THE STRONGEST LINK.

STAHL

INDUSTRIAL ETHERNET –

Digital communication in hazardous areas

INDUSTRIAL ETHERNET – SHAPING THE FUTURE OF HAZARDOUS AREAS

Ethernet and wireless technology will play a decisive role in the implementation of digitalisation concepts in the process industry.

Their main applications will be in data transmission for mobile operating devices, monitoring process technology sequences, and integration and diagnostics for sensors and actuators. The technical challenge is to ensure that the solutions meet the requirements of both digital transmission technologies and explosion protection.

R. STAHL aims to provide products and solutions that combine safe explosion protection and easy handling. R. STAHL's network technology range currently includes explosion-protected products and solutions for installing Ethernet networks and wireless solutions in process plants.

R. STAHL participates in the effort to standardise intrinsically safe Ethernet as a 2-wire (Ethernet-APL) and 4-wire (100BASE-TX-IS) solution.

In combination with our mobile devices, we can provide complete solutions for your repair and maintenance tasks in hazardous areas.

R. STAHL's solutions involve the best possible products in combination with associated services. Also included are complementary service level agreements and consultation that benefits from our wide-ranging expertise in explosion protection and also includes the integration of 3rd-party products.
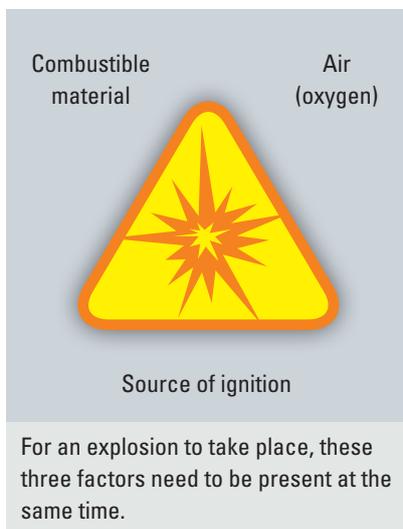
IT MEETS EXPLOSION PROTECTION

The use of Ethernet in the process industry gives rise to an aspect that for most IT experts is absolutely new – explosion protection. Protective regulations in the form of laws, decrees and standards have been implemented across the world to prevent explosions.

The primary aim is to prevent the formation of dangerous explosive atmospheres. In the production areas of the process industry, this often cannot be completely excluded. Measures are therefore required that prevent the ignition of this atmosphere.

Potential ignition sources include sparks, hot surfaces and electro-

Combustible material   Air (oxygen)

Source of ignition

For an explosion to take place, these three factors need to be present at the same time.

magnetic radiation from a radio signal. One or more standardised types of protection can be used for electric and electronic devices.

The specific choice of protection depends on the type of hazardous area and the device application.

Developing a solution that takes into account both these aspects poses a real challenge.Our experience of more than 50 years in the field of explosion protection and our products that communicate via Ethernet make R. STAHL your ideal partner for network solutions.

We also have a wide range of seminars on topics related to explosion protection, which you can find at r-stahl.com/en/global/services-and-seminars/seminars.

R. STAHL –
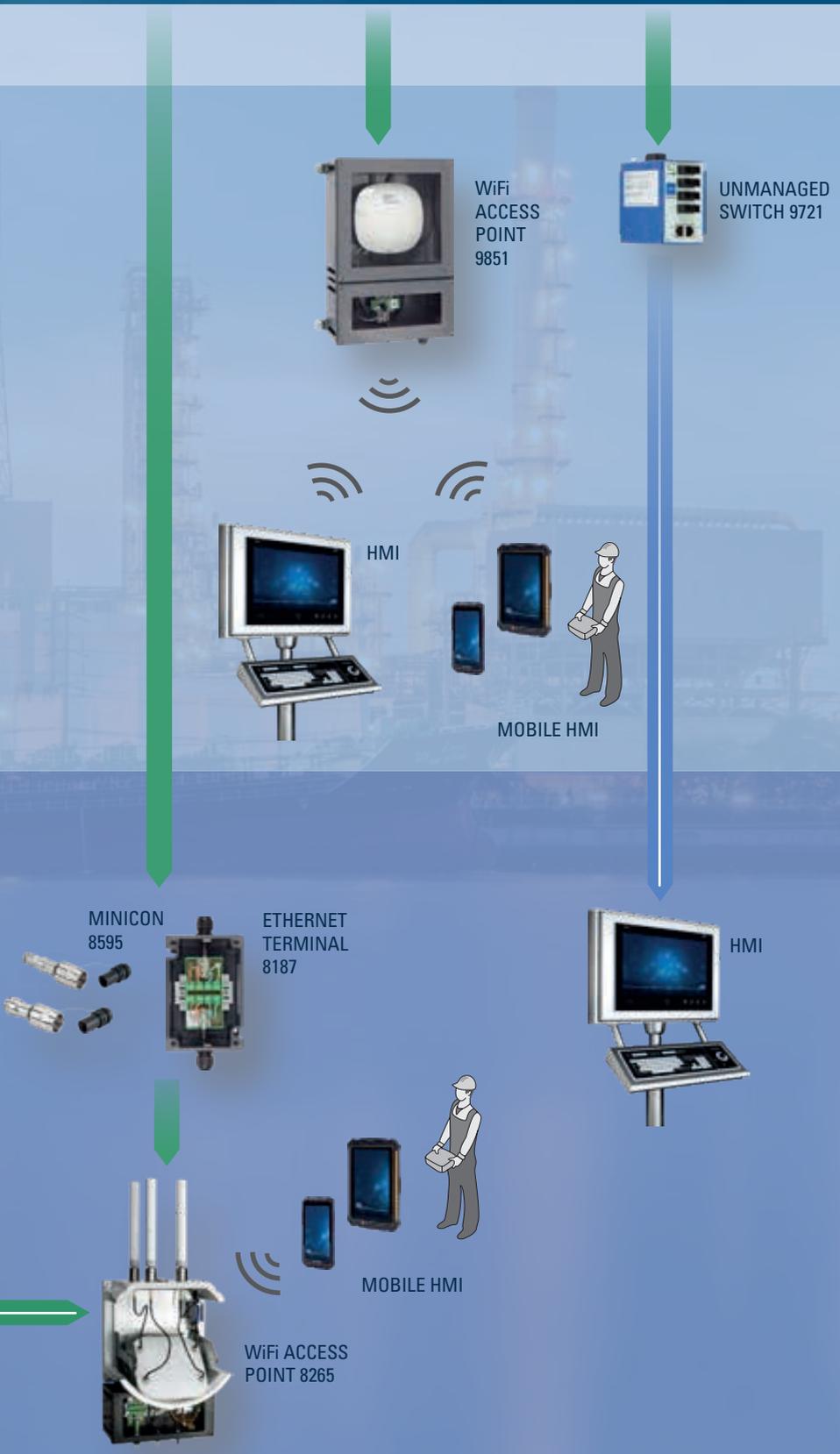# SOLUTIONS FOR DIGITAL NETWORKS

ETHERNET NETWORK

ZONE 2

UNMANAGED
SWITCH 9721

INDUSTRIAL
SWITCH

REMOTE I/0 IS1+

FIELD
SWITCH
9740

ZONE 1

MEDIA
CONVERTER
9723

FIELD
SWITCH
9740

FIBRE OPTICAL
SPLICE BOX
8186

REMOTE I/0 IS1+

ETHERNET-APL – Ex i / 2-WISE

100BASE-TX-IS (COPPER CABLE) – Ex i

1000BASE-TX (COPPER CABLE) – Ex e

100BASE-FX (FIBRE OPTICS) – Ex op is

1000BASE-FX (FIBRE OPTICS) – Ex op pr

CCTV CONTROL

WiFi
ACCESS
POINT
9851

UNMANAGED
SWITCH 9721

MEDIA
CONVERTER
9721

HMI

MOBILE HMI

MEDIA
CONVERTER
9721

MINICON
8595

ETHERNET
TERMINAL
8187

HMI

CCTV

MOBILE HMI

WiFi ACCESS
POINT 8265

MEDIA CONVERTERS AND SWITCHES

Ethernet data transmission via copper cables is limited to a distance of about 100 metres. This is frequently not enough for the large production sites in the process industry. Also, data transmission via copper cables can be affected by electromagnetic interference. In both cases, data transmission via optical fibre is preferable.

R. STAHL's media converters and switches work on the basis of explosion-protected laser sources, making installation and operation very simple.

Laser sources used for the transmission of signals are considered potential sources of ignition which require a type of protection according to IEC 60079-28.

9723 Media converter for Zone 1

The Ethernet media converters for installation in Zone 1 convert Ethernet via fibre optics (FX) to Ex i Ethernet via CAT cable (TX). With this converter, industrial CAT cables can be plugged and unplugged during operations also in Zone 1 (hot plug). The devices are particularly suitable for operation of the Zone 1 Remote I/O IS1+.

- Intrinsically safe 4-wire Ethernet 100BASE-TX-IS.
- Transmission rate 100 MBit/s.
- Transmission range up to 5 km (multi mode) or up to 30 km (single mode)
- Extended temperature range: -40 °C ... +75 °C
- Installation in Zone 1.

9721 Media converter

The 9721 series media converter converts electrical signals into optically inherently safe "op is" signals (see IEC EN 60079-28), allowing installation and maintenance work to be conducted on fibre optics in Zones 0, 1 and 2 without the need for downtime (hot plug). It is particularly suitable for the IS1+ Ethernet Remote I/O system.

- Transmission rate 100 Mbps.
- Transmission range up to 5 km (multi mode) or up to 30 km (single mode).
- Extended temperature range: -30 °C ... +75 °C.
- Installation in Zone 2.

9721 Unmanaged switch

The 9721 switch is used for linking electrical Ethernet networks with optical 100 Mbps Ethernet networks. With type of protection "op is", the 4 FO ports are designed for operation in hazardous areas (see IEC EN 60079-28). This way, conventional fibre optic cables can also be used in hazardous areas and may be connected and disconnected during operation (hot plug).

- Transmission rate 100 Mbps.
- Transmission range up to 5 km (multi mode) or up to 30 km (single mode).
- Extended temperature range: -30 °C ... +70 °C.
- Installation in Zone 2.

INSTALLATION TECHNOLOGY FOR CABLES AND FIBRE OPTICS

The installation of Ethernet in hazardous areas is a balancing act between the requirements of explosion protection and those of digital signal transmission. Whilst minimum distances and separate circuits are required, parallel wiring may result in interference.

The usual industrial installation methods, such as RJ45 plugs or FO patch panels cannot simply be used in hazardous areas. R. STAHL provides unique solutions that meet all requirements, while at the same time making installation simple and fast.

8595 miniCON Ex plug connector

The miniCON Ex plug connector supports the simple and easy connection and disconnection of Ethernet networks. The plug connector is particularly suitable for applications that require fast connection or disconnection.

- Easy handling in Zone 1 with hot-plug technology.
- Simple connection and disconnection thanks to one-handed operation.
- For transfer rates of up to 1 GBit/s on 4 pairs of wires.
- Also suitable for Power over Ethernet (PoE).

8187 Ethernet terminal

The 8187 Ethernet terminal is used to connect CAT5/6/7 cables with transmission rates of up to 1 GBit/s in Zone 1 hazardous areas.

- Simple installation in Zone 1 in enclosures with type of protection "eb" (see IEC EN 60079-7).
- For transfer rates of up to 1 GBit/s.
- High-quality shield for interference-free transmission.
- Also suitable for Power over Ethernet (PoE).

8186 FO splice cassette

The 8186 FO splice cassette with type of protection "op pr" (see IEC EN 60079-28) is used for the correct and fast connection of 6 or 12 fibre optic cables in hazardous areas.

- Simple installation in Zone 1 in the Ex e enclosure.
- For up to 12 fibre optics per cassette – cassettes can be stacked.
- No limit to FO transfer rates.
- Integrated crossing field for bend-radius-limited crossing of fibres.

WIRELESS INSTALLATION TECHNOLOGY

Wireless technologies such as WiFi are being used more and more frequently in the process industry. When used in hazardous areas, explosion protection for the wireless interface can be particularly challenging.

The best balance between explosion protection and ease of use of the antenna is achieved by converting the radio signal to an intrinsically safe radio signal. This allows the planner and user to choose from the large range of antennas and plug connectors.

Intrinsically safe radio signal for great flexibility
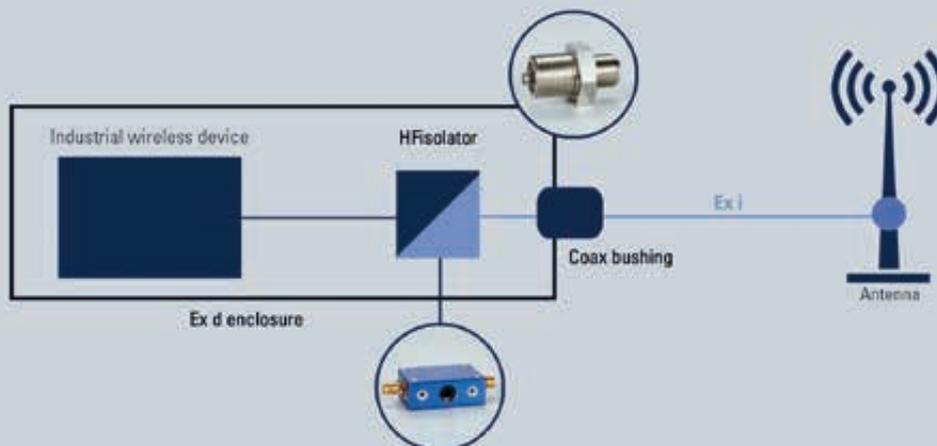
9730 HFisolator

The 9730 series HFisolator from R. STAHL, which can easily be connected between a wireless device and an antenna, converts the radio signal into an intrinsically safe (Ex i) signal. R. STAHL offers two versions of this device, as a simple signal converter or a combined signal converter and enclosure feed-through.

- Use of a wide range of antennas.
- Large frequency range.
- Temperature range: -40 °C ... +80 °C.

Antennas

Having the HFisolator convert the signal into an intrinsically safe antenna signal means that you can use a large range of industrial antennas. The antennas, however, must meet certain requirements for use in hazardous areas, rated according to applicable standards.

R. STAHL´s product range includes antennas for main applications that have already been rated.
Our services also include rating an antenna of your choice.

PROJECT-SPECIFIC SOLUTIONS FOR ZONE 2, 22

R. STAHL will develop solutions to operate network components of your choice in hazardous areas – this includes devices that do not have corresponding certificates. Thanks to the 9851 enclosure system, developing solutions for Zone 2 encompassing standard WiFi access points, RFID readers, IIoT gateways, LTE/5G routers, signal amplifiers and many more components takes little time.

For Zone 22 applications, the 9850/6 enclosure system can provide a whole range of solutions.

FLEXIBLE DESIGN – INTERNAL OR EXTERNAL ANTENNAS

The use of plastic enclosures means that external antennas are no longer required. Devices that only feature an internal antenna, as is often the case with WiFi or RFID readers, can also be used. This approach saves both space and money.

LIGHTWEIGHT ENCLOSURE WITH MINIMUM MAINTENANCE

Compared to Ex d enclosures, the plastic enclosures are up to 70% lighter and are significantly easier to instal. A range of enclosure sizes are available, to ensure that the enclosure is a good fit for the size of the device to be protected. As the connection in the field is situated inside a separate connection box, the required maintenance is kept to a minimum.

SIMPLE CONNECTION – EASY ACCESS

The lower part of the enclosure is used for connecting the network-bound communication and the power supply. Within the separate connection box, connections can be established during the installation process without affecting the explosion protection of the upper part of the enclosure or increasing the maintenance requirements.

PROJECT-SPECIFIC SOLUTIONS
FOR ZONE 1, 21

R. STAHL enables you to operate a WiFi access point or other network components of your choice such as RFID readers, IIoT gateways, LTE/5G routers or signal amplifiers in hazardous areas Zone 1 and 21.

This means that your network remains standardised across your business, with central administration. We are happy to accommodate individual requirements and regional specifics.

CHOOSE FROM A FULL RANGE OF ANTENNAS

The HFisolator converts radio signals into explosion-protected wireless signals. By converting the signal, radio signals can benefit from the advantages of intrinsic safety (Ex i), such as the use of a wide range of antennas, the use of standard coaxial connectors, and the ability to plug in and disconnect these connectors in hazardous areas (hot plug).

GREATER TRANSMISSION DISTANCES WITH FIBRE OPTICS

The media converter is used to convert electrical Ethernet signals (TX) into optical Ethernet signals (FX). The optical Ethernet signals have "op is" type of protection. Therefore, conventional fibre optic cables can also be used in hazardous areas and may be connected and disconnected during operation (hot plug).

FAST IMPLEMENTATION AND EASY REPLACEMENT

Use the enclosure system for the Ex d explosion protection type (see IEC EN 60079-1) to customise solutions for standard Ethernet devices, such as a WiFi access point. International approvals mean that this approach can be implemented worldwide. A project-specific solution can be developed within a few weeks. With this concept, WiFi access points can be easily replaced, for instance when upgrading to the latest generation.

SIMPLE, TIME-SAVING INSTALLATION

The separate Ex e connection chamber makes installation significantly easier. Ethernet and power supply sources can be inserted into the enclosure in the usual way via simple cable glands. The connection chamber can be opened and closed easily with four screws.

SYSTEM SOLUTIONS – METICULOUSLY PLANNED AND CUSTOMISED

There is no reason for explosion protection to stand in the way of your digitalisation projects. Although not all installation projects can be completely transferred to hazardous areas, good alternative solutions exist for almost all requirements.

Thanks to a comprehensive product range and years of experience, we can provide you with tailor-made solutions for almost any challenge.

We are your partner for the design of networks in hazardous areas with the devices and technologies of your choice: from FO implementation in Ex d controls to remote I/O systems with Ethernet communication in Zone 1, up to the integration of our explosion-protected CCTV cameras into your IP networks.

Ethernet Remote I/O for Class I, Division 1 with PROFINET

Use of the IS1+ Ethernet Remote I/O system in a painting system in the USA with a network connection via the PROFINET protocol.

- Installation in Class I, Division 1, alternatively also in Zone 1 in accordance with ATEX/IECEx.
- Communication via explosion-protected fibre optics ("op is" as per IEC 60079-28) and media converter series 9721.
- PROFINET protocol with a transfer rate of 100 Mbit/s, optionally also with S2 redundancy.
- Full support for the HART protocol with integration into asset management systems via FDT/DTM or HART-IP.

Ex d control for Zone 1 with Ethernet connection

Ex d control for Zone 1 with Ethernet connection.

- Installation in Zone 1 in accordance with ATEX/IECEx requirements.
- "op pr" fibre optics as per IEC EN 60079-28.
- CAT cable with Ex e type of protection.
- Scalable through the use of stackable splice cassettes, each with up to 12 fibre optics.
- Installation possible in the same way as for industrial systems.

WirelessHART/ISA100.11a for an offshore application

Use of WirelessHART and ISA100.11a gateways on offshore platforms in the North Sea.

- Installation in Zone 2 in accordance with ATEX/IECEx requirements.
- Increased availability thanks to gateway redundancy.
- Increased transmission distance thanks to FO.
- Simple fibre optic connection using splice box.

MOBILE WORKER SOLUTIONS

Our Mobile Worker solutions enable you to optimise your processes risk free. Our designs help you to increase process quality and reduce cost at the same time. We have different concepts depending on the various tasks of a Mobile Worker, tailored to the specific requirements of your system. Our guiding principle: not one solution fits all, but the best fit for your system.

The basis for any Mobile Worker solution is continuous connectivity. For this, our product portfolio includes flexible solutions from WiFi access points and routers up to signal amplifiers for LTE or 5G. Together with our service concepts, a wide range of mobile devices such as smartphones, tablets, smart watches, adaptable thermal imaging cameras, and barcode scanners complete the solution.

Inspection and maintenance

- Fast identification of systems and devices with a scan or the mobile retrieval of the floorplan with our Zone 1, 21 tablet solutions.
- Work orders can be allocated to staff dynamically, who can then quickly retrieve the associated instructions.
- Communication concepts with remote support by experts worldwide.
- Substantial reduction of workload by combining smartphones with barcode scanners, RFID readers, and thermal imaging cameras.

Lone worker protection

- Our mobile devices for Zone 1, 21 minimise the risk of entering the wrong hazardous area by mistake – after all, many such areas are not explicitly signposted.
- Reduced cost since additional access control methods are no longer required.
- A programmable button on the side for push-to-talk applications keep workers in touch with the control room (PoC/PTT).
- A programmable emergency button enables workers to make quick emergency calls, thus improving lone worker protection.
- Our smartwatches can be used to access all information whilst keeping both hands free.
- The long-running battery means you can work across several shifts without having to recharge.

Documentation also in outdoor areas

- System status documentation is mandatory in the process industry, and our tablets enable you to do this effectively, saving time.
- Real-time access – any changes can be directly compared to the real status.
- Consultation with the control room at any time, even in difficult-to-access outdoor areas.

ETHERNET-APL FIELD SWITCHES FOR ZONE 1 AND ZONE 2

Ethernet-APL enables continuous IP communication from the control system to the field level in Zone 0, 1 or 2. The technology is based on a 10 MBit/s 2-wire Ethernet (10BASE-T1L) and can cross distances of up to 1,000 metres. At the same time, the 2-WISE concept integrates an intrinsically safe power supply of the field devices.

Ethernet-APL networks are installed either in classic star topology or in 2-wire bus topology familiar from fieldbuses.

The core component of both those installation types are the Ethernet-APL field switches. These are needed for the integration of APL field devices into the superordinate 4-wire Ethernet network, and ensure the intrinsically safe data transmission and auxiliary power supply.

In addition, they feature comprehensive diagnosis functions for the network and for data communication.

2-WISE – 2-WIRE INTRINSICALLY SAFE ETHERNET

Type of protection "i" (intrinsic safety) is common in process automation, but requires meticulous planning. 2-WISE according to IEC TS 60079-47 is a concept for connecting

Ethernet-APL components of different manufacturers without having to calculate proof of intrinsic safety.

Ethernet-APL field switches 9740
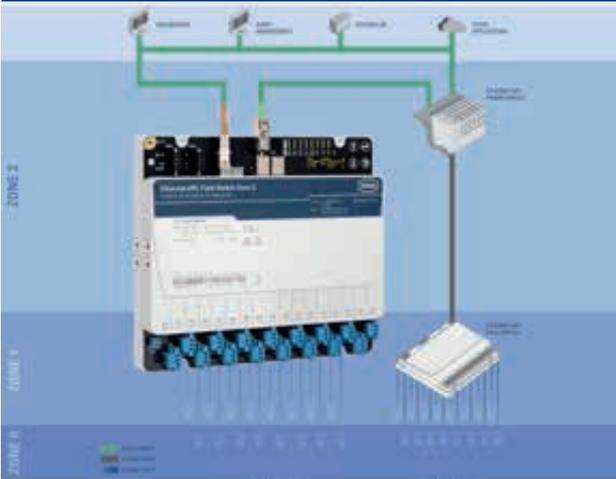
The Ethernet-APL field switches series 9740 are intended for the connection of intrinsically safe 2-WISE field devices to superordinate 4-wire Ethernet networks, and supply the devices with intrinsically safe power. The field switches can be installed in Zone 1 or Zone 2.

• Operation of 16 Ethernet-APL or PROFIBUS PA field devices (PA-Proxy).

• All spurs intrinsically safe "ia" (2-WISE) with port profile A or A+B.

• Operation with 100BASE-TX (Zone 1, 2) and optionally 100BASE-FX (Zone 2).

• Redundant auxiliary power supply and comprehensive integrated diagnoses.

Ethernet-APL

The integrated diagnosis functions of the Ethernet-APL field switches make commissioning or trouble-shooting considerably easier and faster.

• Comprehensive diagnoses of the physical layer including SNR (signal noise ratio) and TDR (time domain reflectometry).

• On-site display of detailed diagnosis information via LEDs and OLED.

• Transmission of diagnosis data via integrated WebServer and the process network.

• Ambient temperature and humidity are also monitored.

BROAD EXPERTISE FOR DIGITALISATION

Engineering

In addition to components, R. STAHL can also provide project-specific solutions. Our experienced engineers work closely together with you to design the ideal solution for your application that is also fast to implement.

Production

From an Ethernet terminal to an HMI with WiFi access point – our production facilities will construct your solution safely, on time, and with certified quality according to ATEX, IECEx or NEC.

Factory Acceptance Test (FAT)

Visit us at our spacious production site for testing and releasing your solutions. Our production team is right there to implement any changes, if required.

Support

Our support will continue to be available beyond the delivery of your system. Our support team is available during the initial on-site commissioning and 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 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.

1700

275 MIO. EUR

75 WORLDWIDE

80 YEARS EXPERIENCE

INTERFACE

NETWORK

HMI

SYSTEMS

CAMERA AND CCTV

SERVICE AND SUPPORT

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