



Ibus fieldbus technology

modules and systems





fieldbus solutions



Three generations of fieldbus devices are in use in the process industries and hazardous areas today. Firstly, there are the classic, conventional sensors and actuators with analogue 4–20 mA signals and, secondly, the HART transmitters and positioners. Besides the conventional IS isolators this does of course relate to explosion protected Remote I/O Systems where conventional and HART devices can be interfaced efficiently with automation systems using modern digital communication technology. For example, this is possible with Profibus DP and Fast Industrial Ethernet today.

The **FOUNDATION™** Fieldbus H1 and Profibus PA, the third generation of fieldbus devices acc. to IEC 61158-2, were introduced some years ago. The predominant types of protection for explosion protected sensors and actuators continue to be intrinsically safe “Ex i” and flameproof “Ex d” in Zone 1 and Division 1. The FISCO specification was developed for an intrinsically safe fieldbus (H1 and PA), standardized in accordance with IEC 60079-27. However, the number of connectable fieldbus devices is small when using a whole fieldbus installation in type of protection “intrinsic safety”. Far more current can be provided for much more fieldbus devices without everything intrinsically safe. The so called “High Energy Trunk” or “High Power Trunk” concept utilizes a non-intrinsically fieldbus trunk that is connected to the FISCO/intrinsically safe fieldbus devices via so called isolating device couplers – also known as fieldbus barriers. Today this is the best way of implementing an efficient and economical installation powering an adequately large number of fieldbus devices. R. STAHL has made its business to provide efficient and economical solutions with suitable couplers, fieldbus power supplies and advanced physical layer diagnostics tools for fieldbus installations. Customized solutions with enclosures in different materials and sizes, extensive accessories plus the long time engineering experience for hazardous area applications round up the fieldbus product range.



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non-Ex

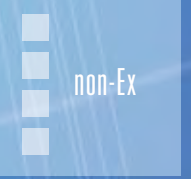
Zone 2

Zone 1

Power Supply & Diagnosis

Fieldbus FF H1

Fieldbus Devices

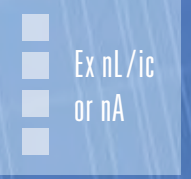


Spur Protector



8 x non Ex

Fieldbus Devices



Zone 2 Ex n FDC



12 x Ex nL/ic/nA

Zone 2 Ex i FDC



8 x Ex i/FISCO

Fieldbus Devices



Zone 1 Ex i FDC



8 x Ex i/FISCO

Temp. Sensors

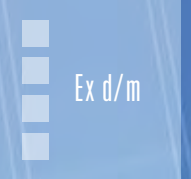


Ex i/FISCO

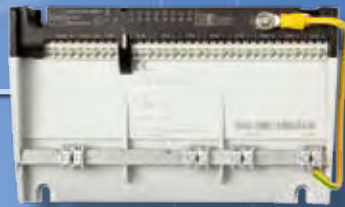
Ex i Temp.-Mux



Fieldbus Devices

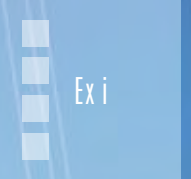


Zone 1 Ex e FDC



8 x Ex e

Discrete Devices



Terminator

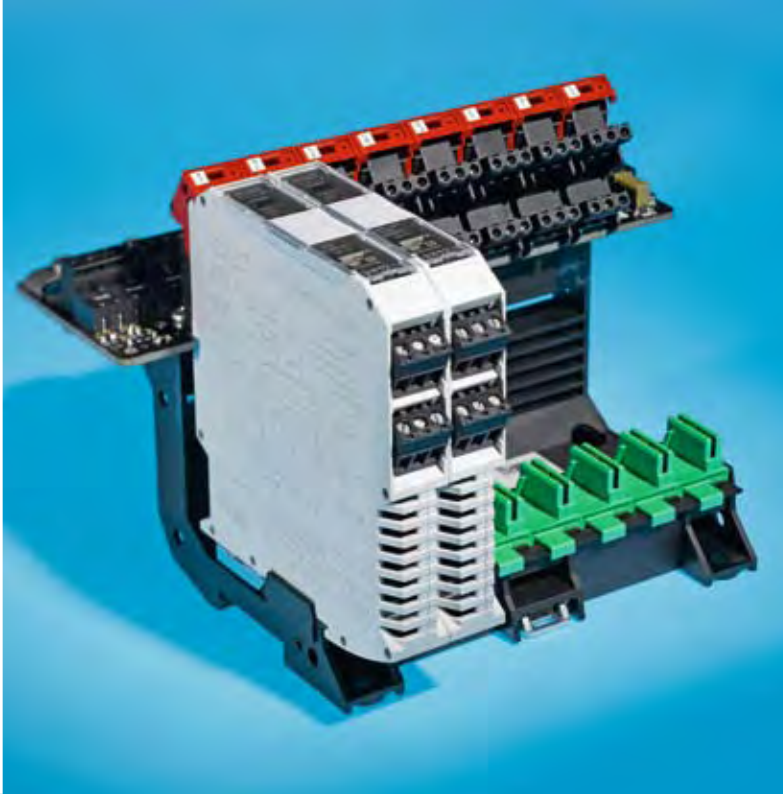
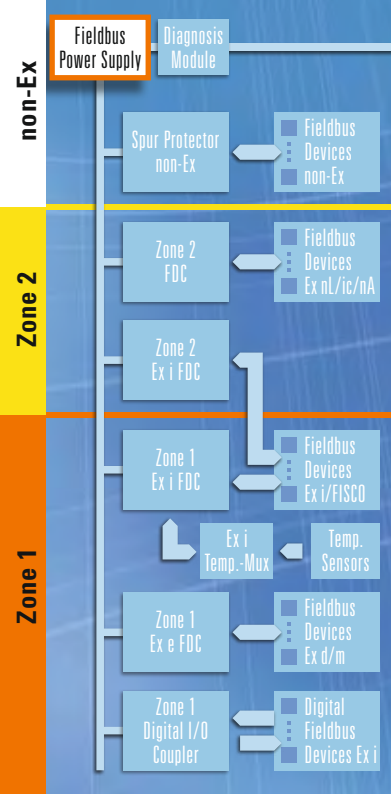
Digital I/O Coupler



4 x Ex i output

8 x Ex i input

Fieldbus FF H1, high power trunk (Ex e/N.L.)



fieldbus power supply

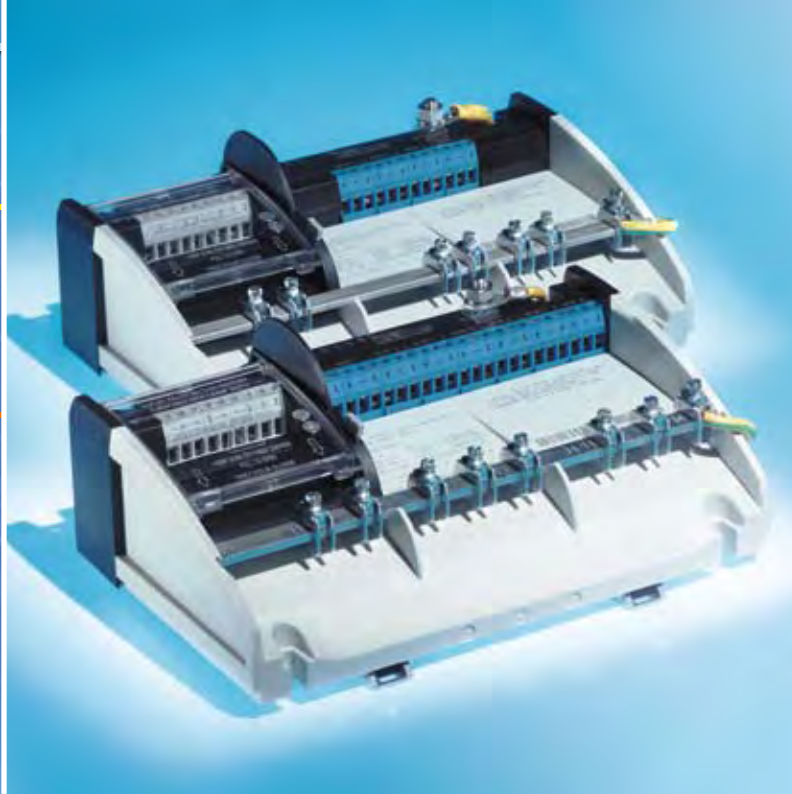
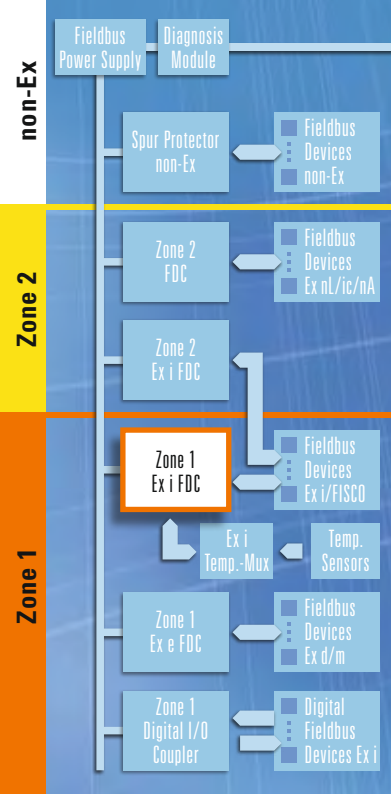
for safe area and zone 2 installations

Highlights

- > for FOUNDATION™ Fieldbus H1 segments, simple or redundant
- > galvanic isolation between fieldbus segment and power supply unit
- > high output power of up to 28 V and 500 mA
- > special Boost Mode for double output power up to 1 A
- > integrated advanced diagnostics for trunk voltage/current, signal level, noise, jitter and asymmetries
- > alarm contact for failures
- > optional with adjustable warning and alarm values and 3-level LED indication
- > serial interface for download of diagnostic information
- > LEDs for diagnostics and operation
- > Integrated, switchable Fieldbus-Terminator

The ISbus Fieldbus Power Supplies series 9412 serve for energy supply and signal conditioning of simple and redundant FOUNDATION™ Fieldbus H1 segments. The unique Boost Mode uses two power supplies connected in parallel to supply even up to 1 A to the fieldbus. All 9412 Fieldbus Power Supplies feature integrated advanced physical layer diagnostics to measure the electrical bus quality with signal level, noise, jitter and asymmetries. A front side service interface allows direct connection of a PC to display these values on a screen. The Advanced Fieldbus Power Supply uses the physical layer diagnoses to monitor quality changes of a fieldbus installation and to generate adjustable pro-active warning messages via “traffic light” LEDs and relay contact. For online access to the parameters a Diagnosis Communication Module is available to connect host and asset management systems via FF H1 and Enhanced DD. The devices can be either fitted onto the DIN-rail or engaged securely into the special bus-carriers. With each bus-carrier it is possible to connect up to 8 segments with individual or redundant power supply to a host by means of optional preassembled system cables.





Zone 1



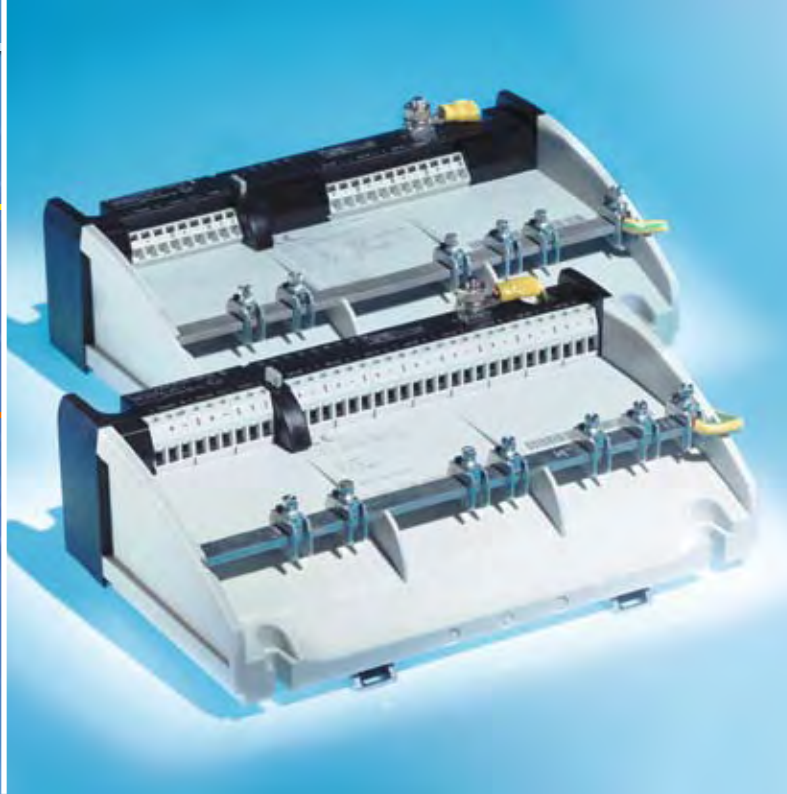
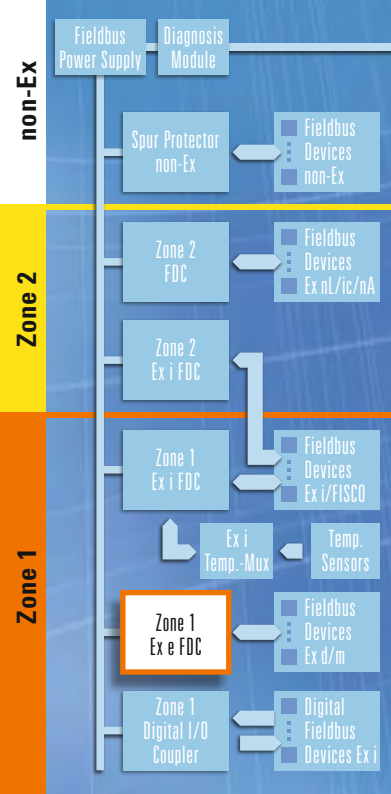
field device coupler

for Zone 1 installations and Ex i devices

Highlights

- > for FOUNDATION™ Fieldbus H1 or Profibus PA
- > connection of up to 4 or 8 intrinsically safe FISCO field devices to a non-intrinsically safe/Ex e/Nonincendive fieldbus
- > isolation between intrinsically safe fieldbus devices and non-intrinsically safe fieldbus
- > spur protection for each spur
- > reduced starting and low fault current through power management
- > LED indication of status and faults on each spur
- > switchable termination on board
- > screw or cage clamp terminals

The R. STAHL Zone 1 Ex i Field Device Couplers (FDC) connect up to eight intrinsically safe or FISCO fieldbus devices to the non-intrinsically safe high power trunk. Each fieldbus device is powered with up to 40 mA. A feedback effect on the trunk and, thus, on the entire system is prevented in the case of short-circuits by 50 mA current limiting per spur. The intrinsically safe spurs comply with FISCO and Entity and are galvanically isolated from the trunk. All the R. STAHL Field Device Couplers feature a power management, described on Page 7. A set of LEDs clearly indicate status and failure of the spurs. The coupler is mounted on DIN rails or directly in the housings made of fibreglass-reinforced polyester, sheet steel or stainless steel. The cables are connected either with screw terminals, detachable screw terminals or with cage clamp terminals. The cable shields can be earthed capacitively or directly at the integrated bus bar. An IP 30 cover protects the non-intrinsically safe connections of the trunk so that work can be carried out at any time on the intrinsically safe spurs. The Ex i Field Device Coupler can be installed in Zone 1 or Division 2 and connected to fieldbus devices in Zone 1 or Division 1.



Zone 1



field device coupler

for Zone 1 installations and Ex d/m/q devices

Highlights

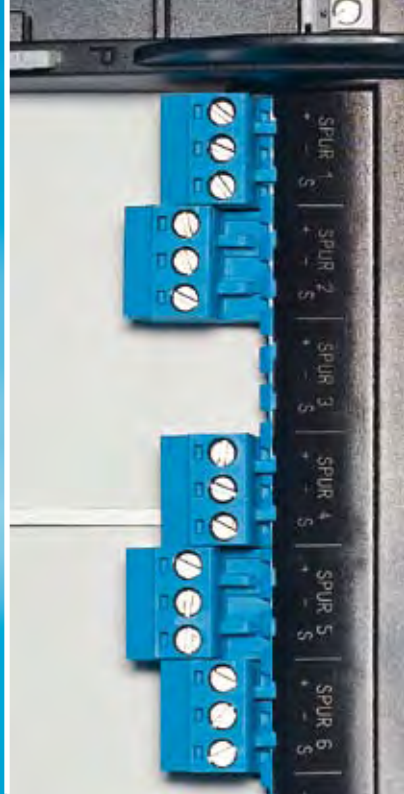
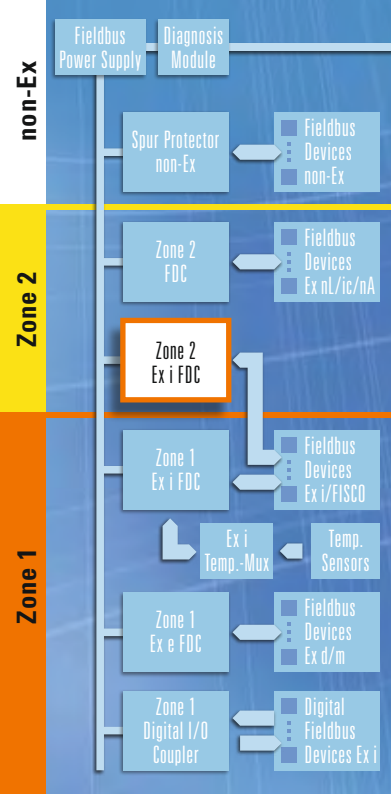
- > for FOUNDATION™ Fieldbus H1 or Profibus PA
- > connection of up to 4 or 8 explosion protected (Ex d/Ex m) fieldbus devices to a non-intrinsically safe/Ex e/Nonincendive fieldbus
- > spur protection for each spur
- > reduced starting and low fault current through power management
- > LED indication of faults on each spur
- > switchable termination on board
- > screw or cage clamp terminals

The R. STAHL Zone 1 Ex e Field Device Couplers connect up to 8 non-intrinsically safe fieldbus devices to the high power trunk. The fieldbus devices in type of protection Ex d, Ex q or Ex m can each be powered with 40 mA. Here as well, each spur features 50 mA current limiting in order to prevent feedback effects on the trunk and, thus, on the entire system in the event of short-circuits. A red LED per spur clearly indicates such a failure condition. Installation, wiring, housings, terminals and shield earthing etc. are designed as on the Ex i Field Device Coupler.

Field Device Coupler Power Management:

All R. STAHL Field Device Couplers feature two functionalities to lower the current consumption on the trunk and of the coupler under all conditions as much as possible:

- > The Soft-Start function – as soon as the trunk voltage at the couplers exceeds 16 V, the spurs are activated one after the other resulting in a significant lower inrush current during start-up compared to other couplers.
- > Short circuit limitation – in the event of multiple spur short circuits, all spurs are de-energized until the failure is eliminated. So even with multiple short circuits the trunk is loaded with maximal one short circuit current at a time.



Zone 2



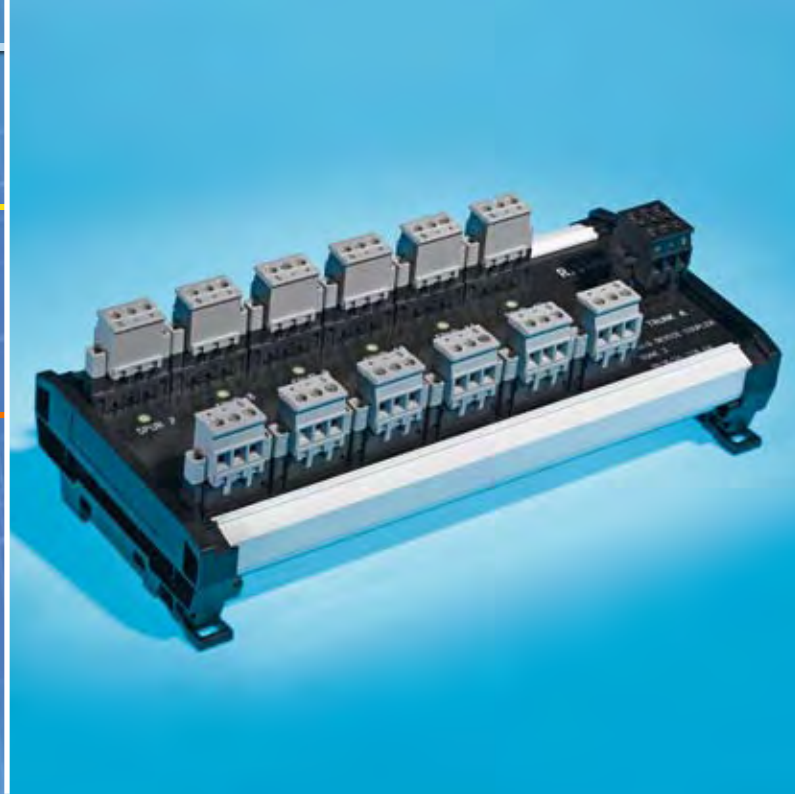
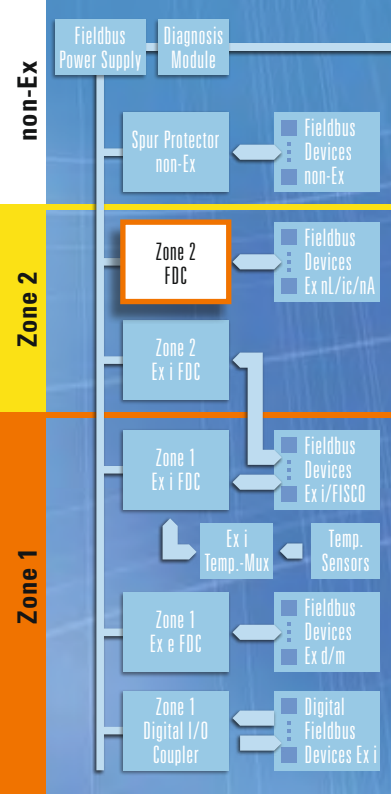
field device coupler

for Zone 2 installations and Ex i devices

Highlights

- > for FOUNDATION™ Fieldbus H1 or Profibus PA
- > connection of up to 8 intrinsically safe FISCO field devices to a non-intrinsically safe/Nonincendive fieldbus (high power trunk)
- > isolation between intrinsically safe fieldbus devices and non-intrinsically safe fieldbus
- > spur protection for each spur
- > reduced starting and low fault current through power management
- > LED indication of status and faults on each spur
- > switchable termination on board

The R. STAHL Zone 2 Ex i Field Device Coupler is installed in Zone 2 or Division 2 and connects up to eight intrinsically safe fieldbus devices to the non-intrinsically safe high energy trunk. Each FISCO fieldbus device can be installed in hazardous area Zone 1 and is powered with up to 40 mA. A feedback effect on the trunk and, thus, on the entire is prevented in the case of short-circuits. For this reason, each spur features 50 mA current limiting. The intrinsically safe spurs comply with FISCO and Entity and are galvanically isolated from the trunk. A set of LEDs clearly indicate status and failure of the spurs. Also this field device coupler features power management, described on Page 7. The coupler is mounted on DIN rails or directly in the housings made of fibreglass-reinforced polyester, sheet steel or stainless steel. The cables are connected either with screw terminals, detachable screw terminals or with cage clamp terminals. The cable shields can be earthed capacitively at the terminals or directly at the optional bus bar.



Zone 2



field device coupler

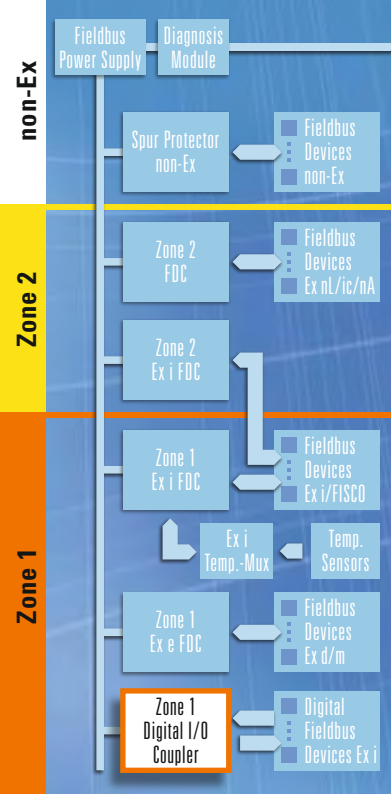
for Zone 2 installation and Ex nL/ic devices

Highlights

- > for FOUNDATION™ Fieldbus H1 or Profibus PA (IEC 61158-2)
- > connection of up to 12 Ex nA/Ex ic/Ex nL field devices
- > spur protection for each spur
- > low start-up current due to power management
- > short-circuit monitoring with automatic switch-off of the respective spur and indicator

The R. STAHL Zone 2 Ex n Field Device Coupler connects four, eight or twelve Zone 2 fieldbus devices in type of protection Ex nL, ic or nA or Zone 1 Ex d/q/m fieldbus devices to the high power trunk. Each fieldbus device is powered with up to 40 mA. Here as well, each spur features 50 mA current limiting in order to prevent feedback effects on the trunk and, thus, on the entire system in the event of short-circuits. A short circuit is indicated via a red LED for each single spur.

Like all the other couplers, this field device coupler also features the power management, described on Page 7. The coupler is mounted on DIN rails in housings made of fibreglass-reinforced polyester, sheet steel or stainless steel. The cables and the cable shields are connected to the detachable terminals that are locked with screws against loosening. The trunk cable can be looped through by a t-connector to other couplers on the segment. For termination at the end of the trunk an external terminator is available that is connected to the t-connector as well. The Ex n field device coupler can be installed in Zone 2 or Division 2.



IS // bus

Zone 1



digital I/O coupler

for Zone 1 and Ex i discrete I/O-devices

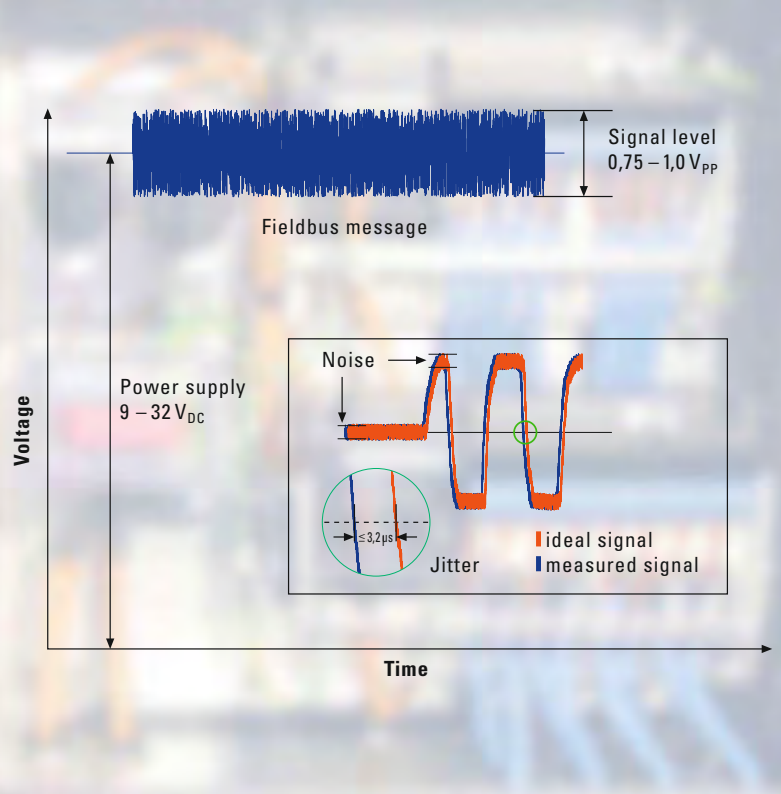
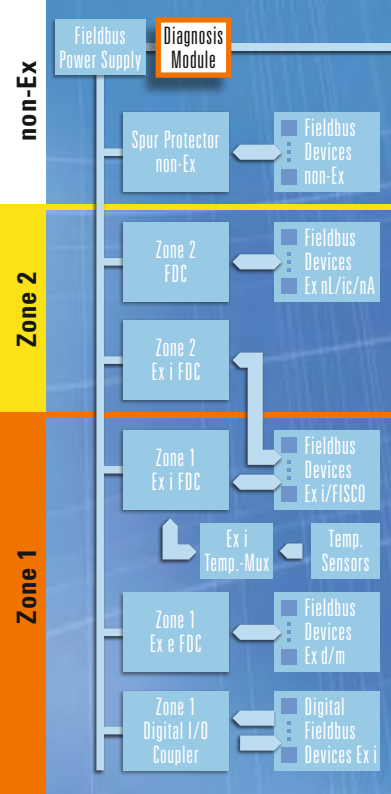
Highlights

- > for FOUNDATION™ Fieldbus H1
- > external power (4-wire version)
- > digital/discrete input, 8 channels, acc. to EN 60947-5-6 (NAMUR)
- > intrinsically safe discrete inputs (EN 60947-5-6)
- > 4 intrinsically safe discrete outputs
- > for connection of 4 intrinsically safe solenoid valves or indicators
- > fieldbus can be intrinsically safe (FISCO) or non-intrinsically safe
- > LED indication for power and fieldbus
- > LED indication for input/output status and line fault (open/short circuit) as optional module

The R. STAHL Ex i Digital I/O Coupler connects simple discrete intrinsically safe devices such as solenoid valves, indicators, contacts and proximity switches to the non-intrinsically safe high power trunk. Alternatively, the Ex i digital I/O coupler can be used on an intrinsically safe/FISCO trunk. The coupler features eight fully fledged, non-multiplexed Ex i NAMUR inputs and four Ex i digital outputs. The four outputs are able to drive standard I.S. solenoid valves with up to 13V @ 30 mA each. All inputs and outputs feature open-circuit and short-circuit monitoring and are galvanically isolated from the trunk.

The 4-wire coupler is powered from an external 24V power supply what reduces the load on the trunk significantly. The digital I/O coupler supports various FOUNDATION™ Fieldbus function blocks such as DI, DO, DO-valve, MDI, MDO and also AI for frequencies up to 20 kHz, CI for counters and a logic transducer block. The Ex i Digital I/O Coupler can be installed in Zone 1 or Division 2 with the discrete devices installed in Zone 1 or Division 1.





diagnosis com-module

for advanced online diagnosis via FF H1

Highlights

- > for FOUNDATION™ Fieldbus H1
- > transmission of diagnostics data from up to 8 FF H1 segments
- > diagnostics physical layer values:
 - voltage/current value;
 - jitter; noise; signal level;
 - unbalance
- > simple integration into asset management systems via FF H1 and Enhanced EDD
- > diagnostics handling acc. to NAMUR NE 107 and FF-912
- > LEDs for diagnostics and operation
- > various bus-Carriers for 4 or 8 segments, simplex and redundant available

The R.STAHL Diagnosis Communication Module (DCM) transmits advanced fieldbus diagnostics data, measured by the ISbus Fieldbus Power Supplies, to a host and/or asset management system via FF H1 communication. These fieldbus power supplies are continuously measuring all the relevant physical layer values acc. to NAMUR NE 123, like noise, signal level, jitter and unbalance.. The DCM collects the values from up to 8 segments and transmits all the diagnostics information acc. to FF-912 and NAMUR NE107 over an FF H1 segment. The integration into host and asset management tools is done via an Enhanced DD, offering sophisticated possibilities for setting alarm and pre-alarm levels, obtaining life maintenance data from the bus and creating detailed reports. The DCM is installed on the same bus-Carrier as the fieldbus power supplies on a dedicated slot.



Fieldbus installations require not only equipment and software functions, but also suitable installation accessories; of course explosion protected and certified for hazardous areas. Products for Zone 1 or Zone 2 (IEC) and Division 1 or 2 (NEC) are required according to the location and region in which they are used.



fieldbus accessories

for hazardous areas and harsh environments



R. STAHL supplies a comprehensive range of accessories with all international certificates to the requirements of ATEX (Europe), FM & UL (USA), CSA (Canada) or IECEx and many more. Field enclosures and distribution boards in different sizes made of polyester resin (GRP) material or stainless steel with the corresponding cable entries are available. Fieldbus terminators for direct cable entry installations as well as special Ex-plug connectors or separation switches with which the high power trunk can be used for hot swap are also possible. Last but not least a large choice of pre-assembled fieldbus cables is available in special colour blue for intrinsically-safe installations.

Technical Details

- > enclosures in many sizes in polyester resin and stainless steel
- > certified inspection windows
- > cable glands made of moulded material, brass or stainless steel
- > fieldbus terminators Ex i or Ex m
- > Ex-plug connectors mini Clix with y-adapter for hot-swap function
- > fieldbus cables for outside and inside installation.





Ready? Then let's go: Industrial Ethernet technology makes its appearance in the sector of process automation and fieldbus technology. This renders integration of Remote I/O in plant structures even simpler. The fast fieldbuses available today will, in some cases, be replaced in future. Universal field stations for connection of a wide variety of sensors and actuators will communicate via Fast Industrial Ethernet with the automation systems. Initial application protocols are already available for this today. R.STAHL is making the crucial step into the future right now with the Remote I/O System IS1 Ethernet.



fieldbus meets remote I/O

IS1 ethernet remote I/O goes FF HSE & PROFINET



The IS1 System is designed for installation in Zone 1 and Division 1. The explosion protected Ethernet interface is optically inherently safe "ex op is" in accordance with IEC 60079-28. With fiber optic cables long distances are possible and no interference by poor shielding or electromagnetic influences can interrupt the communication. In the coming years, perfect integration will be available with ProfiNet and FF-HSE.

R. STAHL actively participates in the Working Groups of Profibus International and Fieldbus Foundation, aiming at integration of Remote I/O technology in the communication architectures of the future. Regardless of the technology for which our customers ultimately choose, R. STAHL provides efficient and economical solutions.

R. STAHL's IS1 Ethernet, ready for ProfiNet, ready for FF-HSE, ready for the future.

- > Remote I/O with Industrial Ethernet communication: Modbus TCP and EtherNet/IP; ready for ProfiNet and FF HSE
- > Installation in Zone1 or Division 1
- > 100 Mbit/s Fast Industrial Ethernet via optically inherently safe fibre-optics
- > Redundant Ethernet interworking; very short switchover time down to 200 ms
- > Hot-Swap of all modules: CPU, Power, I/O modules
- > All standard IS1 I/O modules used
- > High-performance Ethernet ComDTM for configuration and diagnosis

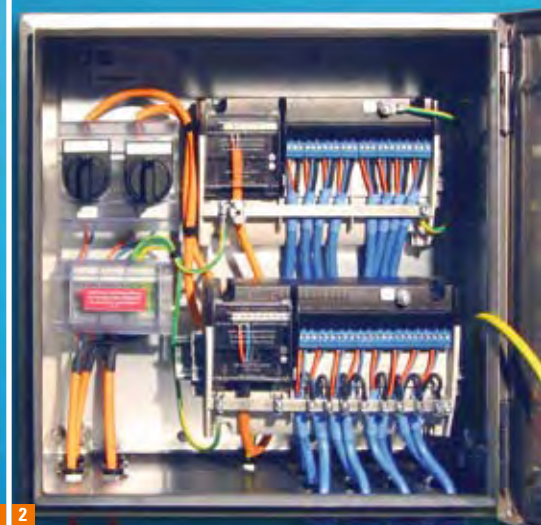
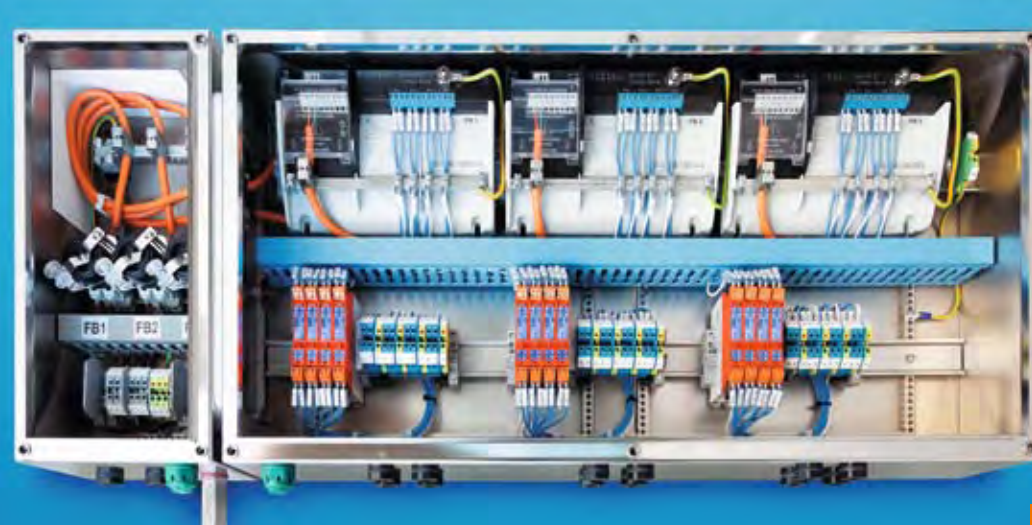
Today, differing applications and diverse customer requirements lead to simultaneous use of several fieldbuses. In addition, mechanical concepts matched to the tasks and ambient conditions are required. R. STAHL, together with its customers, plans selection of the components, bus systems and field-compliant housings. This means that we are able to supply the optimum all-in solution for the interface between fieldbus devices and automation system: for conventional sensors and actuators, for HART field devices and for fieldbus devices, and for any combination of them. Figure 1 shows a typical Zone 1 field station. The Remote I/O System IS1 of R. STAHL is fitted for cost-cutting connection of all conventional sensors/actuators. Unrestricted communication with HART devices is also possible. The IS1 system offers several options for this. Corresponding device couplers connected via the fieldbus directly to the automation system are fitted for connection of fieldbus devices, H1 or PA. This means one field station for all applications.



fieldbus engineering

customized solutions to meet your requirements





R. STAHL supplies all-in system solutions. It has available a wide variety of housing sizes and various materials for this. The R. STAHL fieldbus products can be installed in a compact standard housing made of fibreglass-reinforced polyester, sheet steel, aluminium or stainless steel – suitable for Zone 1, Zone 2 or Division 1, Division 2 installations.

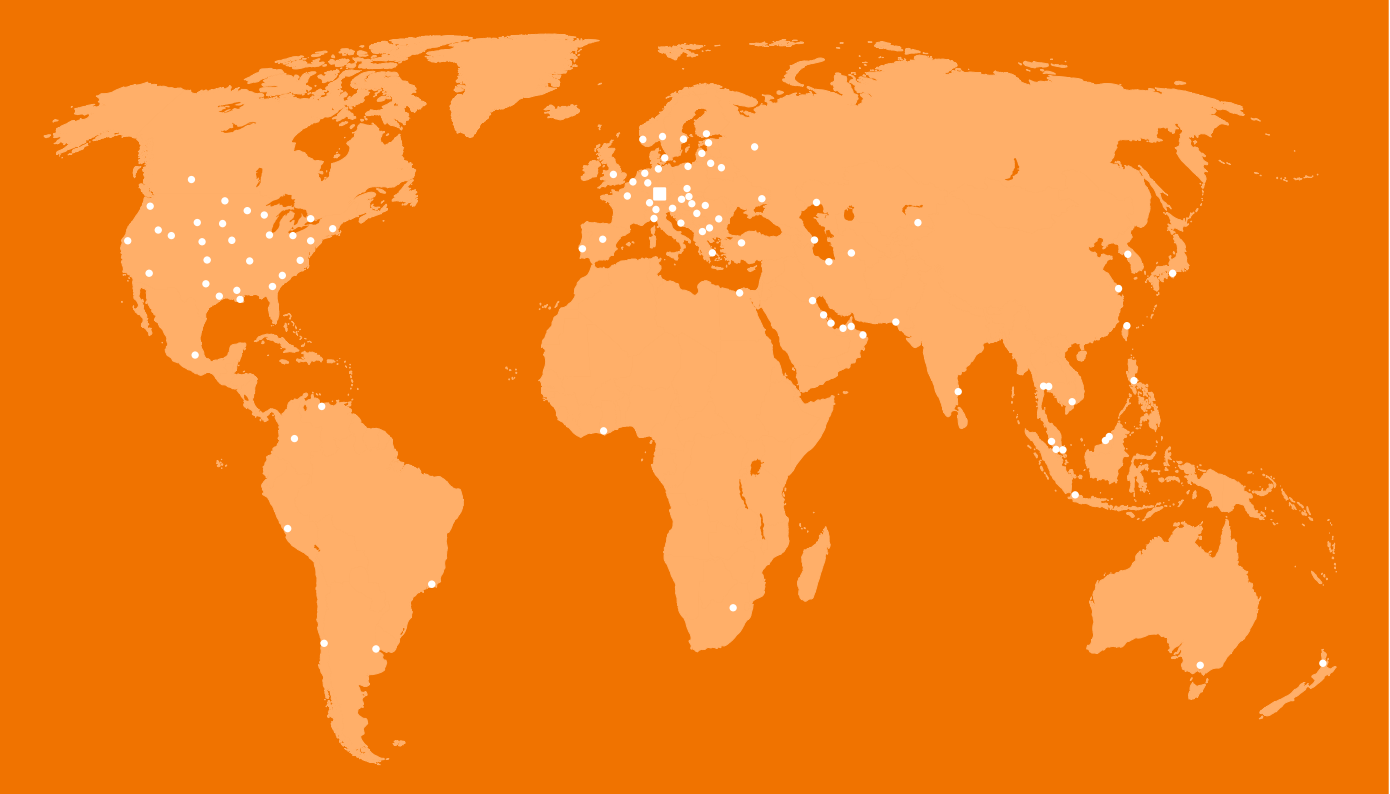
Customized combinations are also implemented with our extensive range of housings and installation material. The housings are supplied with plastic or metal cable glands for the cable entries and can be combined with many accessories, such as breathers, inspection windows and shielding bars or surge and lightning protection for trunk and spurs. Even hot-swap on the non-intrinsically safe high power trunk in Zone 1 installations is easy to achieve. Either with the explosion protected connector system miniCLIX or via an integrated maintenance switch that de-energizes a single coupler and allows replacing it while all the others are still in operation.

Integration of third party components like e.g. solenoid valve islands and special designs for extreme ambient temperatures is our daily work. And of course, all customized R. STAHL system solutions come certified for installation in the dedicated hazardous area – ready to run!



Technical Details

- 1** Zone 1 design with 3 x 4 spur Ex i FDC, maintenance switch and surge protectors for trunk & spurs.
- 2** Very compact 16 spur design for Zone 1 Ex i FDC with maintenance switch and inspection windows.
- 3** Up to 24 Ex ic spurs in a 340 x 340 mm GRP enclosure.
- 4** Customized solution integrating remote I/O, fieldbus FF H1 and solenoid islands.



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