924
Fire detection	ESD	EN ISO 16924
Instrument power failure	ESD	EN ISO 16924
Low hose pressure trip	ESD	According to 4.3.2.2
Safety system link failure	ESD	According to 4.3.2.3

Table 2 — STOP actions

Parameter/ Alarm trigger	Action	
High pressure in LNG storage tank	STOP	According to 4.2
High level in LNG storage	STOP	According to 4.2
High pressure in filling line	STOP	According to 4.2

a) Dead man button

The LNG road tanker shall be equipped with a dead man button. If not activated within the maximum time of 3 minutes, the transfer will automatically stop confirm EN ISO 16924.

b) Gas detection

When the gas detection system is activated and reaches 20 % LEL an alarm shall be generated. If 40 % of LEL is reached the ESD system shall be automatically activated confirm EN ISO 16924.

c) Low temperature detection

When the installed low temperature detection system is activated the ESD system shall be automatically activated conform EN ISO 16924.

d) Fire detection

If the fire detection system is activated the ESD system shall be automatically activated confirm EN ISO 16924.

e) Instrument power failure

Failure of the main power, instrument power or air/nitrogen supplies on fuelling station shall automatically activate the ESD system.

f) High pressure in LNG storage tank

If the high pressure in the LNG storage tank occurs during the unloading of LNG, the filling process shall be automatically stopped.

g) High level in LNG storage

If the high level in the LNG storage tank is reached during the unloading of LNG, the filling process shall be automatically stopped.

4.3.2.2 Low hose pressure trip

If the pressure in the unloading hose drops dramatically during the unloading, shall automatically activate the ESD system.

4.3.2.3 Safety system link failure

If during unloading the safety system link is disconnected between LNG road tanker and LNG fuelling station, the ESD system shall be automatically activated.