



Ing. Antonio Gordillo / MKT PHOENIX CONTACT / 12 AGO 2021

Welcome

Presentación Profibus PA

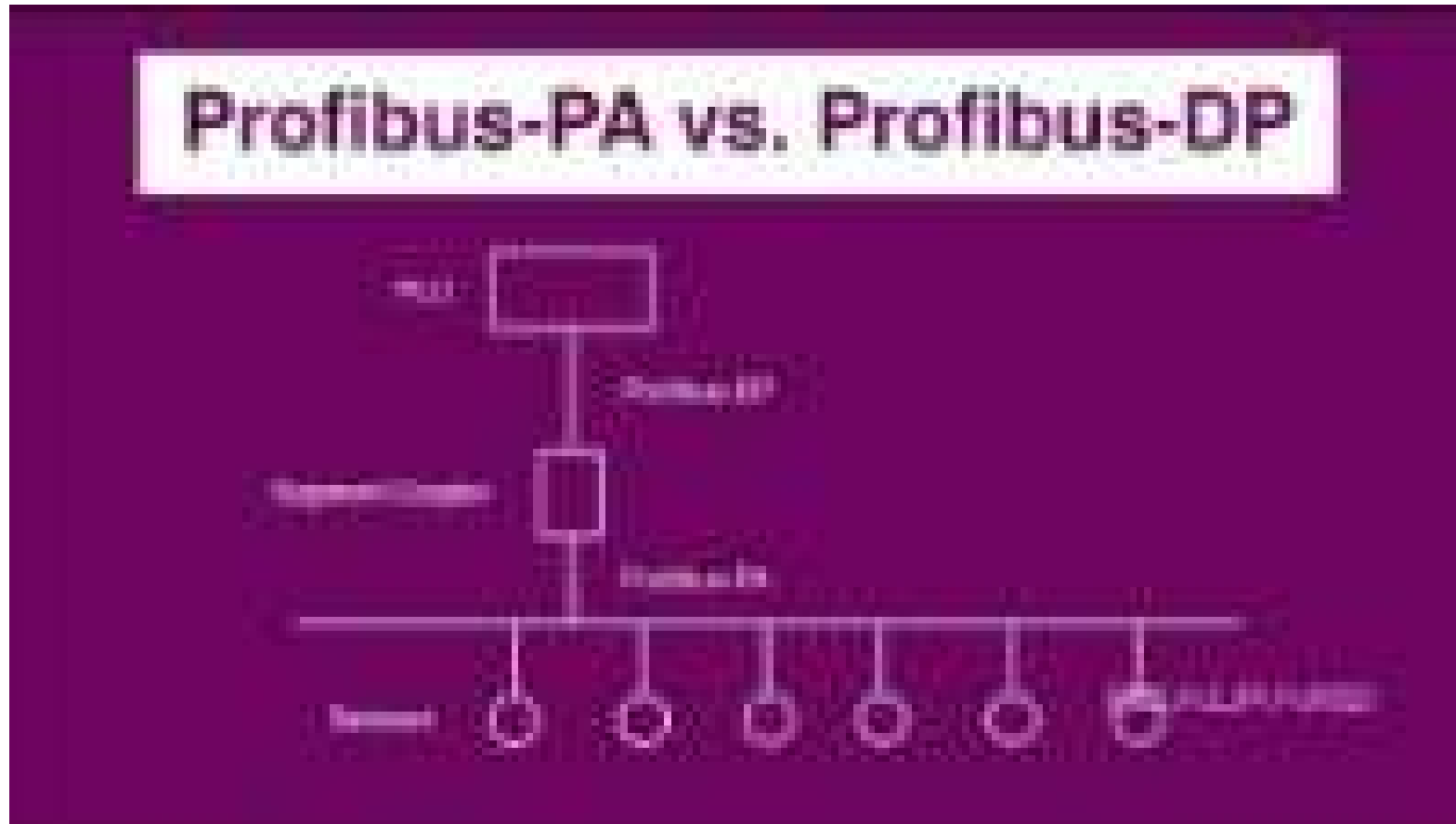
What is PROFIBUS-PA ?

Agenda

- Background on PROFIBUS-PA
 - PROFIBUS-PA Field Devices – manufacturers
 - Process Automation Infrastructure
Product Portfolio and Applications
 - Axioline P - the PROFINET / PROFIBUS-PA Proxy
 - The Future of PROFIBUS-PA in Process
-



¿Qué es Profibus PA y en qué se diferencia de Profibus DP



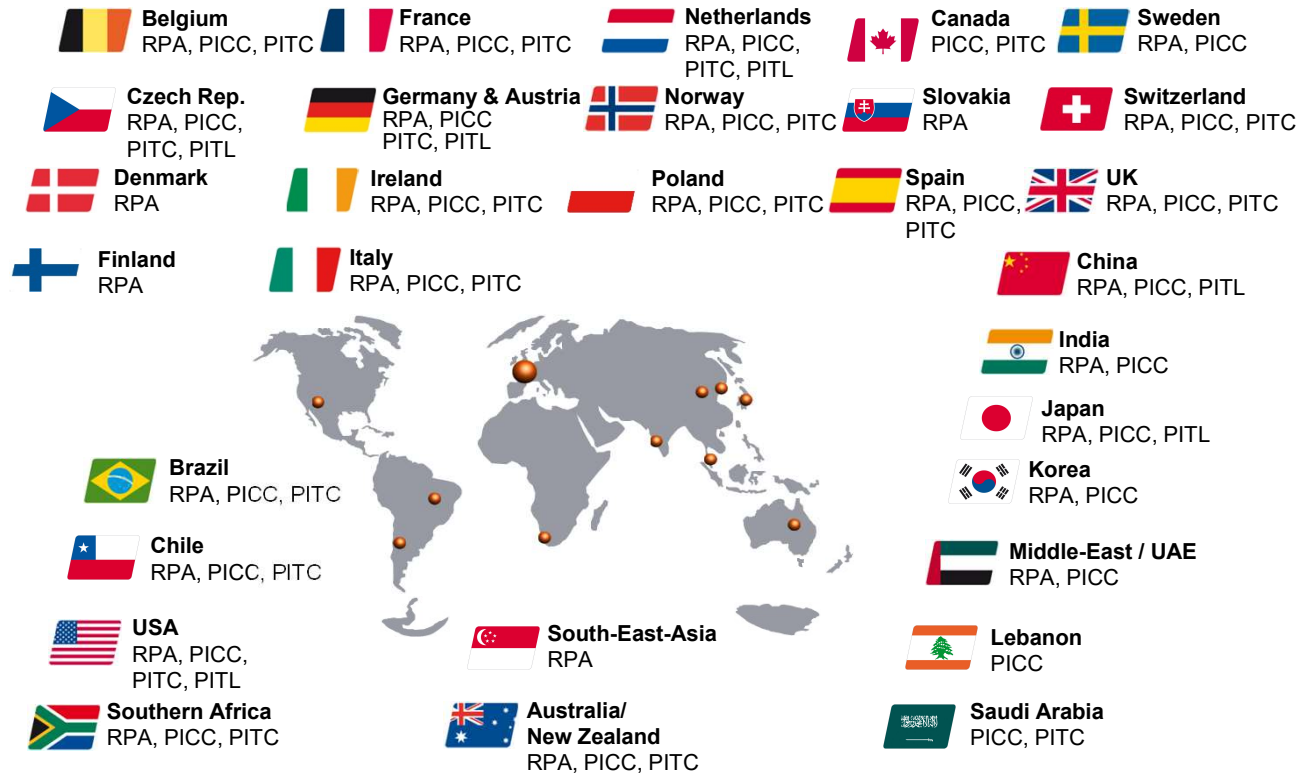
What is PROFIBUS-PA ?

PROFIBUS-PA



- PROFIBUS-PA (**PRO**fessional **FI**eld **BUS** for **P**rocess **A**utomation) is a 25 year old technology that connected digital Fieldbus devices to DCS and PLC systems.
- There are over 750,000 PA devices sold annually globally, and over 12,000,000 million PA devices have been sold since its inception. The member companies belong to **PI** (**P**rofinet **P**rofibus **I**nternational) and represent leading companies in the field of Process Automation.
- PI host numerous activities across the globe, and Phoenix Contact is active many of those events too.
- In 2004, Phoenix Contact announced **PROFINET** as its Ethernet backbone for **INTERBUS**.
We are a significant supplier of PROFINET components and systems in Factory and Process Automation .
- The physical layer infrastructure products can be used in both **PROFIBUS-PA** and **FOUNDATION Fieldbus** systems since they share the same physical layer of **31.25 kHz** signal.
- We have products specific to **PROFIBUS-PA** since a positive trend of PA has emerged for 20+ years now.

PI Worldwide Support



PI worldwide:

27 Regional PI Associations (RPA)

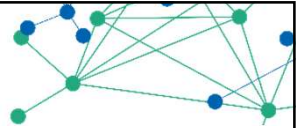
PI Technical Support:

51 PI Competence Centers (PICC)

28 PI Training Centers (PITC)

10 PI Test Laboratories (PITL)





auma®
Solutions for a world in motion

ABB

BARTEC

Danfoss

Endress+Hauser
People for Process Automation

EMERSON
Process Management

Heinrichs
KOBOLD Group

Industrial Solutions
SOL

KUNBUS
industrial communication

KROHNE

MURR
ELEKTRONIK
stay connected

SIEMENS
Ingenuity for life

optimize!
softing

STAHL

SAMSON

SICK
Sensor Intelligence.

PHOENIX CONTACT

PEPPERL+FUCHS

PROCENTEC

THORSIS
TECHNOLOGIES

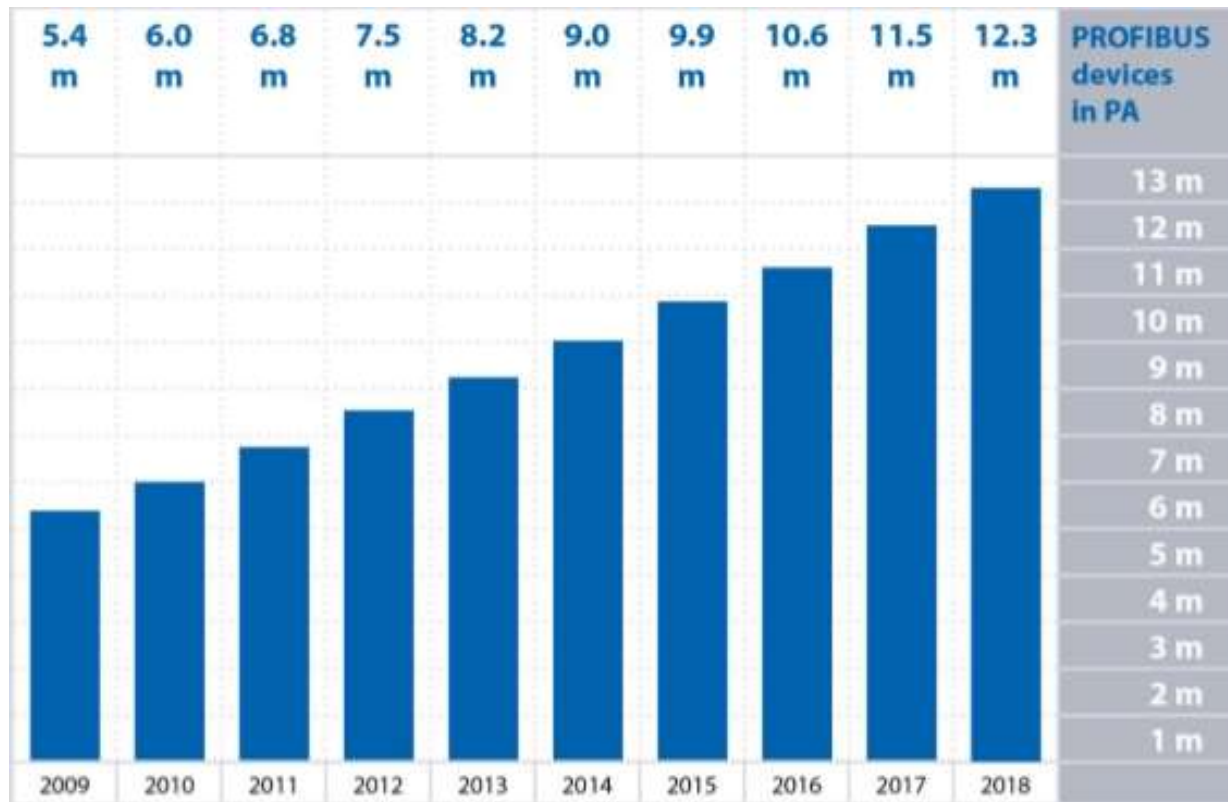
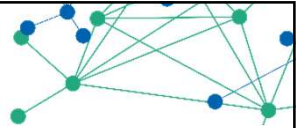
TURCK

Weidmüller

WIKAI

YOKOGAWA

PROFIBUS-PA nodes sold worldwide



PROFIBUS System Overview



Engineering Station

- Maintenance
- Monitoring

PROFIBUS DP



PLC/DCS

Process Control

- Program
- Control

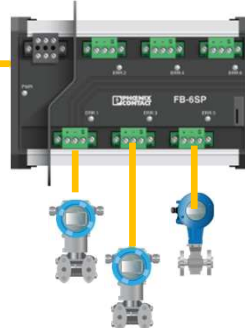
24
VDC



- 9.6 kbps .. **12 Mbps** on the **PROFIBUS DP** side
- **31.25 kHz** on the **PROFIBUS-PA** Side
- Integrated PA termination on Gateway & Selectable on Field Device Coupler
- 500 mA PA current
- Customizable PA voltage
- Max. 9 PA segments (+1 DP module for PLC/DCS)

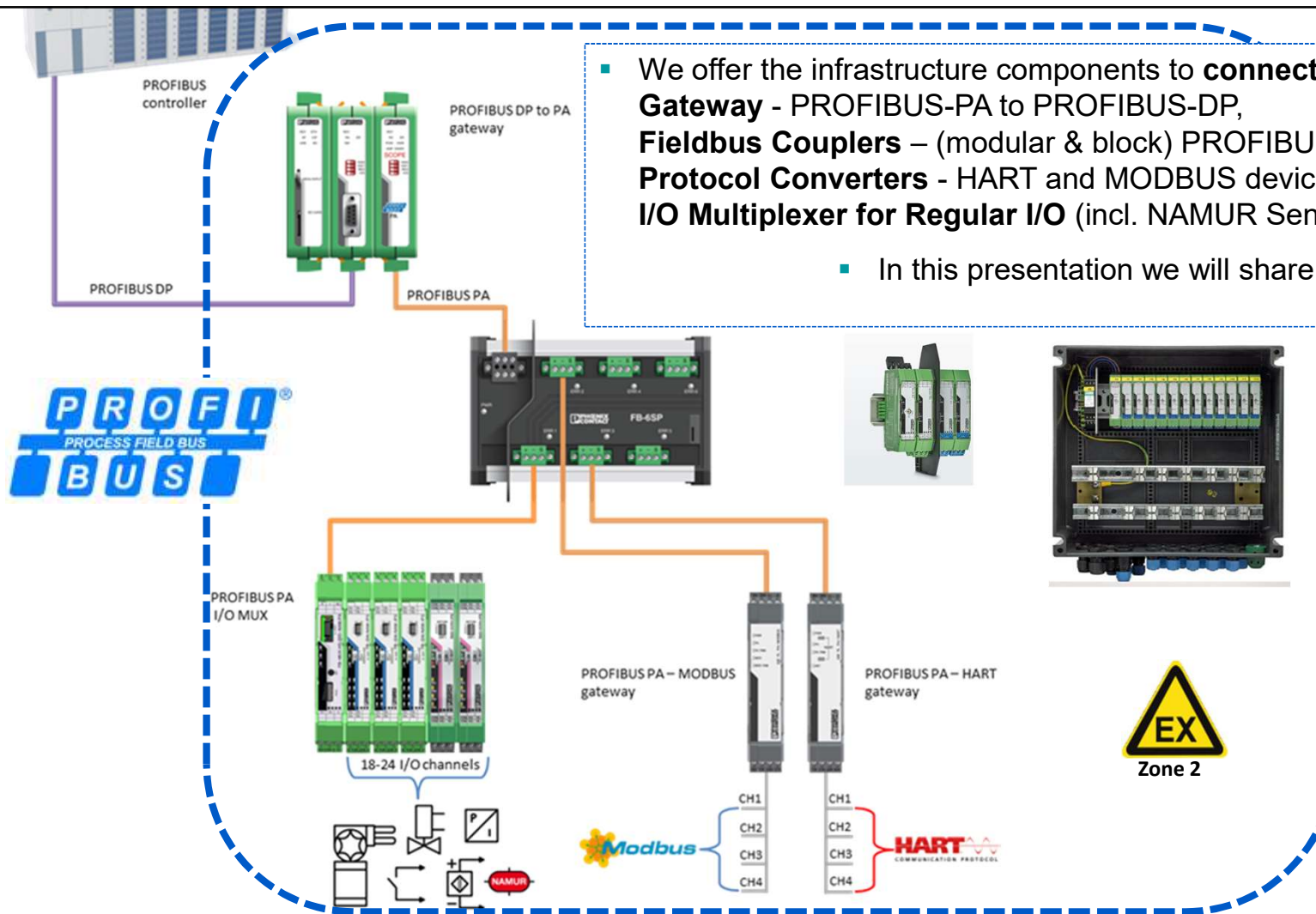
PROFIBUS PA

10 .. 27 V (500 mA) per segment



Up to
32 PA
devices





- We offer the infrastructure components to **connect:**
Gateway - PROFIBUS-PA to PROFIBUS-DP,
Fieldbus Couplers – (modular & block) PROFIBUS-PA in Zone 2 or Zone 1,
Protocol Converters - HART and MODBUS devices to PROFIBUS-PA, and
I/O Multiplexer for Regular I/O (incl. NAMUR Sensors) to PROFIBUS-PA.

- In this presentation we will share some application successes from around the world.



PROFIBUS-PA Portfolio

Protocol Converter



A **Protocol converter** is a device used to convert the protocol of one device to the protocol suitable for the other device or tools to achieve the interoperability. This is sometimes referred to as a gateway, although a gateway typically has higher functionality.



Product
overview

Protocol Converter - MODBUS – DP/PA/FF



Converts Modbus RTU variables to modern digital Fieldbus signals

Set up and Parameterization via DD, EDD, GSD, & DTM from the Host/Asset Management System

Connect up to 4 legacy Modbus RTU devices to a fieldbus (maximum of 16 total registers per converter)

2-wire RS485 interface (1200...115.2kbps)

MODBUS RTU to Profibus DP, Profibus PA or Fieldbus Foundation converter



Product overview

Protocol Converter HART – DP/PA/FF

Converts HART instrument data to modern digital Fieldbus signals

Set up and Parameterization via DD, EDD, GSD, & DTM from the Host/Asset Management System



Connects up to 4 HART instruments to a Fieldbus (4 process variables maximum per converter)



2-wire HART loop signal connections using terminal blocks

Digital HART data to Profibus DP, Profibus PA or Fieldbus Foundation converter



Product overview

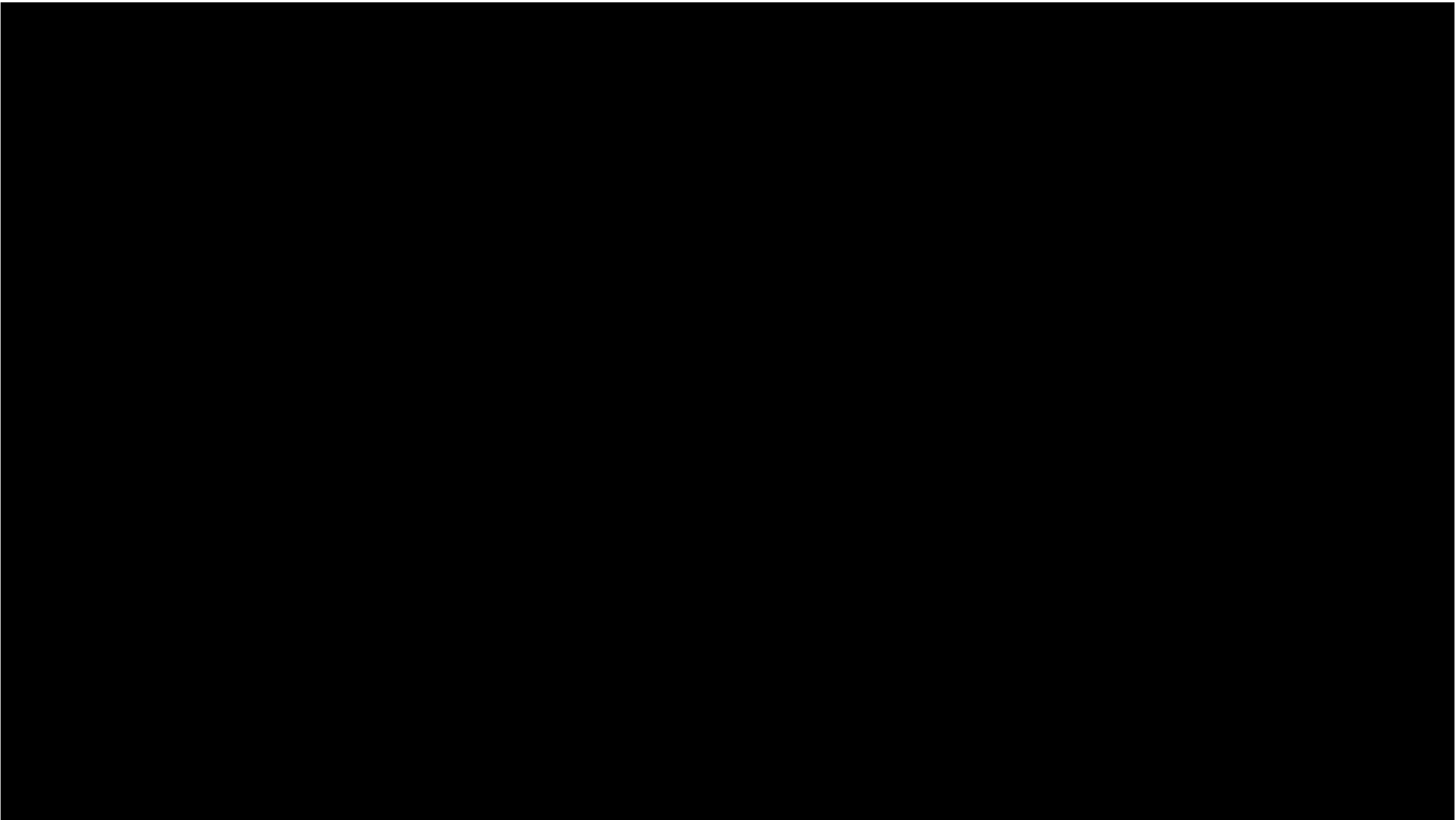


Protocol Converter



	GW PL FF/MODBUS	GW PL PA/MODBUS	GW PL DP/MODBUS	GW PL FF/HART	GW PL PA/HART	GW PL DP/HART
Description	Modbus/RTU to FOUNDATION Fieldbus protocol converter	Protocol converter capable of connecting four Modbus/RTU devices to a PROFIBUS PA network	Modbus/RTU to PROFIBUS DP protocol converter	Protocol converter capable of connecting four HART (4-20 mA) devices to a Foundation Fieldbus network	Protocol converter capable of connecting four HART (4-20 mA) devices to a PROFIBUS PA network	Protocol converter capable of connecting four HART (4-20 mA) devices to a PROFIBUS DP network
Interface 1	Foundation Fieldbus	Profibus PA	Profibus DP	Foundation Fieldbus	Profibus PA	Profibus DP
Interface 1 connector	Combicon	Combicon	D-SUB 9, Combicon	Combicon	Combicon	D-SUB 9, Combicon
Interface 2	HART FSK	HART FSK	Modbus RTU	HART FSK	HART FSK	HART FSK
Interface 2 connector	Combicon	Combicon	Combicon	Combicon	Combicon	Combicon
Order number	2316363	2316364	2316365	2316360	2316361	2316362



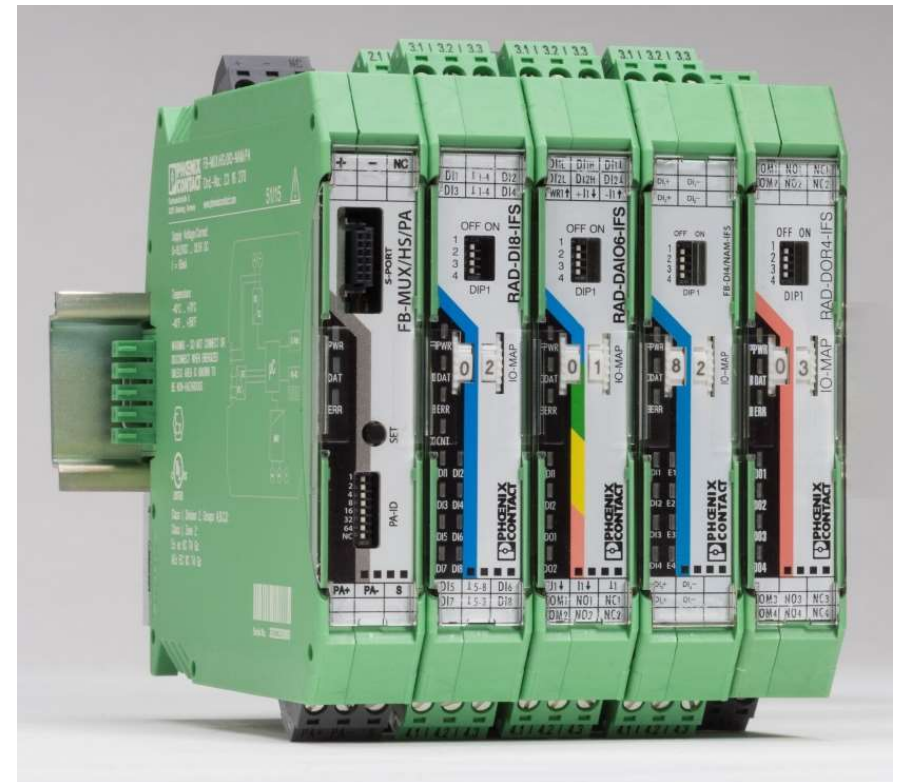


Fieldbus I/O

PROFIBUS-PA I/O Multiplexer

5 PROFIBUS-PA Profiles exist with specifically defined head stations:

- 2316270 FB-MUX/HS/DIO-NAM/PA
- 1005331 FB-MUX/HS/AI/PA
- 1005330 FB-MUX/HS/AIOTEMP/PA
- 1005329 FB-MUX/HS/DAIO/PA
- 1005332 FB-MUX/HS/DI24/PA



PROFIBUS-PA Multiplexer I/O Modules

- | | | |
|------------------|---------------------|-------------------------------|
| ■ 2316275 | RAD-NAM4-IFS | 4 NAMUR Digital inputs |
| ■ 2901535 | RAD-DI4-IFS | 4 Digital inputs |
| ■ 2901539 | RAD-DI8-IFS | 8 Digital inputs |
| ■ 2904035 | RAD-PT100-4-IFS | 4 PT100 inputs |
| ■ 2901533 | RAD-DAIO6-IFS | 1 I/O 2 Digital I/O |
| ■ 2901536 | RAD-DOR4-IFS | 4 Digital relay outputs |
| ■ 2901537 | RAD-AI4-IFS | 4 Analog inputs |
| ■ 2901538 | RAD-AO4-IFS | 4 Analog outputs |



Application

Coal and Thermal Power

Customer Profile

- A company is a state owned enterprise that is one of Asia largest thermal power generating conglomerate. The corporation has a total installed capacity of 53,561MW.

Application

- MAC won the bid as Main Automation Contractor (MAC) for the expansion project
- Phoenix Contact partnered with MAC to promote the adoption of digital fieldbus technology to EU
- The expansion project is EU first venture implementing **Profibus** technology and **Redundancy**
- Phoenix Contact worked together as a global team to demonstrate automation expertise in the power industry

Solution

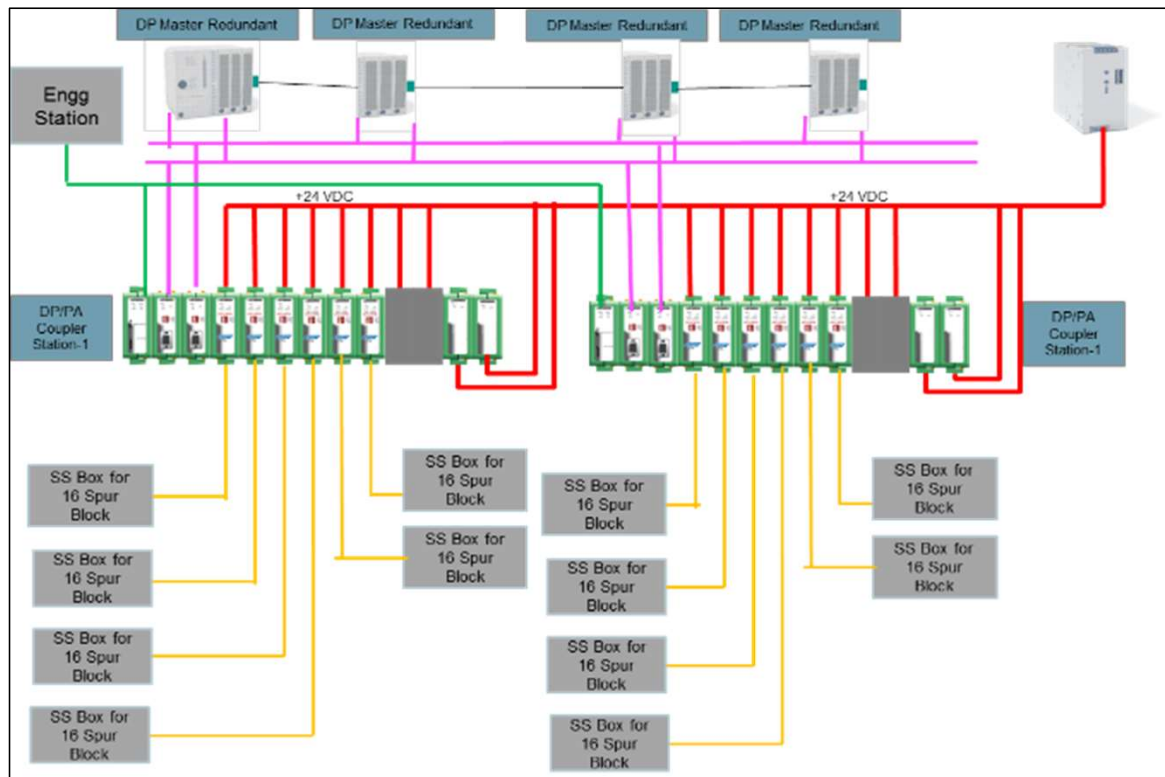
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|-------------------------------------|----------------------------|
| ■ PROFIBUS DP/ PA Gateways | 20 systems with Redundancy |
| ■ FB-PA/SCOPE | 5 per system |
| ■ FB-DP-REPEATER | one extra on each system |
| ■ FB-HSP-PLUG 6A Power Supply | redundant power |
| ■ FB-12SP & FB-6SP | 90 modules total |
| ■ Clip Safe Enclosures and Trabtech | |



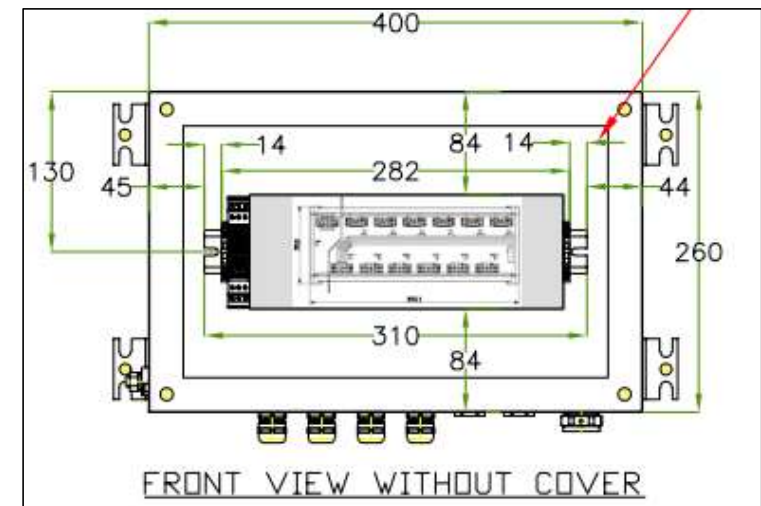
Product



Coal and Thermal Power – NTPC (2)



Profibus Network Topology for **ABB 800M** System at NTPC



**Phoenix India Clip Safe Junction
Solution Box with FB-12SP
Device Coupler**

Application

Water Project

Customer Profile

- A municipality in a Country building a state of the art water treatment facility to reclaim water and treat it according to the new regulations imposed by the state.

Application

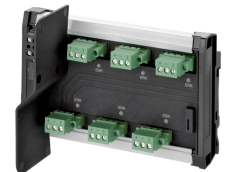
- State has recently imposed stricter regulations on treating water that is reintroduced into water ways
- Multiple Engineering companies across the country have contributed to the design of the \$1.6 billion facility with planned completion in 2023
- Control platform is Rockwell Control Logix PACs

Solution

- | | |
|--|---|
| ■ PROFIBUS DP/ PA Gateways
FB-PA/SCOPE with
FB-DP-REPEATER/SCOPE | over 40 systems
with PA &
DP Connectivity |
| ■ FB-6SP Block Couplers | over 125 |
| ■ FB1-S1-6SP-T-0-10-00-0-0 | over 80 boxes |
| ■ Ethernet Infrastructure | |



Product





Application

Power Plant

Customer Profile

- Country has been working with his Government to supply automation solutions for power plants

Application

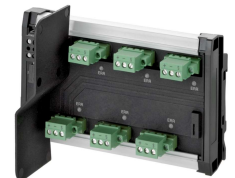
- Phoenix Contact approached MAC Electric to offer the Profibus Complete portfolio
- Phoenix Contact launched the Profibus DP to PA Gateway in 2015 together with a complete Profibus-PA automation solutions
- Business opportunity currently continues YTD with several project wins over the past four years

Solution

- | | |
|-------------------------|------------------|
| ■ FB-HSB-DP/PA Gateways | over 350 systems |
| ■ FB-DP-REPEATER | over 175 pieces |
| ■ FB-PA/SCOPE | over 250 pieces |
| ■ FB-6SP Block Coupler | over 850 pieces |



Product



Application

SO₂ SO₃ Plant

Customer Profile

- A Chemical Company.... Good relationship with Phoenix Contact
- Phoenix Contact developed PA products based on their needs

Application

- Phoenix Contact provided the **Modular Coupler** as a box-build solution from PxC Combinations
- Phoenix Contact sold the **PA I/O Multiplexer** into this plant to allow all I/O to be sent via a PROFIBUS-PA cable
- Business is repeated as plant with high Sulphur content damages field devices and electronics

Solution

- Box Builds of Modular Couplers repeat business
- Box Build of PA I/O Multiplexer repeat business



Product



Application

Coke Plant

Customer Profile

- A European company

Application

- Phoenix Contact was asked to provide a solution to allow the Coking plant to extend its lifetime by 20 years
- A **PROFIBUS-PA Redundancy Scheme** was needed to increase the availability and functionality of the installation
- A technical support to solve all requirements of customers, and using the diagnostic features of the DP/PA coupler was able to show added value to the application

Solution

- PROFIBUS DP/PA Gateway with Redundancy
- Ongoing upgrades to all parts of the plant as the older systems is migrated to our new solution

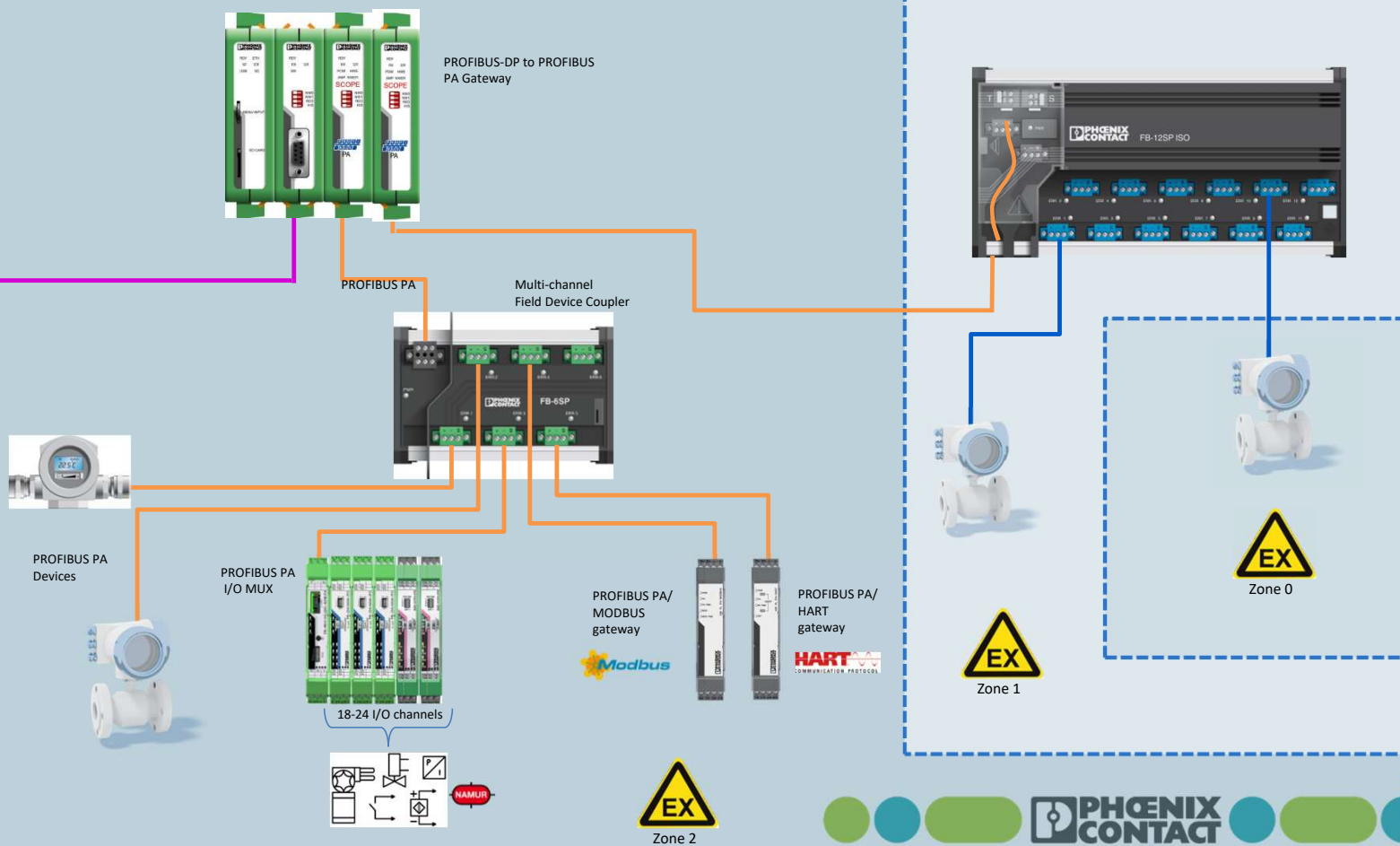


Product





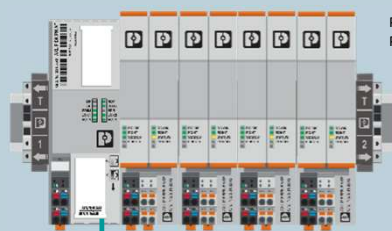
At present, the current PROFIBUS-PA installation goes through a PROFIBUS-DP Gateway





PROFINET controller

PROFINET



PROFINET to PROFIBUS PA Proxy

PROFIBUS PA

Multi-channel Field Device Coupler



PROFIBUS PA Devices

PROFIBUS PA I/O MUX



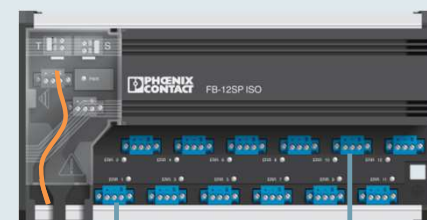
18-24 I/O channels



PROFIBUS PA/ MODBUS gateway

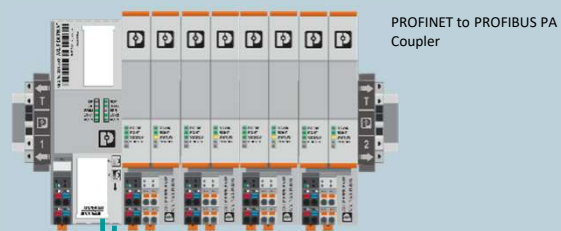
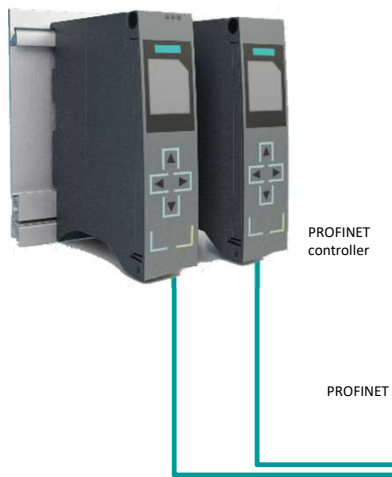


PROFIBUS PA/ HART gateway



The future will connect the current PROFIBUS-PA installation directly to via a PROFINET Proxy





PROFIBUS PA

Multi-channel Field Device Coupler



PROFIBUS PA Devices

PROFIBUS PA I/O MUX



PROFIBUS PA/ MODBUS gateway



PROFIBUS PA/ HART gateway



Zone 1

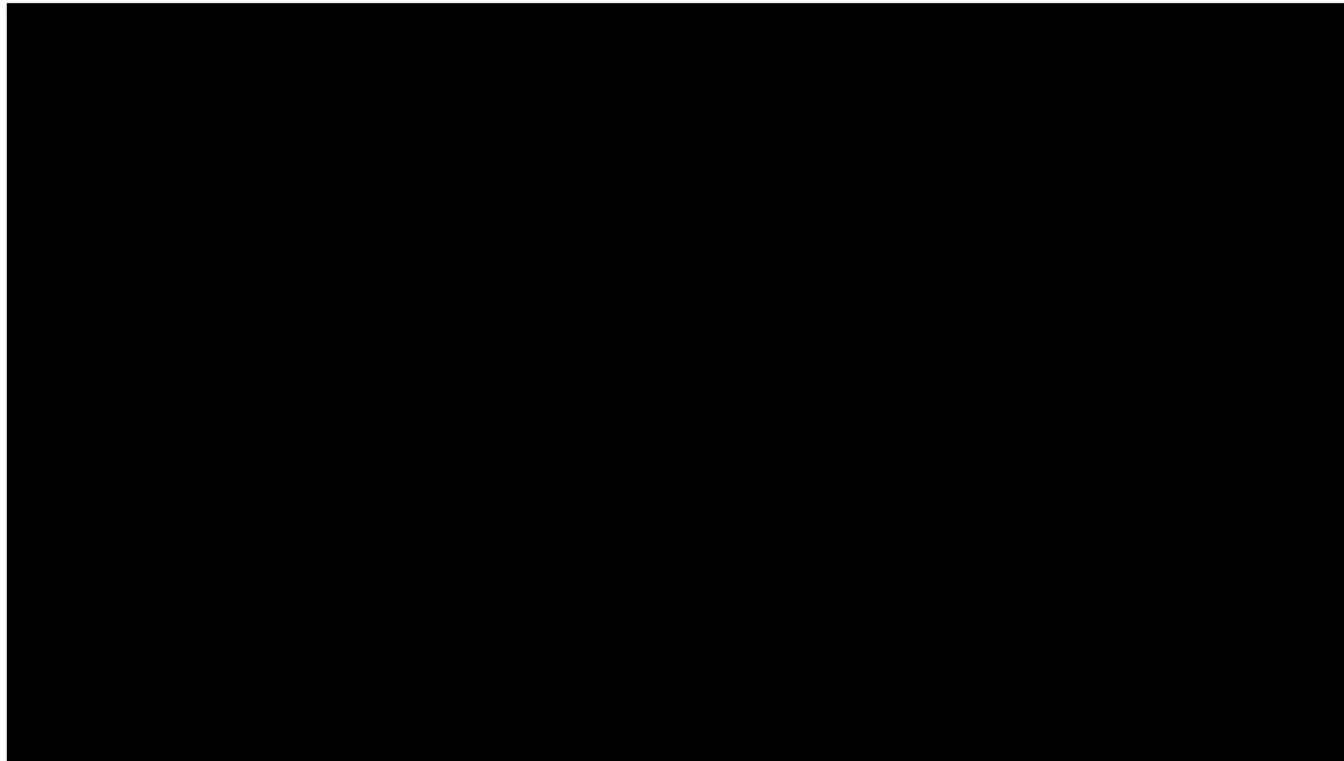


Zone 0



Zone 2

The future will also include redundancy:
S2 Redundancy from the PROFINET Proxy

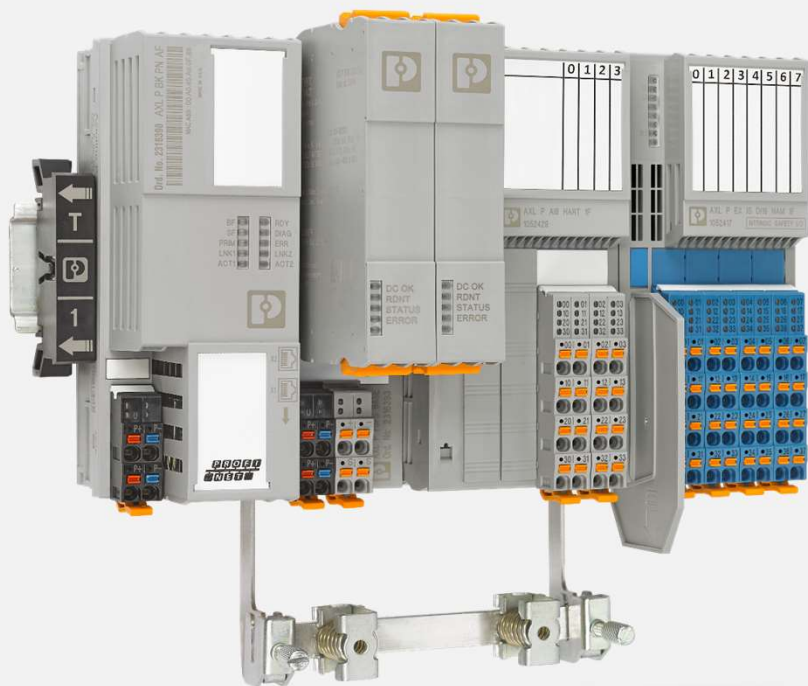


Axioline P

Redundancy S2

PA / Proxy

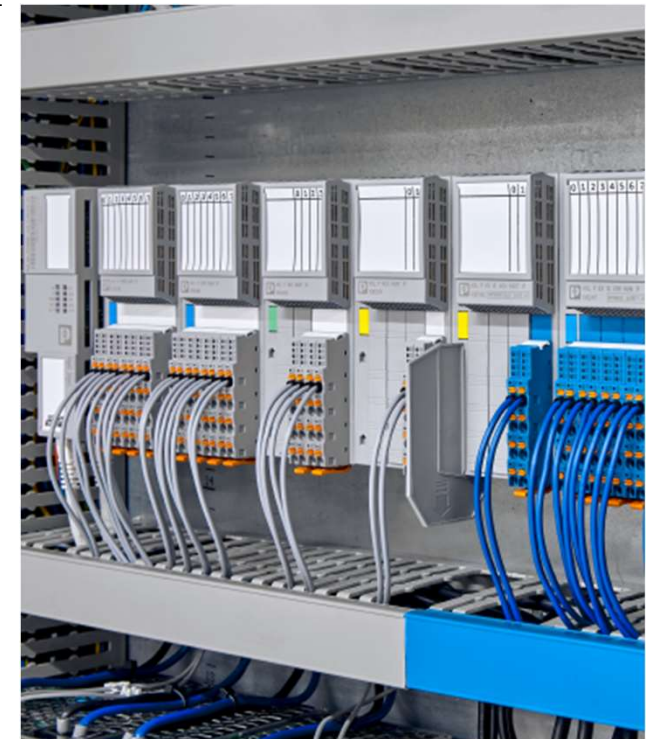
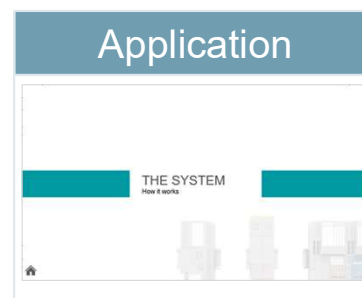
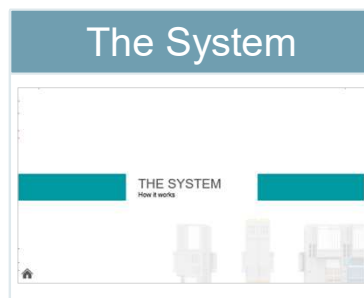
to PROFINET



Axioline P

THE HIGH-AVAILABILITY
I/O SYSTEM

Axioline P



Click on a single title to skip to that topic. Click  to return.

Axioline P

Dependable Process I/O

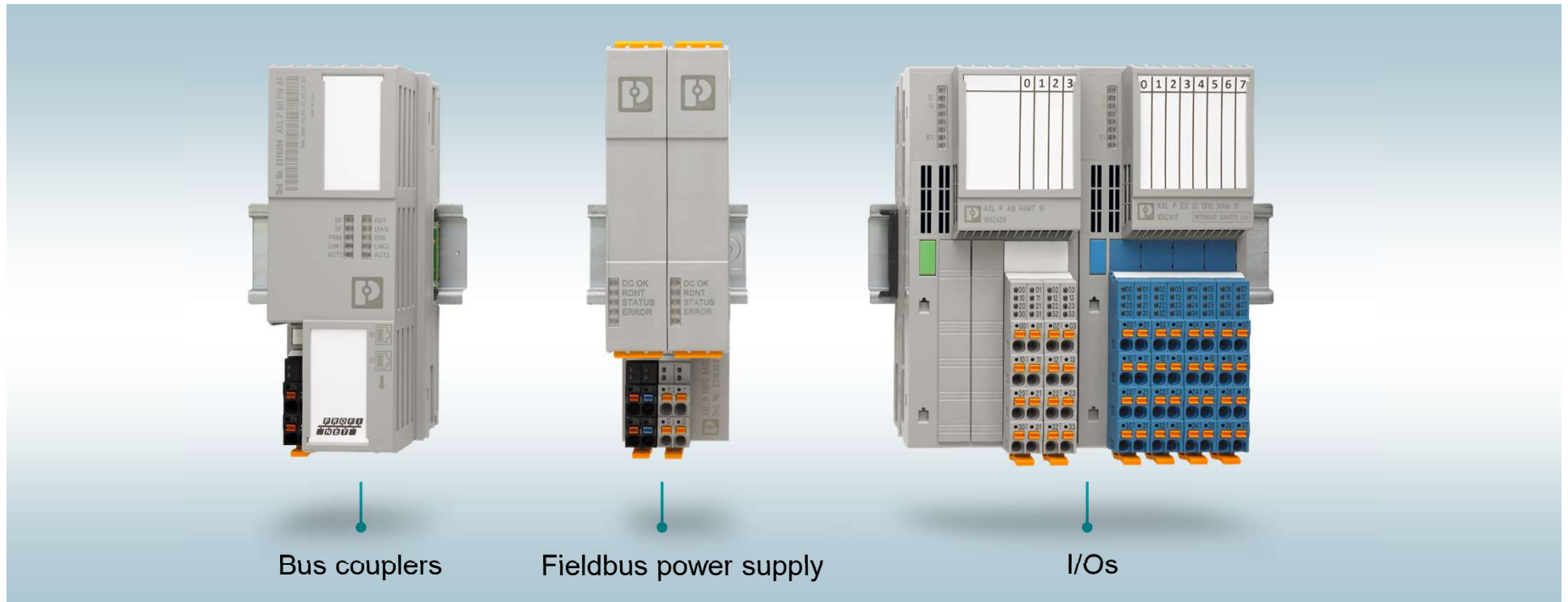


Modular I/O platform for hardened process applications where up-time is critical with signal connectivity in both Ex and non-Ex areas.

This presentation informs you about our high-availability I/O system **AXIOLINE P**.

Axioline P

The high-availability I/O system



Axioline P

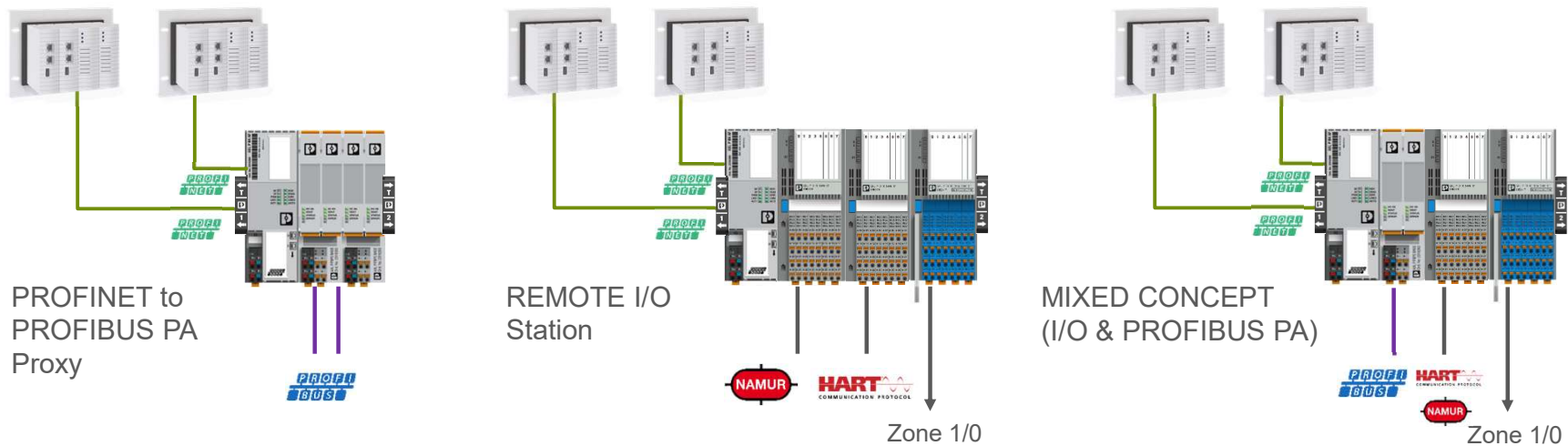
Basics

SYSTEM SPECS AT A GLANCE

TYPE	Modular remote I/O-system, IP20
SYSTEM COMPONENTS	Bus coupler, Fieldbus power supply, I/Os
SUPPORTED PROTOCOLS	PROFINET
SUPPORTS REDUNDANCY	Yes
TYPE LOCAL BUS	Ethernet-based, Hot-Swap capable, Powered Local Bus
SUB-LEVEL COMMUNICATION	PROFIBUS-PA, HART, NAMUR
AMBIENT TEMPERATURE	-40°C up to + 70°C
INSTALLABLE EX-ZONE	Zone 2
APPROVALS	ATEX, IECEx and UL EX approvals for Zone 2 installation

Axioline P

Use Cases



“ Axioline P can be connected directly to a distributed control system (DCS) in the form of a remote I/O system. PROFINET S2 system redundancy is supported, which ensures very reliable communication between the I/O station and DCS. ”

PORTFOLIO

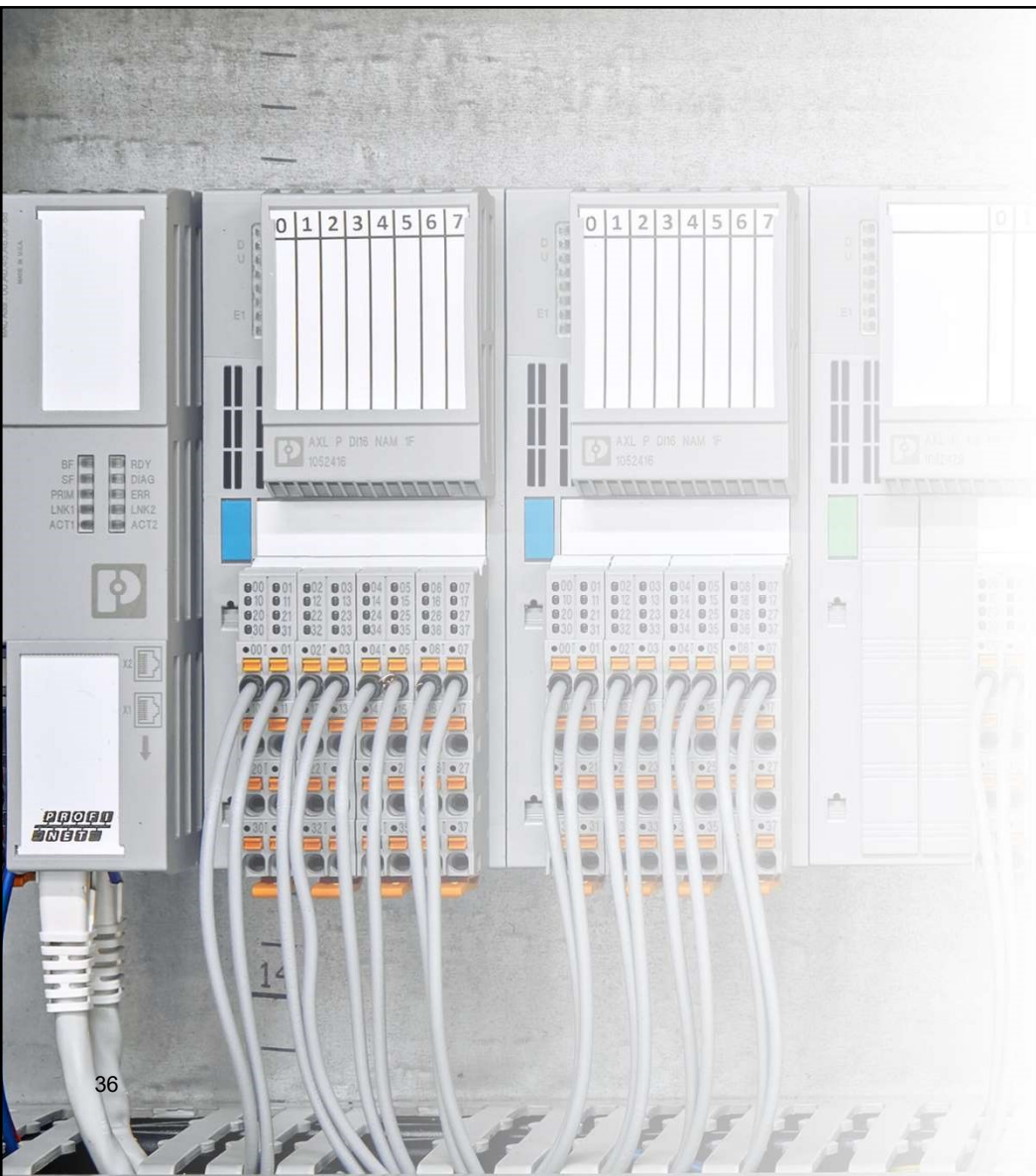
Product details



Axioline P

Product details



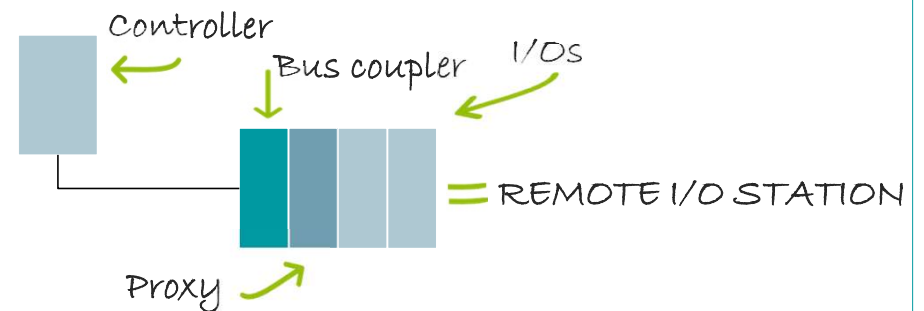


Bus coupler

Connect to a controller

“Use the Axioline P bus couplers to connect an Axioline P station to a DCS or a PLC. Choose between connecting only I/Os or I/Os in combination with a PA proxy functionality.”

Bus coupler for a remote I/O solution



Bus couplers

Portfolio overview



PROFI
NET

ADVANCED FUNCTION

AXL P BK PN AF

PROFINET

SUPPORTS PROXY & I/Os



PROFI
NET

FOR ONLY I/Os

AXL P BK PN

PROFINET

SUPPORTS ONLY I/Os

Bus couplers

Features – bus couplers for PROFINET

COMMON FEATURES

- Two Ethernet ports with integrated switch
- PROFINET RT
- MRP (Media Redundancy Protocol)
- SRL (System Redundancy Layer) S2, (ready for R1 and R2)
- DTM (Device Type Manager)
- Hot swappable and hot extendable
- Wide temperature range (-40°C to +70°C)



Bus couplers

Features – bus couplers for PROFINET

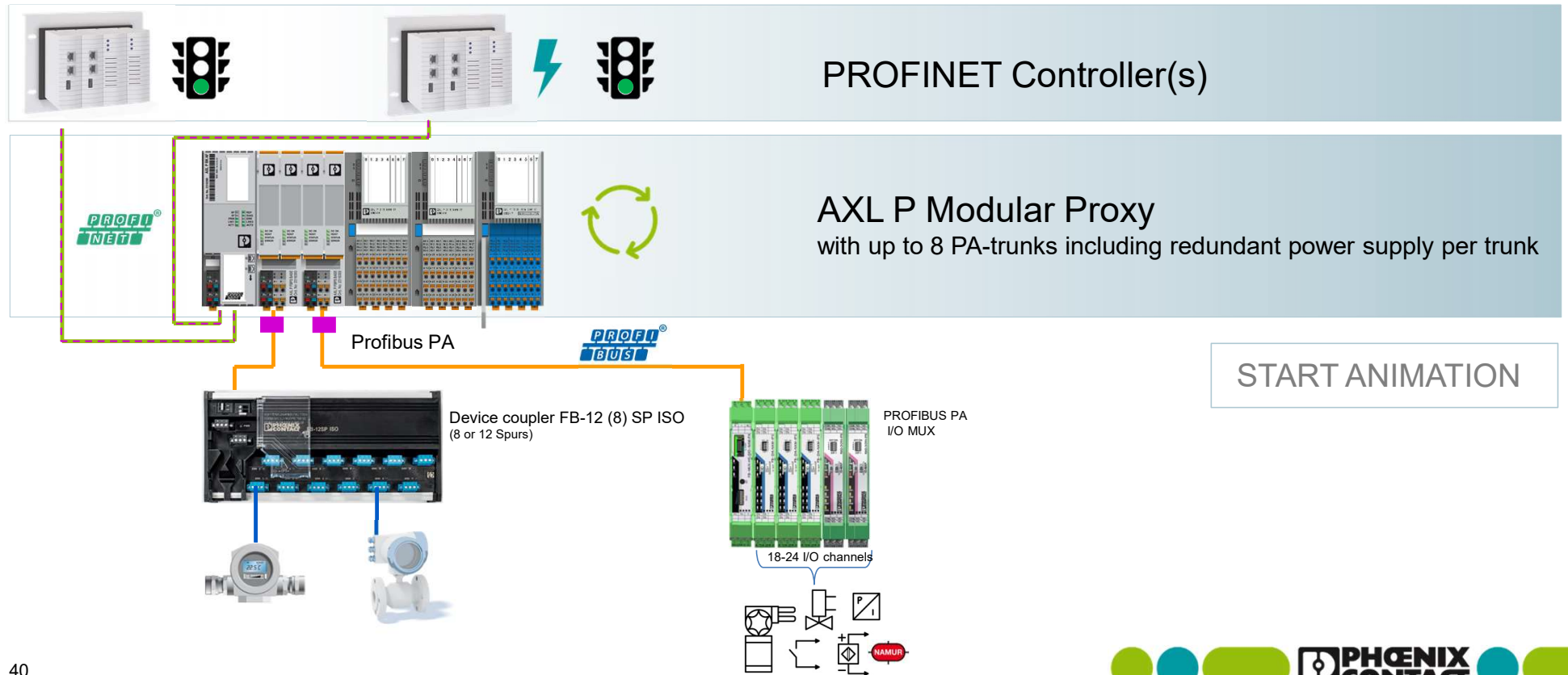
ADVANCED FUNCTIONALITY OF AXL P BK PN AF

- Connects up to 8 modular and redundant PROFIBUS PA segments
- GSDML composer tool and FDI (Field Device Integration)



Bus couplers

S2 - Redundancy



Modular proxy

Portfolio overview – Fieldbus power supply



POWER DISTRIBUTOR

AXL P FBPS BASE

Axiline P local bus

For two power supply plugs

POWER SUPPLY PLUG

AXL P FBPS 28DC/0.5A

PROFIBUS PA

Provides 500 mA @ 28 V DC

Modular proxy

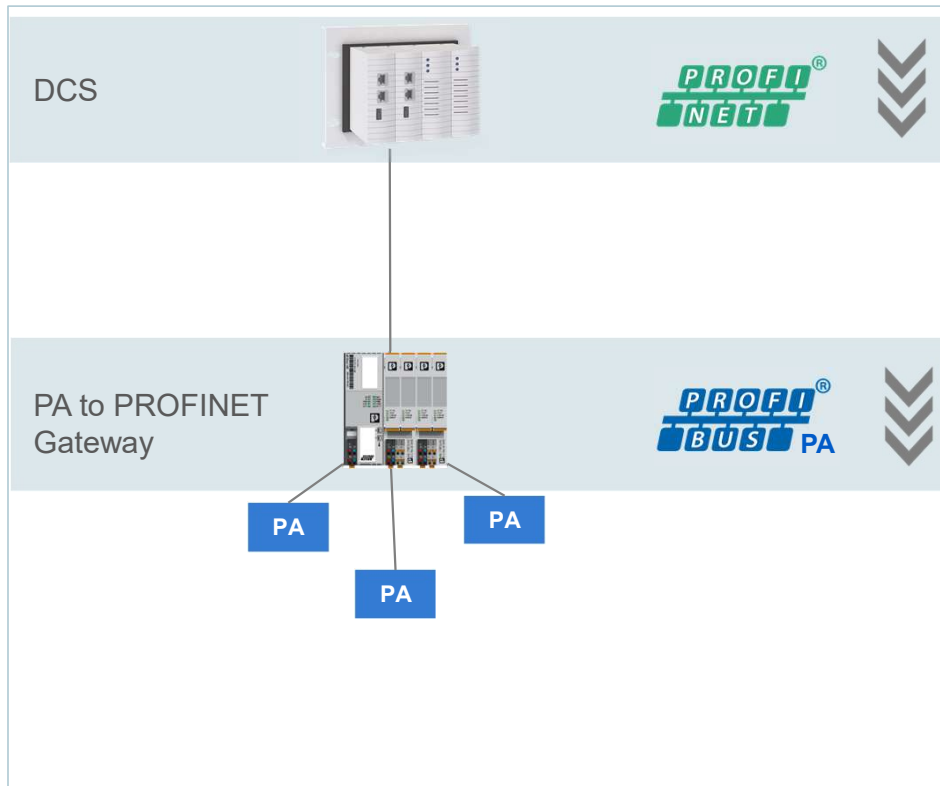
Components of the proxy solution

- 1** Redundancy in PROFINET bus coupler
 - ✓ High system availability, thanks to support of PROFINET system redundancy S2. And in the future R1 and R2
- 2** Base for fieldbus power supply plugs
 - ✓ Fast connection of PROFIBUS PA segments, thanks to Push-in connection technology
- 3** Fieldbus power supply plugs
 - ✓ Redundant fieldbus power supply plugs for supplying PROFIBUS PA segments guarantee highest reliability
- 4** Mechanical design
 - ✓ Increased system availability, thanks to the particularly robust mechanical design as well as shock and vibration resistance
- 5** Axioline shield set
 - ✓ Corresponding shield set for the easy connection of shielded cables



Modular proxy

Interfacing to PROFIBUS PA



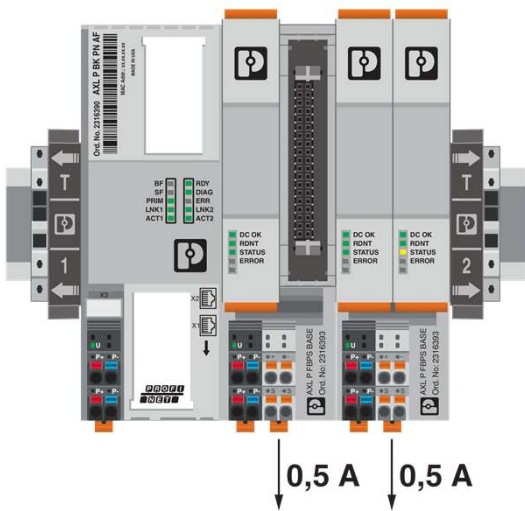
OUR SOLUTION

Use of the Axioline P modular proxy as a gateway from PROFINET to PROFIBUS PA

- ✓ Direct connection of PROFIBUS PA segments to Ethernet saves time and additional interfaces
- ✓ Efficient modernization of systems and the combination of proven fieldbus technology with today's and tomorrow's digitalization

Modular proxy

Power supply redundancy



You can supply a PROFIBUS PA segment with power using a single fieldbus power supply module.

High failsafe performance and process reliability can be achieved by installing two power supply modules in a single base and thus supplying a PROFIBUS PA segment redundantly. The local LED indicator on the power supply module provides the status of the module and redundancy.

confidential



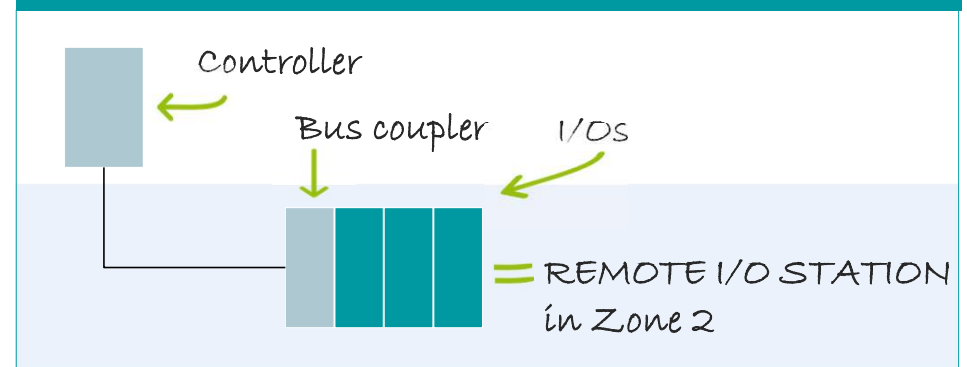


I/Os

Grey or Blue

“Build up an I/O station by adding the required I/Os next to the bus coupler. Choose between intrinsically safe and non-intrinsically safe I/Os fitting to your application.”

Remote I/Os for Zone 2 installation



I/Os

Portfolio overview – I/Os



STANDARD I/O

Digital inputs NAMUR

Digital inputs 24 V DC

Analog HART inputs
Analog HART outputs



INTRINSICALLY SAFE I/O

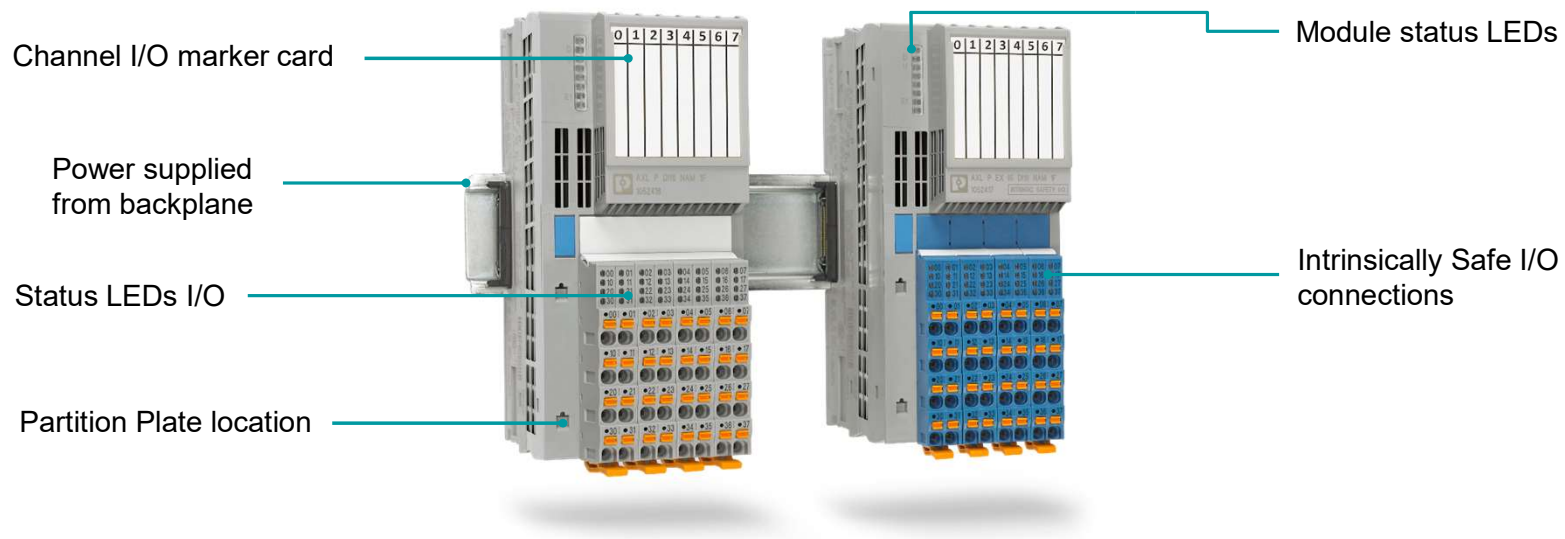
Digital inputs NAMUR

Digital outputs

Analog HART inputs
Analog HART outputs

I/Os

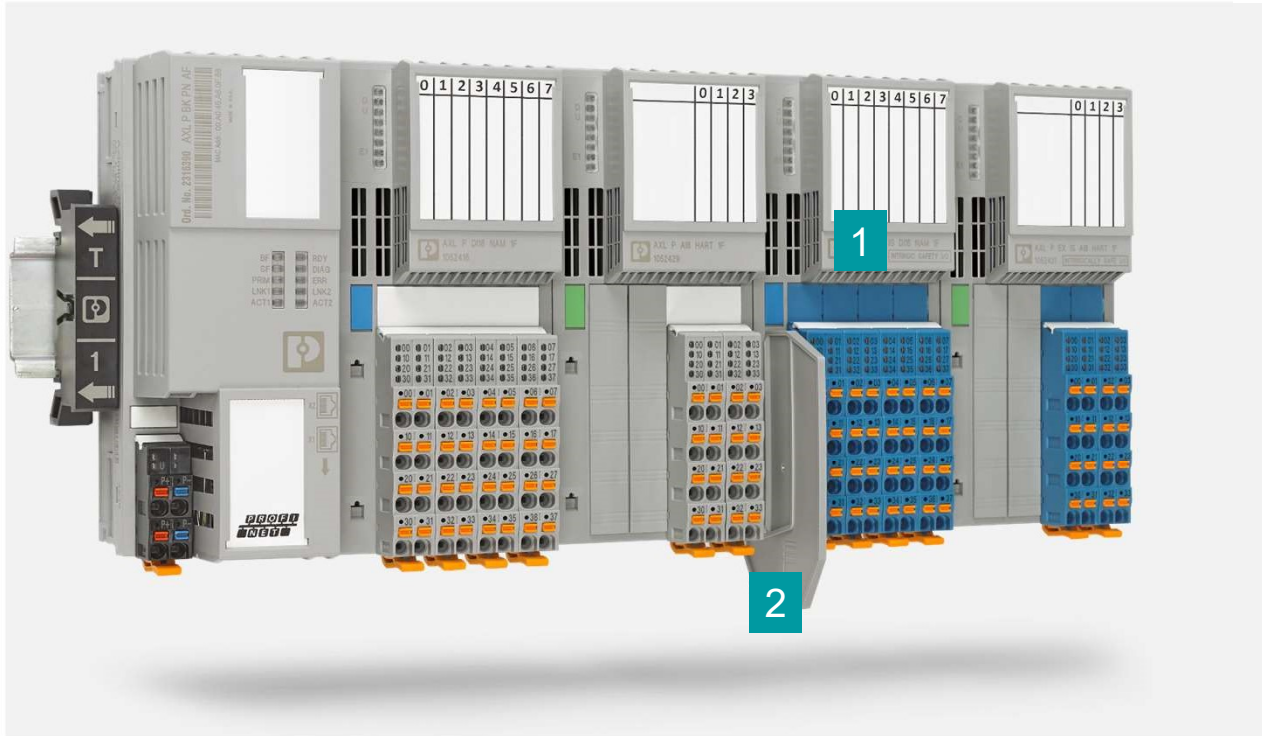
I/O details



Additional modules can be added or removed without interrupting power to installed modules

I/Os

Easy expansion of Ex-i modules



- 1 Expansion of Ex-i modules after last non
- 2 Ex-i module

Partition plate
necessary between



No additional power
supply module needed

I/Os

I/O details – DI16 NAM

DIGITAL INPUT FOR NAMUR SENSORS

- 16 channels
- For 2-wire NAMUR sensors acc. to EN 60947-5-6
- Also known as a supervised input, since Input Module can also detect short circuit, or open circuit in the loop.
- Intrinsic safe and non-I.S. versions

AXL P DI16 NAM 1F	1052416
AXL P EX IS DI16 NAM 1F	1052417



I/Os

I/O details - AI8 HART

ANALOG INPUT FOR HART SENSORS

- 8 channels
- 4...20 mA
- For 2-wire loop powered passive transmitters
 - our Input module powers the loop.
- HART Functionality can be deactivated on module
- Compliant to HART Standard Versions 5, 6, or 7
- Intrinsic safe and non-I.S. versions

AXL P AI8 HART 1F	1052429
AXL P EX IS AI8 HART 1F	1052432



I/Os

I/O details – AO4 HART

ANALOG OUTPUT FOR HART ACTUATORS

- 4 channels
- 0/4...20 mA
- HART Functionality can be de-activated on module
- Compliant to HART Standard Versions 5, 6, or 7
- Intrinsic safe and non-I.S. versions

AXL P AO4 HART 1F	1087079
AXL P EX IS AO4 HART 1F	1087082



I/Os

I/O details – DO4 SD

DIGITAL OUTPUT FOR SOLENOID / ACTUATOR

- 4 channels
- 21V @ 60 mA or 24V @ 48 mA
- Intrinsically safe

AXL P EX IS DO4 SD 24-48 1F	1087077
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AXL P EX IS DO4 SD 21-60 1F	1087078
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I/Os

Portfolio overview – I/Os

DI



16 NAMUR digital input signals for NAMUR proximity sensors

AXL P DI16 NAM 1F

ArtNo.: 1052416

AI



8 analog input with HART functionality

AXL P AI8 HART 1F

ArtNo.: 1052429

AO



4 analog output with HART functionality

AXL P AO4 HART 1F

ArtNo.: 1052417

DO



4 analog output to connect solenoid drivers, output characteristics: 24 V DC and 48 mA, intrinsically safe

AXL P EX IS DO4 SD 24-48 1F

ArtNo.: 1087077

DI



16 NAMUR digital input signals for NAMUR proximity sensors, intrinsically safe

AXL P EX IS DI16 NAM 1F

ArtNo.: 1052417

AI



8 analog input with HART functionality, intrinsically safe

AXL P EX IS AI8 HART 1F

ArtNo.: 1052431

AO



4 analog output with HART functionality, intrinsically safe

AXL P EX IS DI16 NAM 1F

ArtNo.: 1052417

DO



4 analog output to connect solenoid drivers, output characteristics: 21 V DC and 60 mA, intrinsically safe

AXL P EX IS DO4 SD 21-60 1F

ArtNo.: 1087078

THE SYSTEM

How it works



Basics

System configuration

i

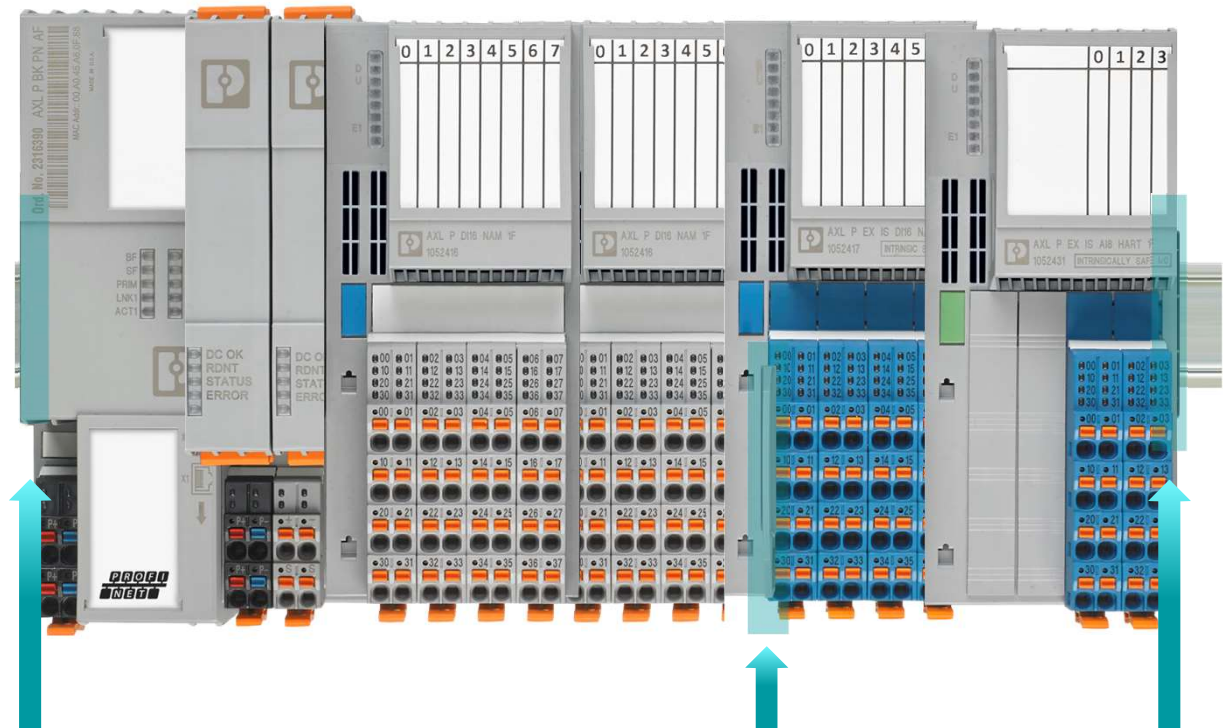
ADDITIONAL INFORMATION

2.

Add the bus coupler to the first module base. Start with the bus coupler.

2306202
AXL P/PE/EX/RR

Please order separately!



Basics

Data exchange - Local bus

i

ADDITIONAL INFORMATION

1

2-port PROFINET switch integrated in the bus coupler

2

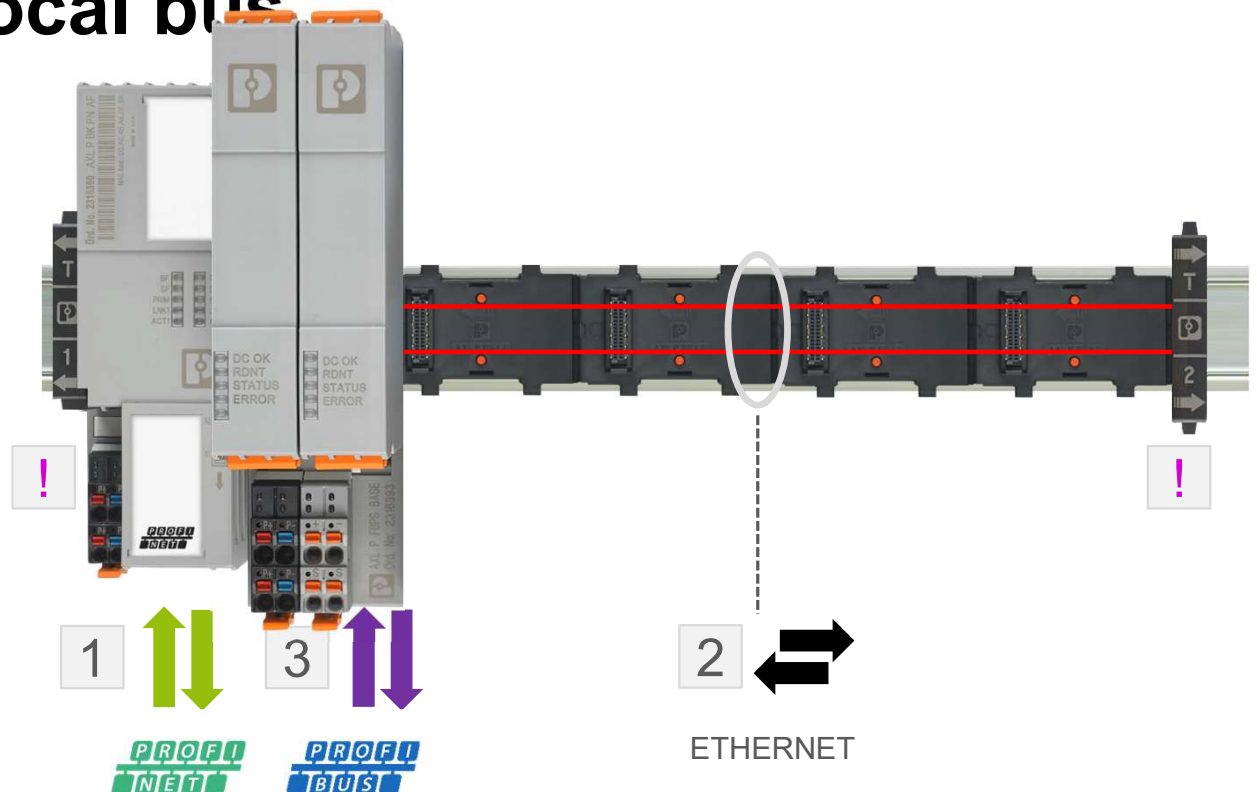
Ethernet-based local bus communication as a ring

!

Term pairs necessary to close the ethernet ring

3

1-8 PROFIBUS PA segments for proxy functionality



Basics

Power supply concept

i

ADDITIONAL INFORMATION

1

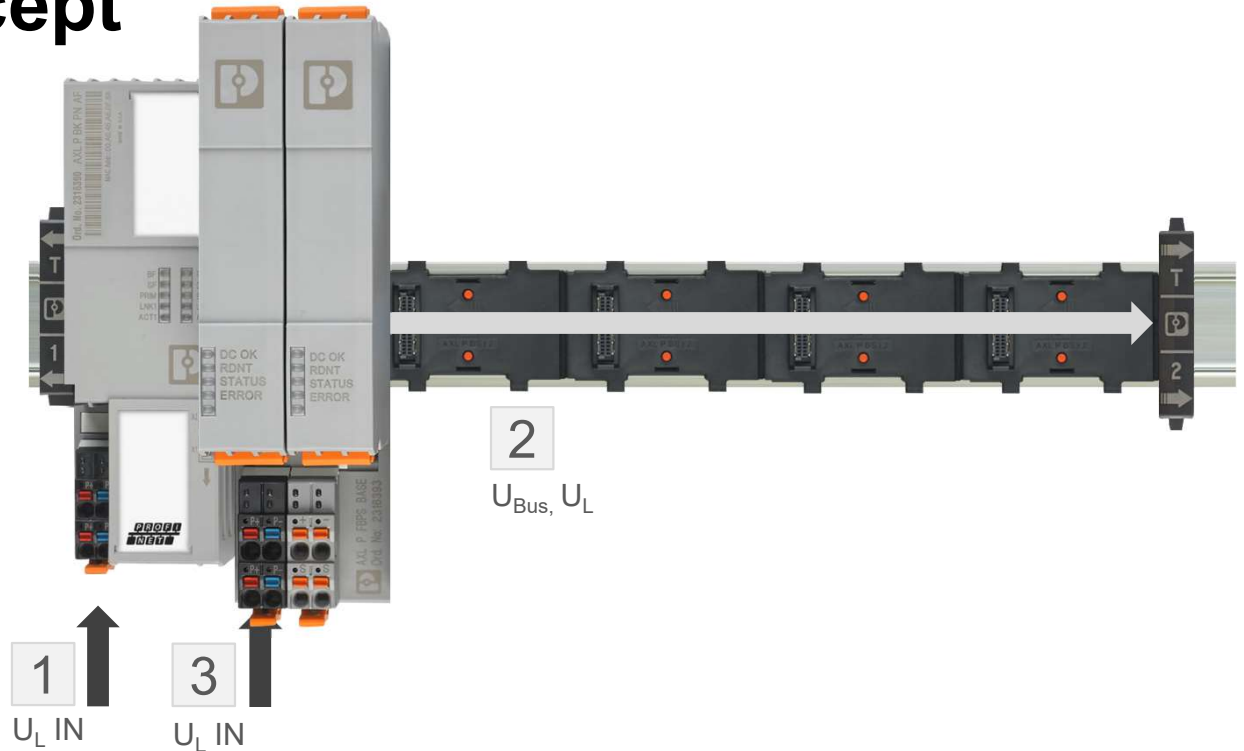
U_L : 24 V DC Must be supplied at bus coupler. U_L feed-in supplies 24 V DC to I/O modules along the local bus.

2

U_{Bus}, U_L : Supply and logic bus for I/O modules is generated from the U_L feed-in at the bus coupler.

3

U_L : The PROFIBUS PA trunk also requires external 24 V DC, U_L feed-in.



Basics

Hot Swap

LOCAL BUS STATUS:



Status module 1: **active**

Status module 2: **inactive**

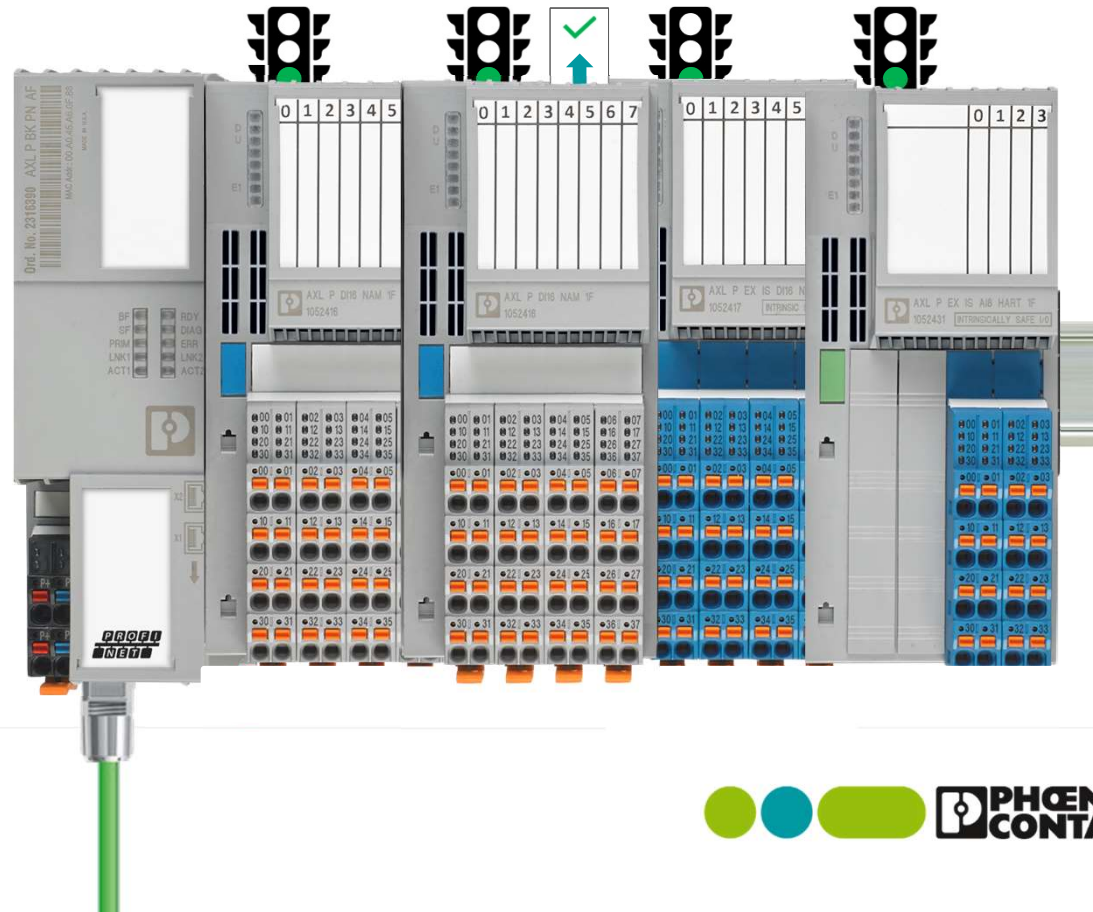
Status module 3: **active**

Status module 4: **active**



All connected I/O modules are still in communication!

START COMMUNICATION



Basics

Hot Extend

LOCAL BUS STATUS:



Status module 1: **active**

Status module 2: **active**

Status module 3: **active**

Status module 4: **active**

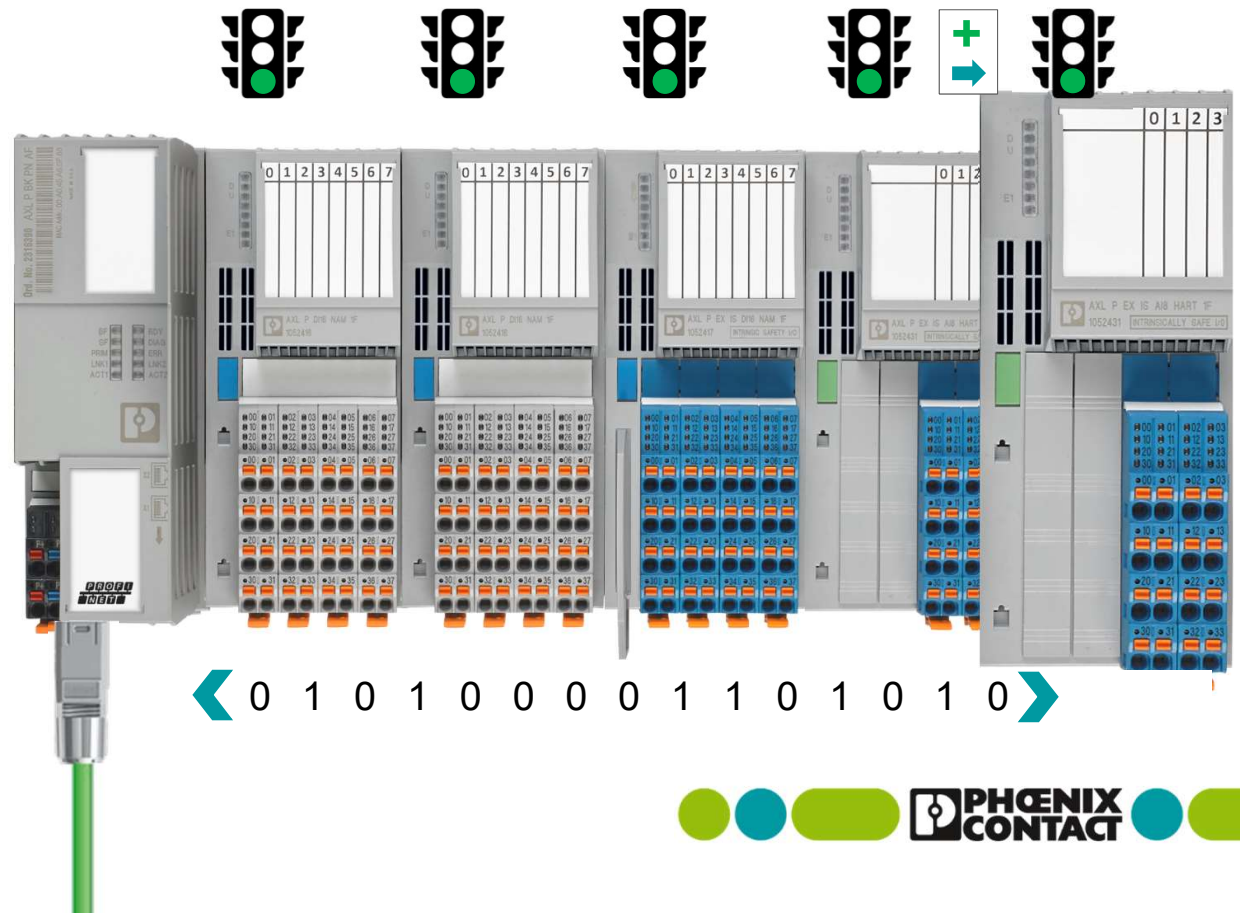
Status module 5: **ready to configure**



All connected I/O modules are still in communication!



Module added while station in communication and under power!



THE APPLICATION

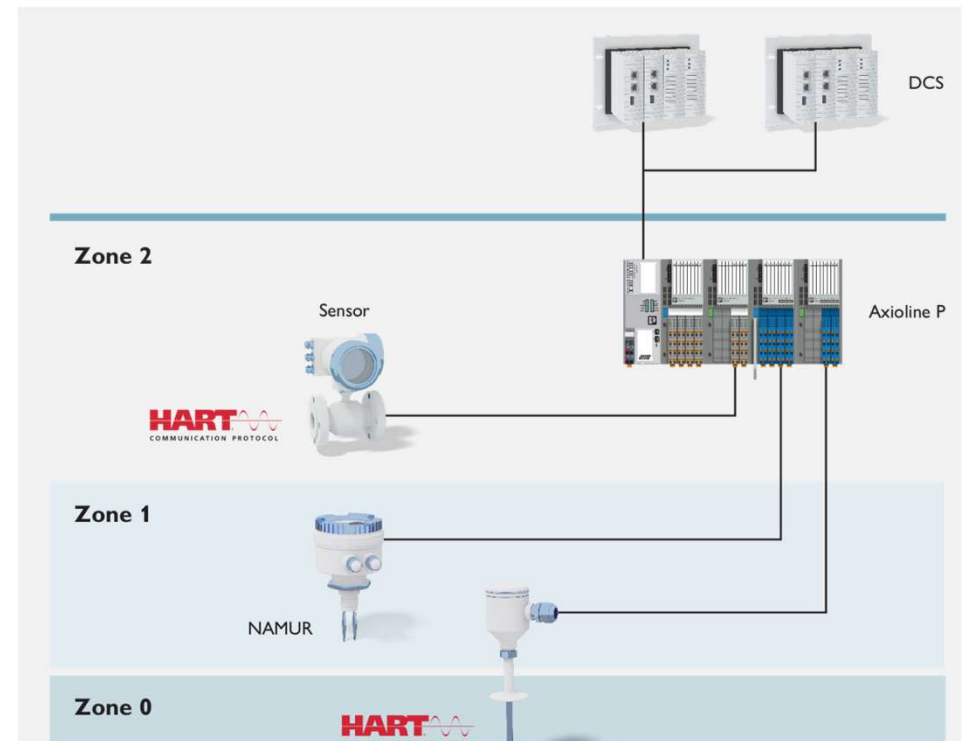
How to use it



Application

Reliable communication up to zone 0

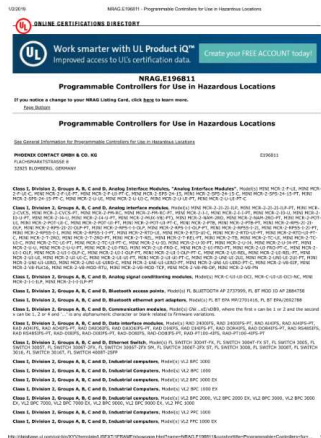
“You can install Axioline P directly in zone 2 as a remote I/O system. PROFINET S2 system redundancy is supported, which ensures reliable communication between the I/O station and DCS or PLC. It has the ability to connect sensor and actuator signals to zones 1 and 0.”



(C)UL-EX LIS:
Class I, Div. 2,
Groups A, B, C, D T4

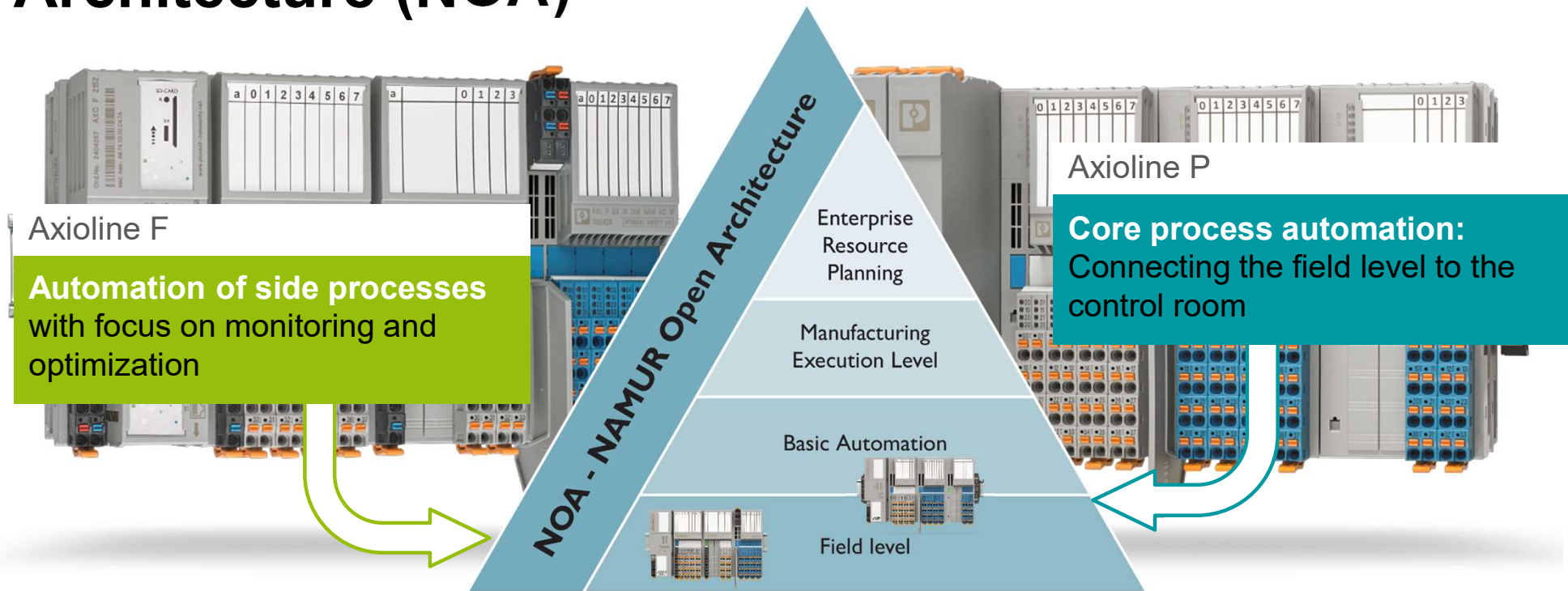
IECEx:
EX ec IIC T4 Gc

ATEX:
Ex II 3G;
Ex nA IIC T4 Gc



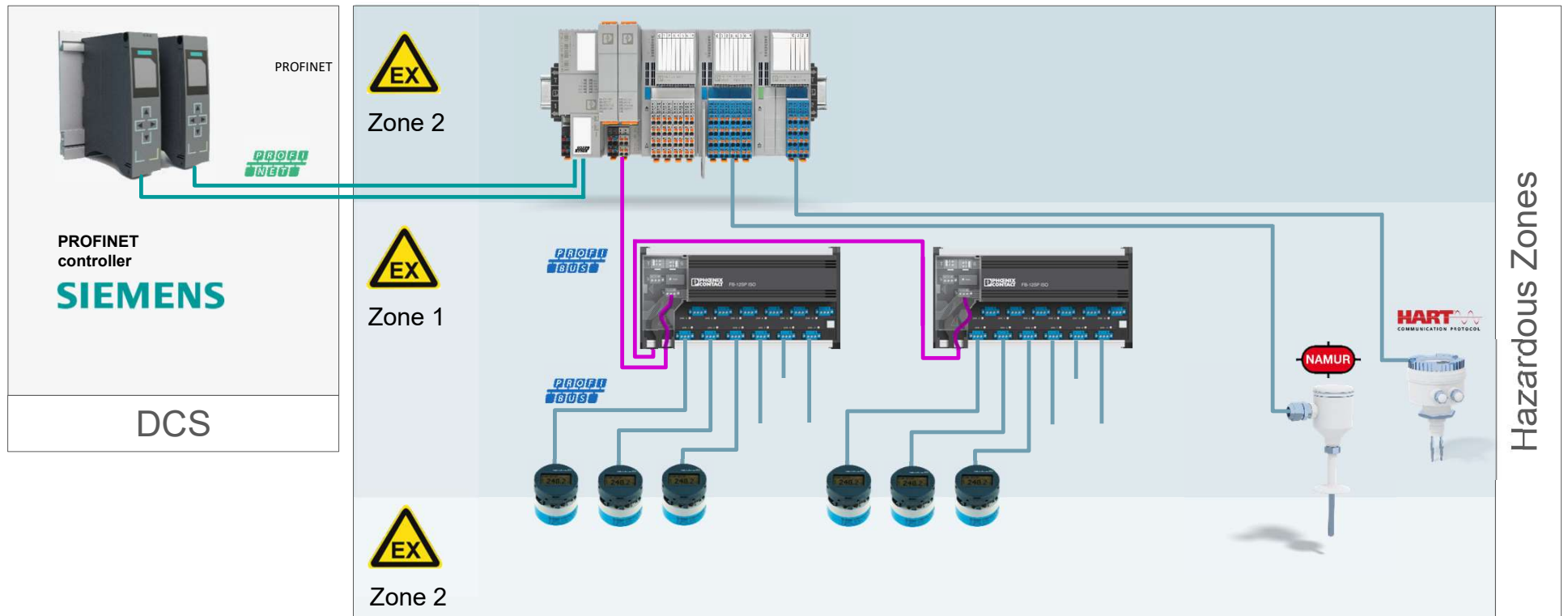
Application

Axioline F & Axioline P for NAMUR Open Architecture (NOA)



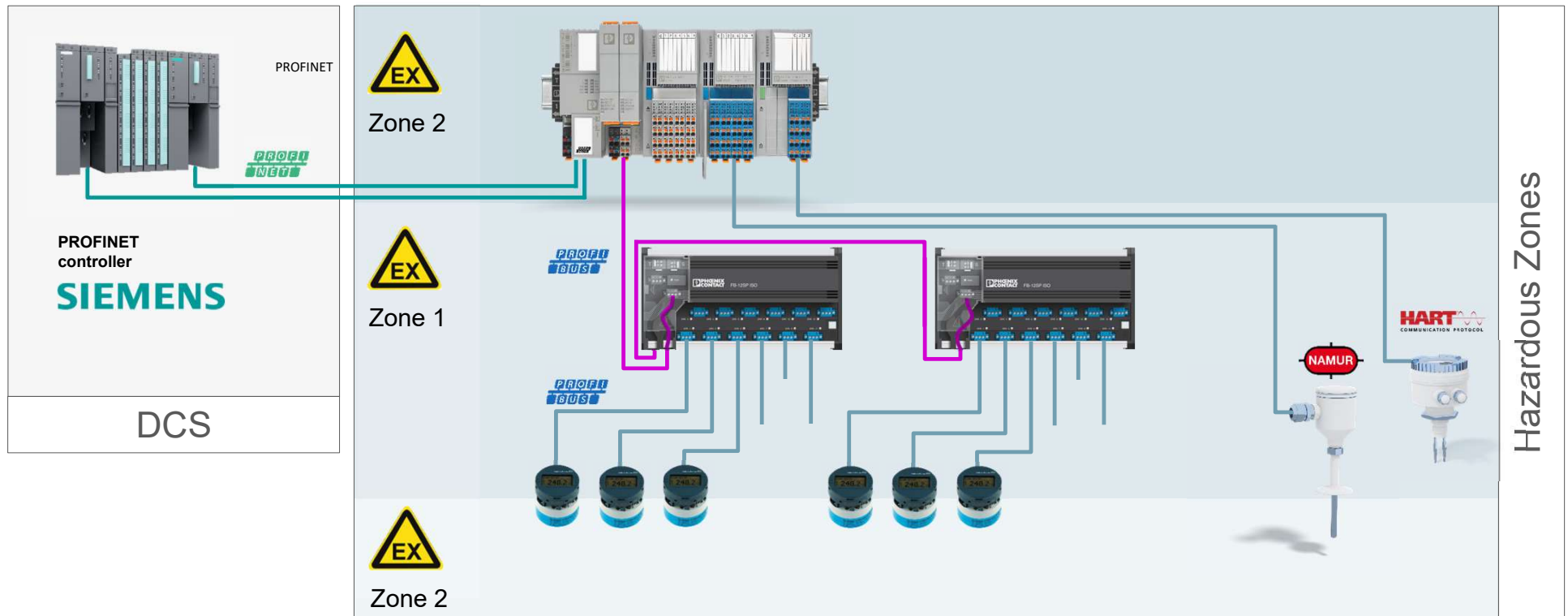
Application

Topology – Connection to various controllers



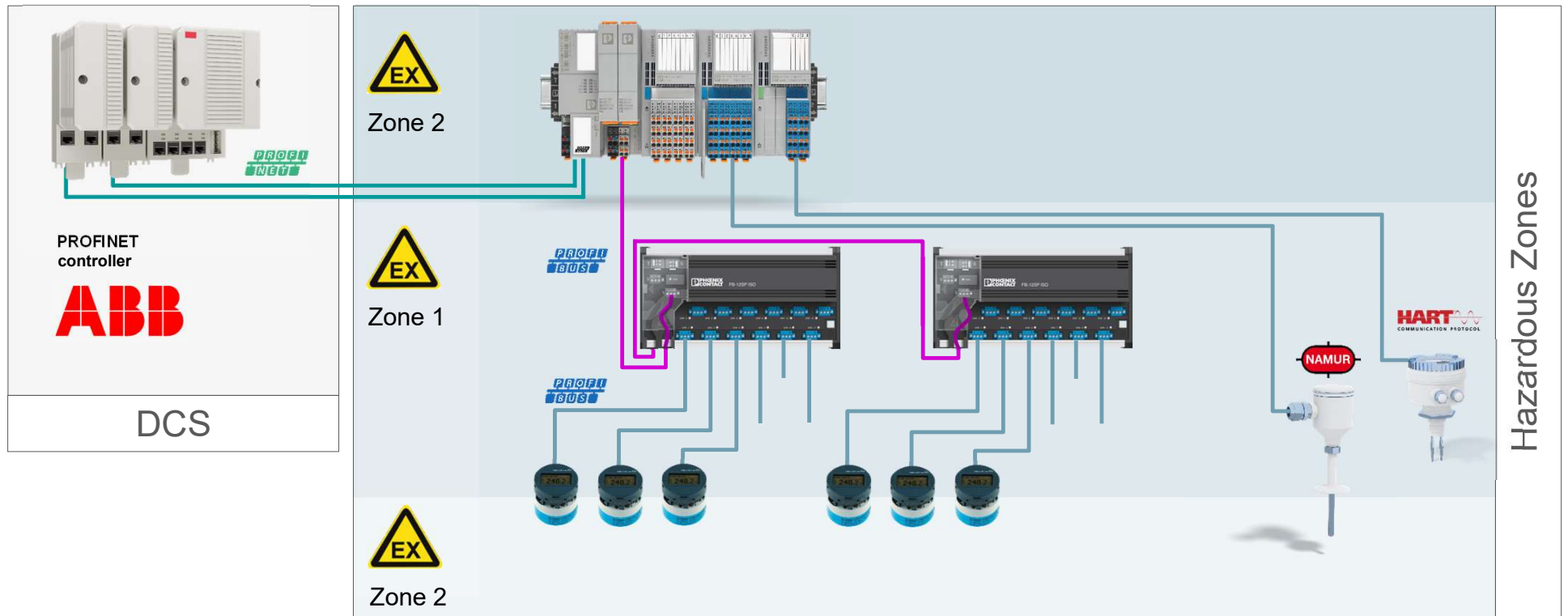
Application

Topology – Connection to various controllers



Application

Topology – Connection to various controllers



Axioline P

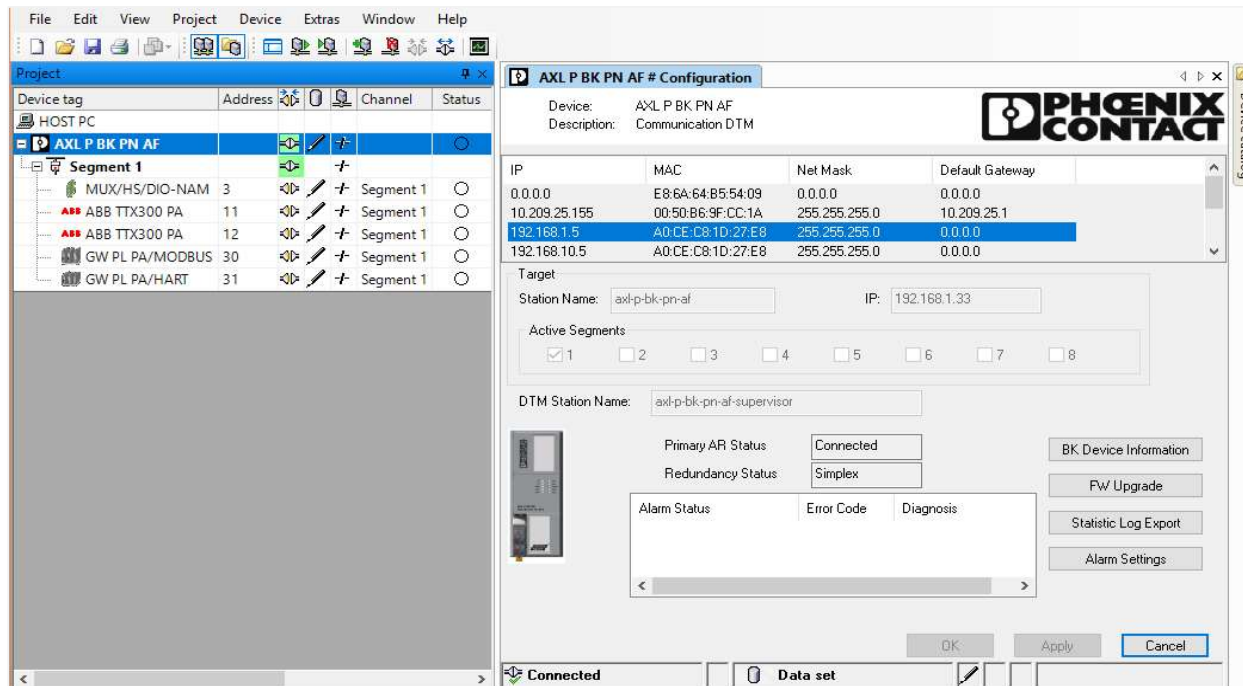
Advanced Functionality



Example Axioline P Advanced Functionality S2 Redundancy

Application

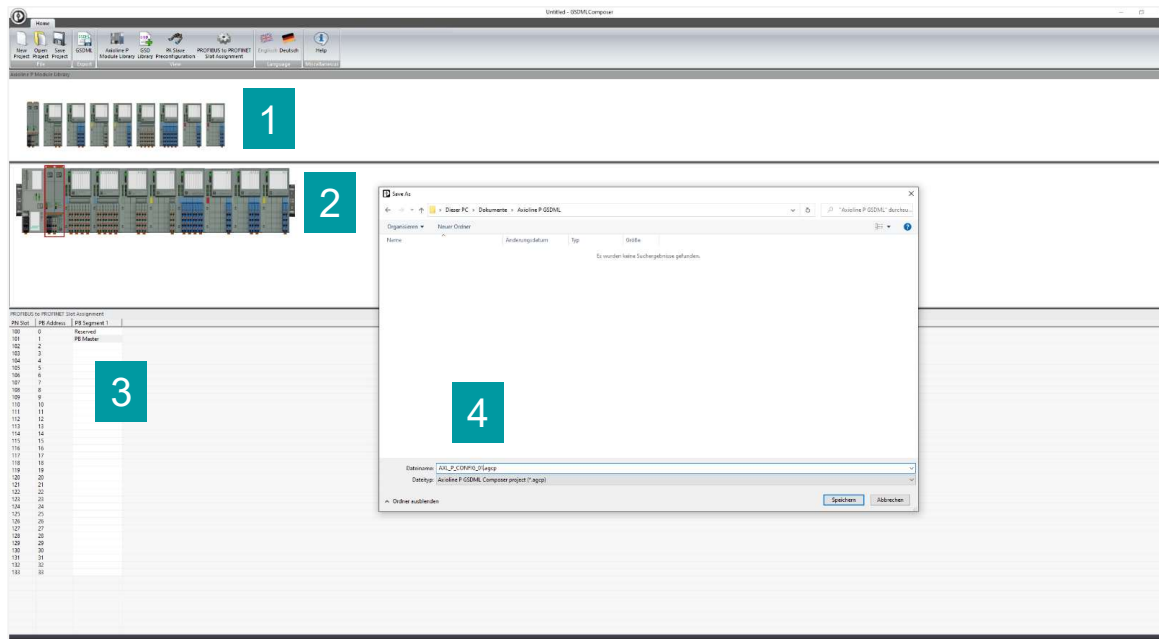
Easy diagnostics with FDT / DTM



- Device Type Manager for Axioline P
- Alarm diagnostic configuration
- Standalone supervisor functionality
- NAMUR NE 107
- Vendor-specific DTM tunneling is possible

Application

Easy to use GSDML composer



- 1 Axioline P module selection
- 2 Visual representation of Axioline P station
- 3 PROFIBUS to PROFINET slot assignment
- 4 Exported GSDML file composed by the tool



Easy integration in a DCS or PLC system with one GSDML file covering the complete Axioline P station

Axioline P

PLC and I/O systems



BASIC



AXIOLINE P

- Absolutely reliable
- Well suited for process automation



COMPLEX



INLINE



IO-Link



IO-Link



Ex HART
COMMUNICATION PROTOCOL

"AXIO F Control and I/O System"



AXIOLINE P



AxioLine P

“Relevant technologies ”

by addressing relevant trends



5G



TSN



**SPE &
APL**



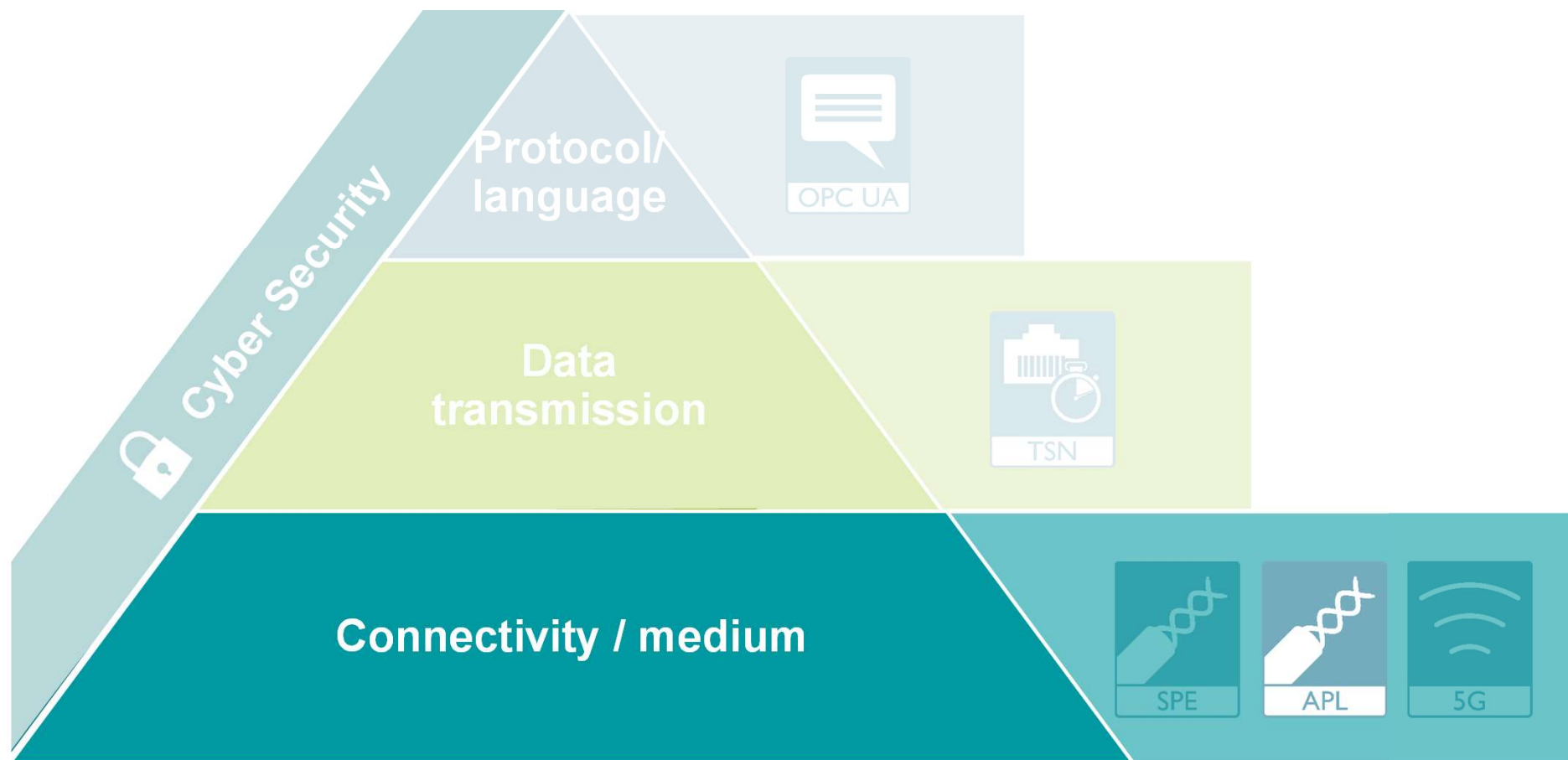
**OPC
UA**



**Edge &
Cloud**

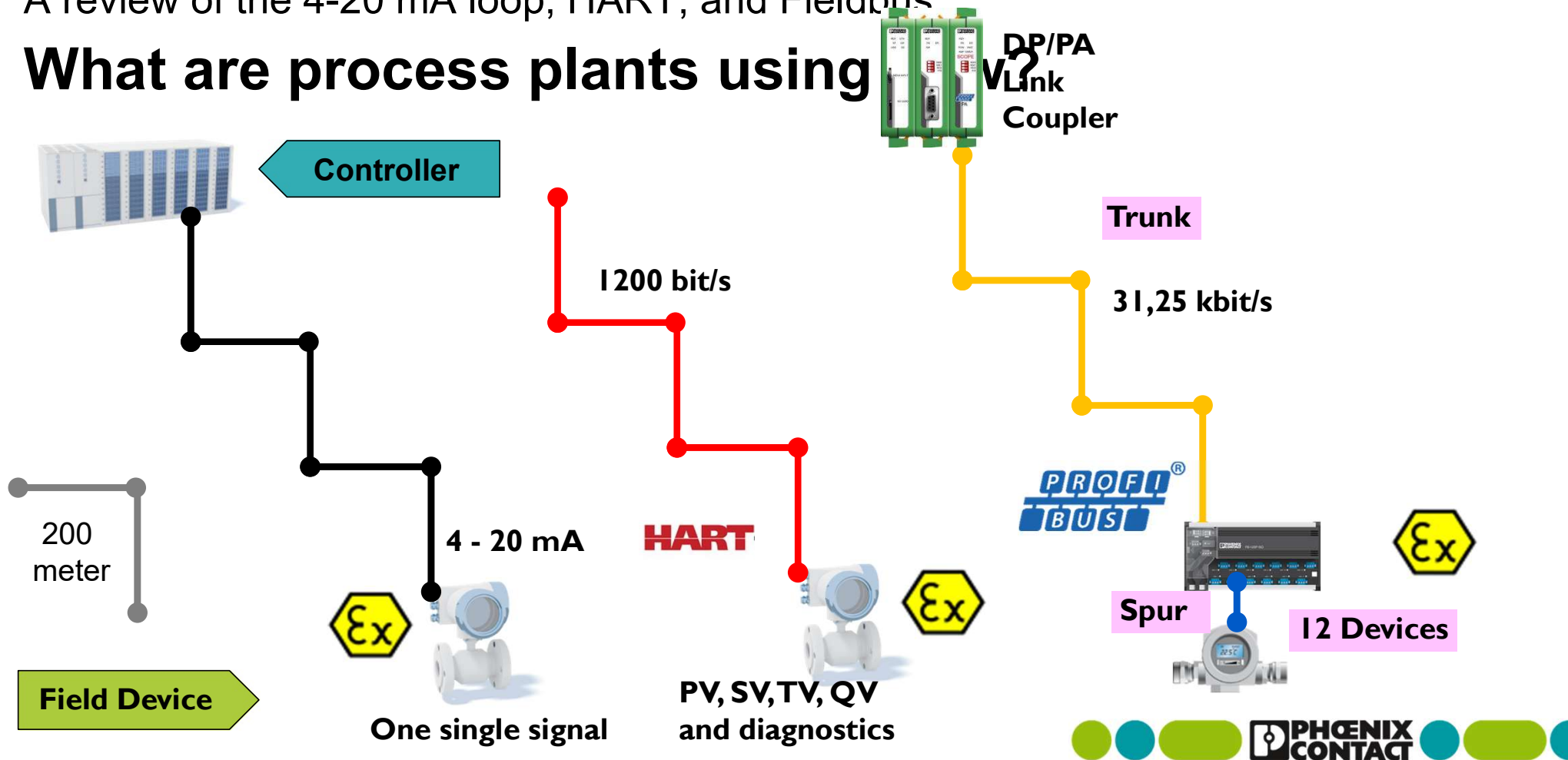


**Cyber
Security**



A review of the 4-20 mA loop, HART, and Fieldbus

What are process plants using v?





Ethernet - APL

What is it?



ethernet-apl™
advanced physical layer



Ethernet to the Field Within Process Plants

Standards
Development
Organizations



Member
Companies



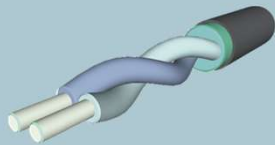
Technology, that enables
Ethernet communication
over 2 wires instead of 4 or 8
with **intrinsic safety** into the
hazardous environment

ETHERNET-APL

Data transmission:
SPE Standard

10 BASE-T1L

IEEE 802.3cg



+

Explosion protection:
2-Wire Intrinsically Safe
Ethernet

2-WISE

IEC TS 60079-47



=



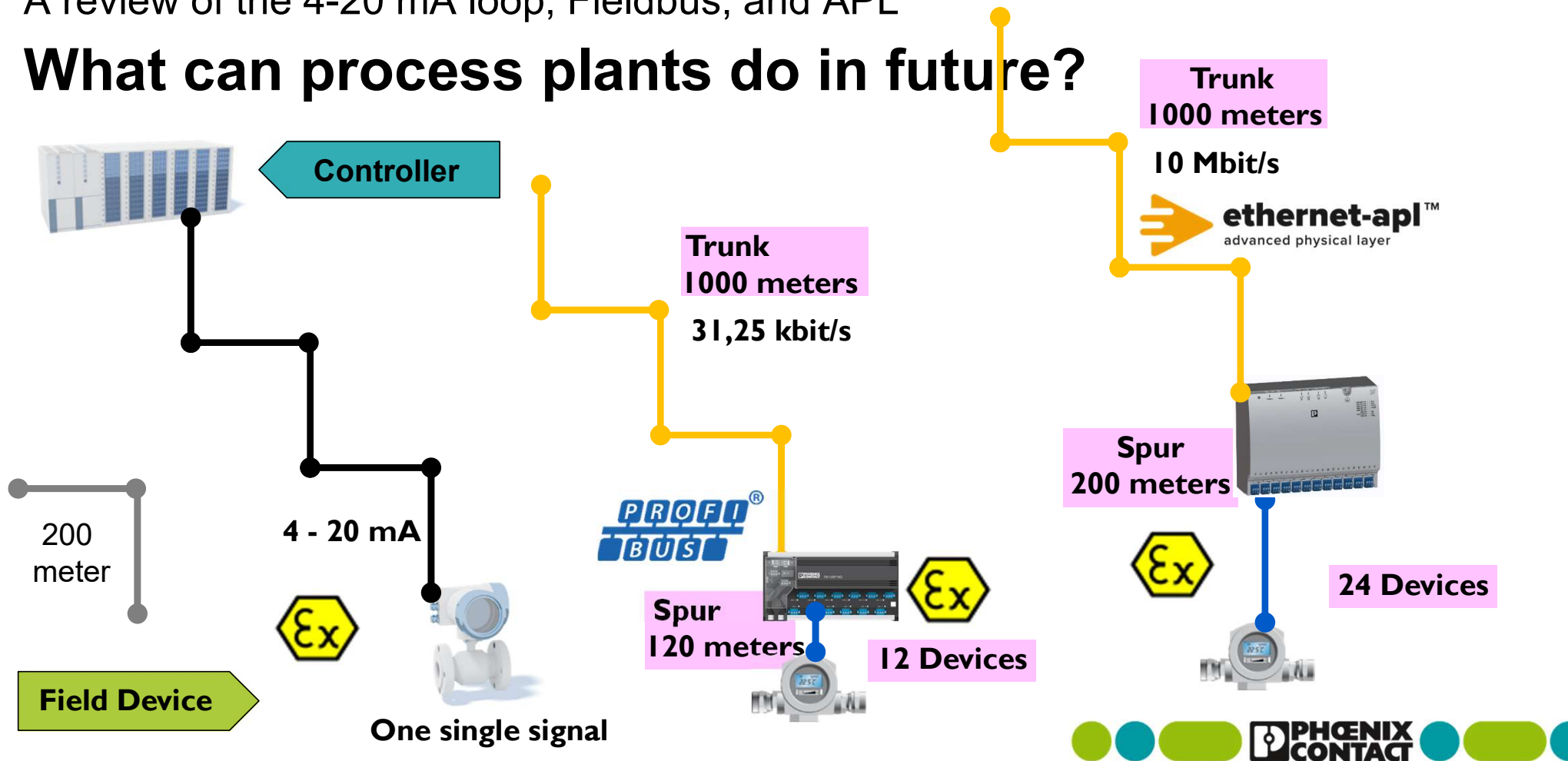
ethernet-apl™
advanced physical layer

RELEVANT SPE STANDARDS – IEEE OVERVIEW

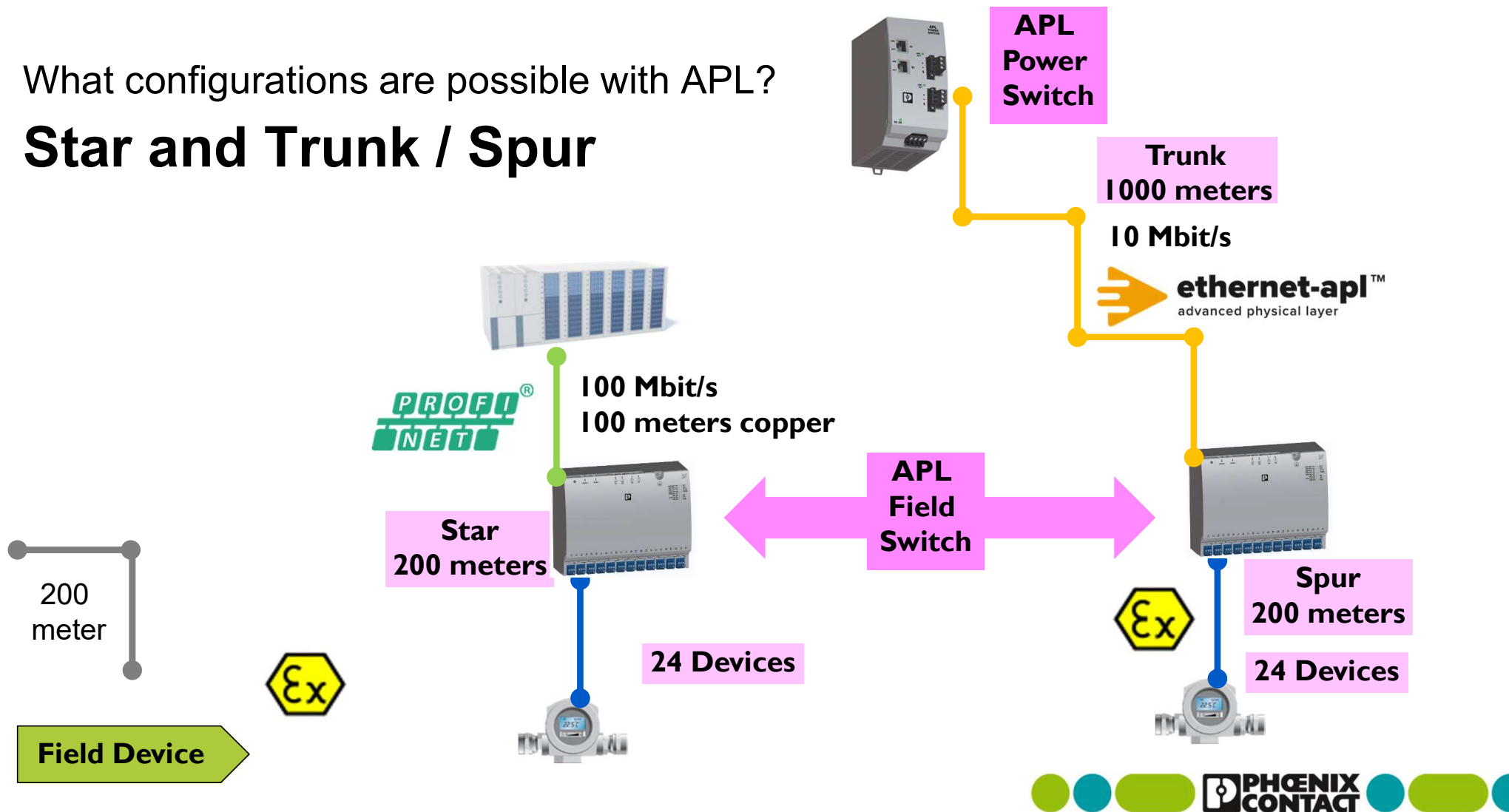
IEEE project	Description / Application	Reach			
		15 m	40 m	100m	1000 m
802.3bp	1000Base-T1 Automotive, Industrial, IoT				
802.3bw	100Base-T1 Automotive (Industrial, IoT)				
802.3cg	10Base-T1S				
802.3cg	10Base-T1L				
IEEE 802.3 bu	Power over Data Line (PoDL)	Reach according used SPE standard and cable specification			

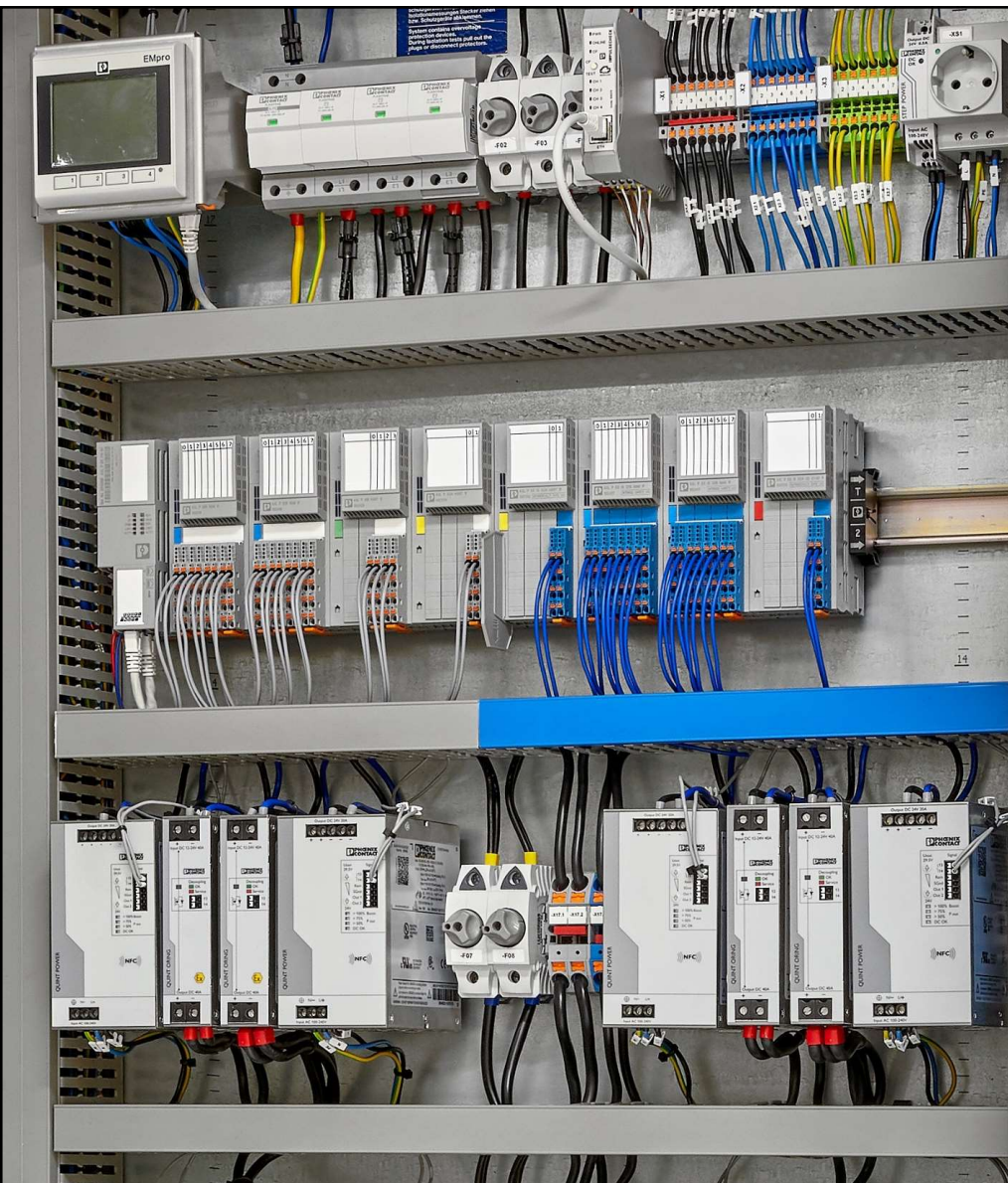
A review of the 4-20 mA loop, Fieldbus, and APL

What can process plants do in future?



Star and Trunk / Spur





Thank you

Axioline P Profibus PA

THE HIGH-AVAILABILITY
I/O SYSTEM

