The LNG Engineering Solution



01.2023

INTELLIGENT MOTION
Columbus McKinnon

STAHL
CraneSystems

Liquefied Natural Gas

Liquefied natural gas (LNG) is purified natural gas containing more than 90 % methane and cooled down to –164 to –161 °C. In this state it is odourless, colourless, only slightly toxic and non-corrosive. It is more than 600 times more compact than in its gaseous state and weighs half as much as water. In the form of LNG, natural gas can be safely and cost-effectively transported by sea over long distances in special tankers. This makes it a significant alternative to pipeline-bound natural gas. Experts are of the opinion that LNG will be the fastest growing energy source in the coming years. Global reserves will presumably not be exhausted for many years.

New exportation methods have enabled additional gas sources to be opened up and states previously barred from this market on the basis of their location to enter the international gas business. Gas-rich countries, particularly in the Arabian and Asian regions, have been investing in liquefaction plants and port terminals for some years.

The largest LNG exporters at present are Qatar, Indonesia, Malaysia, Nigeria and Algeria. Russia, Iran, Norway, Angola and the Ivory Coast have also recently entered the market. The main importers are Japan, China, India, South Korea, Pakistan, Chile and Brazil. In future Germany, Croatia and Romania could also import liquefied natural gas.

Natural gas is extremely sensitive and easily inflammable. For this reason strict safety regulations must be observed and safety precautions taken in LNG trains, the large industrial plants for liquefying and regasifying natural gas.

STAHL CraneSystems is recognised internationally as an explosion protection specialist and is a world market leader in explosion protection technology. As a developer of numerous innovations in this field we have had perceptible influence on crane technology. The experience and knowledge gained in many decades, our own fundamental development, approvals from the Federal Physico-Technical Institute (PTB) and other inspection authorities in many countries around the world underline our particular expertise in major international projects.

All explosion-protected hoist and crane components and our systematic engineering solutions are based on our standard programmes.

All parts, from motor and brake to control and switchgear, come from our in-house production with certified quality assurance system.

This guarantees the comprehensive high-quality explosion protection on which users, crane builders, systems builders and EPC contractors around the world have relied for decades.

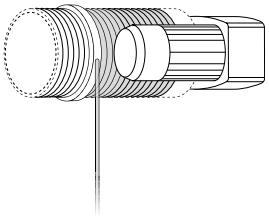
The strict ATEX directives and international IECEx regulations on mechanical and electrical explosion protection are of course met.

→ Please order our brochure on the subject of »Expertise in explosion protection«.

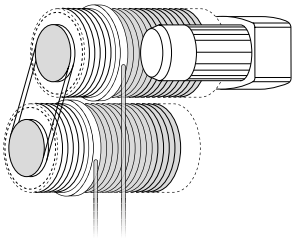



LNG liquefaction plant with LNG hoists from STAHL CraneSystems
LNG liquefaction plant
LNG receiving terminal with LNG hoists from STAHL CraneSystems
LNG receiving terminal
Main LNG trade route
L N G

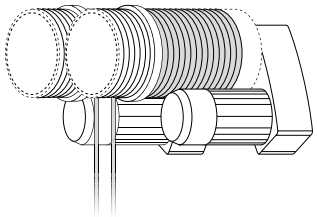
The engineering solution for LNG tanks



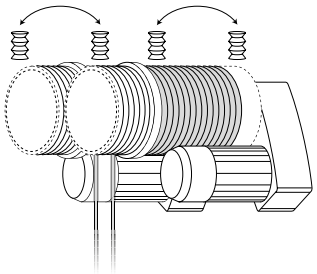
Safety Level 1



Safety Level 2



Safety Level 3A



Safety Level 3B

STAHL CraneSystems offers suitable wire rope hoists for all safety levels

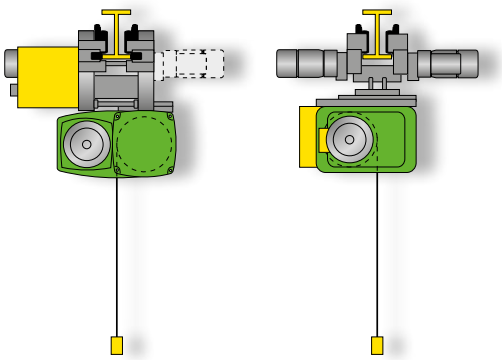
	Rope drums	Wire ropes	Hoist gear	Reeving	Floating and spring-loaded suspension
Safety Level 1	1	1	1	1/1	–
Safety Level 2	2	2	1	1/1	–
Safety Level 3A	2	2	2	1/1	–
Safety Level 3B	2	2	2	1/1	■

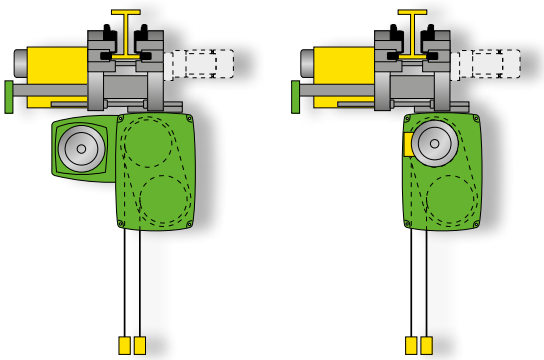
Safety Level 1

As a basic principle, LNG hoists are custom built to the individual specifications and requirements provided by systems builders and EPC contractors. Safety Level 1, the lowest level, employs explosion-protected hoists from STAHL CraneSystems' SH wire rope hoist programme or AS 7 wire rope hoist programme, specifically designed for routine maintenance work on LNG trains. The modular principle enables various customer requirements to be met.

Safety Level 2

In Safety Level 2, two rope drums from the SH wire rope hoist programme, permanently connected by a chain, are driven by one motor. As an option, a fast action lock can be used to exchange the standard wire rope and the rope of the liquefied gas pump. The LNG pump's ropes can be taken up on one drum or on both drums in parallel as required. There is only one motor, hoist gear and brake. The modular principle enables various customer requirements to be met.







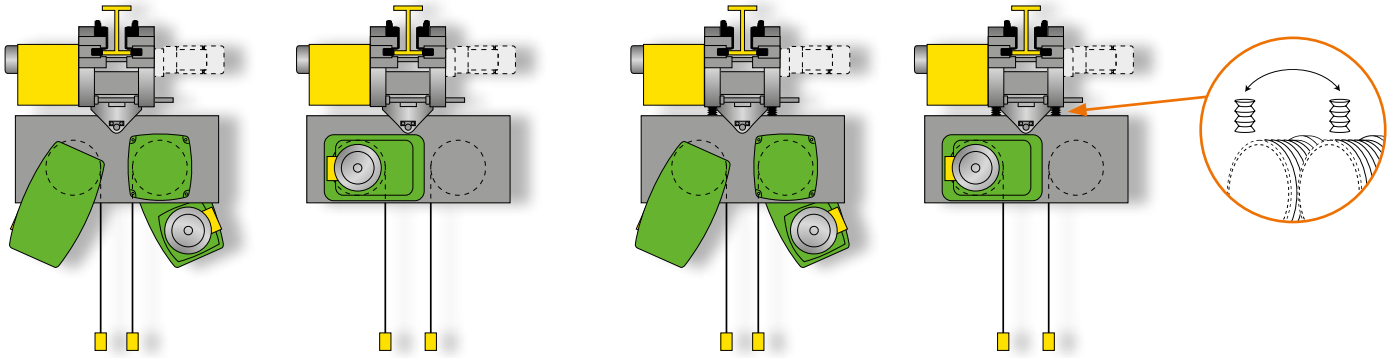


Safety Level 3A

The LNG hoist in Safety Level 3A is equipped with two separately driven motor-gear units running parallel, two rope drums and two brakes. The brakes are designed so that each one individually is able to brake or hold the load in an emergency. The brakes are synchronously controlled and act as service and holding brakes.
The off-standard wire ropes permanently connected to the pump are attached to the rope drum of the LNG hoist by an optional fast action lock. Generally, lifting is performed by one load-bearing rope, the second rope runs parallel as a dead rope without load. In the unlikely event that one of the ropes should break, the second hoist can take over the load and continue lifting.

Safety Level 3B

LNG wire rope hoists in Safety Level 3B are masterpieces of STAHL CraneSystems' engineering and are regarded as the safest, most technically mature hoists in the world. As with the LNG hoists in Safety Level 3A, their construction is fully redundant. Increased safety is guaranteed by the additional floating and spring-loaded suspension. Only one rope acts as lifting rope when lifting the pump. The second hoist runs in parallel with a dead rope as backup. If the load rope should break during lifting, the second hoist takes over. However in safety level 3B, the hoist's floating and spring-loaded suspension absorbs the impact of the abrupt load change without jolting and ensures that the load's centre of gravity stays centred under the hoist. Lifting can continue without disruption and without damaging the valuable pump or any part of the system.







STAHL CraneSystems' LNG hoists are specifically designed for maintenance work on LNG tanks and are now employed successfully in many plants and terminals throughout the world. Thanks to the high-quality components, robust construction, corrosion-resistant paint and extensive additional equipment they are optimally suited for use in coastal areas with challenging climate conditions. The pumps in the tanks, which pump the liquefied natural gas into a pipe system at temperatures of –164 to –161°C, have to be lifted out of the 70 m high tanks and transported to the exterior up to five times a year for maintenance. The extreme conditions prevailing in the tank necessitate off-standard ropes permanently connected to the liquefied natural gas pump and remaining constantly in the tank. These ropes are attached to the rope drum and the hoist for maintenance work.

The experts in our engineering department develop these customised hoists individually for each systems builder and EPC contractor to meet their individual requirements, specifications, quality standards and national regulations. Manufacture in our factory with cost-effective standard components, strict test procedures and certified quality control guarantee optimum explosion protection. Thanks to our expertise, our first-class product portfolio, our systematic engineering solutions, international certification and customer-specific documentation we are able to complete projects cost-effectively, efficiently and in consistently high quality.

STAHL CraneSystems' LNG hoists are available in four safety levels, from Level 1 with increased safety to Level 2 with two rope drums running in parallel, Level 3A with redundantly built hoist and Level 3B with additional floating, spring-loaded suspension. STAHL CraneSystems' LNG hoists in Level 3B are regarded as the safest explosion-protected hoists currently on the market.

The facts

- Sophisticated engineering ideally adapted to your project
- Technically mature, using field-proven standard components
- International specialist for explosion-protected hoist and crane technology
- Our own production with certified quality assurance
- Design to ATEX or IECEx in certified quality
- Partner for official international procedures
- Full documentation
- Country-specific certifications available



Explosion-protected hoist technology for LNG trains

For all other operations in LNG trains, STAHL CraneSystems offers the whole portfolio of explosion-protected standard wire rope and chain hoists, from individual custom-built solutions to complex engineering solutions. As an international specialist with experience and expertise in all the world's climate zones, we also supply safe and cost-effective hoist and crane technology for extreme climatic conditions such as saline air, offshore and onshore plants, extreme heat or Siberian cold. Even if maintenance and auxiliary cranes are shut down for long periods, you can rely on STAHL CraneSystems' technology to be fully operational and work reliably and safely. Spare parts supply for decades is a matter of course.

STAHL CraneSystems' SH ex, AS 7 ex and AS 7 ex ZW explosion-protected wire rope hoists in systematically modular design are available for the safe working load range from 500 kg bis 125,000 kg. They are built for use in Zone 1 or Zone 21, however are also available for use in Zone 2 or Zone 22. The explosion-protected SHW ex winches are available for the heavy lifting range up to 250,000 kg. The ST ex chain hoist, one of the world's most comprehensive chain hoist programmes, is designed for the safe working load range from 125 kg bis 6,300 kg. It is specifically designed for use in Zone 1 or Zone 21, however it is also available for use in Zone 22. Our explosion-proof hoists meet all requirements for the storage and transport of liquefied hydrogen. In the gas group IIC version, all prescribed guidelines are fulfilled.

The facts

- International specialist for explosion-protected hoist and crane technology
- One of the widest comprehensive hoist product ranges in the world
- Our own production with certified quality assurance
- All designs certified to ATEX directives or IECEx regulations
- Explosion protection according to Ex db eb IIC T4 Gb



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2



3



4

1 A slewing crane equipped with an explosion-protected AS 7 ex wire rope hoist, S.W.L.: 5,200 kg.

2 Single girder overhead travelling crane with an explosion-protected ST 20 ex chain hoist, S.W.L.: up to 1,600 kg. The travel drives for the underhung crane endcarriages are also explosion-protected.

3 Gantry crane with an explosion-protected SH 6 ex wire rope hoist, 15,000 kg.

4 LNG wire rope hoists on slewing cranes, Safety Level 2, engineering solution comprising two explosion-protected AS 7 ex wire rope hoists per crane, S.W.L.: 2,000/2,900 kg.

5 Single girder overhead travelling crane with two explosion-protected SH 40 ex wire rope hoists in tandem operation, S.W.L.: 3,200 kg each.



5

Danger areas

A challenging industry is involved in natural gas liquefaction plants. Work with inflammable gas is hazardous. In an explosive atmosphere, both electrical and non-electrical components and elements in the lifting, drive and control technology can trigger an explosion. As a technological leader in explosion-protected crane technology, STAHL CraneSystems supplies hoist equipment suitable for all fields of LNG technology. The range extends from standard explosion-protected wire rope and chain hoists for routine maintenance work to the dual safety LNG wire rope hoists guaranteeing a maximum of safety.

It is reassuring to know what convincing technology is concealed behind each hoist and each component. Everything is perfectly coordinated and thus provides unvarying high performance, long service life and high efficiency.

Motors



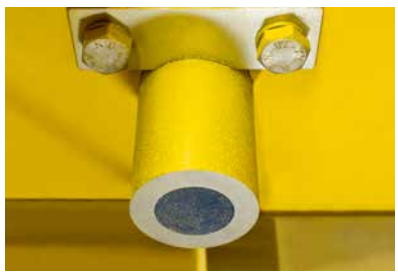
Motors for Zone 1 and Zone 21 are of grey cast iron, protection is a combination of flame-proof enclosure ›db‹, increased safety ›eb‹ and protection by enclosure ›tb‹. For Zone 2, the motors are made of aluminium and have the protection class increased safety ›ec‹. For Zone 22 the motors are in IP66 and with protection by enclosure ›tc‹.

Panel box and control



The type of protection of panel boxes for Zone 1, Zone 2 and Zone 21 on crane and hoist combines flameproof enclosure ›db‹, increased safety ›eb‹ and protection by enclosure ›tb‹.

Overload protection



Overload protection for 1/1 reeving depends on the type of hoist and is provided by evaluation devices with field-proven analog or digital load measurement.

Cable entry



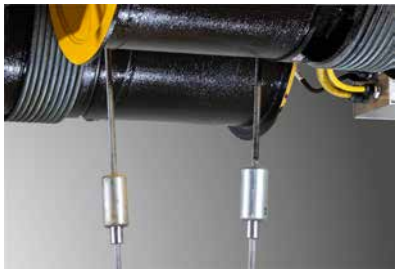
Indirect cable entry, extremely high safety level, provided by protection types increased safety ›eb‹ and flameproof enclosure ›db‹. Connection from the Ex e connection box to Ex d is by means of post-type bushings.

Off-standard rope drum



Off-standard rope drum for accommodating a work rope, with a recess for the fast action lock available as an option.

Rope lock



The client's off-standard ropes for pump maintenance are connected by rope locks. With the aid of the fast action lock, the hoist can easily be equipped with a bottom hook block to suit its application.

Control pendant



The SWH 5 ex control pendants are specifically designed for controlling hoists and cranes in hazardous areas. For explosion-proof wire rope hoists, the two-stage control unit SWH ex is used in protection type flameproof enclosure ›db‹ and increased safety ›eb‹, as well as in IP66 and protection by enclosure ›tb‹.

Signal transmitters



Visual and acoustic signal transmitters such as horns and flashing lights meet ATEX directives and IECEx regulations. They can be used in Zone 1, Zone 2, Zone 21 and Zone 22. The signal transmitters can be activated by a button in the control pendant.

Wheels



The protection type of all wheels is constructional safety ›c‹. Among other measures, wheels are made of brass for high travel speeds.

In action across the world

Experts in all countries immediately recognise hoists and crane components of the STAHL CraneSystems brand. Our systematically engineered and highly developed solutions are in use everywhere. STAHL CraneSystems ranks among world market leaders for explosion-protected crane technology. With the world's widest product portfolio, we know what is important and always find the ideal solution combined with maximum cost-effectiveness. The off-standard LNG hoists and the explosion-protected hoist and crane technology programme as a whole meet European ATEX directives or the international IECEx regulations. STAHL Crane-Systems is represented on all continents by subsidiaries, sales and crane building partners.





Netherlands

At the GATE terminal (Gas Access To Europe) in Rotterdam, Netherlands, there are three LNG tanks with a total volume of 540,000 m³. Each tank is equipped with LNG hoist technology from STAHL CraneSystems in Safety Level 3A. The hoists, each equipped with two separately driven rope drums and with 2,400 kg S.W.L., are used for maintenance work on the tanks' liquefied gas pumps. The custom-built hoists are protected from the severe environmental conditions such as wind and rain by a housing with maintenance bridges on both sides. Supplementing the maintenance crane, there is a further slewing crane equipped with an explosion-protected SH 30 ex wire rope hoist on each of the liquefied gas tanks. These slewing cranes transport tools and small components up to the tank's platform.







China

STAHL CraneSystems has been producing custom-built hoists for LNG plants and gas tanks in all safety levels since 1997. Our subsidiary in Shanghai, China, has from 2006 up to the present processed orders for twelve LNG terminals in China, comprising both standard explosion-protected hoists and custom-built LNG hoists. The current project in North China involves LNG wire rope hoists in Safety Level 1. The hoists are based on the SH 60 ex wire rope hoist and are mounted on slewing cranes on the liquefied gas tanks. They have a safe working load of 3,500 kg and a lifting height of 58 metres. The wire rope hoists were adapted to meet Chinese specifications for use on the LNG tanks by modifying the controls and the rope drums. The saline air and the harsh coastal climate made special corrosion-resistant paint necessary. A housing protects the hoists from adverse weather conditions during shutdowns, which may often last several months. The maintenance bridges on both sides provide better access to the hoists when changing the ropes and for maintenance.

















1 **Australia, Perth**
Special offshore solution for a maintenance crane to lift the thrusters of the FPSO tanker. This double girder overhead travelling crane has a load capacity of 70,000 kg and is equipped with two SHWF 8 winches, each with a load capacity 50,000 kg. Two SH wire rope hoists, each with a load capacity of 5,000 kg, serve as fast auxiliary hoists. All travel drives have gear rack drives, which allow them to be used on ships even in rough seas.

2 **Russia, Yamal**
3 For an LNG plant in north-western Siberia, all crane components were enclosed and fitted with heaters and a separate safety circuit. The AS 7 ex ZW twin hoist with a load capacity of 100,000 kg is used to service the heavy gas compressors. In addition, each of the cranes has an SH ex wire rope hoist as an auxiliary hoist.





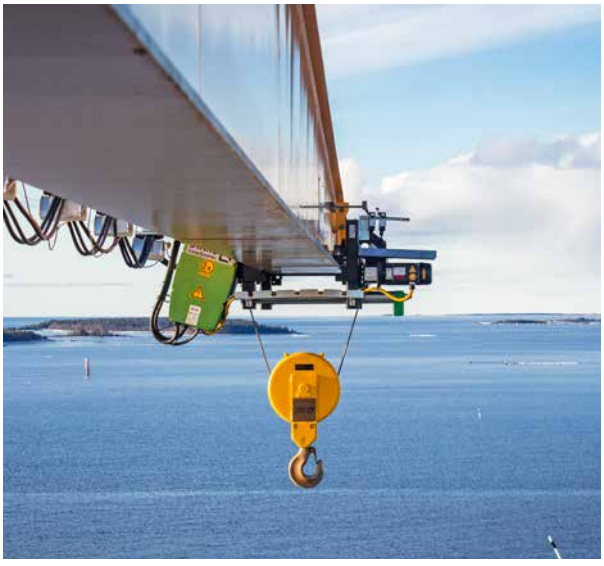
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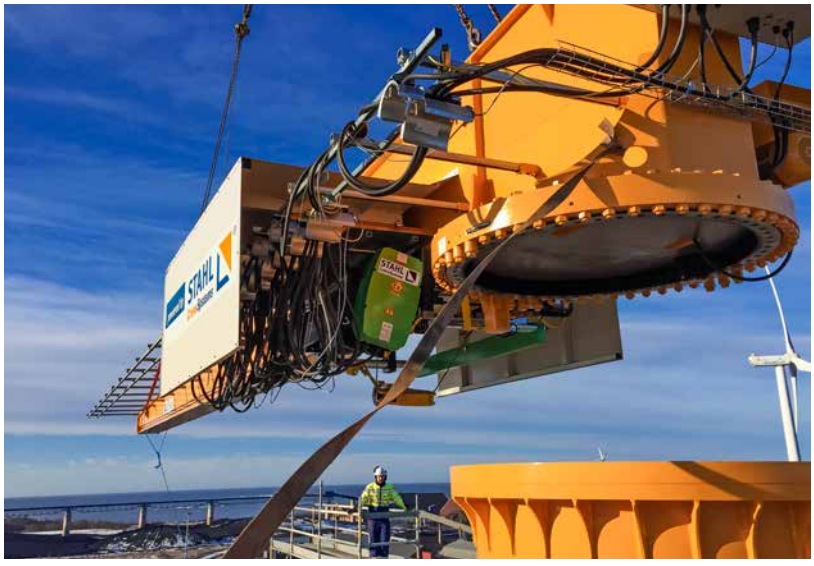


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4 USA, Texas

5 The first greenfield LNG project in the USA near Corpus Christi: An AS 70 ex wire rope hoist with a load capacity of 7.5 ST (short tons) is used on the slewing crane on top of the LNG tank. An additional manual chain hoist with a load capacity of 10 ST can be used to lift the cover of the pump flange.

6 Finland, Pori

7 A maintenance crane for Finland's first LNG tank: cold steel and heated motors allow use between frosty –29 °C and +40 °C. At low temperatures, the modified SH 50 ex wire rope hoist, with a lifting height of 46 metres, moves to its covered parking position and hibernates there.

8 Spain, Sagunto

North of Valencia, four LNG tanks receive liquefied natural gas, also from the liquefaction plant in Damietta, Egypt. A slewing crane with a lifting capacity of 4,200 kg is mounted on each of the gas tanks for maintenance work. The cranes have a 300 kg chain hoist on the outer auxiliary beam.



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All specifications and illustrations are non-binding.
Subject to modification, errors and printing errors excepted.
Printed in Germany 990 070 0 EN-01.23

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