



DEHN protects Gas Industry Plants





Maximum plant availability thanks to lightning and surge protection



Lightning and surge protection for the gas industry

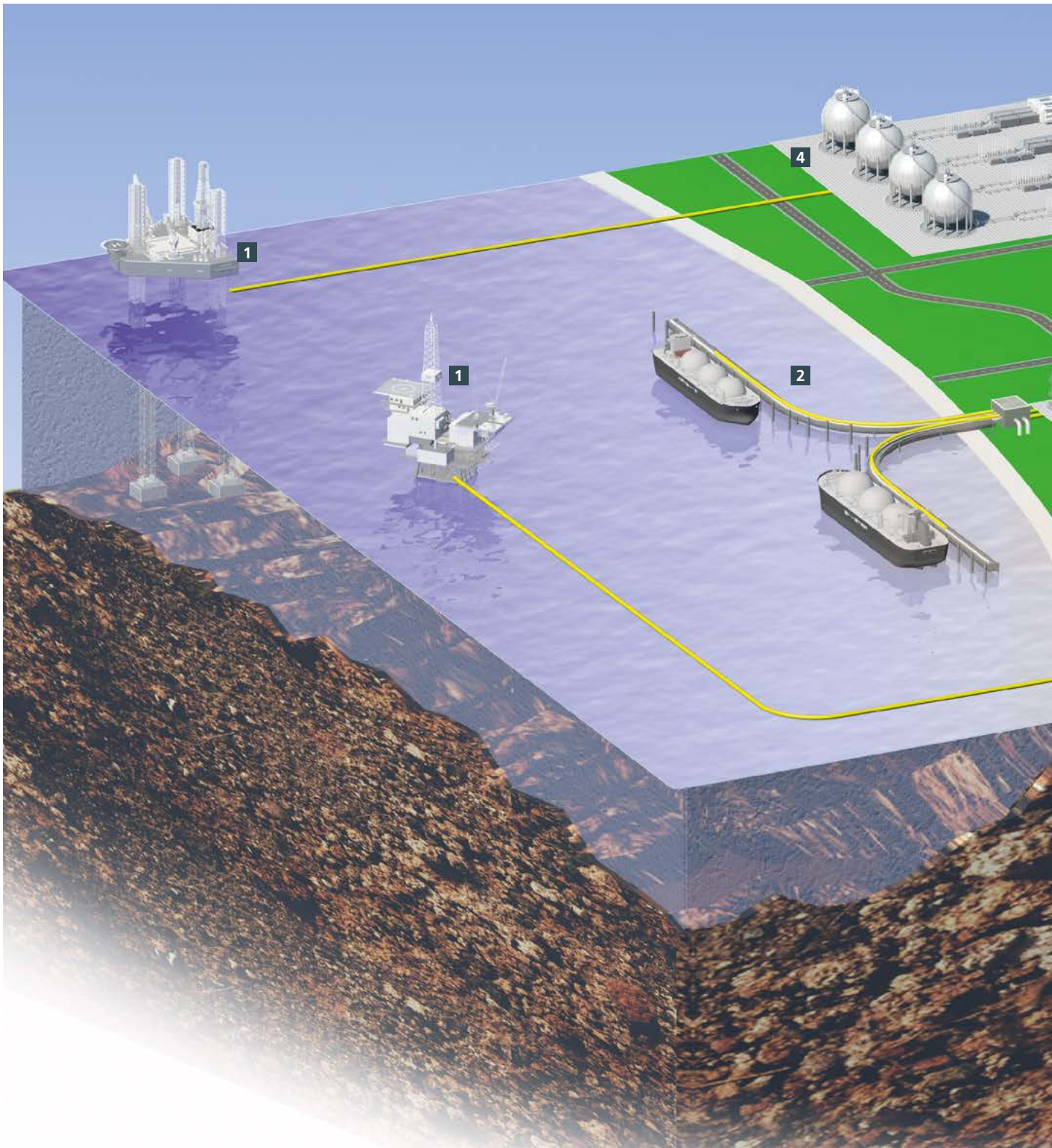
The gas supply network is one of the main arteries of our industrialised world. Numerous complex processes are involved from the exploration to the use of gas. These processes are controlled and monitored by highly automated electronic installations and systems. However, the smooth operation of pipelines, natural gas storage facilities and gas pressure control and measurement systems may be threatened by the effects of lightning strikes and transients due to the wide distribution and geographical location of these systems as well as the electromagnetic interference of modern measuring and control systems.

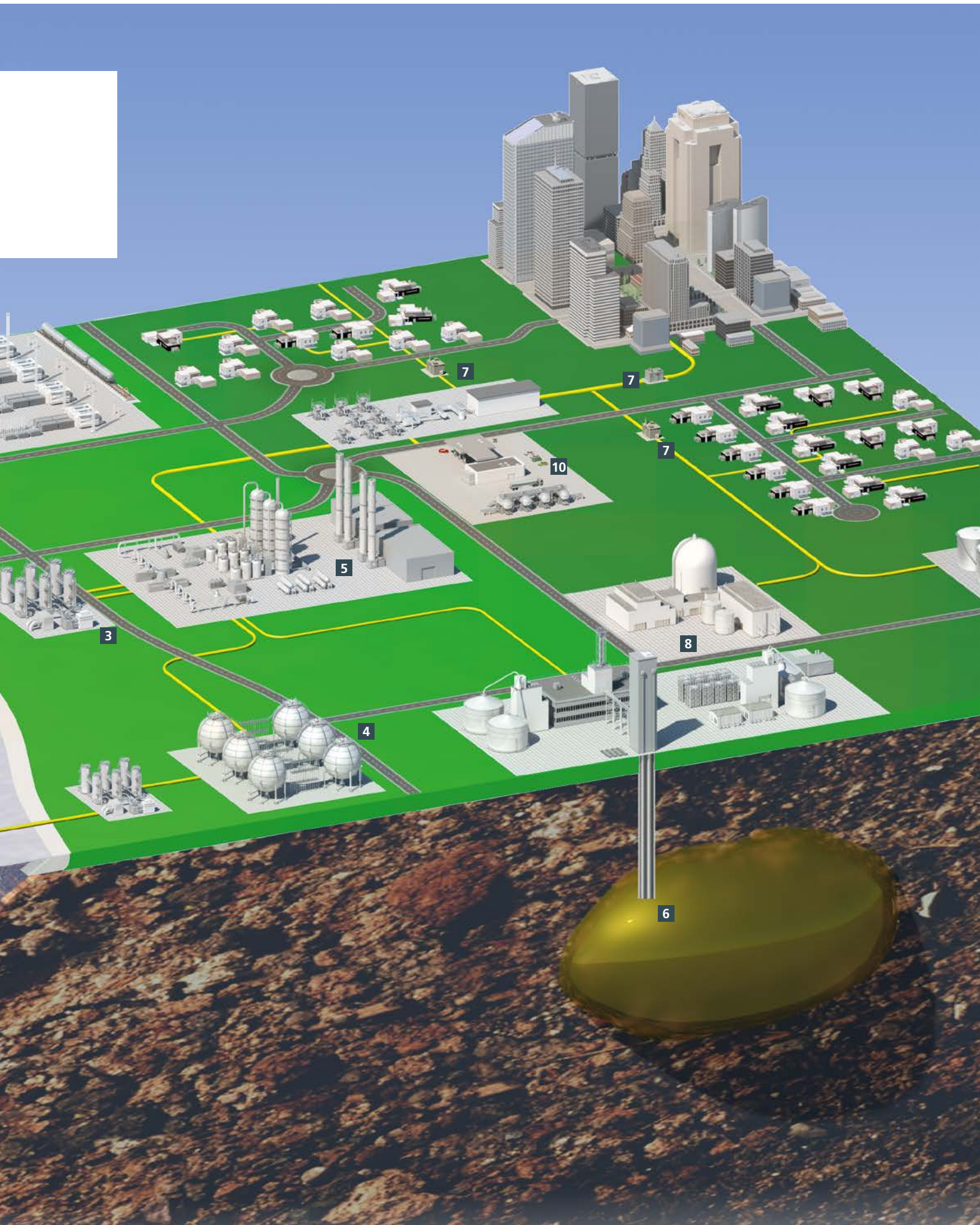
Lightning-related downtime and maintenance costs can be significantly reduced by lightning and surge protection measures. Rely on our long-standing experience in lightning protection and our professional solutions which protect systems from lightning and surge damage, thus effectively preventing downtime.

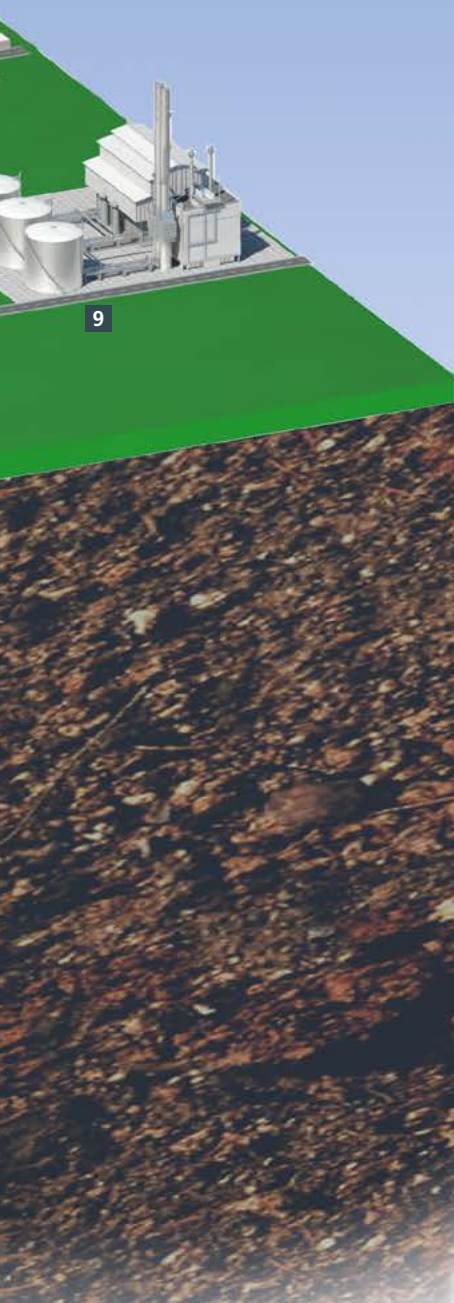
We offer a comprehensive portfolio of proven products and protection concepts which can be aligned to our customers' needs. In our highly specialised laboratories, we simulate the parameters of lightning effects. This allows us to test and analyse the lightning safety of our customers' installations and systems, even under the supervision of recognised test laboratories. In our impulse current laboratory, we perform engineering and test services to optimise customer-specific protection solutions, for example

- Testing of prewired connection units for protecting electrical installations
- Testing of measuring and control systems
- Testing of system cabinets

DEHN protects gas industry plants: Upstream, midstream, downstream







Upstream: Exploration

- 1 Drilling platforms
- 2 LPG tankers**
- 3 LNG terminals*

Midstream: Transport and storage

- 4 Gas tanks
- 5 Gas compressor stations
- 6 Underground gas storage facilities

Downstream: Distribution and consumption

- 7 Gas pressure control and measurement systems
- 8 Industrial plants
- 9 Gas-fired power plants
- 10 LPG / CNG*** petrol stations

*LNG: Liquefied Natural Gas
**LPG: Liquefied Petroleum Gas
***CNG: Compressed Natural Gas



Focus on personal and environmental protection

Pioneering spirit and innovative strength, intensive research and development as well as close cooperation with plant operators and end customers form the basis of our protection concepts.

Different technologies are required for the different processing stages. Therefore, the protection concepts against the effects of lightning currents and surges must also meet this challenge. Nevertheless, all plants of the gas industry have the same goal: Trouble-free operation and particularly personal and environmental protection.

For this reason, our goal is to protect plants of the gas industry ranging from drilling platforms to natural gas petrol stations.



Liquefied natural gas terminals

As a result of the increasing energy demand, it is more important than ever before to efficiently and quickly supply hydrocarbon fuels and products to the relevant markets where they are further processed. In this context, all relevant aspects of personal, plant and environmental protection must be observed. DEHN offers high-quality products, long-standing experience in lightning and surge protection and professional protection concepts to ensure that the transport and intermediate storage systems meet the strict safety requirements.

Liquefied natural gas (LNG) has a considerable advantage over natural gas which is particularly important during transport and storage: It has a significantly reduced volume. Particularly in case of large distances, transport by means of LNG tankers is a flexible alternative to onshore and offshore pipelines. Therefore, LNG tankers have increasingly gained importance over the last years.

Complex and expensive plants are required to convert natural gas into liquefied natural gas and to store and load liquefied natural gas. Therefore, lightning-related downtime of LNG terminals is not acceptable from an economic point of view.



Gas compressor stations

Natural gas compressor stations allow continuous transport from the exploration to the use of natural gas. To transport the natural gas to the consumers, the gas is fed into a pipeline system at a pressure up to 100 bars. Due to the flow loss, the pressure in the pipeline is reduced as the distance from the infeed point increases. For this reason, gas compressor stations are required.

The natural gas supply may not be ensured any more if a gas compressor station fails as a result of a lightning strike – particularly during times of peak consumption. To efficiently address this threat and to significantly reduce the probability of failure, preventive external and internal lightning protection measures must be taken. These protection measures mainly include fire and explosion protection, personal protection and the protection of electronic systems.

Underground gas storage facilities

The storage of natural gas allows to compensate seasonal demand fluctuations and to prevent supply bottlenecks. In the liberalised gas market, gas storage facilities are used to trade with natural gas, which is mostly stored underground in natural or artificial cavities (cavern storage facility) or porous rocks (porous rock storage facility). To ensure that the energy flow is not interrupted, these storage facilities, particularly all aboveground plant parts required for the operation of natural gas storage facilities such as compressor and gas dehydration systems and their control and monitoring equipment, must fulfil high availability requirements.

In case of natural gas storage facilities, particularly the buildings and the aboveground plant parts required for the operation of natural gas storage facilities are prone to direct lightning strikes. Therefore, lightning protection measures are required to protect the plant from lightning strikes and to significantly reduce the risk of a plant failure. These protection measures prevent lightning and surge damage and mainly include:

- An external lightning protection system to prevent direct lightning strikes to buildings, pipelines and plant parts.
- Prevention that dangerous explosive atmospheres ignite.
- Consistent implementation of equipotential bonding measures and interconnected earth-termination systems to prevent potential differences.
- Adequate SPDs to reduce conducted lightning currents and induced surges.



Source: Open Grid Europe

Gas pressure control and measurement systems

Gas pressure control and measurement systems are power supply systems. In Europe, they are subject to the Council Directives 2004/67/EC and 1999/92/EC*, which were transposed into local laws and standards.

One of the main functions of gas pressure control and measurement systems is to control and calculate gas volumes. This is an important economic aspect for operators.

Compared to conventional systems, the new electronic systems in gas pressure control and measurement systems only have a low immunity to transients. In addition, the structural conditions of widespread outdoor systems with widely distributed measurement equipment and controllers increase the risk of interference by lightning discharges or surges.

If no lightning and surge protection measures are taken, there is a risk that a part of the measurement equipment or even the entire measurement equipment will fail as a result of lightning effects. The follow-up costs of such a failure may be high and typically involve investments for re-establishing the system functions. To address the risk of damage resulting from a lightning strike and to increase the availability of gas pressure control and measurement systems, external and internal lightning protection measures must be taken.



LPG and CNG petrol stations

Operators of LPG and CNG* petrol stations must ensure that employees, customers and pedestrians are protected against fire and explosion risks. Due to the characteristics of LPG and CNG as well as the technical properties of tank systems, different risks must be considered.

All over the world there are different regulations and laws concerning the safety of LPG/CNG petrol stations. The following regulations apply to the design, installation, maintenance and operation of petrol stations:

- Building regulations
- Occupational health and safety laws
- Technical Rules for Operational Safety

A risk analysis according to the IEC/EN 62305-2 standard must be performed to assess the risk potentials of a lightning strike and to define suitable protection measures. The measures resulting from the risk analysis reduce the existing risk to an acceptable level and include, for example:

- External lightning protection system
- Surge protection
- Fire alarm and extinguishing systems

To ensure that the plants meet the most stringent safety requirements, DEHN offers professional protection concepts and solutions, long-standing experience and high-quality products for

- Earth-termination systems
- Equipotential bonding systems
- External lightning protection
- Surge protection for power supply systems
- Surge protection for measuring and control systems

* LPG: Liquefied Petroleum Gas
CNG: Compressed Natural Gas



Source: GASCADE Gastransport GmbH

Cathodic protection systems

Buried pipelines are costly investment objects with a long service life. To prevent that pipelines are destroyed by corrosion, active and passive corrosion protection measures must be taken. However, even the slightest imperfection in the pipeline covering quickly causes local corrosion of the pipeline. This results in leakage which can cause enormous damage to material assets and the environment.

One way of preventing corrosion of the pipeline is impressed current cathodic protection. In this process, a cathodic protection rectifier generates a protective current

which is led into the ground via impressed current anodes. The cathode is situated at the pipeline so that the protective current flows from the anode via the ground to the imperfections. To monitor the effectiveness of the cathodic protection, the potential is measured by means of permanent reference electrodes at the measuring points.

Due to the large interception areas of the pipelines and their direct galvanic connection to the cathodic protection rectifier, lightning and surge protection measures are required to prevent failure of the cathodic protection rectifier.



Source: MERO

Surge protection for cathodic protection systems

DEHN protects pipeline systems by means of practice-proven products and innovative concepts. Our portfolio includes isolating spark gaps for use in hazardous areas to protect insulating joints. Our combined arresters protect the anode and cathode side of cathodic protection systems.

Isolating spark gap for use in hazardous areas

Aboveground and underground isolating spark gaps for protecting insulating joints



Type	Part No.
EXFS 100	923 100
ESFS 100 KU	923 101
EXFS L 100	923 060

Coaxial connection system

Coaxial connection system for isolating spark gaps for use in hazardous areas with a low sparkover voltage which protects insulating joints



Type	Part No.
Coaxial connection box EXFS 100 / SN 4631	999 990

BLITZDUCTOR® VT KKS

Combined arrester for protecting the rectifiers in the protective circuit



Type	Part No.
BVT KKS ALD 75	918 420

BLITZDUCTOR® VT KKS

Combined arrester for protecting the rectifier in the sensor circuit



Type	Part No.
BVT KKS APD 36	918 421



Surge protection for power supply systems

The Red/Line® series from DEHN includes surge protective devices of different designs to protect power supply systems. DEHN offers lightning current arresters for main low-voltage distribution boards as well as surge arresters for the supply of control and monitoring systems.

DEHNbloc® Maxi S

Coordinated single-pole lightning current arrester with integrated arrester backup fuse for busbars



Type	Part No.
DBM 1 255 S	900 220

DEHNvenCI

Combined arrester with integrated arrester backup fuse for space-saving integration in switchgear installations



Type	Part No.
DVCI 1 255	961 200
DVCI 1 255 FM	961 205

DEHNventil® modular

Modular combined arrester with a high discharge capacity for easy replacement of protection modules without tools



Type	Part No.
DV M TT 255	951 310
DV M TT 255 FM	951 315

DEHNguard® modular

Modular surge arrester with integrated backup fuses for TT and TN-S systems



Type	Part No.
DG M TT CI 275	952 322
DG M TT CI 275 FM	952 327



Surge protection for measuring and control systems

The Yellow/Line series from DEHN includes a comprehensive portfolio for protecting measuring and control systems: for example arresters for analogue 4...20 mA signals and surge protective devices for field bus systems or intrinsically safe measuring circuits in potentially explosive atmospheres.

BLITZDUCTOR® XT and BLITZDUCTOR® XT Ex (i)

Combined arrester for two-pole, three-pole or four-pole interfaces and intrinsically safe measuring circuits; with base part and plug-in protection module



Type	Part No.
BXT ML4 BD EX 24	920 381
BXT ML2 BD S 24	920 244
BXT BAS	920 300
BST BAS EX	920 301

Condition monitoring system with LifeCheck® sensor

Maximum availability due to permanent condition monitoring of LifeCheck®-equipped arresters



Type	Part No.
DRC MCM XT	910 695
DRC SCM XT	910 696

DEHNconnect SD2 and DEHNconnect SD2 Ex (i)

Space-saving terminal block with integrated surge protection and disconnection function



Type	Part No.
DCO SD2 MD EX 24	917 960
DCO SD2 MD 24	917 941

DEHNpipe Ex (i) + Ex (d)

Surge protection for parallel or series connected field devices for one or two interfaces



Type	Part No.
DPI MD EX 24 M 2	929 960
DPI CD EXI+D 2X24 M	929 950



Earthing, external lightning protection, equipotential bonding

DEHN offers components for a complete lightning protection system ranging from earth-termination systems over air-termination systems and pipe clamps to the integration of pipelines into the equipotential bonding system in hazardous areas without ignition sparks.

Conductor

Wires, cables and strips made of different materials for use in lightning protection and earth-termination systems



Type	Part No.
Copper cable	832 095
Stainless steel strip	860 335

Clamp

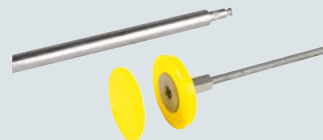
Connection components for safe and lightning-current-tested connection of conductors



Type	Part No.
Parallel connector	306 101
Clamp with intermediate plate	319 229

Earth rod and fixed earthing terminal

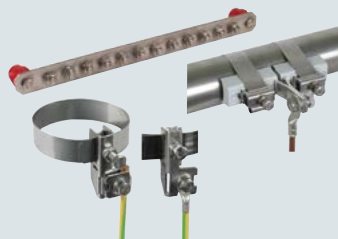
Earth-termination systems and corrosion-free connection possibilities for connection to the equipotential bonding system



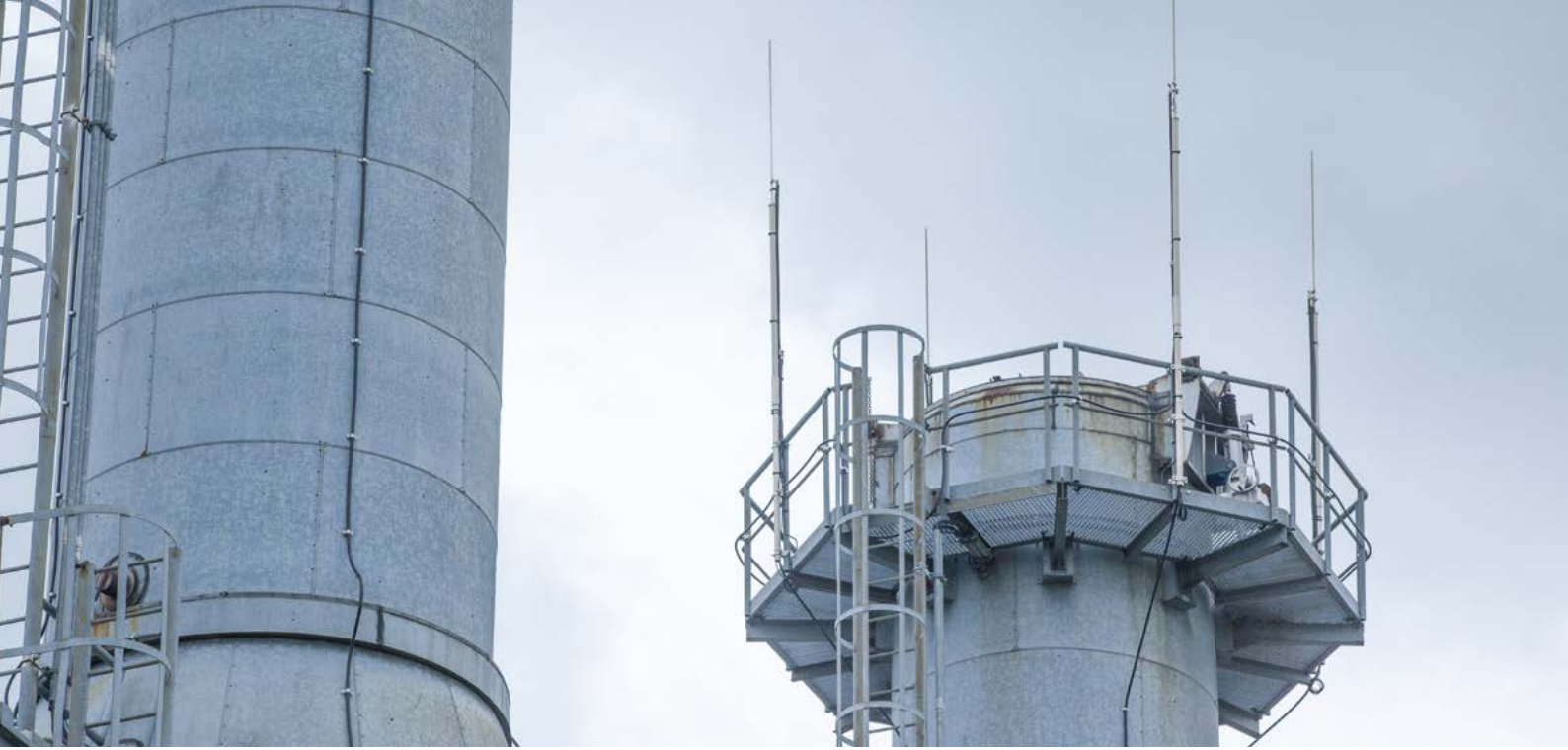
Type	Part No.
Earth rod of type S	620 150
Fixed earthing terminal of type K	478 200

Equipotential bonding bar and pipe clamp for use in hazardous areas

Equipotential bonding bar and pipe clamp for use in potentially explosive atmospheres



Type	Part No.
Equipotential bonding bar	472 239
EX BRS 90	540 801
BRS 27.89 AK1x10 2x6.8	540 104
GSG V2A	



Isolated lightning protection

Especially in hazardous areas it must be observed that there are no ignitable sparks between conductive system parts and the external lightning protection system. The HVI® lightning protection system from DEHN is an innovative solution which copes with this risk.

HVI®Conductor

Isolated lightning protection systems for preventing dangerous flashover to conductive system parts



Type	Part No.
HVI®Conductor in supporting tube with air-termination rod	819 328

Conductor holder

For installing HVI®Conductors in hazardous areas



Type	Part No.
HVI®Ex W70 holder	275 440
HVI®Ex P200 holder	275 442

Conductor holder

For installing HVI®Conductors by means of HVI-Ex W70 conductor holders on a non-conductive structure, for example stone, wood



Type	Part No.
HVI-Ex busbar 500	275 498

Earthing busbar

For connecting down conductors to the earth-termination system and equipotential bonding measures



Type	Part No.
2x2 terminals	472 109



Safety equipment

The safety equipment portfolio from DEHN comprises safety devices and personal protective equipment for working according to the five safety rules and live working.

Safety helmet for electricians (ESH) and DEHNcare® arc-fault-resistant face shield (APS)

Protection of the head and face region from the thermal and mechanical effects of arc faults



Type	Part No.
ESH U 1000 S Y	785 730
APS T 12C SC	785 762

DEHNcare® protective gloves (APG) and coat (APC)

Arc-fault-tested protective clothing with an extremely high wearing comfort



Type	Part No.
APG 10	785 798
APC 48 50	785 755

Interface test unit and voltage detector

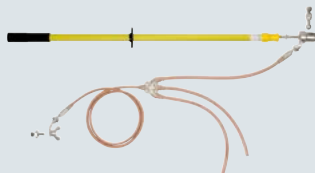
For verifying that switchgear installations with different designs and nominal voltage ranges are dead



Type	Part No.
SPG DCA IT LRM	767 122
PHE3 6 20 S ZK	767 951

Earthing and short-circuiting device

Devices for safe working in a de-energised state



Type	Part No.
ES SK STK 1000	761 001
EKV 3+1 9SR	VP9K3BJ



Approvals and certificates

Many plants and applications of the gas industry are located in potentially explosive atmospheres. Devices and equipment for use in these atmospheres must fulfil different requirements depending on the frequency and duration of dangerous potentially explosive atmospheres. The aim is to reduce or prevent the probability of ignition by means of structural and protection measures.

Devices and equipment, which are developed and produced according to the relevant standards and guidelines and are thus suited for use in potentially explosive atmospheres, are labelled accordingly and are approved by certified independent institutes. DEHN products comply with the relevant regulations and standards and are approved for use in potentially explosive atmospheres. This is confirmed by certificates such as ATEX, IECEx or CSA HazLoc to name just a few. All certificates are available on the relevant product page at www.dehn-international.com.

DEHN test laboratory

The lightning current carrying capability of plant components of the gas industry and the coordination of DEHN products with downstream equipment are tested in laboratory tests. Tests in our impulse current laboratory show whether the selected protection measures are effective.

We offer operators, system integrators and manufacturers the following engineering and test services:

- Lightning current tests, for example for equipotential bonding connections without ignition sparks
- Coordination tests with downstream protective circuits of the inputs, for example of process control systems, cathodic protection rectifiers and field devices
- Coordination tests between isolating spark gaps and insulating joints

The DEHN test laboratory is equipped with high-performance devices. Tests are carried out in line with the latest national and international standards. Thanks to our representation in standardisation committees over decades, our employees are always familiar with the latest standards and have in-depth knowledge of technical basics. We use this knowledge to carry out our engineering and test services, thus making our protection concepts feasible for applications in the gas industry.



Our promise

DEHN protects.®

Our key objective is to protect workers and material assets. It was our pioneering spirit and innovative ideas that have defined our company for more than 100 years and made us a market leader with more than 1,700 employees. Market needs as well as our determination and innovative ideas are incorporated into new products and safety concepts.

As early as in 1923 our founder Hans Dehn started the production of external lightning protection and earthing components to optimise the protection of buildings and installations. In 1954, we launched the first series of surge protective devices. Constant further development of these devices ensures safe operation and permanent availability of electrical and electronic installations. Also in the 1950s, our third sector, safety equipment, was added to our portfolio.

The Bavarian town of Neumarkt is the heart of our activities where product managers and developers advance our protection technologies. Here we manufacture our high-quality safety products.

We offer the best solution.

Our concern is to be a reliable and fair partner for our industrial, commercial and technical customers all over the world. To this end, we always focus on the best solution to protection problems. Our sales teams and our global network of 20 subsidiaries and offices as well as more than 70 international partners competently serve customer needs. Proximity and close contact with our customers are of utmost importance to us, be it on-site support by our experienced field staff team, our telephone hotline or personal contact at trade fairs. In hundreds of seminars, workshops and conferences held every year we impart practical knowledge of our products and solutions. Our specialised book "Lightning Protection Guide" and our brochures will broaden your know-how.

Visit us at www.dehn-international.com.



www.dehn-international.com/partners



**Surge Protection
Lightning Protection
Safety Equipment
DEHN protects.®**

DEHN + SÖHNE
GmbH + Co.KG.

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