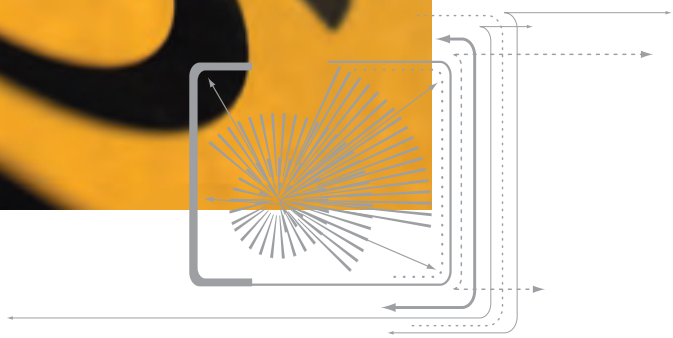
Expertise in explosion protection



05.2011

Partner of Experts

STAHL CraneSystems

STAHL CraneSystems – The Experts

ATEX

IECEx

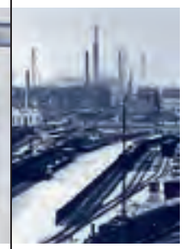
Over 130 years of tradition, over 130 years of practical approach, competence and experience: STAHL CraneSystems can look back on a history characterised by the constant drive for innovation and significant modernisations.
At the end of the nineteen-twenties, STAHL CraneSystems was one of the first, and for some time the only manufacturer to influence and advance the development of explosion-protected lifting technology. Revolutionary and programmatic in many fields, always receptive to new aspects, we have amassed a wealth of experience that gives us distinct advantages today.
Profit from these advantages, from the expertise of one of the world's leading manufacturers of explosion-protected components and systems for overhead transportation. Technically and economically, our products not only belong to the top flight internationally but lead the way in the field of explosion protection.

1876 Company founded by Rafel Stahl

1898 First large electric portal crane

1922 First electric hoist with wire rope and drum

1926 Development of explosion-protected hoists, crane components and control technology begins



1935 Construction of explosion-protected crane systems up to a lifting capacity of 100,000 kg for the chemical industry

1953 World innovation: first explosion-protected flameproof enclosed electric wire rope hoist

1978 AS range of wire rope hoists

1983 T range of chain hoists

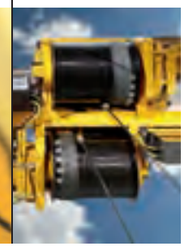
1997 ST range of chain hoists

1998 SH range of wire rope hoists

2003 STAHL CraneSystems implements the ATEX product directive 94/9/EC comprehensively for the whole range of products

2009 STAHL CraneSystems presents the world's largest portfolio of explosion-protected lifting technology, drive technology and control technology

2010 As explosion protection expert, STAHL CraneSystems offers explosion-protected customised solutions and crane technology for the gas liquefaction industry (LNG)



STAHL CraneSystems

Information and standards

Products and services

Explosion protection

The beginnings of explosion protection are to be found in the mining industry where miners are exposed to the dangers of fire damp. This term refers to methane gas which escapes in coal mines in particular and which reacts explosively when combined with fine coal dust and air (fire damp explosion). Explosive atmospheres may however occur in other branches of industry too, for example in the chemical or petrochemical industries. Electrical apparatus used in potentially explosive atmospheres must be constructed in such a way that it does not become a source of ignition.

In order to avoid serious injuries and damage to material and the environment, safety regulations, laws, decrees and standards have been established in most states. In this way a high degree of safety has developed in explosion protection across the world. As the physical laws regarding the occurrence of explosions and the measures taken to prevent them are based on similar principles everywhere, currently the aim is to harmonise approval conditions and regulations regarding conformity at an international level. This brochure merely outlines the European explosion protection directives which however correspond largely to the international IECEx regulations. It cannot take the place of an intensive analysis of national legal principles and standards.

STAHL CraneSystems is pioneering, dynamic and uncompromising when the safety of persons and machines in areas subject to explosion hazards is at stake. STAHL CraneSystems occupies an exceptional position in this field with our many decades of experience and expertise, our own fundamental research and development, approvals from the Federal Physico-Technical Institute (PTB) and other national and international test institutes and worldwide certification. All hoists and components without exception come from our own production, from motor and brake to controls and control pendant.

STAHL CraneSystems is the world specialist for explosion protection and as world market leader offers the most comprehensive, complete programme of explosion-protected lifting, drive and control technology.

Food processing industry

Shipbuilding and offshore industry

Pharmaceutical industry

Energy supply

Chemical industry

Petrochemical industry

Legal principles

ATEX

With the ATEX product directive 94/9/EC (ATEX 95) and the ATEX user directive 1999/92/EC (ATEX 137) the European Community has established the basis for uniform European explosion protection. This safety concept is applicable both for manufacturing electrical and non-electrical apparatus and for operating this apparatus in the respective industrial plants. The legislators of the individual member countries implement these directives in equivalent statutory regulations.

In Germany for example these are the Explosion Protection Ordinance ExVO (implementation of directive 94/9/EC), the Industrial Safety Ordinance (implementation of directive 1999/92/EC) and the Technical Regulations for Industrial Safety (TRBS), the regulations issued by the Employers' Liability Insurance Associations (e.g. BGR 104, BGR 109 and BGR 132), the Employers' Liability Insurance Association information sheets (e.g. BGI 740) and the regulations issued by the VDI (Association of German Engineers) (e.g. 2263 and 3673).

ATEX directive 94/9/EC defines the properties required by apparatus for safe use in explosive areas. This includes classification into equipment groups and categories, the respective conformity assessment procedures to be followed, manufacturers' responsibility including CE conformity marking, basic safety requirements for the development and manufacture of explosion-protected equipment and recognised quality management measures to be implemented during production. ATEX directive 99/92/EC defines the obligations of users and employers for employees' protection in explosive areas. Inter alia, the user must assess risk and classify the potentially explosive areas into corresponding zones so that the apparatus required by directive 94/9/EC can be used in safety.

IECEx

The international IECEx scheme also aims to assess conformity and certify apparatus, systems and services for use in explosive areas. The IECEx system, introduced in 1996, supports the standardisation of norms and the issuing of certificates of conformity (CoC) unrelated to specific countries or regions, in order to thus simplify the free global movement of goods. There is already extensive agreement as to classes and requirements between the European ATEX directives and the IECEx regulations. This means that ATEX could one day be superseded.

IECEx is of great importance outside Europe. A total of 26 countries have acceded to IECEx and there are 34 recognised IECEx certification bodies (ExCB) and 36 recognised test laboratories (ExTLs) around the world. In countries which recognise IECEx, apparatus with the corresponding certification can be commissioned without further testing.

All products of STAHL CraneSystems are available also with IECEx certification. You will find further information on the IECEx system and its provisions including regulations, handbooks and procedures at: www.iecex.com

Useful links

ATEX
→ http://ec.europa.eu/enterprise/atex

Explosion Protection Ordinance 11th GPSGV)
→ http://bundesrecht.juris.de/gsgv_11 (German)

Technical Regulations for Industrial Safety (TRBS)
→ http://www.baua.de/en

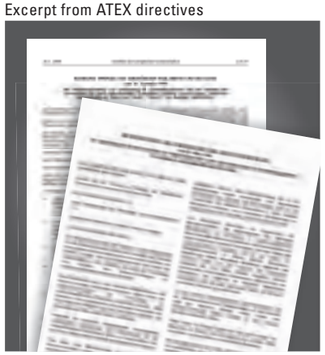
Industrial Safety Ordinance (BetrSichV)
→ http://bundesrecht.juris.de/betrsichv (German)

Regulations and information sheets of Employers' Liability Insurance Associations
→ http://www.bghm.de (German)

VDI regulations
→ http://www.vdi.eu

International Electrotechnical Commission System for Certification to Standards Relating to Equipment for use in Explosive Atmospheres (IECEx)
→ http://www.iecex.com

Excerpt from ATEX directives



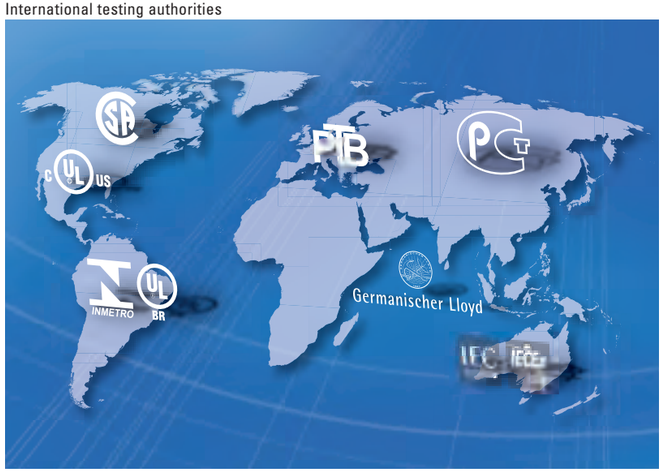
Assessment of conformity in compliance with ATEX 95

Category 1 and M1	EC prototype test (III)	Production quality assurance (IV)		CE
		Product verification (V)		
	Individual verification (XI)			
Category 2 and M2	Electrical equipment or Internal combustion engine	EC prototype test (III)	Quality assurance of products (VII)	
			Conformity with prototype (VI)	
	Other apparatus	In-house production testing (VIII) and documentation at notified body		
	Individual verification (XI)			
Category 3	In-house production testing (VIII)			
	Individual verification (XI)			

The figures in brackets refer to the modules of directive 94/9/EC which define the procedures to be followed for meeting conformity.

Explosion protection

International testing authorities

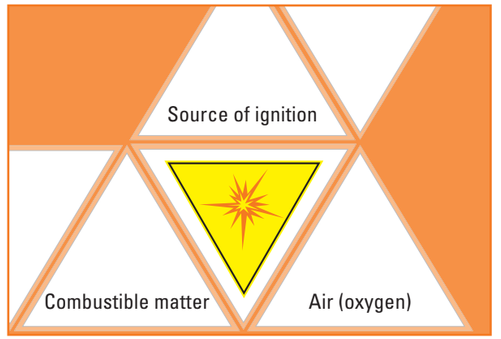


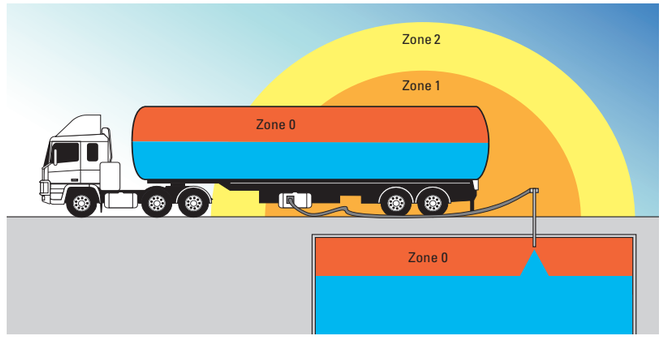
Physical and technical principles

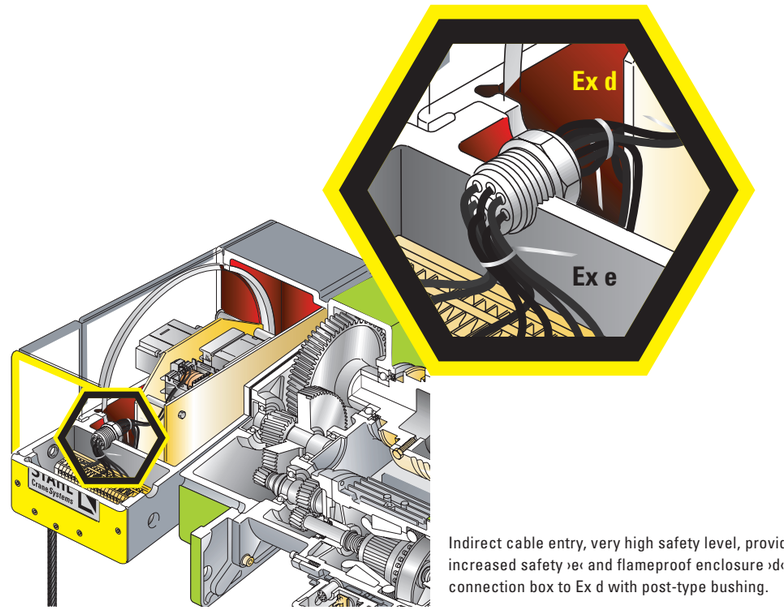
An explosion is a precipitate chemical reaction of combustible matter with oxygen setting free high energy. In this connection, combustible matter may be gases, mists, vapours or dusts. An explosion can only take place if three factors come together: combustible matter (in suitable dispersion and concentration), oxygen (in the air) and a source of ignition (e.g. an electric spark).

It is thus necessary to prevent ignition or reduce the effect of an explosion to an innocuous level. To ensure this, apparatus which is used in potentially explosive atmospheres must be designed, manufactured and of course marked in compliance with the relevant regulations (ATEX product directive 94/9/EC, IECEx regulations, etc.). Classification of devices into groups and categories according to ATEX product directives or in EPL according to IECEx standards results from their area of use or the safety level of protective measures and the frequency of occurrence of an explosive atmosphere. The highest possible risk potential must be taken into account when carrying out this classification. Only explosion-protected apparatus may be used in areas in which explosive atmospheres may occur in spite of all preventive measures. This apparatus is produced in various types of protection in accordance with the corresponding construction regulations (series of standards IEC/EN 60079, IEC/EN 61241 and EN 13463). The type of protection applied by the manufacturer depends on the type and function of the apparatus.

All standardised types of protection within a category are equivalent. In the CE declaration of conformity included in the technical documentation the manufacturer confirms that the product meets the ATEX directives.







Indirect cable entry, very high safety level, provided by type of protection increased safety ›e‹ and flameproof enclosure ›d‹. Connection of Ex e connection box to Ex d with post-type bushing.

IEC/EN 60079 for equipment in areas subject to gas/dust explosion hazards

Ex d flameproof enclosure IEC 60079-1 EN 60079-1	**Ex p** pressurised apparatus IEC 60079-2 EN 60079-2	**Ex e** increased safety IEC 60079-7 EN 60079-7	**Ex n** Zone 2 equipment IEC 60079-15 EN 60079-15	**Ex o** oil immersion IEC 60079-6 EN 60079-6	**Ex m** encapsula-tion IEC 60079-18 EN 60079-18	**Ex op** optical radiation IEC 60079-28 EN 60079-28	**Ex i** intrinsic safety IEC 60079-11 EN 60079-11	**Ex q** powder filling IEC 60079-5 EN 60079-5	**Ex t** protection by housing IEC 60079-31 EN 60079-31

EN 13463 for non-electrical equipment in areas subject to gas/dust explosions

Ex b monitoring sources of ignition EN 13463-6	**Ex c** constructio-nal safety EN 13463-5	**Ex fr** restricted breathing apparatus EN 13463-2	**Ex k** liquid immersion EN 13463-8	**Ex d** flameproof enclosure EN 13463-3	**Ex p** pressurised apparatus EN 13463-7

IEC/EN 61241 for equipment in areas subject to dust explosions

*applicable up to 01.10.2012

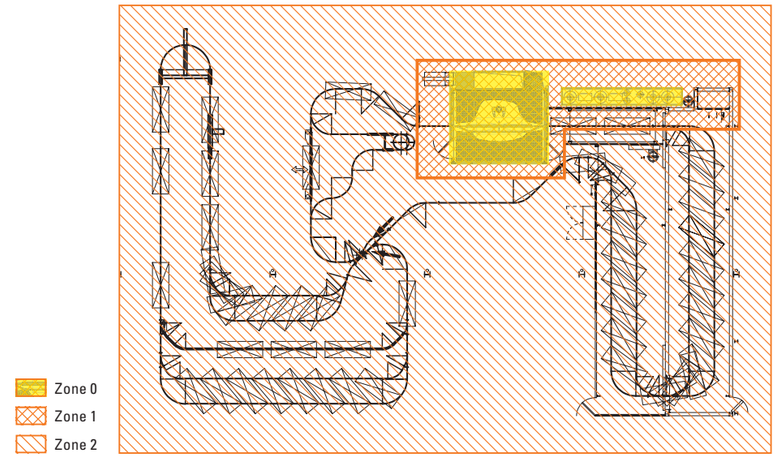
Ex tD protection by housing* IEC 61241-1 EN 61241-1	**Ex iD** intrinsic safety IEC 61241-11 EN 61241-11	**Ex pD** pressurised apparatus IEC 61241-4 EN 61241-4	**Ex mD** encapsula-tion* IEC 61241-18 EN 61241-18

Duties and obligations of users in Europe

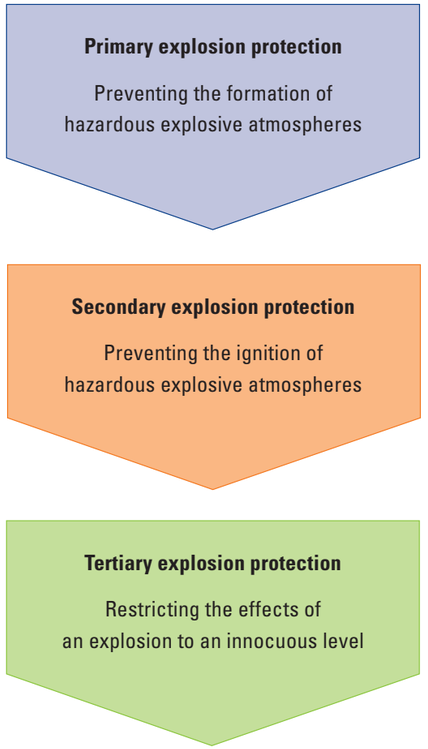
ATEX directive 1999/92/EC defines users' obligations for the protection of employees working in potentially explosive atmospheres. The user is obliged to establish technical and organisational measures to prevent explosions occurring. In this respect he must for example assess the potential danger and explosion risk, ensure that the working environment has been designed for safety and classify the hazardous areas into zones in accordance with the directives for safe operation of the apparatus which has been classified into categories. In addition he is obliged to issue and maintain an explosion protection document.

Naturally further issues are defined in directive 1999/92/EC in order to implement explosion protection effectively. After a system has been commissioned in due form it must be monitored and maintained so that the safe condition of the system is ensured and all dangers can be excluded. The plant's expert has product-specific documents (rating plate, operating instructions, EC prototype test certificate, declaration of conformity, etc.) and universally valid documents (legal ordinances, industrial safety ordinance, technical regulations TRBS, norms and standards, etc.) at his disposal. The full product-specific documentation must be managed and retained throughout the period of use of the apparatus and placed at the disposal of the experts entrusted with maintenance work.

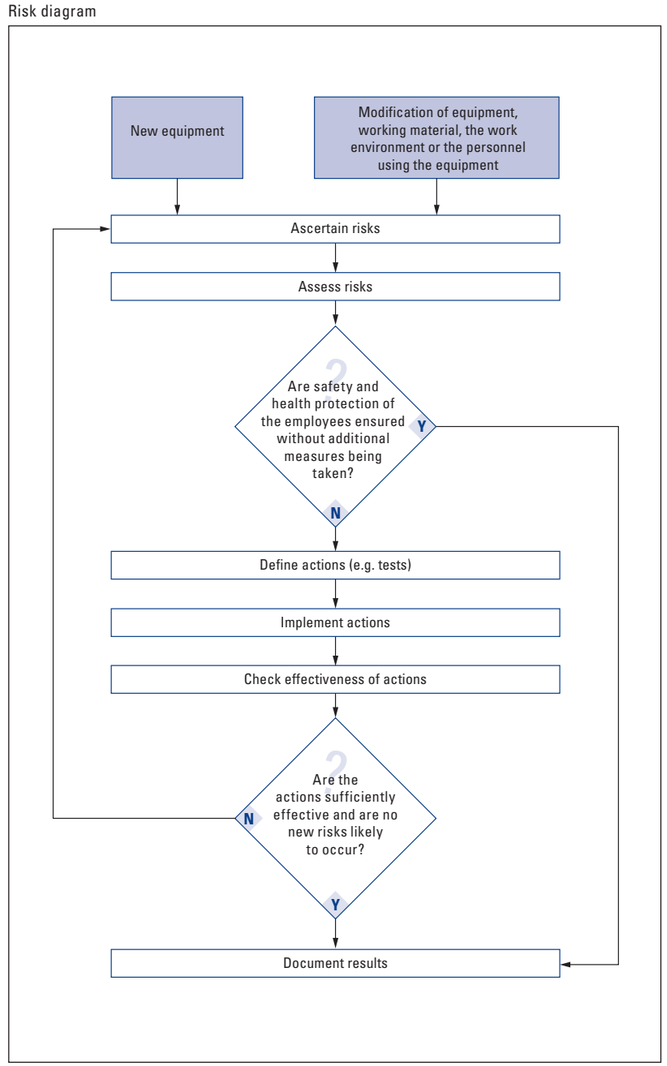
Zone plan of a paint shop



Integrated explosion protection



Risk diagram



Expertise in explosion protection

As the world's leading manufacturer of explosion-protected lifting technology and explosion-protected crane components, STAHL CraneSystems offers the widest complete portfolio and most comprehensive services in this field. Explosion-protected products from STAHL CraneSystems meet not only German national laws and European ATEX directives but also international standards and laws for the American and Asian market. For example, all products are certified both to ATEX and IECEx.

Our product types are certified after passing an EC prototype test and undergo the conformity assessment procedure specified in the directives. Development and manufacture of the series products are subject to our strict quality management monitored by independent European inspection authorities. The test certificates from the notified European inspection authorities are recognised throughout the EU. The rating plates indicate in addition to the usual data (manufacturer, type, serial number, electrical data) the data relevant to explosion protection. CE marking of the products, declaration of conformity in writing and detailed operating instructions and documentation confirm that all valid EC directives applicable to the apparatus are observed.

Decades of experience in the field of explosion protection, responsible, expert staff and production in accordance with the latest directives and standards guarantee quality down to the last detail for every piece of explosion-protected equipment from STAHL CraneSystems.

Example of device marking

Specific marking of explosion-protected devices (current marking)

CEN/CENELEC/IEC — **Ex** | **mb** | **IIB** | **T4** | **Gb**

Symbol for explosion protection (for electrical apparatus only)

Types of protection: Ignition source monitoring – **b**
Constructional safety – **c** | Flameproof enclosure – **d, db**
Increased safety – **eb** | Restricted breathing enclosure – **fr**
Intrinsic safety – **ia, ib, ic** | Liquid immersion – **k**
Encapsulation – **ma, mb** | Type of protection ›n‹ – **nAc, nCc, nRc**
Oil immersion – **ob** | Pressurised enclosure – **p, pxb, pyb, pzc**
Powder filling – **qb** | Protection by housing – **ta, tb, tc**

Gas group:
e.g. propane – **IIA**
e.g. ethylene – **IIB**
e.g. hydrogen – **IIC**

Dust group:
combustible flakes – **IIIA**
non-conductive dust – **IIIB**
conductive dust – **IIIC**

(as required)
EPL (equipment protection level):
G – Gas
D – Dust
a – Very high safety level
b – High safety level
c – Extended safety level

Gas: temperature classes – max. surface temperature
T1 – 450 °C **T3** – 200 °C **T5** – 100 °C
T2 – 300 °C **T4** – 135 °C **T6** – 85 °C

Dust: specification of max. surface temperature in °C (as required)

ATEX (EU directive 94/9/EG) — **CE** | **II** | **2** | **G**

CE marking

Explosion protection symbol

Equipment group: mining – **I**
Other potentially explosive atmospheres – **II**

Equipment category for Equipment Group **II**:*
very high safety level – **1**
high safety level – **2**
normal safety level – **3**

Type of explosive atmosphere for Group II
G Gases, vapours, mists **Zone 0, 1, 2**
D Dust **Zone 20, 21, 22**

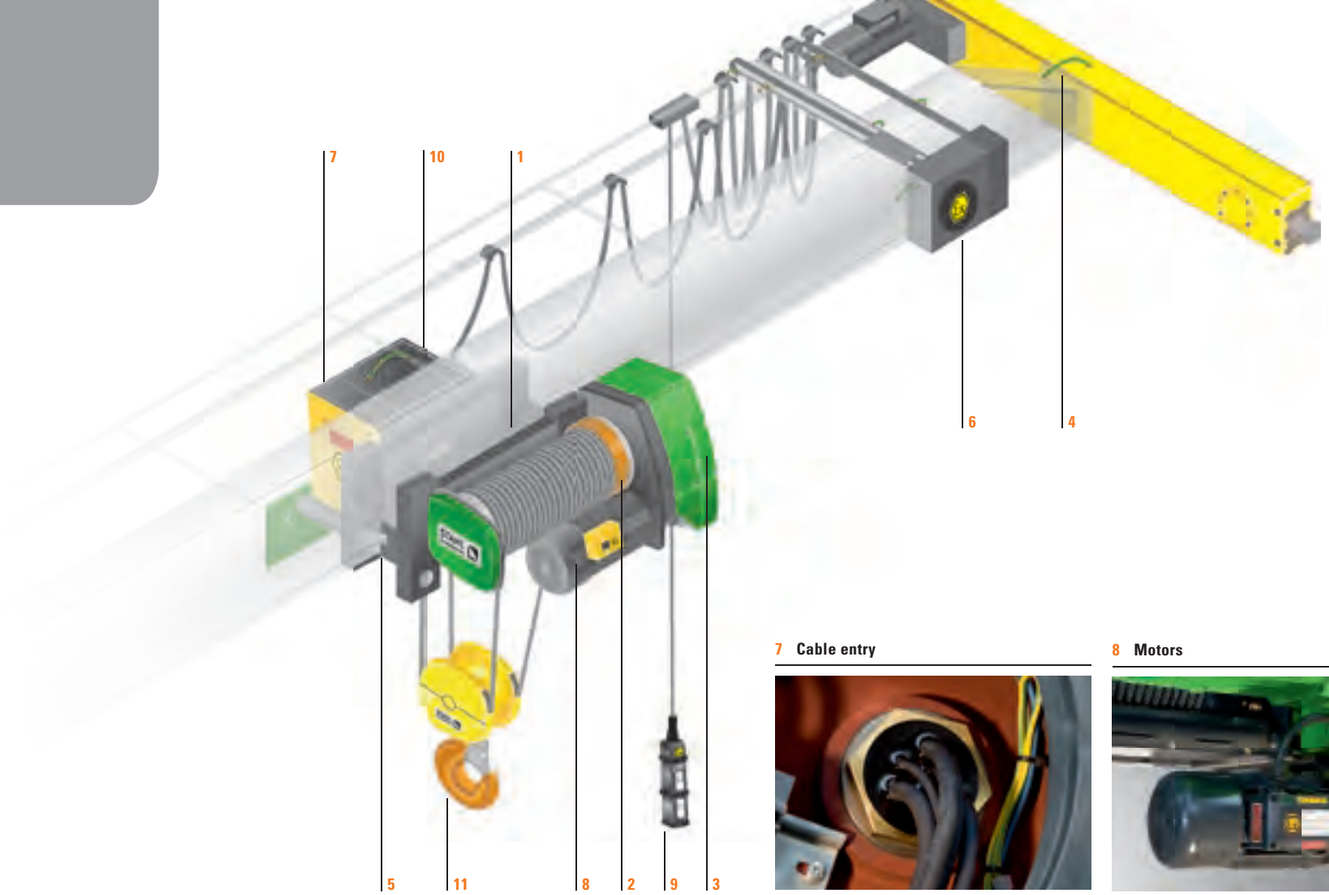
* for Equipment Group **I: M1, M2**

Operating instructions – contents in accordance with IEC/EN 60079-0 and IEC/EN 61241-0

- Commissioning
- Use
- Installation and dismantling
- Maintenance
- Electrical installation
- Electrical parameters
- Particular conditions

Danger points

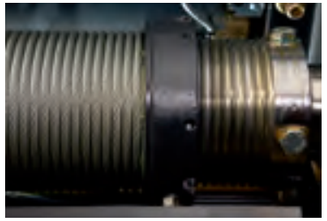
In lifting, drive and control technology both electrical and non-electrical components and parts can trigger an explosion. STAHL CraneSystems therefore offers apparatus specially designed for use in areas subject to gas or dust explosion hazard. All hoists and crane components without exception are from our own production, from motor and brake to controls and switchgear, and meet the latest European (ATEX) and international (IECEx) construction and safety regulations for potentially explosive atmospheres.



1 Wheels

The type of protection of all wheels is constructional safety ›c‹. If travel speeds are high, this also includes brass wheels.

2 Rope guide/chain guide



The wear-resistant rope guide in nodular graphite casting GJS (previously designated GGG) is extremely durable and not subject to temperature limitations. The same applies to the chain guide, type of protection used: constructional safety ›c‹.

3 Gear

The types of protection of the gear are constructional safety ›c‹ and liquid immersion ›k‹. The protective liquid (oil) prevents sparks.

4 Equipotential bonding

Equipotential bonding is essential for avoiding incendive sparks when installing crane technology in potentially explosive atmospheres.

5 Overload device

The overload devices for Zone 1 and 21 comprise mechanical sensors (LMS), analog sensors (LET) for Zone 2 and 22.

6 Panel box

The type of protection for panel boxes for Zone 1, 2 and 21 on cranes and hoists combines types of protection flameproof enclosure ›d‹, increased safety ›e‹ and protection by housing ›tD‹.

7 Cable entry

Indirect cable entry, very high safety level from type of protection increased safety ›e‹ and flameproof enclosure ›d‹.
Connection of the Ex e connection box to Ex d by post-type bushing.

8 Motors

Motors for Zone 1 and 21 are made of grey cast iron, the type of protection combines flameproof enclosure ›d‹, increased safety ›e‹ and protection by housing ›tD‹. For Zone 2 the motors are made of aluminium and in type of protection non-sparking equipment ›nA‹. For Zone 22 the motors are manufactured in IP 66 and protection by housing ›tD‹.

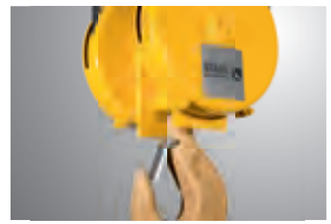
9 Control pendant

The type of protection of the housing is IP 66, installed elements protected by flameproof enclosure ›d‹, increased safety ›e‹ and protection by housing ›tD‹.

10 Limit switch

The type of protection of the limit switch combines flameproof enclosure ›d‹, increased safety ›e‹ and protection by housing ›tD‹.

11 Bottom hook block



The type of protection employed is constructional safety ›c‹, no aluminium is used.
If travel speeds are high, individual parts, such as the load hook, are bronze-coated.

Explosion-protected wire rope hoists

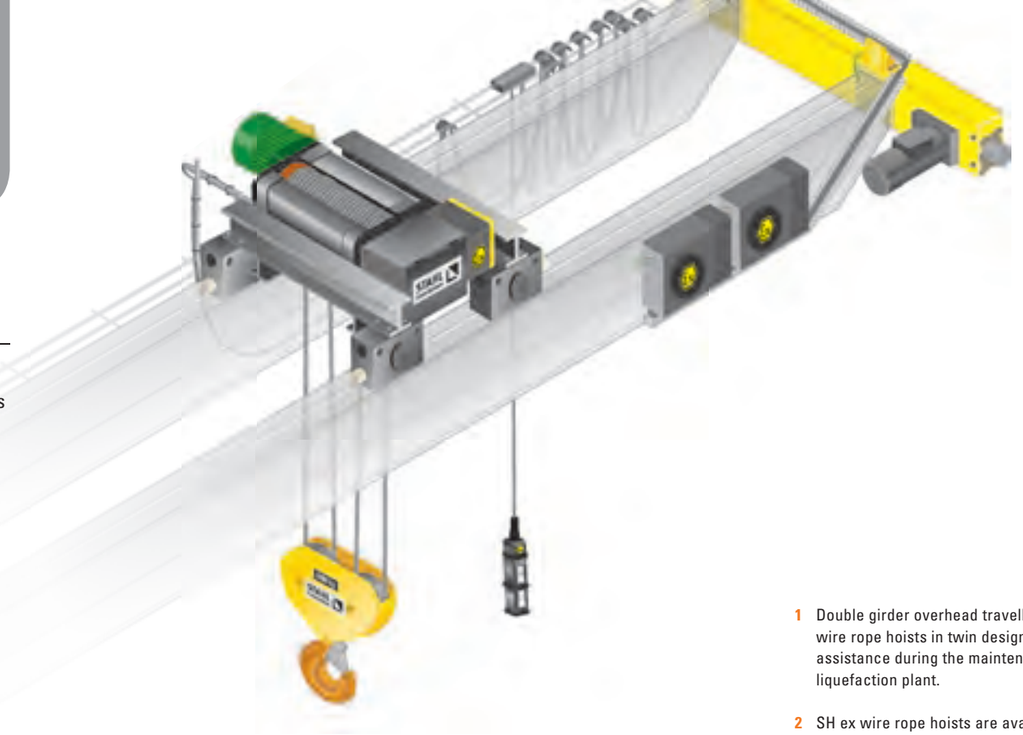
The SH ex and AS 7 ex explosion-protected wire rope hoists from STAHL CraneSystems meet EC product directive 94/9/EC (ATEX 95) and the international IECEx regulations. They are constructed for use in Zone 1 or Zone 21, however they can also be used in Zone 2 or Zone 22.

These adaptable wire rope hoists are of systematically modular construction and designed for a load capacity range of 1,000 kg to 160,000 kg. For the load capacity range of 1,000 kg to 25,000 kg the versatile SH ex series is available in five frame sizes with 15 load capacity brackets. The upper load capacity range up to 100,000 kg is covered by the field-proven AS 7 ex and AS 7 ex ZW series. The SHW ex and SW ex winch programme extends the range of applications in the high-load bracket up to 160,000 kg.

The attractive design of STAHL CraneSystems' wire rope hoists conceals a compact, robust construction which is largely low-maintenance. They are extremely reliable and have a longer-than-average service life. Common to all of them is the particularly smooth precise starting and braking characteristic.

The facts

- Condition monitoring apparatus in explosion-protected design ensures safe operation
- Electronic motor and brake management guarantees a long service life
- Most comprehensive explosion-protected wire rope hoist programme for the load capacity range from 500 kg to 160,000 kg
- Equipped as standard with two hoisting and two travelling speeds
- High standard classification in accordance with FEM



1 Double girder overhead travelling cranes with explosion-protected wire rope hoists in twin design with auxiliary hoist provide assistance during the maintenance of compressors in a hydrogen liquefaction plant.

2 SH ex wire rope hoists are available for Zone 1 and Zone 2, and for Zone 21 and Zone 22. They reliably meet the technical, normative and practical requirements specified by ATEX and IECEx.

Standard classifications in accordance with FEM

		Load capacity [kg]																	
Type	Reeving	1,000	1,250	1,600	2,000	2,500	3,200	4,000	5,000	6,300	8,000	10,000	12,500	16,000	20,000	25,000	32,000	40,000	50,000
SH 3	2/1, 4/2	3m	2m	2m															
	4/1				3m	2m	2m												
SH 4	2/1, 4/2			3m	2m	2m	1Am												
	4/1						3m	2m	2m	1Am									
SH 5	2/1, 4/2						3m**	2m	2m	1Am									
	4/1									3m	2m	2m	1Am						
SHR 6	2/1								2m	2m	1Am								
	4/1											2m	2m	1Am					
SH 6	2/1										3m	2m	1Am						
	4/1													3m	2m	1Am			
	4/2										2m	2m	1Am						
AS 7	2/1												3m	2m	1Am	1Bm*			
	4/1															3m	2m	1Am	1Bm*

* for Zone 2, 22 only ** with 2/1 reeving, for Zone 1, 21 only

1

2

Use	Category	Protection against	Explosion protection class
Zone 1	Ex II 2 G	Gas	Ex de IIB T4 or Ex de IIC T4
Zone 2	Ex II 3 G	Gas	Ex de nA IIB T3 (T4) or Ex de nA IIC T3 (T4)
Zone 21	Ex II 2 D	Dust	Ex tD A21 IP 66 T 120 °C
Zone 22	Ex II 3 D	Dust	Ex tD A22 IP 66 T 120 °C

Explosion-protected chain hoists

The ST ex explosion-protected chain hoists from STAHL CraneSystems meet EC product directive 94/9/EC (ATEX 95) and the international IECEx regulations. They are specially constructed for use in Zone 1 or Zone 21, however they can also be used in Zone 22. The mechanical design is prototype-tested: TÜV10ATEX7642x.

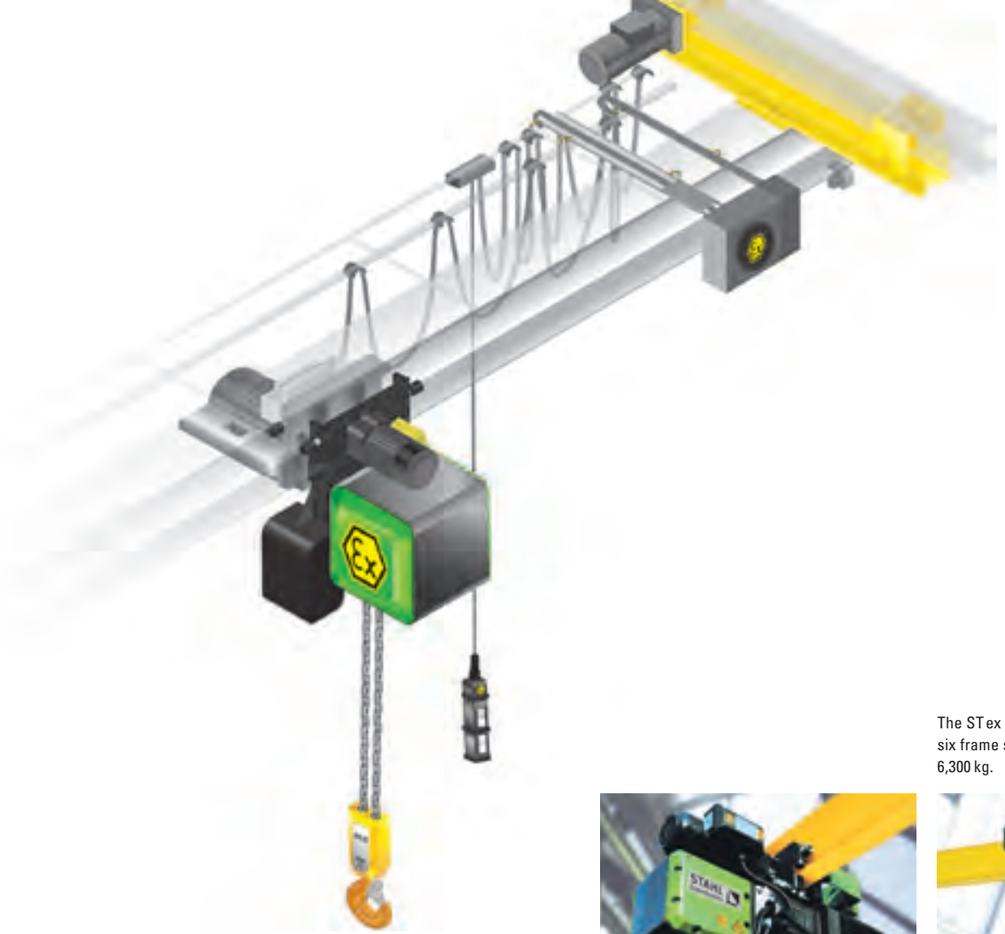
This series of chain hoists belongs to the most distinctive and comprehensive on offer in the world. In use in thousands of applications for decades, modernised and optimised again and again, this chain hoist is a classic, powerful, reliable and undemanding as regards maintenance and power consumption. The ST ex series is available in 13 load capacity brackets from 125 kg to 6,300 kg. It can be used as stationary hoist with suspension hook or eye, rigid suspension, or with push or electric trolley, and is particularly suitable for rugged use in industry. The innovative and pioneering design of the chain hoist brings considerable economic advantages. The extremely short headroom available as an option for every type of chain hoist optimises the effective hook height while minimising wear on the chain. In addition to standard versions, further off-standard versions and customer-specific solutions are available.

The facts

- Patented suspension directly on the chain guide
- The most comprehensive explosion-protected chain hoist programme for the load capacity range from 125 kg to 6,300 kg
- Maximum utilisation of space thanks to the extremely short and compact headroom dimensions
- Standard classification in accordance with FEM

Standard classifications in accordance with FEM

		Load capacity for Zone 1 and 21 [kg]								Load capacity for Zone 22 [kg]												
Type	Reeving	250	500	1,000	1,600	2,000	2,500	3,200	5,000	125	250	320	500	630	1,000	1,250	1,600	2,000	2,500	3,200	5,000	6,300
ST 05	1/1									3m/2m	1Am	1Bm										
	2/1												1Am	1Bm								
ST 10	1/1												1Am									
	2/1														1Am							
ST 20	1/1	3m	3m	1Am											2m/1Am							
	2/1		3m	3m	2m	1Am										3m		2m/1Am				
ST 30	1/1																1Bm					
	2/1																			1Bm		
ST 32	1/1															3m	2m/1Am					
	2/1																			2m/1Am		
ST 50	1/1					2m	1Am												1Am			
	2/1							2m	1Am												1Am	
ST 60	1/1																			1Bm		
	2/1																					1Bm



The ST ex chain hoist for Zone 22 is available in six frame sizes up to a load capacity of 6,300 kg.

The ST ex chain hoist for Zone 1 and Zone 21 is available in two frame sizes up to a load capacity of 5,000 kg.

Use	Category	Protection against	Explosion protection class
Zone 1	Ex II 2 G	Gas	Ex de IIB T4 or Ex de IIC T4
Zone 21	Ex II 2 D	Dust	Ex tD A21 IP 66 T 120 °C
Zone 22	Ex II 3 D	Dust	Ex tD A22 IP 66 T 120 °C

Components and electrics

The components and electrics, which also meet both EC product directive 94/9/EC (ATEX 95) and the international IECEx regulations, are the perfect complement to explosion-protected lifting technology from STAHL CraneSystems.

The correct functioning and high performance of a crane system depend on the quality of all its components. These are developed down to the last detail by STAHL CraneSystems and supplied from our own production. Forward-looking, high-quality modules complement one another in the system and ensure both safety and cost-effectiveness. Using the modular components, our crane manufacturing partners in your region are able to adapt the crane system individually to customer-specific requirements and wishes. Mature, cost-effective electronics, drive technology to meet the highest demands, innovative modules and field-proven, robust standard components are available for these adaptations. The expert crane manufacturing partners and experienced system manufacturers are trained by STAHL CraneSystems' explosion protection experts so that they are always up to date as regards the status of national and international regulations and state-of-the-art technology.

Bottom hook block

For high and very high travelling speeds the load hook and the solid parts of potential impact surfaces are bronze-coated. In addition, all other exterior surfaces of the bottom hook block can be bronze-coated to prevent sparking.

Panel box

Flameproof enclosure for Zone 1 and Zone 2: the sheet steel or aluminium housings can be used as individual housings or in combination. All components required such as transformers, contactors, fuses, measuring instruments and tripping devices can be installed in the modular-design housing. Post-type bushings provide the connection to the terminal box (in increased safety Ex e).

Travel drive

The explosion-protected travel drives Zone 1 and Zone 21 are designed for intermittent operation. They have a sliding rotor brake motor with conical brake and centrifugal mass for smooth starting and braking characteristics. All motors are pole-changing providing two travel speeds. The particularly quiet gear requires little maintenance thanks to its long-term oil bath lubrication.

Explosion-protected crane endcarriages	For single-girder overhead travelling cranes, 7 wheel diameters and 5 wheelbases
	For double-girder overhead travelling cranes, 7 wheel diameters and 6 wheelbases
	For single-girder suspension cranes, 4 wheel diameters and 3 wheelbases
Explosion-protected drive technology	Supplied as standard with 2-step speeds 20/5 m/min or 40/10 m/min, other speeds on request
	As an option, stepless speed control
Explosion-protected control technology	SWH 5 ex wired control pendant
	Panel box in explosion-protected design
Explosion-protected electrics	Festoon cables in conjunction with control pendants or radio remote controls

Crane endcarriages

Crane systems up to a load capacity of 50,000 kg and with spans of up to 30 m can be built with explosion-protected endcarriages for suspension and overhead travelling cranes. For particular applications, at customers' request and for increased safety all wheels can be supplied in brass.

Control pendants

The SWH 5 ex control pendants are designed specifically for controlling hoists and cranes in hazardous areas. Activation is generally 2-step and permits a quick changeover from ›fast‹ to ›slow‹ and vice versa. All control pendants are equipped with an EMERGENCY STOP slam button meeting the requirements of IEC/EN 6094755.

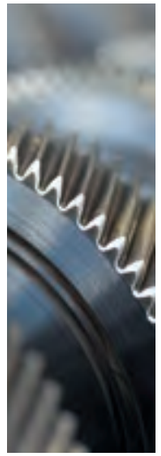
Engineering

Engineering means innovation and individuality. Constantly redefining the lifting and transporting of loads for complex requirements even in explosive areas is a job for our experts. From one of the widest product ranges of standard components they regularly develop modern, individual explosion-protected customised solutions which meet all national and international directives and laws. The whole portfolio and all customised solutions are available in explosion-protected designs for Zone 1, Zone 2, Zone 21 and Zone 22.

Hardly any other manufacturer of lifting and crane technology can offer you this diversity of precisely designed explosion protection solutions in the highest quality and cost-effectiveness. Our products rank among the safest technology, in particular in the chemical, petrochemical and pharmaceutical industries, the food processing industry, power supply, shipbuilding, offshore and natural gas liquefaction industries (LNG).

The facts

- Perfectly matched to your product
- Every hoist is the result of over 130 years of experience and expertise
- Short development time
- Cost-effective thanks to modular system
- Technically mature thanks to the use of field-proven standard components
- High quality and reliability ensured by production by ourselves in Germany



LNG

The LNG hoists from STAHL CraneSystems have been designed especially for maintenance work in natural gas liquefaction plants (LNG). Thanks to their high-quality components and robust design they are ideal for use near the coast in challenging climate conditions.

The pumps which pump the liquid natural gas into a pipeline system at a temperature of –161 °C must be lifted out of the tanks and transported to the outside for maintenance up to five times a year. The extreme conditions prevailing in the tank necessitate special ropes which are permanently connected to the liquid gas pump. When maintenance is required, these ropes are attached to the wire rope hoist by means of a rope clamp, so that no hook is necessary. All safety-relevant components are doubled. This means that the hoisting procedure proceed without disruption even if a rope should break. One of the two wire rope hoists lifts the pump, the second hoist runs alongside with a dead rope as backup. If the load rope should break during the hoisting procedure, the second wire rope hoist carries on hoisting. The shock-absorbing rocking suspension of the hoist cushions the impact of the abrupt load change.

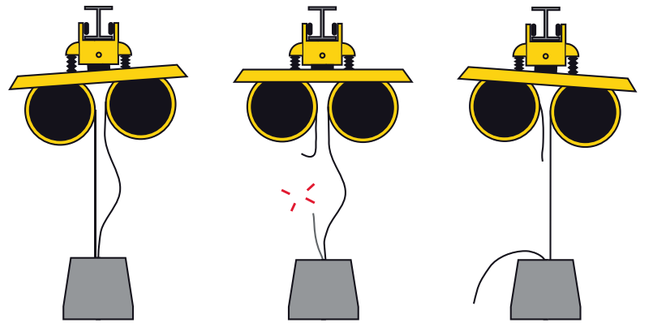
Thanks to their redundant design and rocking suspension, STAHL CraneSystems' LNG wire rope hoists are regarded as the safest hoists presently available on the market.

The facts

- Constructed from field-proven series components
- Hoist, gear, drum and motor doubled up
- Off-standard ropes connected by rope clamps
- Special recess in the drum for the rope clamp
- Design minimises risk if a rope should break
- Integrated load sensors monitor the suspended load
- Reliable, high-performance, low-maintenance, mechanisms classified in accordance with FEM
- Special-purpose equipment for use in LNG plants
- Approvals to ATEX and IECEx standards

→ Please order our special brochure on the subject of LNG

Maximum safety level 3B: normal operation even after rope breakage



Normal operation with 1/1 reeving

Accident! The rope breaks.

Normal operation with second hoist unit

Support

Quality right down to the most minor detail is the standard STAHL CraneSystems is committed to. Not only in the field of crane technology, but also on the subject of support. You will find lifting and crane technology from STAHL CraneSystems all around the world. Developed by engineers and experts, manufactured with maximum care following our well-known standard of quality. All around the world, many companies from various fields have decided on maximum safety and quality, on products from STAHL CraneSystems.

When it comes to sales, we are committed exclusively to capable, professional crane manufacturing partners. You can expect optimum support from them when your individual crane system with components from STAHL CraneSystems is at stake. Consulting and erection of a new system, system-oriented testing and maintenance, modernisation, spare parts supply and training courses. Together with our subsidiaries and crane manufacturing partners we offer you perfectly coordinated support all over the world.

Spare parts – accessible right around the clock

Our own subsidiaries and numerous partners around the world ensure reliable spare parts supply and expert assistance in your area. Even decades after a series has been discontinued, spare parts are available all over the world right around the clock.

Training courses

We constantly keep our regional crane manufacturing partners up to date with training courses, seminars and information material. You too can profit directly from our expertise. We impart practical and theoretical knowledge in our own training centre or on your premises. The seminars on offer in the form of individual, basic and advanced courses cover all main product groups. However we would also be pleased to match a special programme to your individual specifications and requirements.

You will find our current seminar programme at
www.stahlcranes.com/en/support

Factory service centre – in action all over the world

Our factory service centre is a service for our customers: wherever you are we assist your crane or systems manufacturer with our experience and expertise whenever he needs us. Up-to-date diagnostic apparatus and condition monitoring systems stand by to support professional service and maintenance work. Not only you, but your system too, are in safe hands. You can rely on us.

Your will find our online service at
www.web.stahlcranes.com
and you can reach our factory service centre on
customer.service@stahlcranes.com

On the spot and in action all around the world

1

2

3

1 An explosion-protected ST 20 chain hoist with a load capacity of up to 1,600 kg is used for outdoor maintenance work in a chemical plant. The narrow construction of the explosion-protected chain hoist enables the whole width of the crane bridge to be utilised. The suspension crane endcarriages are naturally also in explosion-protected design.

2 An explosion-protected SH ex wire rope hoist transports goods through a shaft over several storeys of a chemical plant. The single-girder overhead travelling crane with a load capacity of 5,000 kg is operated by radio remote control.

3 The explosion-protected SH ex wire rope hoist is mounted on a double girder overhead travelling crane and intended for outdoor use in a chemical plant. Both hoist and control are in thermally insulated housings enabling the crane to be operated safely down to –40 °C.

STAHL CraneSystems

In action all around the world

You will find explosion-protected lifting and crane technology from STAHL CraneSystems all around the world. Our universally connected network of subsidiaries and partners enables us to be directly in your vicinity and yet to act globally. We would like to list here just a few of the companies which have decided on maximum safety and quality, on products from STAHL CraneSystems.

Europe
ABB Lummus Global GmbH, Germany
ABB Lummus Global GmbH, Spain
AkerKvaerner (Houston, USA), Italy
Borealis, Germany
BP CHEMBEL N.V., Belgium
Cobra Plantas Industriales, Spain
Eastern Petrochemical Co (Linde), Germany
Fluor, Germany
Fluor Daniel B.V., Norway
Fluxys Refinery, Belgium
Intecsa Industrial, Spain
Jacobs Engineering, Germany
Motor Oil (Hellas) Refineries Corinth, Greece
OMV Burghausen, Germany
Repsol Petroleo S.A. Petronor, Spain
Repsol YPF/Petronor, Spain
Sagas, Spain
Saipem S.A. (Technigas), Belgium
Scanraff Refinery (PREEM), Sweden
Sparrows Offshore Services Ltd, Great Britain
Statoil, Norway
Technip, Belgium
Ticona, Germany
Total Refinery (Antwerp), Belgium
Turkiye Petrol Rafinerileri A.S., Turkey
voestalpine AG (Linz), Austria

Asia
Alla Co., Thailand
Daelim Engineering Co., Iran
Ethylene Malaysia Sdn Bhd, Malaysia
Formosa Plastics Corporation, Taiwan
Foster Wheeler, Malaysia
GS Engineering and Construction Corp., Thailand
Hercules Chemical (Nanjing) Co., Ltd, China
Iran Chemical Industries Investment Co., Iran
Jacobs Engineering, Singapore
JGC Corporation (Japan), Oman
Kuwait National Petroleum Co., Kuwait
MAN Ferrostaal Essen, Oman
MaisonWorleyParsons (Shanghai), China
Mitsubishi Heavy Industries, Brunei
PT Wirya Krenindo Perkasa, Indonesia
Qatar Petroleum Dolphin Energy Co., U.A.E.
Ras Laffan Olefins Company Limited (RLOC), Qatar
Samsung, Saudi Arabia
Saudi Petrochemical Company, Saudi Arabia
SembCorp Simon Carves (UK), China
Singapore Refining Co., Ltd (SRC), Singapore
Sparrows Offshore Services Ltd., Azerbaijan
Technip France (Paris), Qatar
The Kuwait Olefins Company (TKOC), Kuwait
ToyoThai (Bayer BPA, Thailand), Thailand

Africa
BP Exploration, Algeria
Cullum Detuners Limited, Nigeria
El Djazairia El Omania Lil Asmida SpA, Algeria
Mitsubishi Heavy Industries, Algeria
Mobil, Nigeria
Tecnicas Reunidas (Spain), Algeria
TFT Argelia, Algeria
North America
AKER Kvaerner Contracting, USA
Noble Drilling, USA
South America
Atlas Methanol Company, Trinidad and Tobago
Ferrostaal (Germany), Trinidad and Tobago
HDTHCK UTE, Chile
KÜTTNER, S.A. (Germany), Mexico
UTE Coker Aconcagua I, Chile
Australia
Kellogg Joint Venture, Australia
Woodside Energy Ltd., Australia







Presented by

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Partner of Experts

STAHL CraneSystems

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