FULL SPEED AHEAD WITH LNG

Liquefied Natural Gas: valve solutions for the entire value chain

HEROSE

LNG, or liquefied natural gas, offers numerous advantages, including lower emissions, higher energy density and, because the liquid form takes up 1/600th of the volume, more flexible transportation options compared to other fossil fuels.

WHO WE ARE

More than **150 years** speak volumes

Quality made in Germany by HEROSE: when it comes to the safety and performance of our valves, the numbers send a clear message. More than 150 years of HEROSE – that means **more than 150 years of know-how and experience.**

Year after year, more than half a million valves are shipped from our plants, almost 80 percent of which are exported to customers in more than 90 countries. For cryogenic liquefied technical gases or LNG, for steam, compressed air or liquids, powdered or granular media – customers from a **huge variety of industries rely on HEROSE every day.**

Behind the numbers are the people at HEROSE: worldwide morethan 550 highly qualified employees and more than 100 partners work hand in hand to deliver on our quality promise – around the clock, with a high level of motivation and no ifs or buts.

More than
500k
valves produced per year

Owner-managed company

More than
550
employees worldwide

More than
150
years of experience

Global sales network

More than
100m
annual turnover

Six
production facilities

More than
42
sales partners worldwide

More than
170
certifications & classifications

More than
65
authorised service partners

APPLICATIONS

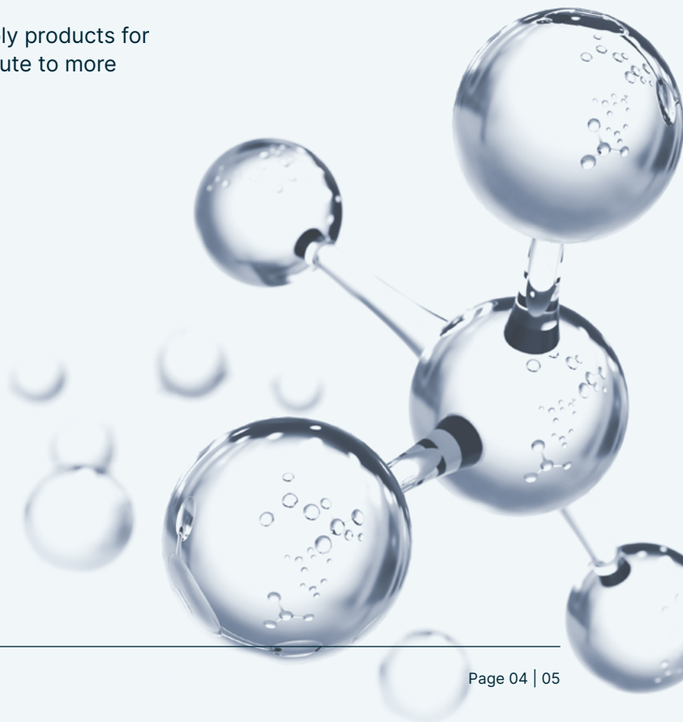
Warm or cold: we are right there

Safety, durability and ease of maintenance are top priorities for our valves and their areas of application. Whether in the low temperature range, where extreme conditions must be withstood, or in industrial applications, where the safety of people and machines is paramount, you can rely on us.

LNG

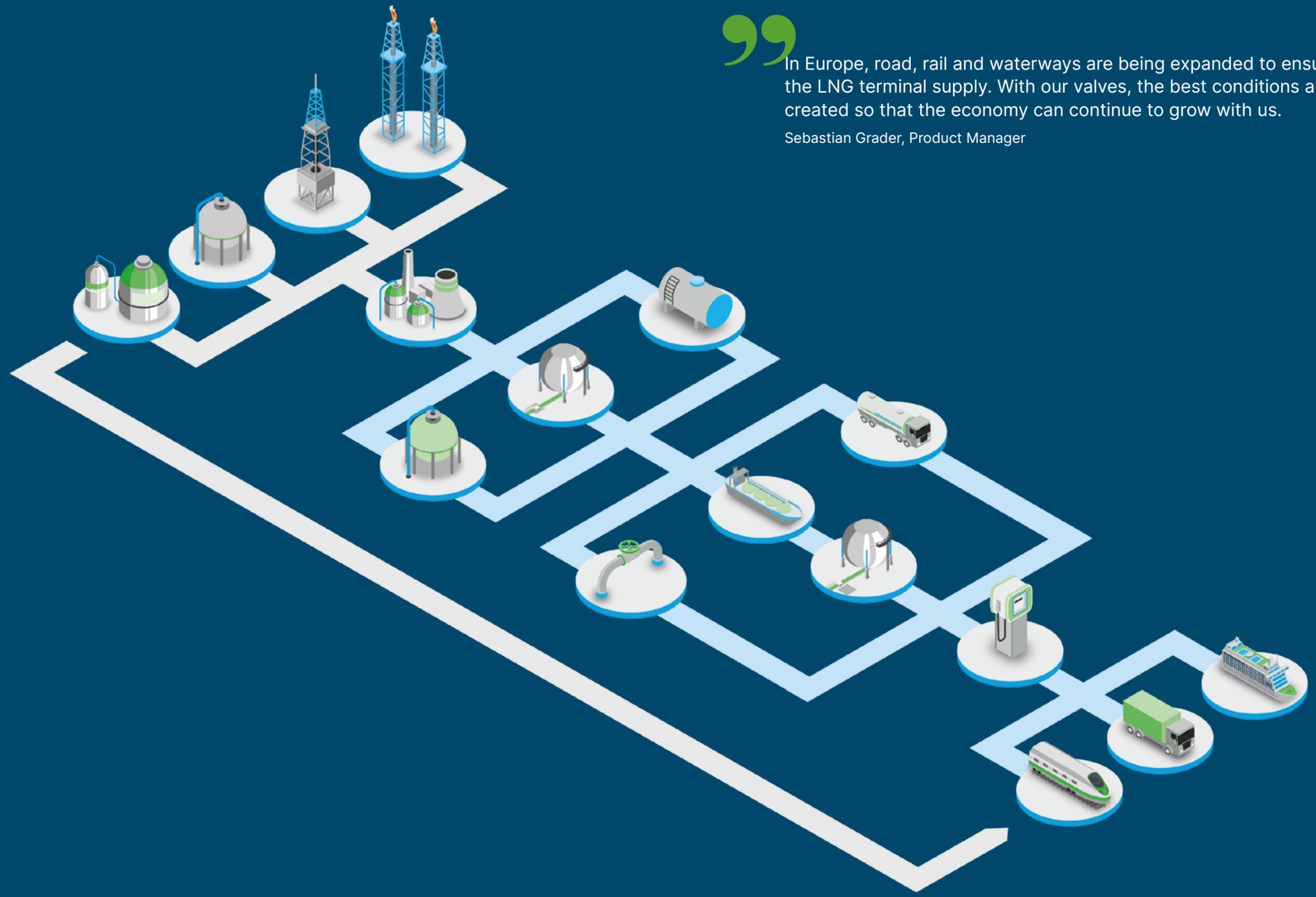
Two thirds of LNG fuelled vessels use HEROSE products

LNG (Liquefied Natural Gas) consists of 98 percent methane and is used as a clean type of fuel at sea and on the road. Our products are used worldwide in state-of-the-art propulsion systems powering LNG vessels. In container ships, tankers, ferries and cruise ships, the use of environmentally-friendly LNG reduces CO_2, sulphur and nitrogen oxide emissions, and makes it therefore an efficient and powerful fuel. More and more shipping companies are using LNG to meet international environmental regulations and to future-proof their fleets.
In addition to the maritime sector, we also supply products for LNG truck-fuelling infrastructure, which contribute to more sustainable road haulage.



Value chain

- **Types of production, manufacture:**
  LNG can be made both using conventional processes and produced from biomass (bio-LNG) as well as synthetically (SLNG).
- **Liquefaction plants:**
  To effectively store and transport LNG, natural gas is liquefied at approximately –162 °C, reducing its volume by a factor of 600.
- **LNG storage:**
  LNG is stored in special tanks, which are carefully insulated to maintain the extremely low temperatures and to minimise evaporation. Different kinds of LNG tanks can be used. For example, vacuum-insulated vertical or horizontal cylindrical tanks and flat-bottomed tanks, large import terminals or smaller regional receiving terminals.
- **LNG transport:**
  There are different ways of transporting LNG. One option is to ship it. LNG carriers, LNG feeder vessels, LNG bunker vessels and FSRUs (Floating Storage and Regasification Units), for example, all transport LNG to the consumer by water. In addition, LNG can also be piped (in gas and liquid form) or transported to the consumer by road or rail.
- **End use:**
  LNG lends itself to various applications. For one, LNG is supplied to fuelling stations to refuel trucks that run on LNG. For another, LNG is used as a fuel for trains and ships as well as for local energy supply.



> In Europe, road, rail and waterways are being expanded to ensure the LNG terminal supply. With our valves, the best conditions are created so that the economy can continue to grow with us.
>
> Sebastian Grader, Product Manager

A promising solution for the future

Bio-LNG is a climate-friendly alternative to LNG derived from fossil, and has the same technical properties. It is a renewable fuel produced from organic waste, such as slurry. Bio-LNG is mainly used in heavy goods transport and in shipping, where it serves as a fuel for LNG-powered vehicles.

The process of turning slurry into bio-LNG

Pretreatment: cleaning the gas

At the pretreatment stage, the raw biogas is cooled and contaminants such as H_2S and VOCs are removed using activated carbon filters.

Upgrading: separation of methane and CO_2

When pressure is applied, CO_2 passes through the surface of a membrane faster than CH_4. This three-step process recovers over 99 percent of the CH_4.

Fine cleaning and liquefaction of biomethane

A molecular sieve adsorbs any remaining H_2O and CO_2 before the biomethane is compressed to 100 bar, and Joule-Thomson valves are used to reduce the pressure and cool the gas in multiple stages.

Liquefaction of CO_2 from the upgrading waste gas stream

The waste gas stream from biogas upgrading, which contains CO_2, can be cleaned, dried and liquefied in a further step in the process.

Storage: shipment in tanks

Cooled to approx. –150 °C, the bio-LNG is put into interim storage in a double-wall vacuum-insulated tank until it is shipped in tanks.

Where our valves are used in a biogas plant

On the CO_2 storage tank

Piping of the LNG storage tank

Transfer to the LNG filling station

Protection against overpressure

The advantages of bio-LNG

- Renewables reduce CO_2 emissions by 80 percent compared with diesel
- Lower pollutant emissions than diesel
- Lower noise pollution because vehicles running on bio-LNG are quieter than diesel-powered vehicles
- Bio-LNG can be used in LNG filling stations and vehicles as well
- Heavy goods transport cost savings because bio-LNG is cheaper than diesel, and has a longer range
- Minimal risk of explosion or ignition thanks to the absence of oxygen in the bio-LNG tank

Back-of-the-napkin estimate:
1 bull will take you from Hamburg to Munich

Range of valves for cryogenic temperatures and toxic media

LNG has paved the way for gas-based marine fuels – with sophisticated, cryogenic Fuel Gas Supply Systems (FGSS). Ammonia is an up-and-coming carbon-free energy source. Valves are at the heart of safety, availability and emission control: they separate, regulate, provide protection and pressure relief, and connect vessels with the onshore facility.

WHY SPECIAL VALVES FOR AMMONIA

Ammonia is a demanding medium.

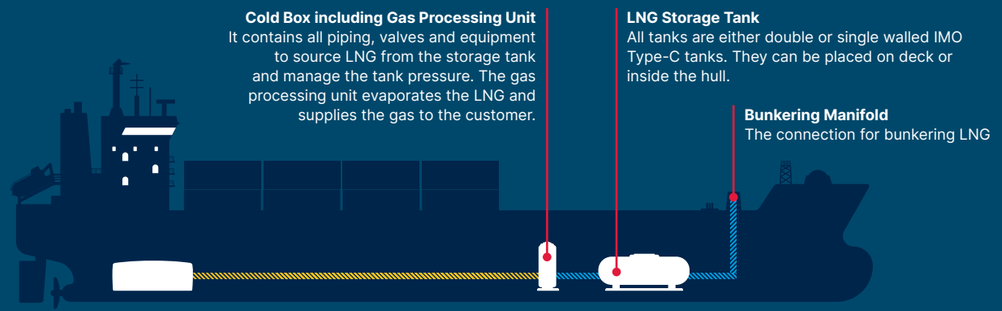
Physical: Pressure-liquefied or stored at approx. –33 °C

Chemical: Highly toxic even at ppm concentrations, very pungent odour

Material-critical: Corrodes copper alloys and certain elastomers, Forms salts in the presence of moisture

What does a FGSS do?

An FGSS ensures safety the along the process from bunkering connection to fuel tanks, conditioning (pressure, temperature, phase change) and cleaning to the controlled supply of gas to engines, boilers or fuel cells. It incorporates shut-off, control, safety and check valves, overrange protection, leak detection, pressure relief and inerting mechanisms as well as emergency shutdown functions (ESD). HEROSE valves are used for all these functions.



LNG range – safely carries cryogenic media

Cryogenic natural gas LNG which is at a temperature of –162 °C, has a low flash point with significant volume expansion when it vaporises. Therefore, controlling the pressure is essential. Materials must remain shock-resistant at cryogenic temperatures; elongated spindles protect actuators and handwheels from icing up. Sealing extended materials are designed according to thermal cycling.

Ammonia range – handles toxicity and corrosion

The transition to climate-neutral fuels is shifting the focus to ammonia as an alternative energy source in shipping. While the IGF Code currently primarily relates to LNG, we already adhere to the interim IMO guidelines as well as the rules of leading classification societies such as DNV.

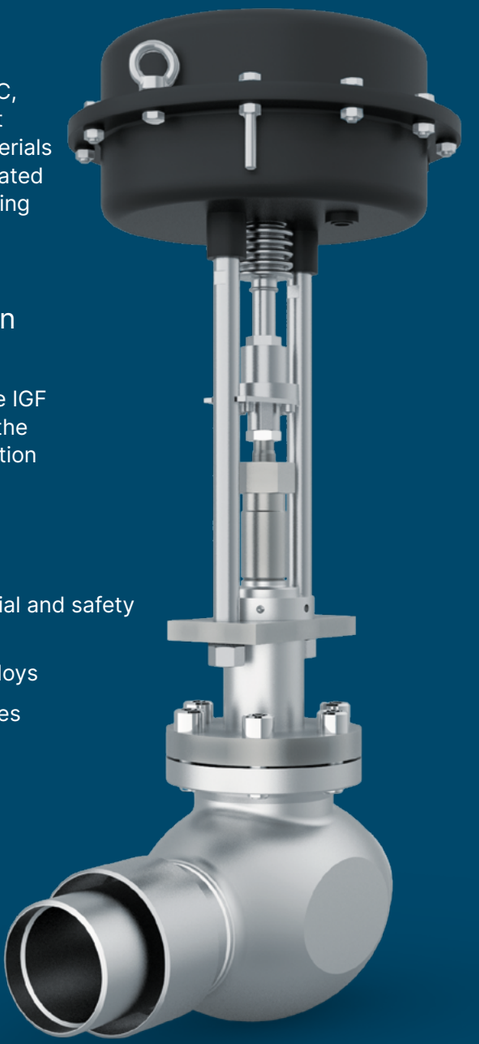
Our range of valves for ammonia

We apply our LNG experience to ammonia, adapting the material and safety concepts accordingly:

- Bodies made of low-carbon steel, stainless steel or nickel alloys
- Ammonia-resistant sealing materials or metal sealing surfaces
- Gastight spindle seals

How you benefit

A partner who is offering today market-ready solutions for the fuels of tomorrow – safe, compliant and tried-and-tested.



OUR SOLUTIONS

Absolutely reliable even in extreme conditions

Individual solutions for particular challenges

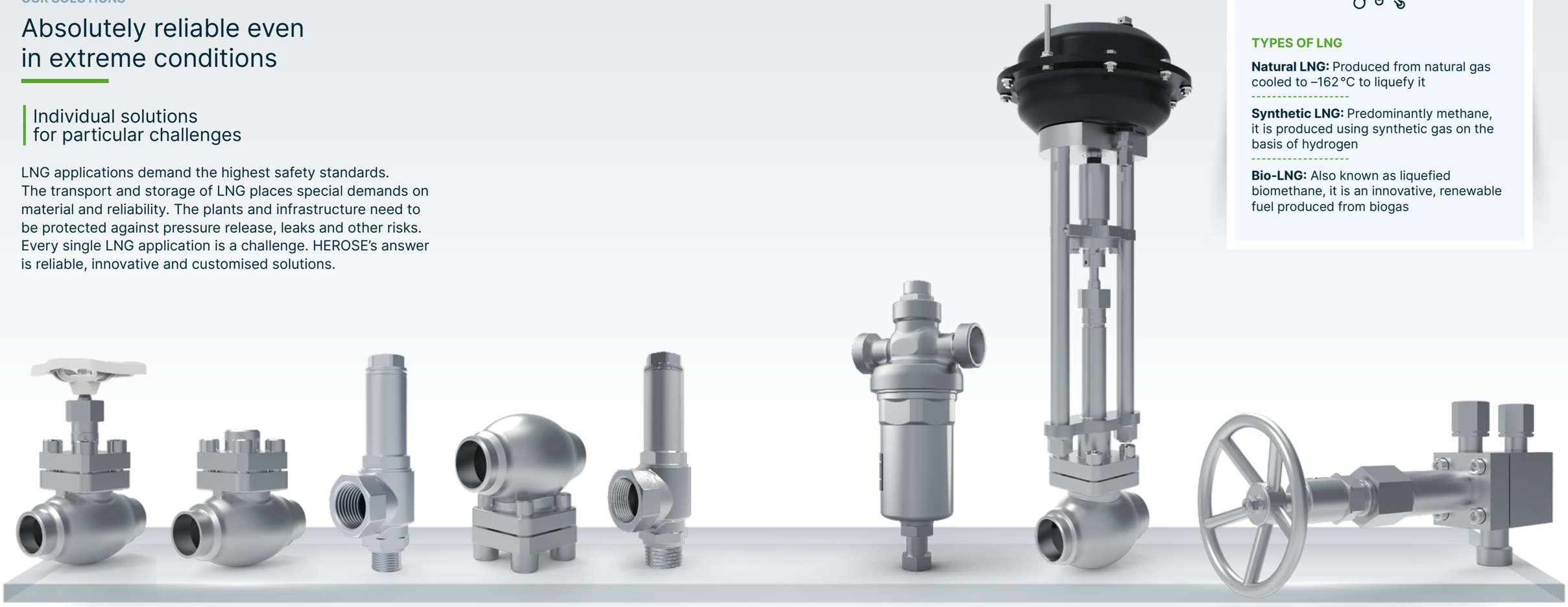
LNG applications demand the highest safety standards. The transport and storage of LNG places special demands on material and reliability. The plants and infrastructure need to be protected against pressure release, leaks and other risks. Every single LNG application is a challenge. HEROSE's answer is reliable, innovative and customised solutions.

TYPES OF LNG

Natural LNG: Produced from natural gas cooled to –162 °C to liquefy it

Synthetic LNG: Predominantly methane, it is produced using synthetic gas on the basis of hydrogen

Bio-LNG: Also known as liquefied biomethane, it is an innovative, renewable fuel produced from biogas



Globe Valves | **Check Valves** | **Safety Valves** | **Filters** | **Overflow Valves** | **Pressure Regulators** | **Actuated Valves** | **Changeover Valves**

BELLOW VALVES

Bellows: a solution for particularly high tightness

Media that must not be allowed to escape to the outside and into the environment require special sealing technology and place high demands on valves. By integrating a bellows, HEROSE valves can achieve an exceptionally high external tightness 10^{-6} mbar l/s up to 10^{-9} mbar l/s.
The HEROSE cryogenic globe valves with bellows for extremely high tightness requirements.

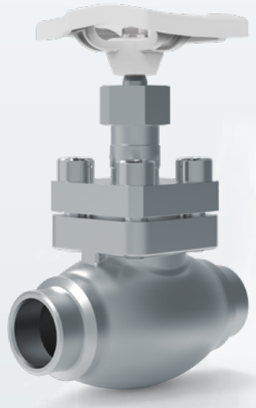
01272 – with bellows

Size:	DN10 to DN50
Pressure:	Up to 50 bar
Temperature:	–255 °C to +120 °C
Connections:	Weld connection
Material:	Stainless steel

FIRESAFE VALVES

Safety in case of fire

Even under extreme conditions, valves must still function, for example in the event of a fire. During the firesafe test, the valves must withstand a fire for 30 minutes and then be able to be opened completely at least once. Despite the heat stress, they must only have minimal leaks and must still be operable. To achieve this, they contain fewer soft seals, as these can melt in high heat. HEROSE offers a wide range of firesafe valves.
The operability of valves can determine the safety of lives and property in an emergency.



01851

Size:	DN10 to DN100
Pressure:	Up to 50 bar
Temperature:	–255 °C to +120 °C
Connections:	Weld connection
Material:	Stainless steel

01841

Size:	DN10 to DN200
Pressure:	Up to 50 bar
Temperature:	–255 °C to +120 °C
Connections:	Weld connection
Material:	Stainless steel

FULLX AND VACUUM INSULATION

When heat input leads to losses FullX is required

During transportation and storage of crygenic media, any heat input leads to evaporation and thus to losses. The HEROSE FullX is a globe valve for low-temperature applications that can be completely covered with a vacuum jacket. This reduces heat input to a very low value.

The insulation does not even have to be removed for maintenance or repairs due to the valve's top entry design. FullX saves space because it can be installed in any position. Even overhead installation is possible thanks to the bellows in bottom position.
FullX – the completely vacuum-insulated valve in a modular system with many installation options.

11C01

Size:	DN10 to DN50
Pressure:	Up to 63 bar
Temperature:	-269 °C to +80 °C
Connections:	Weld connection
Material:	Stainless steel
Version:	Actuated, manual

Flexibility and options

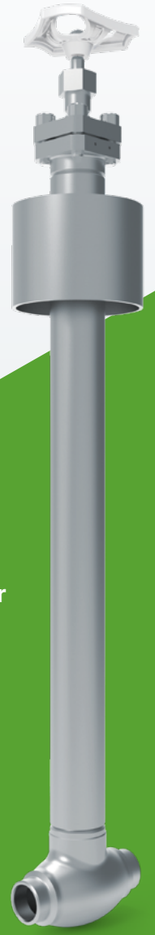
Our FullX can be installed in any position thanks to the integration of bellows. This way, we turn the world upside down.

The options are as varied as the applications:

- Various body versions (straight, angle and y-pattern)
- Top or bottom bellows
- Check, control and throttle function
- Firesafe design
- Purge port
- and many more ...

Discover also our other top-entry valve series

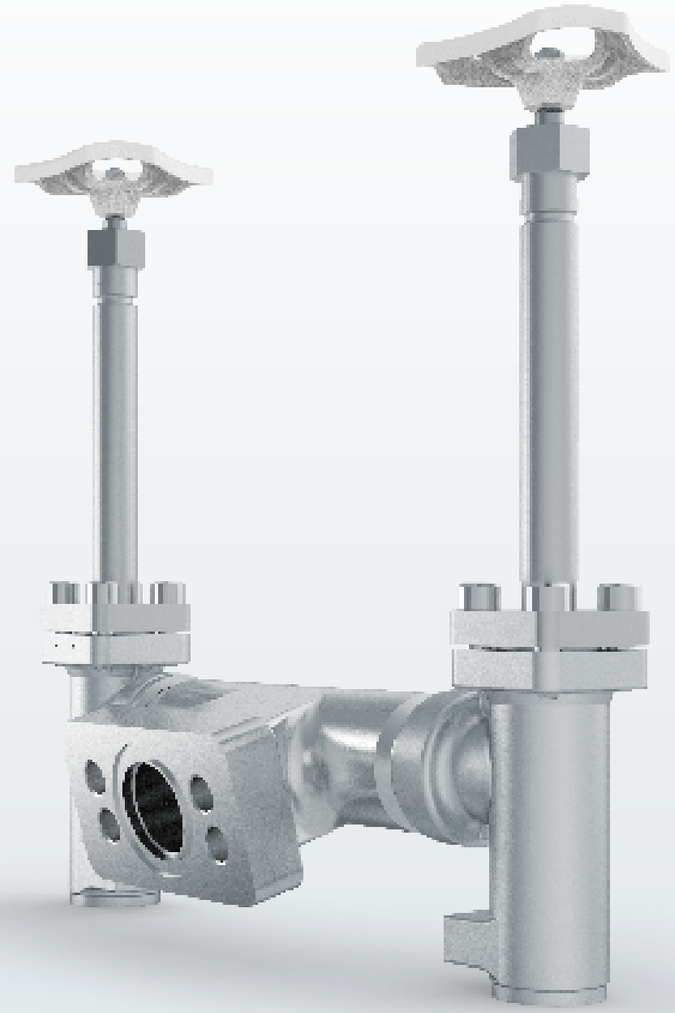
The first choice for all sizes from DN65 and bigger: Type 01470



FILL CLUSTERS

Various functions, one compact solution

The fill cluster from HEROSE meet various requirements for a filling setup. The fully assembled clusters are fully tailored to the customer's individual requirements and offer a compact and cost-efficient solution. The complete system consisting of HEROSE valves with various functions is factory preassembled. This reduces the on-site welding and assembly work and cuts the time and cost of installation on the vacuum-insulated tank.



07017

Size:	DN25 and DN40
Pressure:	Up to 50 bar
Temperature:	–196 °C to +120 °C
Connections:	Filling connection, socket weld
Material:	Stainless steel

BALL VALVES

A quarter turn for high flow

In cryogenic settings, ball valves hold many advantages: high flow capacity, quick reaction times, ease of handling and maintenance as well as being space-saving. The HEROSE ball valve has a larger flow diameter than similar globe valves. This results in lower flow losses and fast opening and closing times. It is versatile and ideal for container applications, cryogenic pumps, pipelines and low-pressure trailers.

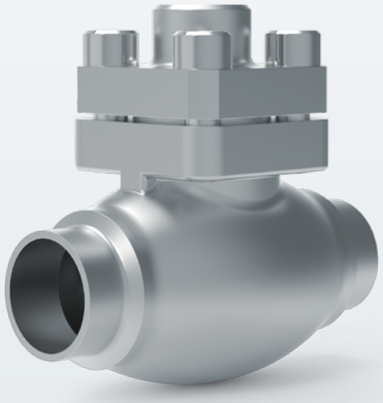
15C01

Size:	DN10 and DN80
Pressure:	Up to 100 bar
Temperature:	–196 °C to +65 °C
Connections:	Socket weld, thread
Material:	Stainless steel

CHECK VALVES

Direct protection against backflow

By preventing backflow, i.e. regulating one-way flow, check valves are crucial to ensuring the integrity of pipelines, pump systems and other flow systems.
HEROSE check valves reliably regulate one-way flow to prevent reverse flow.



05714

Size:	DN10 to DN150
Pressure:	Up to 50 bar
Temperature:	–255 °C to +120 °C
Connections:	Weld connection
Material:	Stainless steel

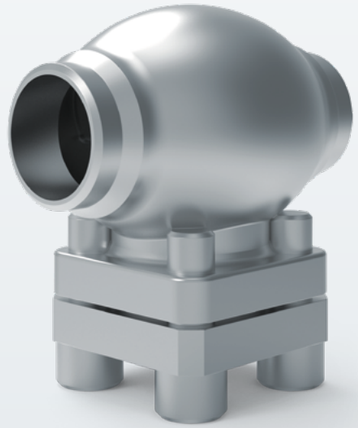
05C02

Size:	DN25
Pressure:	Up to 63 bar
Temperature:	–269 °C to +80 °C
Connections:	Weld connection
Material:	Stainless steel

STRAINERS

No chance for contamination

Strainers play an important role in maintaining the purity of media and the safety of systems. Purity is also an important issue when storing, transporting and using hydrogen. Strainers with mesh sizes in the tenth of a millimeter or micrometer range reliably remove contaminants and particles so that the performance of systems or the quality of the medium is not impaired.
Protection for systems and processes with suitable strainers from HEROSE.



08717

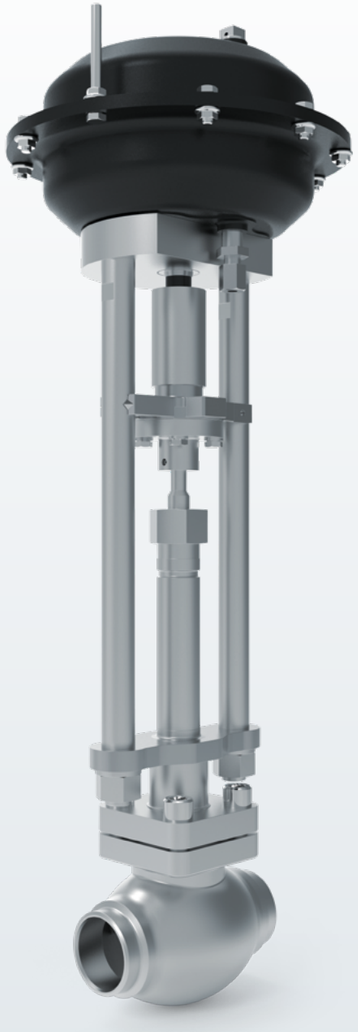
Size:	DN10 to DN150
Pressure:	Up to 50 bar
Temperature:	–255 °C to +120 °C
Connections:	Weld connection
Material:	Stainless steel

ACTUATED VALVES

Reliable and precise remote control

Valves are often installed in places that are difficult to access – due to structural conditions or because they are located in safety areas. HEROSE offers several actuators to control valves remotely. Actuated valves enable precise control of the flow or pressure in the system and can improve energy efficiency. Remote control enables automation and reduces the need for manual intervention. An additional handwheel can also be used to manually open or close the valve in the event of a compressed air failure.

Actuated HEROSE valves offer advantages for performance and efficiency in processes.



01843

Size:	DN10 to DN200
Pressure:	Up to 50 bar
Temperature:	–255 °C to +120 °C
Connections:	Weld connection
Material:	Stainless steel

LNG BUNKERING METHODS

Shore-to-Ship: In this method the LNG is bunkered directly from a trailer, a small bunker station or from an import/export terminal.

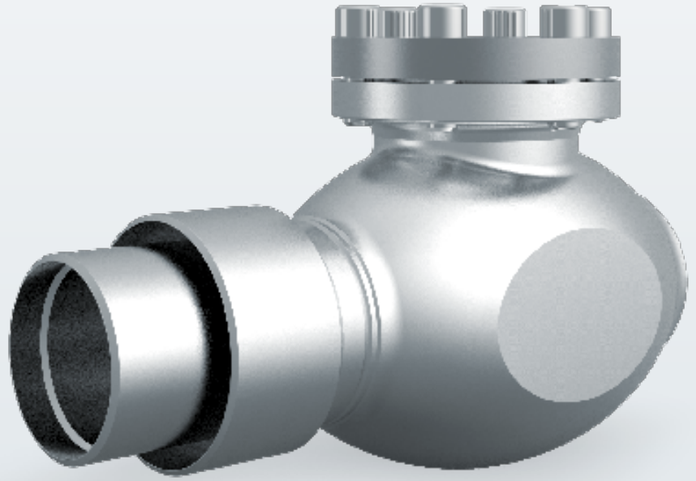
Ship-to-Ship: Ship-to-ship bunkering can take place at the quayside at anchor or at sea. The capacity of the bunkering ships ranges from 150 to 100,000 cubic metres.

Truck-to-Ship: This is the most commonly used method of bunkering LNG-powered vessels in the port currently. A flexible hose connects the LNG trailer to the ship.

GLOBE VALVES

Double-wall connection

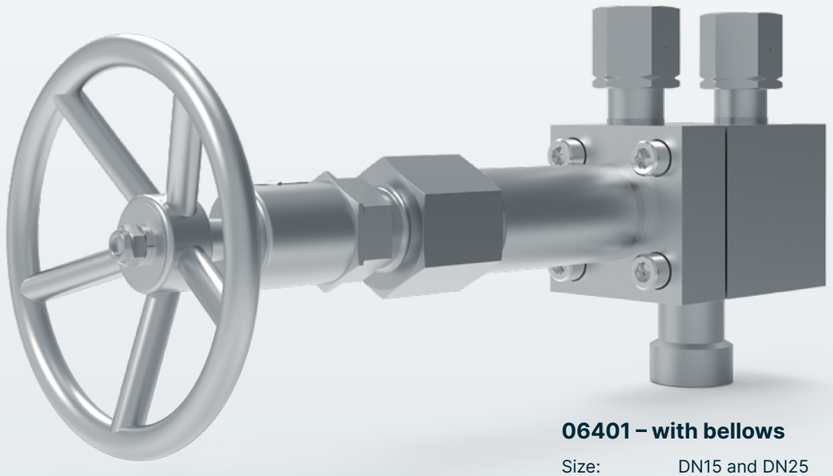
To meet marine class requirements for additional insulation of the entire TCS (Tank Connection Space), HEROSE has developed a double-wall connection. Our special solution creates an additional space for insulation, which covers the first welding seam of the product line. Hence, double protection for your application. The connection is compatible with multiple HEROSE globe valves.



CHANGEOVER VALVES

For maintenance in running systems

Every safety valve must be checked and maintained at least once a year. The valves are often installed in systems whose processes can only be interrupted or stopped with great effort. Changeover valves are the solution. Two safety valves allow maintenance, repairs or replacement to be carried out on one valve, while the other takes over the protection of the system.
HEROSE changeover valves ensure safety and uninterrupted processes.



06401 – with bellows

Size:	DN15 and DN25
Pressure:	Up to 63 bar
Temperature:	–255 °C to +185 °C
Connections:	Locking sleeve, threaded sleeve, flange
Material:	Stainless steel

PRESSURE REGULATORS

This pressure regulator handles all gases with ease

Pressure regulators protect systems from dangerous pressure levels. The HEROSE regulator builds up pressure and releases pressure as well as has a safety function all in one, meaning that fewer valves and pipework are required, which cuts costs.
The pressure regulator offers an economical solution for the storage of cryogenic liquefied gases such as nitrogen, oxygen and argon in a tank under constant pressure.

4186-1

Size:	DN20
Pressure:	Up to 50 bar
Temperature:	–196 °C to +200 °C
Connections:	Thread
Material:	Stainless steel

SAFETY VALVES

Safety valves protect systems from overpressure

Safety valves protect installations from excess pressure and prevent people and prevent damage to people and equipment. The detailed design, taking into account the medium as well as pressure and temperature range, is the basis for good functioning of the valve, especially at pressures of up to 1,200 bar and in cryogenic environments where thermal expansion can occur.
At HEROSE, you will find the right safety valve solutions for smooth and safe processes.

06011

Orifice d_o:	6.0 mm
Pressure:	5 to 55 bar
Temperature:	–255°C to +65°C
Connections:	Thread
Material:	Stainless steel

06383 – full lift SV

Orifice d_o:	7 to 23 mm
Pressure:	20 to 50 bar
Temperature:	–255 °C to +185 °C
Connections:	Thread
Material:	Stainless steel

OVERFLOW VALVES

Reliable pressure control at all times

An overflow valve protects against impermissible overpressure and works similar to a safety valve. As soon as the preset pressure is exceeded, the overflow valve opens and discharges the medium.
A spring inside the bonnet exerts a constant force. If the medium exceeds the spring force, the valve opens and releases overpressure.
Technically, a overflow valve is the same as a safety valve but not type-tested, it is preset in the factory and can be adjusted within the spring range on-site.

06381

Orifice d_o:	10.5 mm
Pressure:	0.5 to 36 bar
Temperature:	–196 °C to +185 °C
Connections:	Thread
Material:	Stainless steel

SERVICE AT HEROSE

We offer an extensive service and maintenance portfolio

We focus our attention on the individual needs of our customers, and act as a reliable partner to ensure the long service life and functional life of our valves. Digital services round off our on-site customer service. Trained specialists from the HEROSE Group and our service partners meet the highest standards. We are continuously improving our services, which means we can offer our customers the best possible service across the board.

- Service engineers
- Regular maintenance
- Spare parts
- Monitoring start-up
- Maintenance service on request
- Class renewal

Valve Information Service

The Valve Information Service (VIS) provides information on each and every single HEROSE valve. As well as product-specific data, certificates that have already been issued can be reissued on activation of the corresponding service level.
Further implementations are planned, such as the provision of suitable spare parts, 3D models and detailed maintenance schedules.

APPROVED WORLDWIDE

Over 170 approvals and certificates confirm our quality

In systems and technical facilities, our products are just a small gear in the machine of the bigger picture. But an important gear because the function and safety usually depend on them. That’s why we pursue a very simple strategy: the highest quality. We document this with over 170 certifications and classifications for worldwide use.

All approvals can also be found on our website.

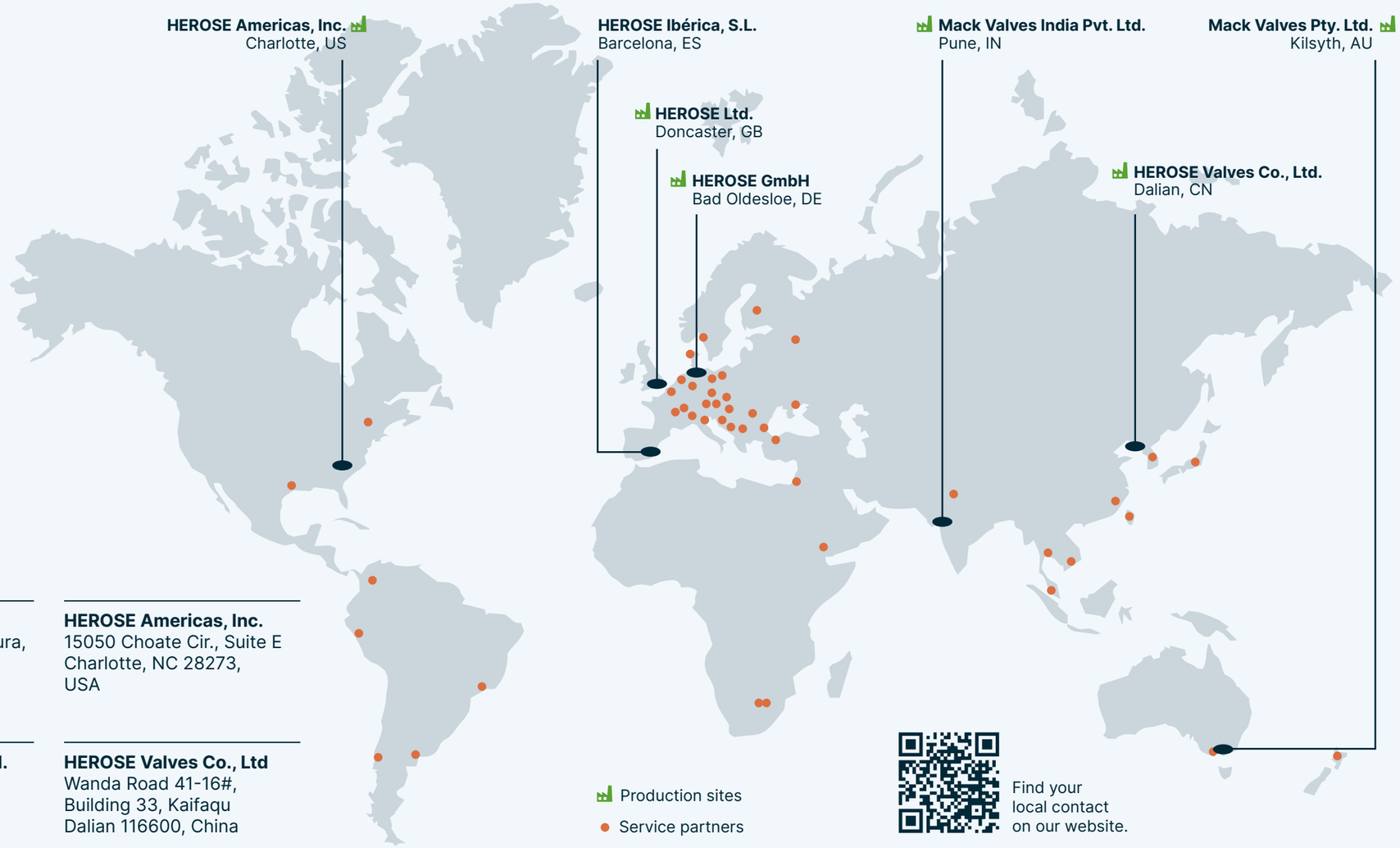
WE ARE CLOSE TO YOU

Our locations

HEROSE GmbH | Armaturen und Metalle

Elly-Heuss-Knapp-Straße 12
23843 Bad Oldesloe
Germany

+49 4531 509-0
info@herose.com
herose.com



HEROSE Ltd.
Unit 13 Durham Lane
Armthorpe/Doncaster
DN3 3FE, United Kingdom

HEROSE Ibérica, S.L.
Carrer de Cristóbal de Moura,
49, Sant Martí,
08011 Barcelona, Spain

HEROSE Americas, Inc.
15050 Choate Cir., Suite E
Charlotte, NC 28273,
USA

Mack Valves Pty. Ltd.
Unit 3/34 Garden Street
Kilsyth VIC 3137,
Australia

Mack Valves India Pvt. Ltd.
53, F–II, MIDC, Pimpri,
Pune, MH – 411018,
India

HEROSE Valves Co., Ltd
Wanda Road 41-16#,
Building 33, Kaifaqu
Dalian 116600, China