



THE STRONGEST LINK.



# EXPLOSION-PROTECTED SYSTEM SOLUTIONS

For automation in Zone 1/2/21/22

# R. STAHL – YOUR FIRST PORT OF CALL FOR EXPLOSION PROTECTION IN AUTOMATION



“ We take on the particular challenges posed by automation in hazardous areas, and realise safe digitalisation solutions.

We can provide you with the best possible customised system solution for all applications in Zone 1/2/21/22. From site inspection, project planning, engineering and certification up to complete documentation, we will meet all of your requirements.

**R. STAHL, the authority in explosion protection in automation**

Carsten Brenner, Head of the Automation Business Unit at R. STAHL



## UNIQUE EXPLOSION PROTECTION EXPERTISE WORLDWIDE

Choosing R. STAHL has always meant being on the safe side. This also applies to new challenges such as the digitalisation of hazardous areas, including the integration into modern ethernet networks, the integration of diagnosis data in plant asset management systems, wireless communication or modern visualisation concepts.

### **CERTIFICATION OF PRODUCT AND SYSTEM SOLUTIONS**

R. STAHL is active in task forces such as NOA (NAMUR Open Architecture) and OPAF (Open Process Automation™ Forum), as well as Ethernet APL (Advanced Physical Layer) dealing with the implementation of modern process automation and digital communication.

Our area of expertise ranges from ATEX, IECEx, EAC, PESO, INMETRO, CNEx to local certifications and special marine certifications such as DNV, LR or ABS.

In North America, explosion-protected product solutions are certified together with a Notified Body (NRTL) according to the NEC and CEC standards, and after all other inspections required by current environmental guidelines and standards covering the protection of staff and equipment.

We are authorised to build individual system solutions for worldwide installation according to ATEX and IECEx standards, in Class I and II, Division 1 and 2, or Class I and II, Zone 1 and 2 or with various degrees of protection.

For this purpose, we bring the requirements of the client and environmental requirements in line with explosion protection, while retaining all functions, and create a system solution after thorough checks by our explosion protection experts.

A system of existing checklists is available to our Engineering department to identify the scope of the required system solution in advance. We will identify the ideal, customised system solution for your application.

For more information please visit: [r-stahl.com](http://r-stahl.com)

# SYSTEM SOLUTIONS FOR THE CHEMICAL INDUSTRY



## ETHERNET REMOTE I/O FIELD STATION FOR ZONE 1 WITH INTEGRATED SOLENOID VALVE ISLANDS

This application uses intrinsically safe as well as pneumatic field devices in Zone 1.

Thanks to the use of IS1+ DOMV modules for ATEX and IECEx Zone 1, separate field stations for solenoid valve islands are no longer required, and the distances for the pneumatic tubes have been strongly reduced. The DOMV modules have eight integrated 3/2-way valves each while only

using one module slot, and they can be combined with the intrinsically safe I/O modules in any way, resulting in very compact explosion-protected field stations.

Communication with the automation system takes place via an ethernet network with either Modbus TCP, EtherNet/IP or PROFINET. Fibre optic is used to ensure interference-free transmission across dis-

tances of up to 2,000 metres, as required in this application. With the "op is" type of protection, these can be easily connected and disconnected in Zone 1, simplifying extension and maintenance work.

With the "Ex op is" or inherently safe optical radiation type of protection, suitable measures prevent ignition of an explosive atmosphere by optical radiation.



## LOCAL CONTROL OF A GAS COMPRESSOR IN ZONE 1 IN HALF THE SPACE

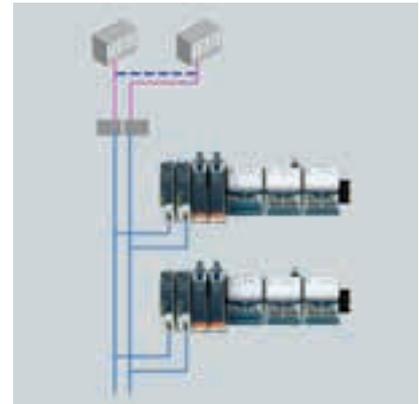
Bently Nevada's monitoring system and screen were integrated into an Ex p enclosure together with Ex i isolators, an HMI solution from R. STAHL and other components such as a PLC. The customer benefited from an individually tailored solution from one provider, with R. STAHL responsible for planning and implementing this solution based on customer specifi-

cations. The two-channel design of the Ex i isolators meant a 50% reduction of the required space.

The Ex i intrinsic safety type of protection is based on the principle of limiting the current and voltage in an electrical circuit. This involves limiting the energy in the electrical circuit (which could ignite

an explosive atmosphere) so that the surrounding explosive atmosphere cannot be ignited by a spark or an extreme temperature rise of the surface of the electrical components.

# SYSTEM SOLUTIONS FOR REFINERIES



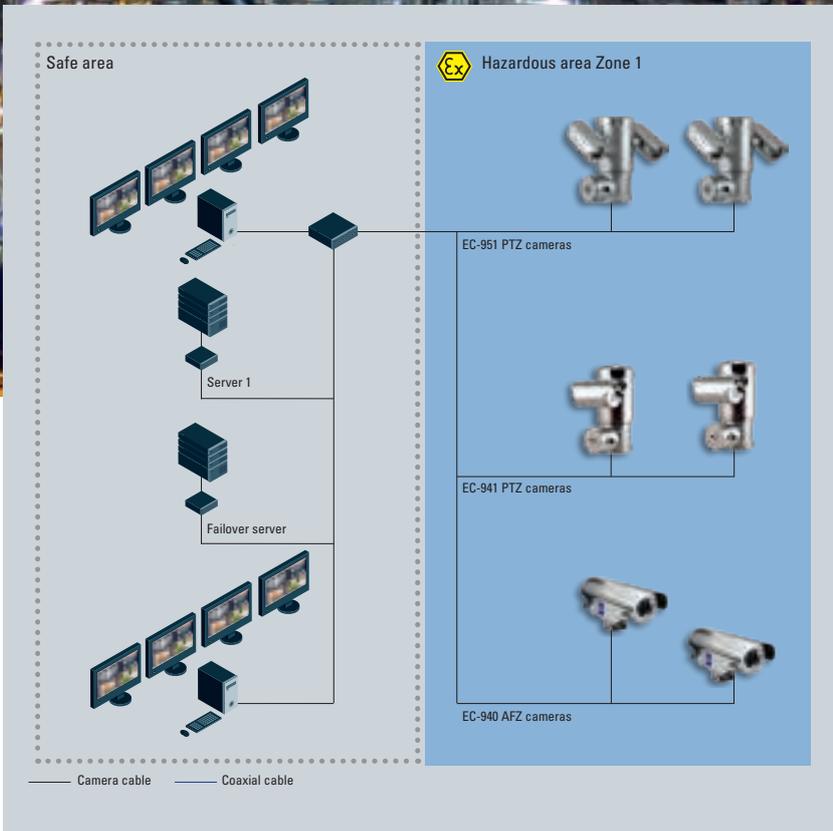
## HIGHLY AVAILABLE PROFIBUS DP REMOTE I/O FIELD STATION FOR A REFINERY

A major refinery has decided to use a highly available version of the IS1+ Remote I/O system for monitoring and controlling critical processes in Zone 2 hazardous areas. The system is supplied via redundant CPU & power modules, and it communicates with the control system via a redundant PROFIBUS DP network.

Both the external 230 V-AC supply and the integrated heater for preventing condensation are designed redundantly.

Temperature and humidity within the field enclosure are constantly monitored by a sensor and communicated to the control system. All Fieldbus and supply lines are equipped with surge protection.

The field enclosure comprises of robust SS316L stainless steel and is fitted with an automatic interior lighting for service technicians. The option for an easy retrofit for ATEX and IECEx Zone 1 held strong importance, whereby: the CPU & power modules merely need to be replaced by Zone 1 versions.



## REDUNDANT CCTV WITH OBJECT RECOGNITION AND TRACKING

The large volume of highly flammable hazardous substances present in the production areas of a refinery make explosion-protected cameras an absolute necessity for any safety-relevant design.

Various PTZ cameras with video analysis technology were installed to monitor unauthorised persons and objects. They

use pre-defined parameters to spot and track objects and raise the alarm where necessary. All network cameras used in this project have been certified for Zone 1/2/21/22 according to ATEX, IECEx, NEC, CEC, EAC or Lloyd's.

This project uses only IP cameras, which can be integrated worldwide

and accessed from any network connection thanks to the global ONVIF standard.

Dimly lit areas are monitored by PTZ cameras with integrated IR spotlight, providing clear vision and object recognition across distances of up to 200 m, even in the dark.

## TYPES OF PROTECTION - AN OVERVIEW

# Ex i INTRINSIC SAFETY – THE MOST COMMON TYPE OF PROTECTION

Today's process industry mainly uses the Ex i intrinsic safety type of protection, which can be found in many product solutions.

The protective principle behind intrinsic safety is based on the concept of limiting the amount of energy in an electrical circuit to a non-ignitable level to ensure that sparks or thermal effects can no longer be sources of ignition. This approach is used in simple point-to-point wiring as

well as in digital automation solutions. With Ex i-protected solutions process data can be captured directly in hazardous areas. They require less installation work and can be tested and maintained during ongoing operation, which represents a crucial advantage in many cases.

Intrinsic safety features in Fieldbus designs with PROFIBUS DP, Modbus RTU, PROFIBUS PA, Foundation Fieldbus H1, operating terminals and analysis

equipment, as well as intrinsically safe antennas in WiFi solutions and modern designs for industrial Ethernet.

New standards for inter-operable, intrinsically safe IP communication have recently been developed as Ethernet APL based on 10BASE-T1L or as 100BASE-TX-IS as an expansion of 100BASE-TX, and they are also part of R. STAHL's portfolio of automation products.

### Example of an application using Ex i type of protection: isolators with ISpac galvanic separation



Connecting individual equipment in an intrinsically safe circuit is permitted provided that certain requirements are taken into account, and is the responsibility of the planner.

If associated equipment is connected to intrinsically safe devices, the safety characteristic values of both must be aligned when setting up the circuit.

IEC 60079-14 and IEC 60079-25 specify further details for the interconnection of devices. The operator has to have proof of intrinsic safety for all intrinsically safe circuits.

A system certification is considered such proof.

# Ex i PRODUCT SOLUTIONS

## Simple handling during ongoing operation – Remote I/O station with IS1+



For repairs, maintenance or expansions, Ex i-protected system solutions are particularly easy to handle. Thanks to this type of protection, these tasks can be carried out during operation in hazardous areas, even when live (hot work), without having to switch off the entire system or parts of the system (hot swap).

In this application, even the communication and power module (CPM) can be swapped without interrupting the operation, since the system was designed redundantly.

## HMI with intrinsically safe keyboards



All R. STAHL HMIs can be configured with the intrinsically safe KB2 keyboards, and they are certified for installation in hazardous areas Zone 1/2/21/22. They are connected to intrinsically safe USB interfaces, and power supply and data communication takes place via these USB interfaces.

The keyboards are available with different layouts such as German, English, French and other languages, and they can be fitted with either a trackball, touchpad or joystick. They can be integrated in our operator stations with device platforms ORCA, MANTA or EAGLE.

## Intrinsically safe antennas in R. STAHL network solutions



R. STAHL's wireless technology and network solutions contain intrinsically safe components, allowing for a flexible use of antennas.

Here again the hot work and hot swap principle means the antennas can be replaced during operation. This is particularly useful for troubleshooting or when replacing device components.

## TYPES OF PROTECTION - AN OVERVIEW

# Ex p-TECHNOLOGY, A SOLUTION WITH MANY ADVANTAGES

Integral explosion protection requires comprehensive expertise in all types of protection. With the increasingly widespread integration of switching, control and communication systems in hazardous areas, this expertise is vital for protection against potential ignition hazards in these areas.

R. STAHL's new x621/1\* Ex p system is an advancement of this technology for explosion-protected enclosures, with

many advantages compared to conventional designs. With its combination of an Ex p control unit, Ex p pressure monitors and Ex p purge valves with digital and proportional control, the modular system is able to meet all requirements, from very small 10 l enclosures to Ex p control cabinets with volumes of up to 4,000 l.

In many areas, this new Ex p system from R. STAHL is an excellent alternative to conventional Ex d solutions. It facilitates

constructing large but lightweight Ex p control cabinets for the safe operation of electrical and electronic standard components in Zone 1 or Zone 2.

In addition to power distribution boards and control technology, Ex p cabinets also enable the explosion-protected installation of large equipment such as transformers or converters, resulting in highly flexible explosion protection solutions.

### Ex p: Large cabinets – saving space, lightweight, maintenance-friendly



Ex p solutions are often the first choice for the explosion protection of large electric control panels and distributions.

Compared to all other types of protection, large system solution cabinets with Ex p type of protection take up relatively little space and weigh less than Ex d solutions.

These designs also offer certain advantages in terms of maintenance, and the effort required for planning Ex p solutions is comparable to that required for industrial, non-explosion-protected control units.

This applies to retrofits and modifications as well as the replacement of components – as tasks that can be easily and quickly carried out in Ex p systems.

# Ex p PRINTER AND AIR-CONDITIONED Ex p CABINETS

## Ex p printers for production systems



Quickly printing out labels in hazardous system areas has so far been out of the question to date: there has been no suitable protected hardware or protection concepts for standard devices. R. STAHL has come up with a solution: a regular printer within an Ex p enclosure (pressurized enclosure). This ex-protection solution comprises of a standard printer and a newly developed enclosure.

With this solution, users can print in hazardous areas Zone 1/21 (Ex px) and Zone 2/22 (Ex pz) without any problems.



- The technical feasibility of special printers in Ex p enclosures can be tested at the customer's plant.
- Fast and easy handling thanks to one-handed operation.
- Optional windows for comprehensive monitoring.
- Sliding enclosure floor for easy maintenance access.

## Ex p: High temperatures – not a problem



Thanks to lightweight construction, and taking into account the significance in certificates and engineering tools, we are able to offer many options for air-conditioning these solutions.

Our cooling designs range from affordable air conditioning solutions for brief rises in temperature to highly professional 4 kW cooling unit – all certified for Zone 1/21 or Zone 2/22.

## Ex p system solution combined with Ex d technology



We will find the optimum solution for each application to meet user's needs of application-specific customised solutions.

In this case, most of the technology was realised with Ex p design, and Ex d technology was used for the remaining equipment.

The type of protection used depends on the specification of the devices that will be integrated into the enclosure, whereby – R. STAHL can support every type of technology.

In this example, the combination of both types of protection ensured an ideal customised system solution.

## TYPES OF PROTECTION - AN OVERVIEW

# Ex d – FLAMEPROOF ENCLOSURES FOR ZONE 1/2/21/22

The wide range of R. STAHL Ex d enclosures is suitable for automation solutions based on components without certification to be used in hazardous areas. This includes complete machine controls with a PLC as well as individual ethernet components such as WLAN access points.

The optional combination of the Ex d enclosures with separate Ex e connection boxes means reliable explosion protec-

tion as well as simple installation. The Ex d enclosure does not have to be opened on site for the connection of power supply, signal or communication lines, as – these are connected via the easily accessible Ex e connection box.

In addition to different series of enclosures, R. STAHL's portfolio also includes a wide selection of accessories such as cable glands, cable entries, plug connectors and HFisolators.

The Ex d enclosures can be installed worldwide in gas and dust explosion hazard environments Zone 1/2/21/22.

They can even be used in extreme temperatures ranging from -60 °C to +70 °C, and IP66 make them the ideal solution for many applications – in areas such as shipbuilding, the pharmaceutical industry, the oil and gas industries and many others.

### Ex d-based WiFi solution in Zone 1



R. STAHL is your partner for setting up IT networks in hazardous areas. Our solutions enable you to use standard IT components in hazardous areas, giving you the advantage of an integrated IT infrastructure.

This project involved the use of ethernet standard components, already tried and tested by the customer's IT department for operation in safe areas, for the explosion-protected connection of an oil and gas production facility to an ethernet network, as well as for the use of mobile devices.

R. STAHL designed a solution comprising of several ethernet network Ex d enclosures. All solutions feature the simple and safe ethernet connection via Cat cables, fibre optics and antennas.

#### R. STAHL's WiFi expertise – an overview

- Our portfolio includes a wide range of Ex d enclosures of different sizes to realise WiFi solutions, adapted to the required built-in components.
- In addition, we recommend the optional combination with Ex e connection boxes for simple and safe handling.
- The wide range of network components including the 8187 ethernet terminal, 9730 HFisolator, 8186 splice cassette and the miniCON 8595 plug connector makes installation and maintenance fast and time-effective.

# Ex e – INCREASED SAFETY IN ZONE 1 AND 2

R. STAHL's Ex e solutions are based on the principle of constructive explosion protection, and they are ideal for automation solutions in Zone 2. Our portfolio includes many different enclosures and enclosure sizes for this purpose.

Together with our explosion-protected operating and function elements, system solutions can be realised exactly according to the system requirements, in particular regarding smaller sized machine controls or for extreme temperatures.

We have many different operating and function elements in store so that we can realise the desired system solution in time – certified for worldwide operation in Zone 1 and 2.

## Ex Zone 2 control panels for smaller machines and wide temperature ranges



Smaller machine controls might have to be installed directly at the system and our 7145/5 Ex Zone 2 control panels are ideally suited for this purpose. These control panels work reliably even in extreme temperatures or when installed outdoors.

We take into account special requirements arising from the scope of validity or conditions of use, and test the safety-relevant values after completion at our factory.

We are able to implement ambient temperatures ranging from -60 °C to +70 °C.

## Two types of protection – one solution



We design our system solutions exactly according to requirements and taking into account the conditions under which the equipment is operated, which required a combination of Ex e and Ex d types of protection in this particular case.

In this system solution, the PLC for machine control, the isolators, the power supply and the remote I/O were integrated into an Ex d enclosure.

The entire cabling was fitted below the Ex d enclosure and connected to the control keys at the front. Additionally, an HMI was mounted on the right-hand side for operation and visualisation of the machine.

## TYPES OF PROTECTION - AN OVERVIEW

# Ex tb – DUST EXPLOSION PROTECTION WITH ENCLOSURES

R. STAHL's Ex tb control panels are ideally suited for automation solutions where industrial products that are not explosion protected themselves and have normal power dissipation have to be installed in hazardous areas Zone 21/22.

Control devices are available to operate these panel-mount devices. The Ex tb control panels have been designed for temperatures ranging from -40 °C to +60 °C. The existing IP66 level of protection makes them ideal for stationary applications.

This means they are perfect for installation in dust explosion hazard environments Zone 21/22.

Based on the system specifications we will provide a system solution that best meets your requirements.

### Ex tb system solutions for unprotected industrial products



R. STAHL's tb control panels are used for installation in Zone 21 or 22, dust explosion protection. Provided that the power dissipation is not exceptionally high they can be universally used, thanks to IP 65/66.

Our portfolio includes various enclosure sizes in stainless steel (AISI 316L / 304), with thermochromic paint or in plastic technology. Existing dimensions and enclosure constructions can thus be easily accommodated.

In addition to standard sizes we can also design customised enclosure solutions.

### Ex tb solution for DECT base stations



The 9850/6 enclosure system can be used for operating wireless technology in dust hazardous areas. Whether a WiFi access point, a DECT base station or an RFID reader – R. STAHL can provide customised solutions based on their comprehensive range of stainless steel or plastic enclosures.

The plastic enclosures are particularly suited for the installation of devices with integrated antennas.

The enclosure system has been certified for worldwide application and can be used for realising project-specific solutions in a matter of weeks.

# Ex nR SYSTEM SOLUTION WITH THE 9851 ENCLOSURE SYSTEM

The Ex nR system solutions are suitable for automation and IT solutions based on components that are not certified for hazardous areas, operating in Zone 2.

These solutions are based on project-specific requirements and can be up and running in a short time, since there

is no lengthy certification process. This relieves users from the obligation of having to regularly test for IP compliance, thus saving time and money.

The Ex ec connection box is easily accessible. Wireless solutions using WiFi access points or RFID readers profit from

the plastic material used for the enclosures, allowing the transmission of radio signals from inside and making external antennas unnecessary.

Ex nR system solutions can be operated in temperatures ranging from -40 °C to +60 °C.

## Ex nR system solution for a WiFi network in the pharmaceutical industry



This Ex nR system solution was designed for a pharmaceutical company that wished to equip their production area with over 200 WiFi access points. The production area is classed as a Zone 2 hazardous area.

To ensure seamless integration into the existing IT network, we used standard devices without certification for hazardous areas. The 9851 Ex nR system solution met the customer's requirements, and its low weight and compact dimensions made integration into the production area easy.

The enclosure system enabled both ceiling and wall mounting. Based on the wide range of enclosure sizes we were also able to design a solution for an additional outdoor WiFi access point with external antennas. An elevated lid provided sufficient room to fit in the antennas together with the device.

# #STAHL4AUTOMATION MORE THAN YOU EXPECT

AUTOMAT

SAFETY  
BARRIERS



ISOLATORS



REMOTE I/O



ETHERNET &  
FIELDBUS

NETWORK  
PRODUCTS

ZONE 2



ZONE 1



FIELD DEV





# ION LEVEL



# ICE LEVEL

UNIVERSAL  
AUTOMATION.ORG

EtherNet/IP

Modbus  
TCP

OPEN  
PROCESS  
AUTOMATION

OPC UA

FDT

ONVIF®

# YOUR PARTNER FOR EXPLOSION PROTECTION WORLDWIDE

## Customised automation solutions for your system



In addition to individual components, R. STAHL offers specific explosion-protected automation solutions. Our experienced engineers work closely together with you to design the ideal and fast-to-implement for your application.

## Engineering, certification and system certificates



From a new CCTV plan to engineering, certification and production, quality control and documentation, R. STAHL's project managers will put their expertise at your service for all questions concerning the project.

We will also issue individual system certificates for customised projects solutions.

## Factory Acceptance Test (FAT) / Site Acceptance Test (SAT)



Do you wish to conduct the tests at our production sites or on-site at your facility? Whichever option you choose, our experts will be available to answer any questions and take note of any change requests.

## Support



Our support will continue to be available beyond the delivery of your system, with our support team available during the initial on-site commissioning as well as over the entire operating life.

# #STAHL4AUTOMATION MORE THAN YOU EXPECT

R. STAHL was founded as a family-run German company in 1876 and has been actively involved in explosion protection since the 1940s.

**AUTOMATION has been firmly established in the company for 50 years**, and has resulted in significant pioneering work, for example, in explosion-protected remote I/O systems and intrinsically safe fieldbus solutions.

We actively cooperate in **future topics**, such as NAMUR Open Architecture (NOA), the Open Process Automation Forum (OPAF), Ethernet APL (Advanced

Physical Layer), and Cyber Security, so that our customers can digitalise their process plant of the future.

Nowadays, R. STAHL is one of the world's three largest providers of components and solutions for electrical explosion protection.

We are the number one company for **system solutions**, including for the most extreme ambient conditions. R. STAHL actively supports standardisation in accordance with ATEX, IECEx and NEC/CEC for its customers in order to ensure a high safety standard within

Germany and internationally.

From development through to production and operation in systems, we act true to the **"Made in Germany"** seal.

R. STAHL places great importance on the safety, quality and durability of its products. This is why we have been certified since 1993 in accordance with ISO 9001 and are one of the first manufacturers to be certified in explosion protection in accordance with IEC EN 80079-34.





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