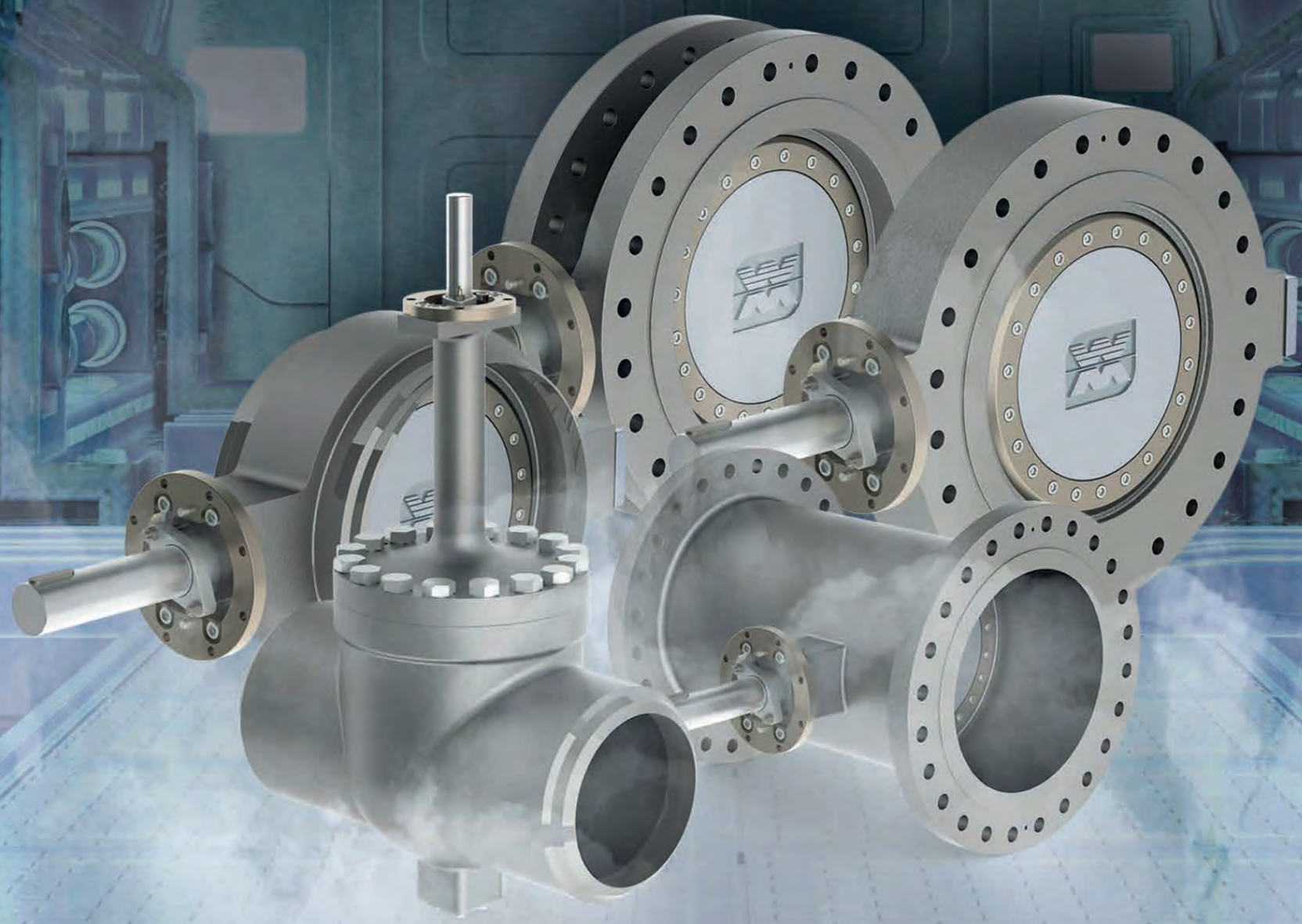
Quadax
four offset butterfly valves

Designed For Your Global LNG and Cryogenic Applications

quadax® valves are in service worldwide for LNG transporting, processing and storing.

HANDLING THE FUTURE:
quadax® engineers and manufactures extreme service butterfly valves for liquefaction and re-gasification in LNG and GNG services with cryogenic capabilities to -454°F/-270°C



LIQUEFIED NATURAL GAS

LNG is exactly what it says: the liquid form of natural gas. The process of liquefying is performed to reduce the volume for purposes of transporting the fuel: LNG reduces volume by 600 times, making it much more economical to transport. Valves are a critical component at each stage of the liquefaction process. Valve performance and reliability are important to the whole process.

Thanks to four offset construction and state of the art manufacturing technology, quadax® valves offer 100% compliance even with the highest tightness or temperature requirements. With this design, the quadax® is the perfect solution for demanding LNG applications.

CRYOGENIC APPLICATIONS

When it comes to temperatures below -259°F, the industry talks about cryogenic applications. We find these temperatures in different applications like air separation plants, chemical plants or LNG plants. With our quadax® Butterfly Valve Series, produced on modern 5 axis machining center in Germany, we can handle cryogenic applications.

Thanks to our four offset construction, the quadax® valve acts with a totally round seat and sealing geometry. This construction allows handling of these extreme temperatures. Even if material is shrinking and expanding due to extreme temperatures, the quadax® keeps its promise of 100% tightness.

quadax®
MADE FOR THE EXTREME = MADE FOR LNG

Our butterfly valves are the perfect solution for handling LNG applications. The special buttweld version TOP ENTRY is the ideal valve for LNG pipelines. The valve is 100% tight when it comes to low temperature or high temperature differences. Moreover, you can do the maintenance and repair work easily in the installed position and you have a reduced risk of unnoticed leakage.

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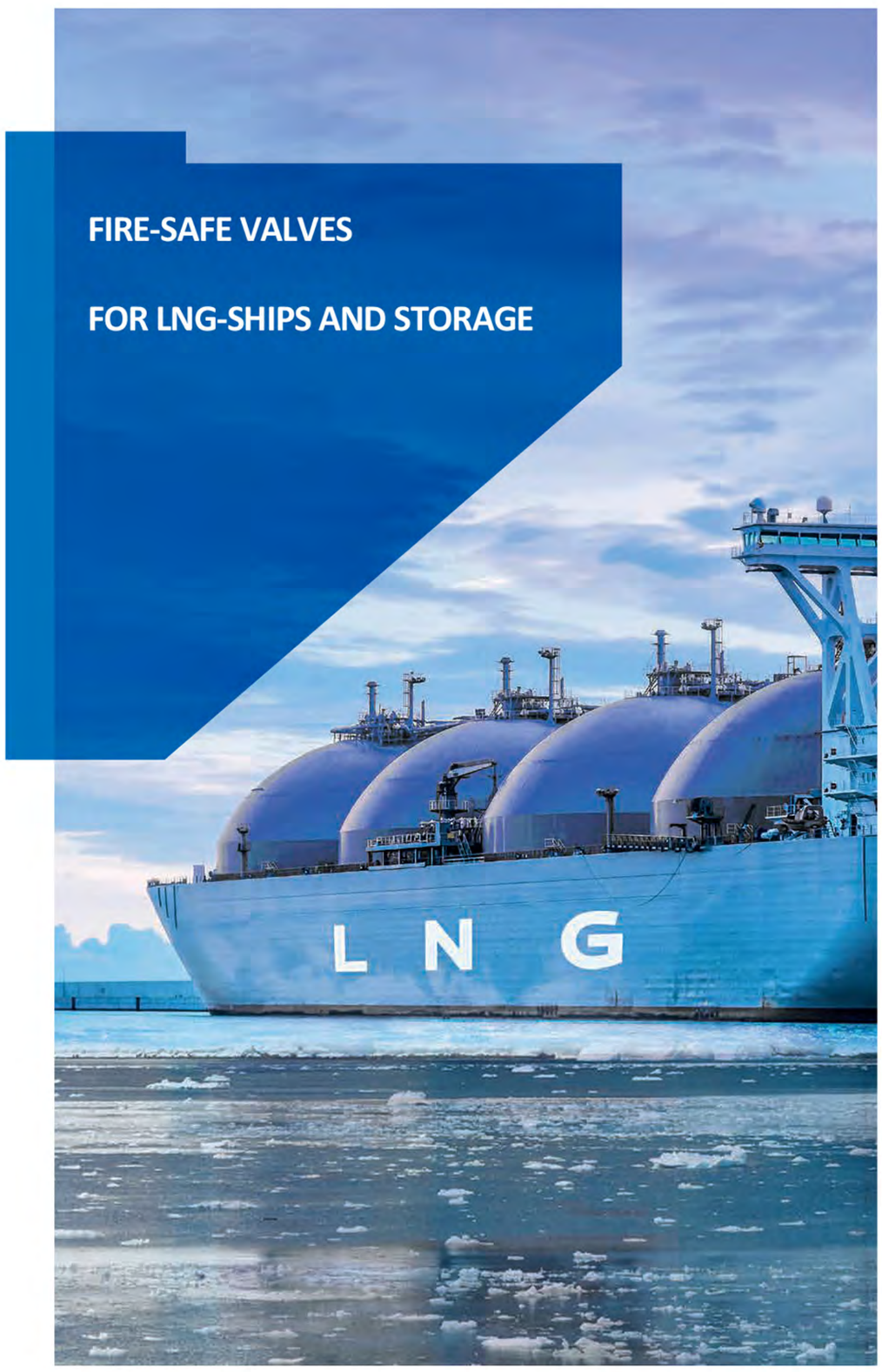
quadax®
Top Entry

Butterfly valve:	Bare shaft
Pressure range:	0-2320 psi
Nom. diameter:	6"-40"
Connection:	Welding ends



FIRE-SAFE VALVES

FOR LNG-SHIPS AND STORAGE

HIGH QUALITY BUTTERFLY VALVES

FOR LOW TEMPERATURE APPLICATIONS

OUR TEMPERATURE RESISTANT VERSIONS

01 quadax®
Double flange

Butterfly valve: Bare shaft
Pressure range: 0 - 2320 psi
Nominal Size: 2" - 72"
Connection: Flange

02 quadax®
Lug type

Butterfly valve: Bare shaft
Pressure range: 0 - 913 psi
Nominal Size: 2" - 72"
Connection: Flange

03 quadax®
Gate valve replacement

Butterfly valve: Bare shaft
Pressure range: 0 - 2320 psi
Nominal Size: 2" - 72"
Connection: Flange

04 quadax®
Buttweld type

Butterfly valve: Bare shaft
Pressure range: 0 - 2320 psi
Nominal Size: 2" - 40"
Connection: Welding ends

HIGHLIGHTS

-454 °F
up to +1472 °F

floating disc
design

2320 psi
and higher

100% tight also in
cryogenic
applications

tight in both
directions up to
the full pressure

fire safe
in both
directions

round
seat seal

friction free
design

high Cv-
value

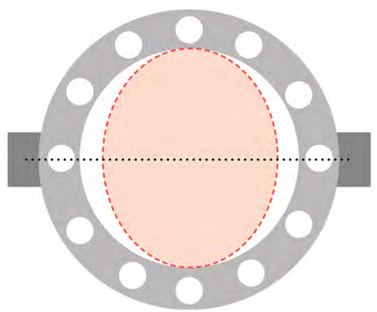
BAM approved
material for oxygen
applications

4

DESIGN PRINCIPLE

In contrast to the elliptical seal geometry of conventional triple offset valves, the quadax® features a totally circular seal geometry. Thanks to this unique four offset construction, the quadax® valves offer 100% tightness even under most extreme pressure and temperature requirements. For that reason, the quadax® range is the perfect fit for LNG applications.

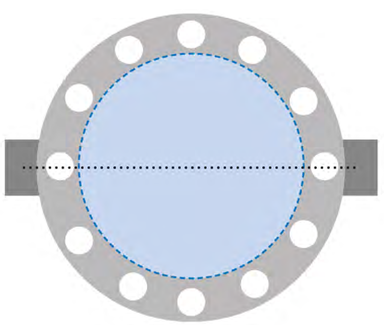
Conventional Triple Offset Butterfly Valves



- Wear due to friction
- Few leaks
- Maintenance prone

A conventional triple offset valve acts with an elliptical seat and sealing geometry.

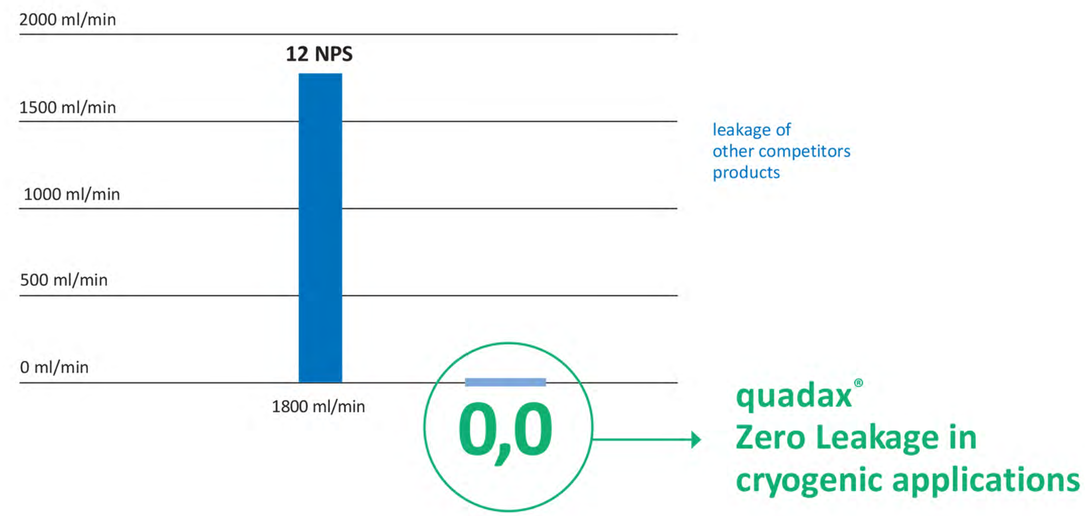
Four Offset quadax® Butterfly Valves



- Friction free
- High Cv values
- Highest tightness/No Leaks (even in the most extreme conditions)

The 4 offset butterfly valve offers a totally round seat and sealing geometry.

ACCEPTABLE TEST RESULTS ACCORDING TO BS6364

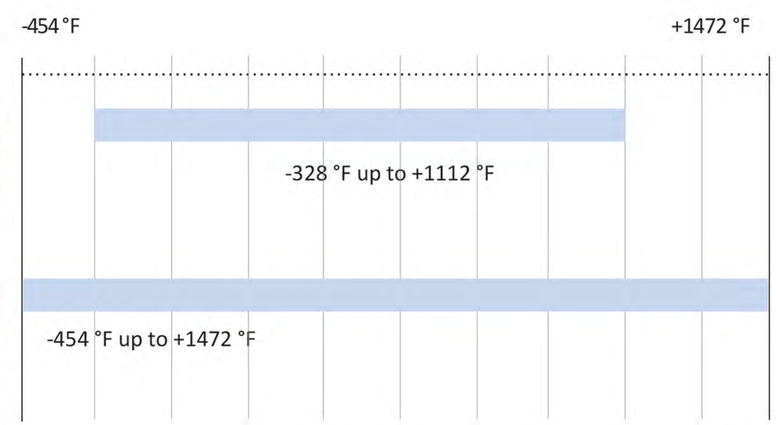


CRYOGENIC SEAL SOLUTIONS

Due to our design principle, quadax® can offer the perfect sealing solutions for cyrogenic applications. We are able to deliver sealing solutions for applications from -454F - +1472F. The two main sealing solutions in cyrogenic applications are the following:

Laminated Stainless Steel

Inconel O-Ring



SUCCESS STORY - BUBBLE TIGHT IN CRYOGENIC APPLICATIONS

THE APPLICATION

The increased storage and reprocessing of LNG (liquefied natural gas) has led to a sharp rise in demand for systems for the cryogenic sector in recent years. To enable the gas to be transported economically, it is cooled down to -265°F and thus liquefied. These systems frequently require shut-off valves that have to achieve a high level of tightness in this application (-259°F LNG to -320°F nitrogen/oxygen). Many manufacturers of triple offset butterfly valves have problems complying with the required leak rate set out in BS 6364. This issue is due to the geometry of the sealing area on the triple offset butterfly valves.

SOLUTION/COMPETITIVE ADVANTAGE

In contrast to the elliptical seal geometry of conventional triple offset valves, quadax® features a completely circular seal geometry. This means that the wall and material thickness is the same all the way around. This design enables bubble tight to be guaranteed even with extreme temperature fluctuations or in cryogenic applications (down to -320°F). Triple offset valves, on the other hand, have different wall and material thicknesses because of the elliptical seal geometry. In cryogenic applications or with extreme temperature differences, this leads to different shrinkage and expansion of the material at the seat, which can result in leaks.

* Source: www.linde-engineering.com/de/process_plants/air_separation_plants/

PRACTICAL EXAMPLE – LINDE AG

One of the müller quadax gmbh's key customers for applications in the cryogenic sector is Linde AG, who was very interested in finding a tight shut-off valve for its air fractionation systems.

AIR FRACTIONATION SYSTEMS

The air fractionation system project involves the following applications: "In cryogenic air fractionation systems, low temperature rectification can be used to produce oxygen, nitrogen and argon. Cryogenic air fractionation can also be used to obtain other noble gases such as krypton, xenon, helium and neon. The systems can create products in a gaseous state for pipelines or cryogenically liquefied for storage and transportation by truck. (…)"*

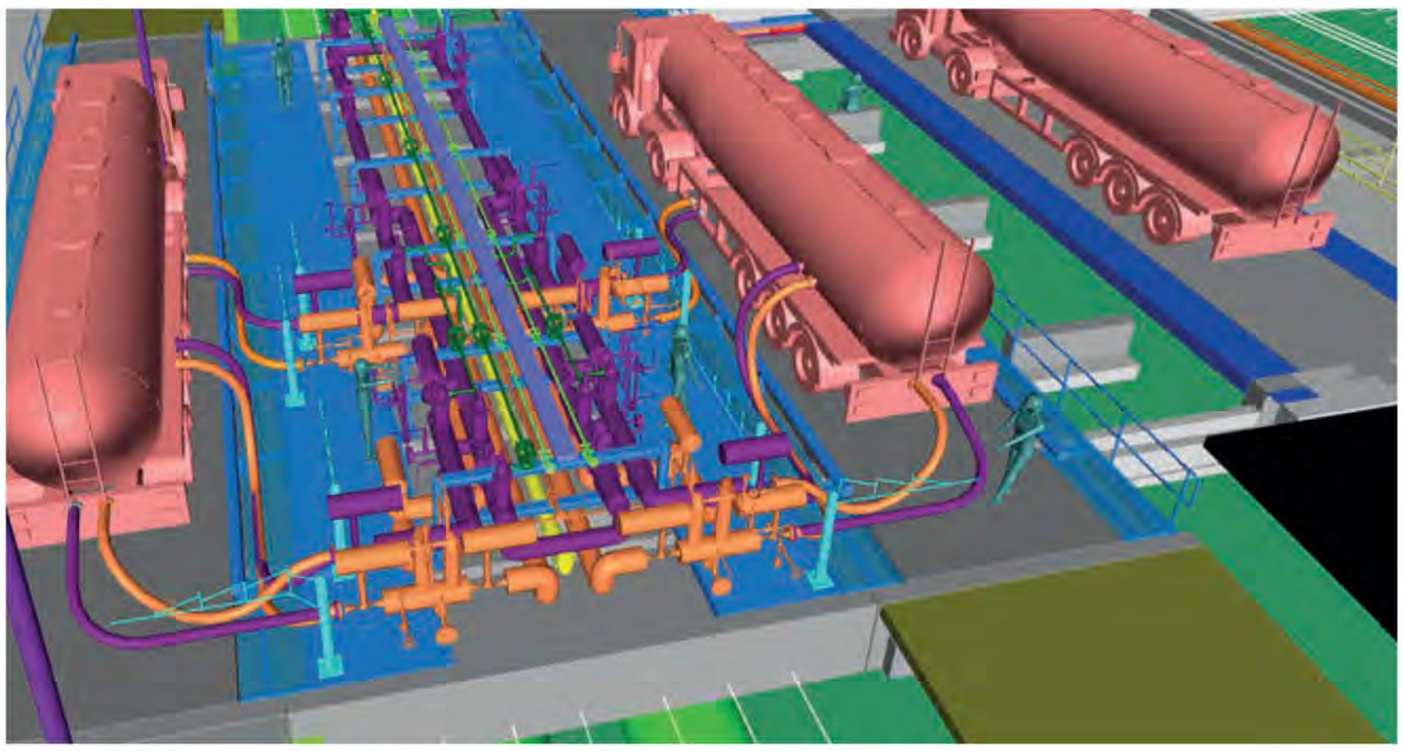
"CRYO TEST"

With the four offset butterfly valve, müller quadax gmbh was not only able to comply with the leak rate stipulated in the well-known BS 6364 standard, they actually managed to exceed it. Example using nominal size DN300:

BS 6343 allows:
100 mm^3/s x 300 = 30,000 mm^3/s = 1,800 ml/min quadax® achieves no visible leakages

THE LINDE GROUP
Linde

SUCCESS STORY - GATE TERMINAL



Truck Filling Station at Gate Terminal Rotterdam (Piping System)

Storage Tanks at Gate Terminal Rotterdam

Truck Filling Station at Gate Terminal Rotterdam

THE APPLICATION

Liquefied Natural Gas (LNG) is a clear, colorless liquid created when natural gas is cooled to -259°F. In liquid form, LNG occupies approximately 600 times less volume than standard natural gas, which enables it to be stored and transported very efficiently. LNG is a good alternative to gas transport via pipelines, particularly for transportation over long distances.

SOLUTION/COMPETITIVE ADVANTAGE

Thanks to the four offset design principle, quadax® acts with a totally round seat and sealing geometry and the same wall thicknesses all around. With this construction features, quadax® can handle extreme temperature ranges and differences. Moreover, quadax® can offer cryogenic sealing solutions like full metal lamella or the patented Inconel O-ring system.

With the valve product features, quadax® is the ideal solution for any LNG creating, LNG transporting or regasification process, where extreme low temperatures occur.

PRACTICAL EXAMPLE – GATE TERMINAL

Gate Terminal receives LNG for its customers, stores it, regasifies it and then supplies it to the gas transport network for distribution to households and industry. LNG is also used as fuel for vessels and lorries, as a replacement for diesel and heavy fuel oil. At Gate Terminal, LNG is loaded into bunkering vessels or trucks that supply other vessels with fuel.

At Gate Terminal, quadax® is used for the filling of tanks and trucks. The customer´s requirement is to keep the LNG pipe at a cryogenic status in the stationary case of not having a filling process. Once the filling process starts, quadax® opens and controls the LNG filling process of the trucks. The customer's challenge was to have a low flow rate to keep the pipe cold while having no filling process and to have an economical higher flow rate once the filling of the trucks starts. quadax® solved this requirement with a special engineering solution by using a combination of quadax® Butterfly Valves and CO-AX® LT (Low Temperature) Valves.

STATEMENT OF THE PROJECT ENGINEER AT GATE TERMINAL (MARCO G.)

”The quadax® solution is the beating heart of the LNG truck filling station. It controls the flow while the trucks are being filled and the pipeline is kept in a cryogenic state. For this special requirement of the LNG filling process quadax® was the perfect high-quality solution.”

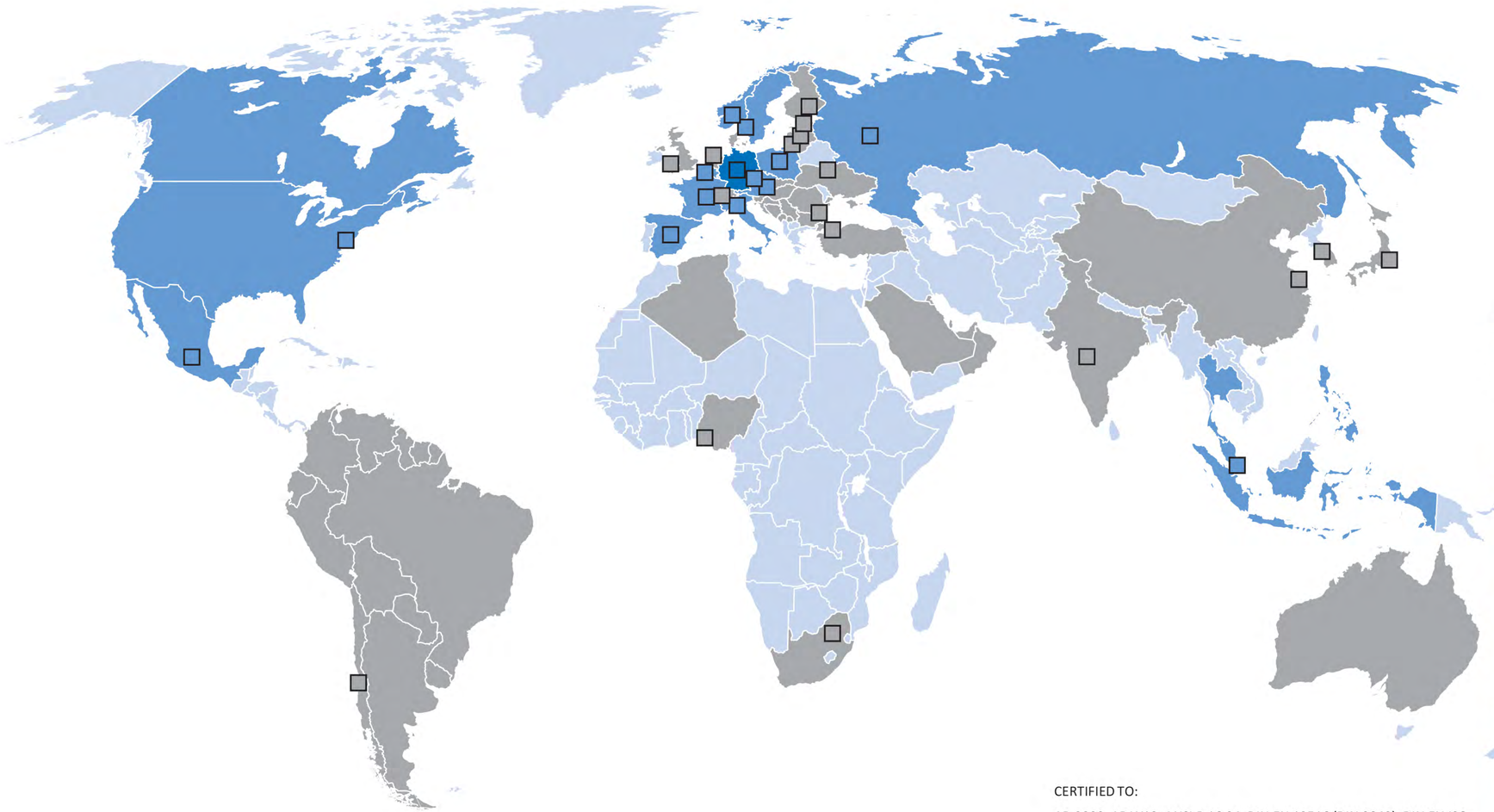
* Gate terminal B.V.
N.V. Nederlandse Gasunie and Koninklijke Vopak N.V. are the initiators and partners in Gate terminal B.V.. The terminal is operational since September 2011. The imported LNG is unloaded at the terminal, stored and evaporated to natural gas before it is delivered to the transmission network for the European markets. The terminal has an initial throughput capacity of 12 billion cubic meters per year (bcma), which in the future can be extended to 16 bcma. Gate terminal has also introduced back loading services for a wide range of LNG vessels. In January 2014, Gate has started loading LNG tank trucks and containers, with a total capacity of 5,000 trucks, to further support break bulk market developments.
Gasunie

Gasunie is a European gas infrastructure company. Gasunie’s network ranks among the largest high pressure gas pipeline grids in Europe, consisting of over 15,000 kilometers of pipeline in the Netherlands and northern Germany, dozens of installations and approximately 1,300 gas receiving stations. The annual gas throughput totals approximately 125 billion cubic meters. Gasunie offers transport services via its subsidiaries Gasunie Transport Services B.V. (GTS) in the Netherlands and Gasunie Deutschland in Germany. With its cross-border gas infrastructure and its services Gasunie facilitates TTF, which has developed into a leading and strongly growing European gas-trading hub. The company also offers other services in the gas infrastructure field, including gas storage and LNG.

Royal Vopak
Royal Vopak is the world's leading independent tank storage provider for the oil and chemical industry. As of 19 August 2016, Vopak operates 66 terminals in 24 countries with a combined storage capacity of 33.6 million cbm, with another 4.5 million cbm under development, to be added by 2019. Vopak's mission is to provide safe, efficient and clean storage and handling services of bulk liquid products and gases at key marine locations that are critical to its customers around the world. The majority of its customers are companies operating in the oil, chemicals and gas sector, for which Vopak stores a large variety of products destined for a wide range of industries. Vopak's strategic focus is on four categories of terminals: Major hubs supporting intercontinental products flows, Terminals facilitating growth in global gas markets, Import distribution terminals in major markets with structural deficits, Industrial and chemicals terminals in the Americas, the Middle East and Asia.

Gate terminal
Gas Access To Europe

THINK GLOBAL & ACT LOCAL



Sales, Service & Production
Sales & Service
Sales

quadax® GLOBAL SALES & SERVICE NETWORK
Our headquarters are located in South Germany. But our products are used all over the world - wherever extreme pressure or temperature ranges are required. For our customers, we combine the values and flexibility of a family-owned company with a long-term perspective and the professionalism of a global player.

CERTIFIED TO:
AD 2000, AD W10, ANSI B 16.34, DIN EN 12516 (DIN 3840), DIN EN ISO 9001:2015, DGRL 2014/68/EU, EAC, NACE MR0175, NACE MR0103, ISO 15848, 2014/34/EU-ATEX

FIRE SAFE IN BOTH DIRECTIONS:
ISO 10497, ISO 15848, API 607, BS 6755

LEAKAGE RATE:
DIN EN 12266 A / ANSI CLASS VI
ZERO LEAKAGE (TESTED ACCORDING to BS6364)

four offset butterfly valves

Rev_01_18

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