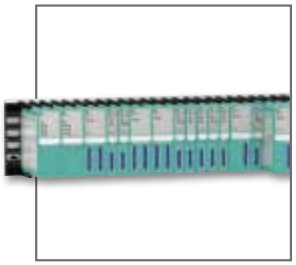
COMBINE TRADITION AND FUTURE

REMOTE I/O SYSTEMS
PRODUCT OVERVIEW



PEPPERL+FUCHS
PROTECTING YOUR PROCESS

PEPPERL+FUCHS PROCESS AUTOMATION

TABLE OF CONTENT

THE EXPERTS IN PROCESS AUTOMATION

BUSINESS OVERVIEW

Pepperl+Fuchs offers proven industry expertise through market-driven, customer-focused products that provide answers to the toughest application problems. We service the chemical, pharmaceutical, oil & gas, petrochemical, and other areas including wastewater treatment, and power technology.

In all industrial areas, Pepperl+Fuchs is both a supplier and partner for end users, control systems manufacturers, system integrators and engineering contractors.

From our expert application analysis and global key account management, to our on-site engineering of new systems and technical support after the sale, we stand solidly behind every product we build.

PEPPERL+FUCHS
PROTECTING YOUR PROCESS

REMOTE I/O INTRODUCTION

DECIDING ON REMOTE I/O

Remote I/O is a signal conditioning system that offers significant savings in many areas compared with other methods of instrumentation. This is particularly true when upgrading existing installations and when building new systems that will continue using traditional signals for digital and analog inputs and outputs.

PEPPERL+FUCHS COVERS VARIOUS STANDARDS

- PROFIBUS
- Modbus RTU
- FOUNDATION fieldbus
- Ethernet, e. g., with Modbus TCP

A wide spectrum of single and multi channel I/O devices offer intrinsically safe and increased safety field connections for sensors and actuators. This ensures that engineering becomes easy and adaptable to the needs of any plant concept.

INTERNATIONAL SAFETY STANDARDS

Safety Integrity Level SIL2 is available for select digital and analog output modules using a bus independent hardware shut down.

YOUR BENEFITS OF REMOTE I/O

- Proven in use redundancy for all major DCS systems
- Single channel high integrity and multi channel compact I/O
- More channels per slave for maximum packing density and the minimum number of cabinets
- The same engineering in all hazardous areas
- IS I/O can be mounted adjacent to non IS I/O
- Ethernet or RS485 bus options

REMOTE I/O SYSTEM INTEGRATION

REMOTE I/O FOR ALL APPLICATIONS

System integration for Remote I/O has now become a reliable and manageable part of process automation, as is demonstrated by the installation of hundreds of thousands of modules in conjunction with control systems from all renowned DCS vendors.

SYSTEM PARTNERSHIPS

LB Remote I/O for Zone 2 or Class 1, Div. 2 and the safe area as well as FB Remote I/O for installation in Zone 1 are integrated into all major process control systems and PLCs.

THE FUNCTIONALITY IS VERIFIED IN A NUMBER OF WAYS

- Agreements with system vendors to ensure support during the life cycle of the plant
- Close cooperation with engineering companies
- Pepperl+Fuchs supplies certified configuration software as DTM or EDD
- Close cooperation with recognized, independent test laboratories e. g. BIS Prozesstechnik GmbH or Dietz Automation GmbH and IFAK System GmbH
- Well-known control systems are available in our laboratories for continuous integration tests

FDT/DTM AND EDDL

The FDT/DTM concept is even more user-friendly than the GSD-based PROFIBUS configuration and has been supported by Pepperl+Fuchs from the outset.

YOUR BENEFITS OF FDT/DTM AND EDDL

- Complete integration in the process control system's environment
- DTM certification by an independent laboratory
- Interoperability for all vendors during the product life cycle
- As an alternative, DTMs and EDDL can be operated from an independent workstation to separate them from the process control system
- Separate workstations ensure that there is no interaction with the control system
- Software can be updated on separate workstations without affecting the main system functionality
- Updates in the system environment are tested in our laboratories

EDDL meets the same criteria but, unlike DTM, does not represent a piece of software but rather a text file describing the devices.

DTM and EDDL technologies can be used for all major busses.

SIMPLE, SECURE SYSTEM INTEGRATION

We use tried-and-tested methods to connect to high-level process control systems and PLCs.

- Standard busses like PROFIBUS or Modbus run under all regular operating systems, irrespective of changes in the Windows®* world and are unaffected by changes in system releases
- Operation, monitoring, configuration, parameterization and diagnosis can be managed from the process control system's own user interface
- Complies with NE105, ensuring secure system integration, even for updates
  - Integration tests control updates and version changes
  - Remote I/Os are compatible when updating on the system side
  - Modern Remote I/Os tolerate system updates
- External tools can be used but are not necessary

* Windows is a registered trademark of the Microsoft Corporation.

INTERNATIONAL SERVICE

Pepperl+Fuchs has a worldwide presence, employing approximately 5,000 people. Well-trained service technicians and consultants are available in all markets.

- Local service, worldwide
- Commissioning assistance
- Fast remote service using PC anywhere
- Telephone assistance
- Personal customer service at the local level
- Training courses tailored to your needs

PRODUCT LIFE CYCLE MANAGEMENT

Pepperl+Fuchs Remote I/O systems have been in use worldwide for more than 10 years and are under continuous development. The chemical, petrochemical and pharmaceutical industries, as well as the oil and gas sector expect a plant to run reliably for at least 10 to 15 years after commissioning.

- Pepperl+Fuchs, therefore, provides compatible products suitable for the life cycle of any plant
- Life cycle agreements with system vendors such as ABB and others
- Life cycle service agreements in projects
- User support from consulting and engineering to commissioning and service
- Contracts and agreements with system vendors to ensure interoperability
- Continuous development of compatible units, so that products meet the latest standards and regulations

Pepperl+Fuchs is an active member of international bodies such as PNO, the FDT Group, the Fieldbus Foundation, and the HART Communication Foundation. We are also represented on the executive board of the PACTware consortium.

HART® COMMUNICATION

Remote I/O offers extensive possibilities for the remote control of connected field devices employing HART communications.

YOUR BENEFITS OF HART COMMUNICATION

- Configuring and parameterizing field devices via the bus
- Stretching service intervals through regular monitoring of the relevant field device parameters
- Use HART secondary variables to save on measuring points
- Some systems offer HART communication directly from their engineering consoles
- Separate, system-independent control terminal available
- HART communication possible without a service bus
- Standard configuration software can be used with EDDL or FDT/DTM technology

HART is regarded as a proven in use technology in new plants. When it comes to modernizing existing systems, installed HART®* field devices can be given an added dimension without any extra efforts.

*HART is a registered trademark of the HART® Communication Foundation

PROFIBUS® Modbus Fieldbus HART COMMUNICATION PROTOCOL FDT Connected PACTware EDDL SIL IEC61508

REMOTE I/O SYSTEM INTEGRATION

SYSTEM VENDOR

ABB

Location

- Germany – chemical plant
- Redundant PROFIBUS in operation since 1999

System description

- 12,000 measuring points connected to ABB Symphony. Now extended to over 18,000 I/O points.
- Other Remote I/O systems on the site are connected to ABB Symphony and ABB Freelance AC800F.
- Successful migration for ABB Contronic P installations at other locations equipped with Remote I/O.

Advantages

- Complete integration employing the FDT/DTM concept
- Reliable and interference-free operation
- Life cycle service agreement

SYSTEM VENDOR

EMERSON

Location

- Ireland – pharmaceutical industry
- PROFIBUS in operation since 2002

System description

- GAMP (good automation manufacturing practice)
- Frequent plant extensions using Remote I/O for Emerson DeltaV.
- Other major projects in Portugal use a redundant PROFIBUS.

Advantages

- Complete integration thanks to GSE and FHX files
- Simple handling in the system environment
- AMS integrated
- HART via class 2 master

SYSTEM VENDOR

HONEYWELL

Location

- Germany – chemical plant
- Redundant PROFIBUS in operation since 2005

System description

- Honeywell has developed Remote I/O drivers to connect to Experion.
- Drivers offer improved handling ability
- The interpretation of the Remote I/O signals at the control level is made particularly easy.

Advantages

- Integration by means of GSE files and software drivers
- Simple engineering

Many more system integrations via PROFIBUS and Modbus from ABB, Allen Bradley, Bernecker+Rainer, HIMA, Hitachi, Mitsubishi, Matsushita and Schneider Electric are in use world wide.

SYSTEM VENDOR

INVENSYS

Location

- Worldwide
- RS485 standard-compliant HDLC bus available

System description

- Complete integration through shared development of FBM functionality for the LB/FB Remote I/O modules
- Auto-configuration of the Remote I/O
- Configuration, parameterization, diagnosis and HART communication from the operator level of the process control system

Advantages

- Identical behaviour for both Invensys and Pepperl+Fuchs I/O devices
- Best possible use of system interfaces
- More compact than comparable solutions

SYSTEM VENDOR

SIEMENS

Location

- Germany – agricultural crop protection
- Redundant PROFIBUS in operation since 2000

System description

- Siemens S7-417H with redundant PROFIBUS DPV1.
- Originally approx. 4,000 I/O channels, now expanded to over 8,000 channels with LB Remote I/O
- Single-channel modules are important here in order to guarantee plant availability
- Use of SIL2 shutdowns and watchdog circuits for additional bus monitoring

Advantages

- Software drivers offer very convenient handling ability in the system environment by interpreting the Remote I/O signals at the control level.
- Siemens PDM Asset Management Tool is approved for LB/FB Remote I/O

SYSTEM VENDOR

YOKOGAWA

Location

- Italy, Poland
- Redundant PROFIBUS in operation since 2007

System description

- Connection to Centum VP
- More than 1,500 LB/FB Remote I/O channels
- First extensions have already been completed
- HART communication can also be used with a class 2 master via the PROFIBUS or service bus

Advantages

- Integration by means of a GSD file
- Simple handling in the system environment
- HART via class 2 master

Complete project list on request

REMOTE I/O SYSTEM ARCHITECTURE

Control Room

DCS, PLC
or SCADA

RS485 BUS

Hazardous Area
Zone 2/Class I, Div. 2

Remote I/O
80 analog or
184 digital I/O

▶ see P. 10

Remote I/O
extendable
80 analog or
184 digital I/O

▶ see P. 12

Hazardous Area, Zone 1

▶ see P. 12

Remote I/O
extendable
80 analog or
160 digital I/O

Sensors and actuators may also be installed in Class I, Div. 1

Remote I/O
4 slaves per cabinet
80 analog or 184
digital I/O each

CONTROL ROOM INSTALLATION

Remote I/O are often installed in the safe area control room next to the DCS or PLC. This leads to a very flexible, easily extendable interface solution.

Sensors and actuators to measure and control process values can be located in Zone 1 or even in Zone 0 or Class I, Div. 1.

ZONE 2 OR CLASS I, DIV. 2 INSTALLATION

In Zone 2 or Class I, Div. 2 area explosion hazards are rare and are only present for a short period of time.

Remote I/O are often installed in Zone 2 close to the plant level. The documentation supplied offers guidance regarding permitted application and installation. This is based on the required temperature class, the expected ambient temperature and also normal operating conditions.

Sensors and actuators to measure and control process values can be located in Zone 1 or even in Zone 0 or Class I, Div. 1.

Make sure to use Zone 2, or Zone 22 or Div. 2 approved housings depending on the application.

ZONE 1 INSTALLATION

In Zone 1 explosion hazards may exist occasionally.

More and more Remote I/O are installed in Zone 1 on the plant level. The documentation supplied offers guidance regarding the permitted extensions. This is based on the required temperature class, the expected ambient temperature and also possible fault conditions.

Sensors and actuators to measure and control process values are also located in Zone 1 or even in Zone 0 or Class I, Div. 1.

Make sure to use Zone 1, or Zone 21 approved housings depending on the application.

LB REMOTE I/O FOR SAFE AREA, ZONE 2, DIV. 2, OR ZONE 22

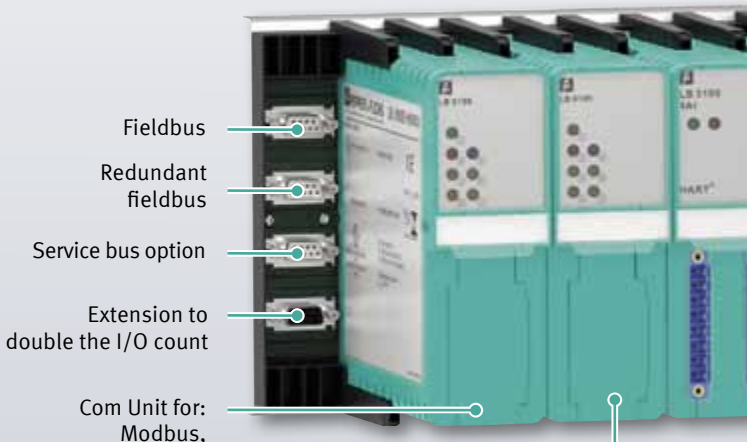
LB REMOTE I/O

LB Remote I/O is mounted on a backplane that snaps onto a standard DIN rail. The backplane supplies power to the modules and provides the internal wiring between the bus communication interface (ComUnits or gateways) and the I/O devices.

Two gateways can be fitted to achieve redundancy. In this case both connections have to be made to the fieldbus and the redundant fieldbus connectors. The type of fieldbus used determines the model number of the gateway.

An extension cable allows the gateway to be used for a maximum of 80 analog or 184 digital input or output channels. Other backplane sizes are available.

Single- and multi-channel modules can be combined



SAFE AREA OR ZONE 2, DIV. 2 MECHANICS

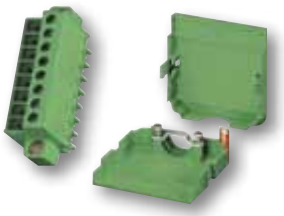
- User friendly plug-in modules with removable terminals
- Hot swap maintenance without hot work permit
- I/O-modules for NON Ex or Ex-i (IS) and Ex-e field connections
- I/O modules can be mounted on the backplane in any order
- Single channel modules for high integrity can be combined with multi channel I/O for maximum packing density
- Decentralized installation saves wiring

APPLICATIONS

- NAMUR sensors, mechanical and electronic switches
- Analog output e.g., for proportional valves and solenoids
- Temperature signals from 2-, 3- and 4-wire RTD
- Thermocouple inputs
- Analog inputs for 2- and 4-wire transmitters
- Current sources
- I/P converters

ACCESSORIES

Fiber Optic Link Zone 2
Long distances between the control room and Zone 2 Remote I/O can be bridged using a PROFIBUS Fiber Optic Link.



IS and NON IS modules can be mounted side by side. Only requires connector hood to achieve 50 mm spacing

Tagging strip

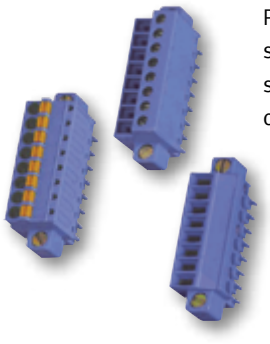
May be plugged in or removed from a live circuit in Zone 2 / Div. 2

Tag labels

Hot swappable modules

Power supplies

Redundant power supply



Plug-in screw and spring cage connectors.

INPUT/OUTPUT SIGNALS

Inputs and outputs rated for Zone 1, Zone 0 and Div. 1

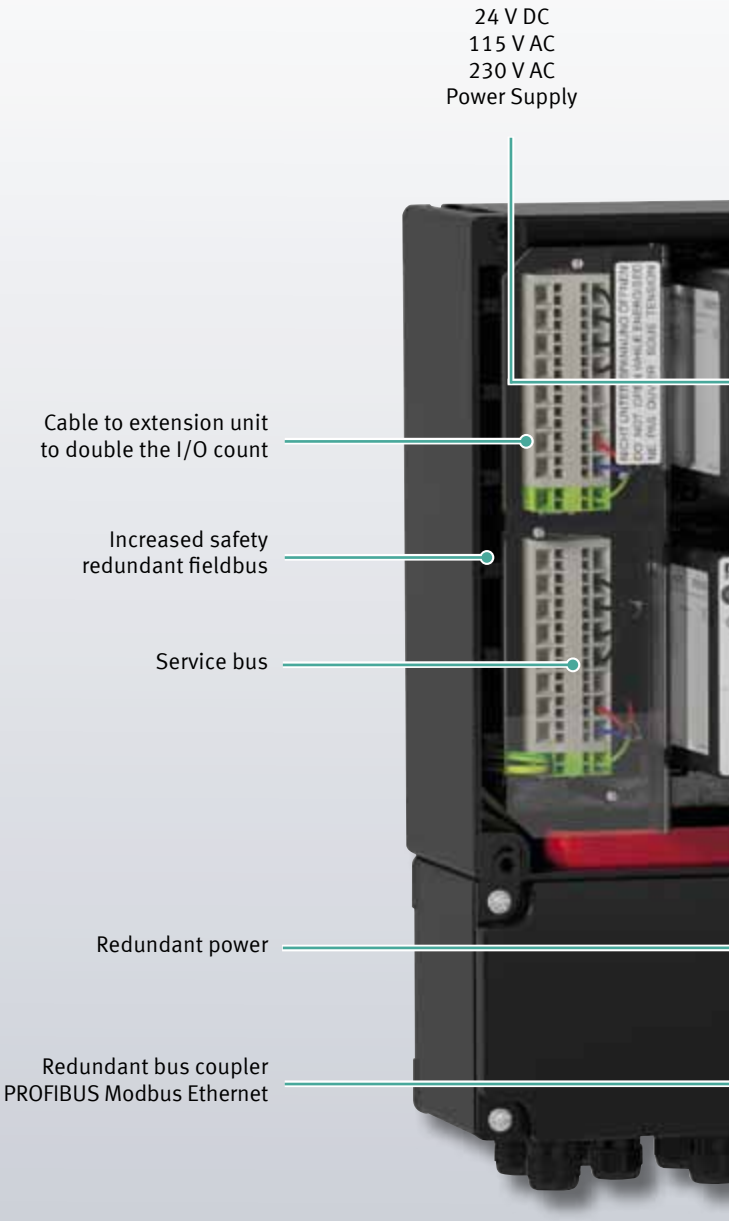
FB REMOTE I/O FOR HAZARDOUS AREAS ZONE 1, OR ZONE 21

FB REMOTE I/O

FB Remote I/O is mounted on a backplane that fits glass fiber reinforced polyester (GRP) or stainless steel enclosures. The backplane supplies power to the modules and provides the internal wiring between the bus communication interface (ComUnits or gateways) and the I/O devices.

Two gateways can be fitted to achieve redundancy. In this case both connections have to be made to the fieldbus and the redundant fieldbus terminals. The type of fieldbus used determines the model number of the gateway.

An extension cable allows the gateway to be used for a maximum of 80 analog or 196 digital input or output channels. As the modules contain the same electronics as those for Zone 2 engineering is the same for all areas. Other enclosure sizes are available.



ZONE 1 MECHANICS

- User friendly plug-in modules with removable terminals
- Hot swap maintenance without hot work permit
- I/O-modules for NON Ex or Ex-i (IS) and Ex-e field connections
- I/O modules can be mounted on the backplane in any order
- Single channel modules for high integrity can be combined with multi channel I/O for maximum packing density
- Decentralized installation saves wiring

APPLICATIONS

- NAMUR sensors, mechanical and electronic switches
- Analog output e.g., for proportional valves and solenoids
- Temperature signals from 2-, 3- and 4-wire RTD
- Thermocouple inputs
- Analog inputs for 2- and 4-wire transmitters
- Current sources
- I/P converters

ACCESSORIES

Fiber Optic Link Zone 1
Long distances between the control room and Zone 1 Remote I/O can be bridged using a PROFIBUS Fiber Optic Link

Bus Termination

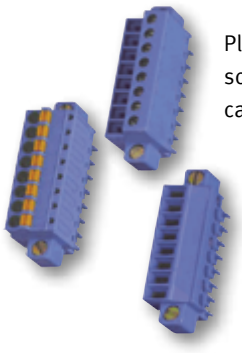
Primary bus coupler
PROFIBUS
Modbus
Ethernet

Hot swappable
I/O modules

Single and multichannel Ex-i and Ex-e modules can be combined on the same backplane

Tag labels per module

Flanged box for easy cable entry and screens



Plug-in screw and spring cage connectors.

Increased safety options upon enquiry.

INPUT/OUTPUT SIGNALS

Inputs and outputs rated for Zone 1 and Zone 0

CUSTOMIZED SOLUTIONS

COMPLETE SOLUTIONS – FAST INSTALLATION TO SUIT INDIVIDUAL NEEDS

Pepperl+Fuchs products are used thoughout the world involving industrial, hazardous, and corrosive environments. Close cooperation with our customers allows our project engineers to provide complete solutions in a variety of panels and enclosures. Customized and standard solutions are equally competetively priced and ensure the fastest possible installation on site.

CONTROL ROOM INSTALLATION

Control cabinet with process control system and space for three remote I/O stations with 3 x 46 slots for 240 analog signals or a combination of these.
Dimensions: 800 x 2000 x 400 mm

ZONE 2 / DIV. 2

Standard stainless steel housing with LB Remote I/O for 80 analog or 184 digital I/Os or a combination.
Dimensions: 800 x 800 x 300 mm

ZONE 1/ZONE 21

Customized FB Remote I/O with added valve banks, marshalling terminals and replaceable power fuses 80 analog I/O or 196 digital I/O or a combination of analogs and digitals.
Dimensions: 800 x 1000 x 300 mm.

ZONE 1/ZONE 22

Customized GRP FB Remote I/O with increased safety wiring to replaceable fuses. Flanged enclosures made up of standard 544 x 272 x 212 mm boxes.

NETWORK BASED PROCESS VISUALIZATION

VisuNet Remote monitors and Panel PCs transfer data via Ethernet and does not require proprietary structures so changes of the topology of a plant can be made quickly and easily. VisuNet is approved for zones 1+21 (ATEX and IECEx) and compatible with all established PC-based distributed control systems (DCS).
It can be used to control plant operations via Remote I/O. VisuNet meets even the toughest requirements on robustness, safety and functionality.

CERTIFICATES

Pepperl+Fuchs equipment is supplied with a wide range of certificates from ATEX to IECEx to UL and many others for gas hazardous areas Zone 0, Zone 1, Zone 2, and Div. 1, Div. 2 or dust hazards in Zone 21, Zone 22, and Class III. In addition we offer FAT (factory acceptance tests) and GAMP procedures.

Marine certificates are also available for offshore or other marine applications.

SIL2 FUNCTIONAL SAFETY

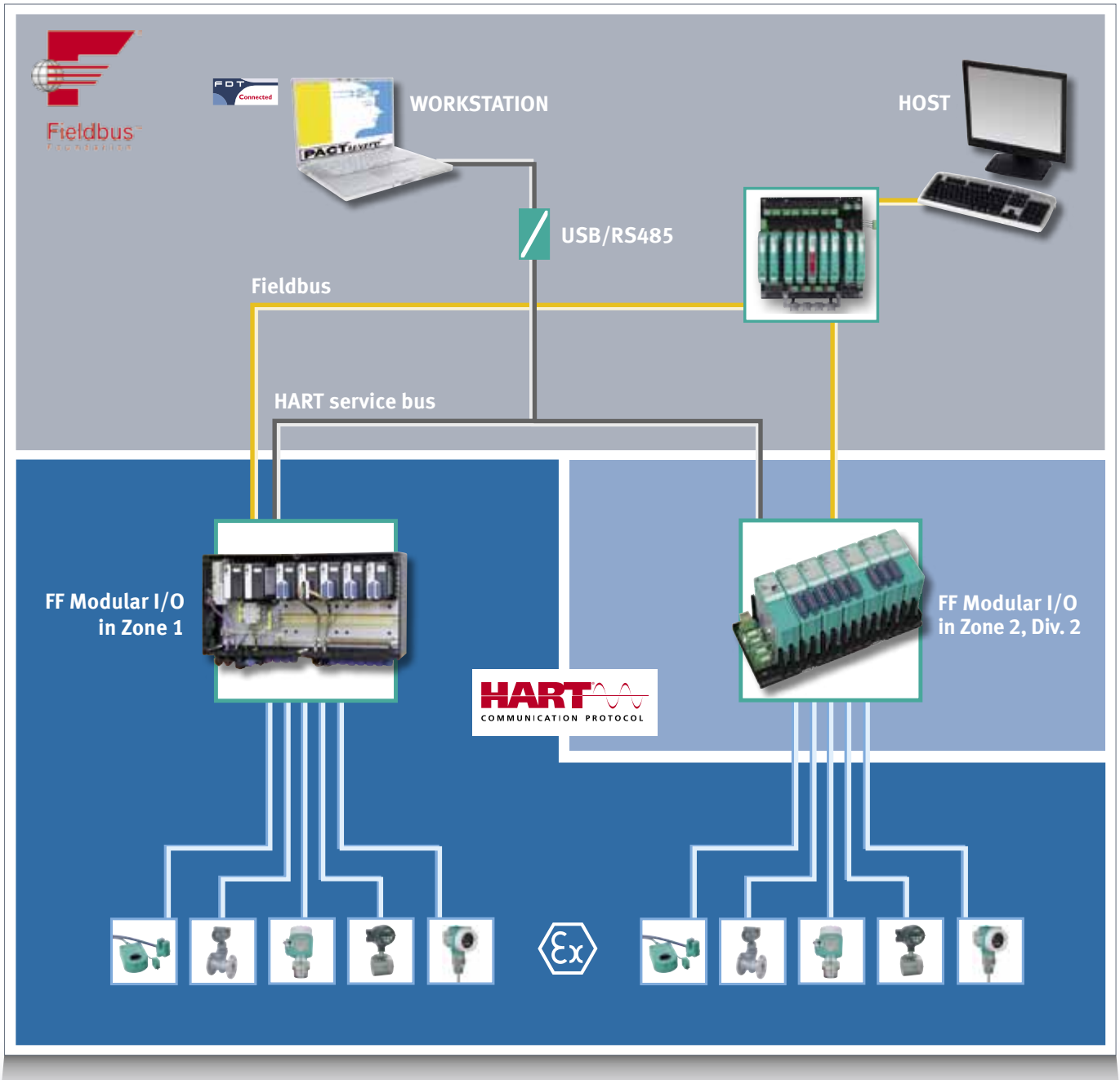
Many output modules are available with a hard wired bus independent shut-down input. This allows outputs to be disabled at the push of a button or under the control of a safety system without having to wait for bus response times.

FOUNDATION FIELDBUS SOLUTION

Remote I/O are increasingly used for plant retrofits in brown field applications but also for new installations in green field plants. They even appear in conjunction with Foundation fieldbus systems to support all non Foundation fieldbus signals.

The modular I/O stations take up one just one address on the Foundation fieldbus for up to 40 digital signals or 20 analog I/O.

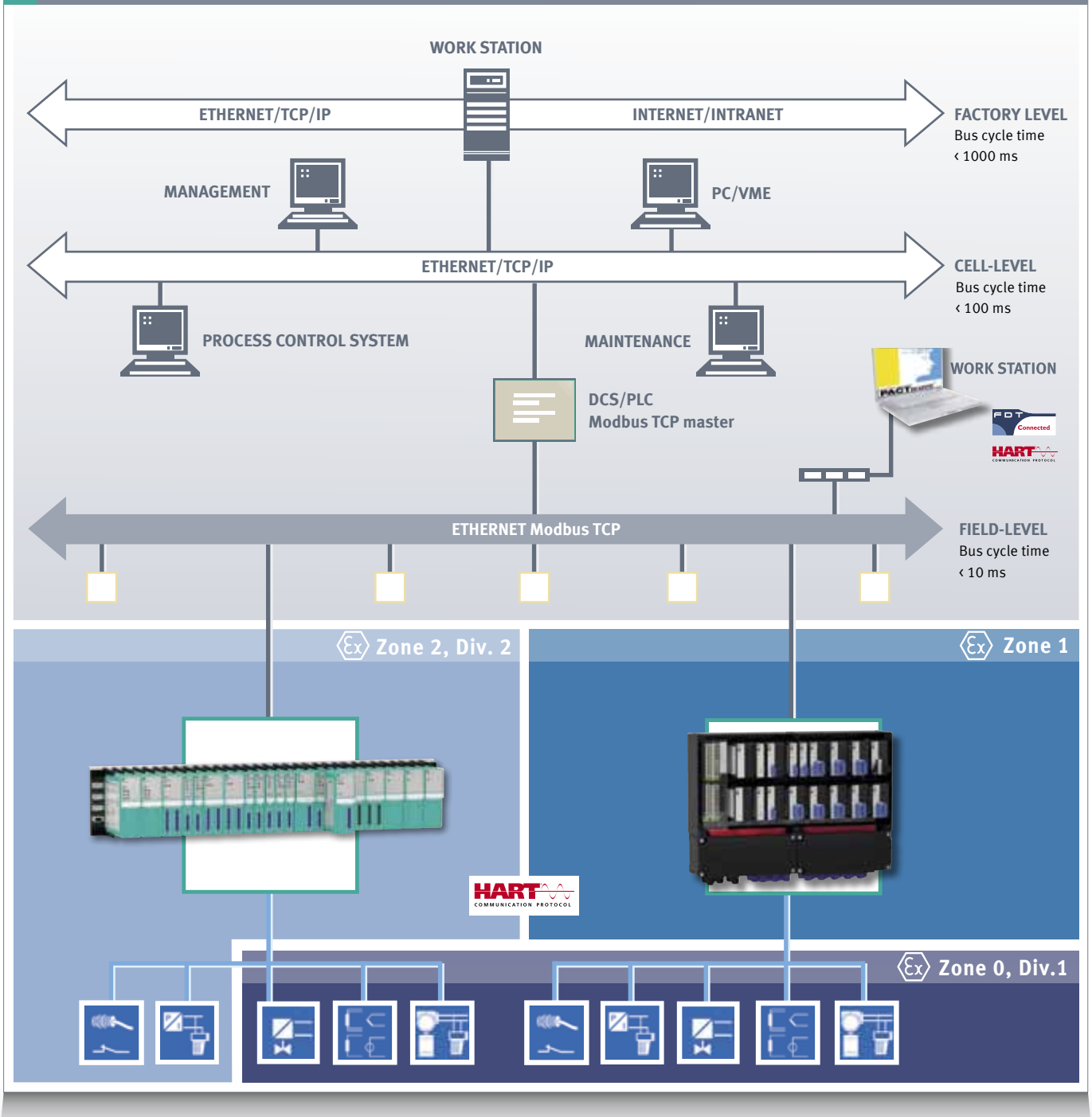
The I/O boxes only load the bus with the minimum 10 – 12 mA required by the standard. The power supply taps into the standard 24 V DC available around the plant in Class I, Div 2. There is also a 230 V or 115 V bulk power supply available when required.



INDUSTRIAL ETHERNET REACHES ZONE 2/DIV. 2, AND ZONE 1

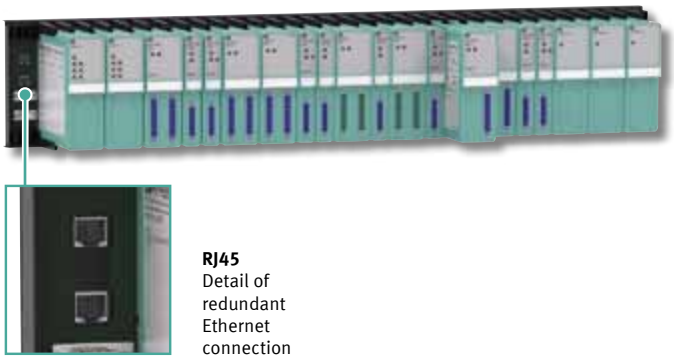
Industrial Ethernet is already widely used in the industry and is now finding its way into process instrumentation. Together with Remote I/O it can now be used on green field sites and even more so on legacy plants. In the past the communication path was based on the field-proven RS485 hardware using PROFIBUS or Modbus protocols. Now industrial ETHERNET is moving forward. All major DCS vendors offer industrial Ethernet links with the Modbus TCP protocol.

SYSTEM ARCHITECTURE



MODBUS TCP ZONE 2/DIV. 2 REMOTE I/O

The system architecture shows how industrial ETHERNET stretches from the control room to the field. Remote I/O is used to adapt all kinds of traditional digital and analog signals from NAMUR and temperature sensors, contacts, and frequency signals to solenoid or proportional valves, and positioners.



RJ45
Detail of redundant Ethernet connection

YOUR BENEFITS

- Ethernet is available from all major DCS vendors
- Ethernet makes use of existing network topologies. It is, therefore, often not necessary to lay new bus cables
- The Ethernet backbone of DCS and PLC architectures ensures that customers are familiar with Ethernet technology
- Network administrators can employ standard fault finding procedures
- No new hardware training required for service engineers

MODBUS TCP ZONE 1 REMOTE I/O

Industrial Ethernet even reaches Zone 1 hazardous areas employing increased safety cables. These make additional intrinsically safe converters superfluous cutting costs, simplifying the installation, and even ensuring higher availability.

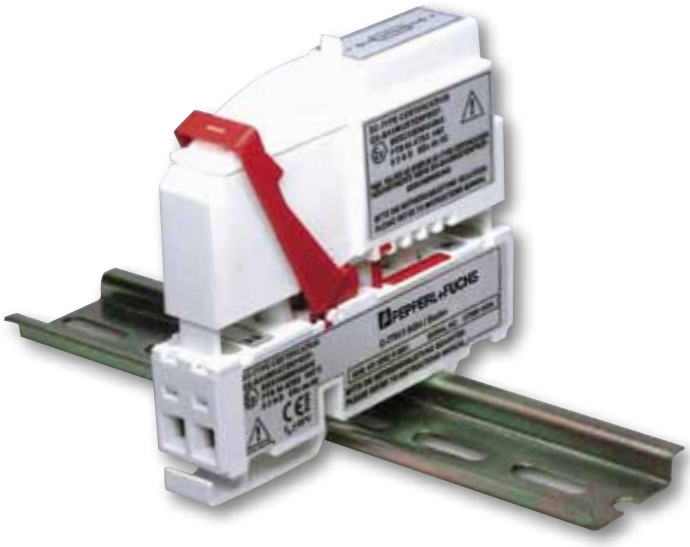
YOUR BENEFITS

- ETHERNET Remote I/O is easily integrated into the DCS environment using the long-established Modbus TCP standard
- Practically everyone is familiar with Modbus. No extensive training required to learn about how to configure the Remote I/O
- Ethernet switches are directly linked to Remote I/O in hazardous areas using enhanced safety Ex-e technology rather than employing additional isolators
- 80 analog, 184 digital channels per slave allow a very high packing density
- Mounted in Zone 2 or Div. 2 hazardous areas. Separate Zone 1 version.
- Optional power, bus, and gateway redundancy

POWER HOT SWAP IN ZONE 1

The multi function terminal for hazardous areas offers more energy than intrinsically safe circuits. This leads to the following advantages:

- Can be fitted with various type of modules including diodes, relays and other simple circuits
- Hot-swap in Zone 1



Multi function terminal with plug-in base

ADVANTAGES

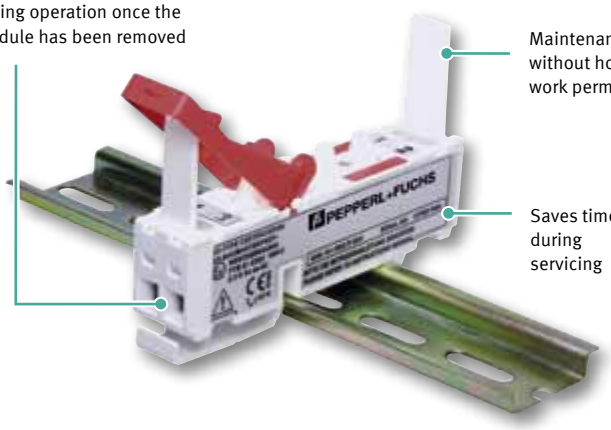
Simplifies engineering

Energy loops become interruptible as if they were intrinsically safe

Wires can be disconnected during operation once the module has been removed

Maintenance without hot work permit

Saves time during servicing



Multi function terminal after having been removed from the base

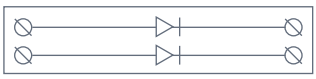
APPLICATIONS

- Fusing Ex-d solenoids, alarm indicators, sounders and diode decoupling of power supplies
- Simple OR-Gate for Zone 1 mounting, visible separation for field devices, relay switches, and power circuits
- Bus termination
- Current limiter
- Isolating relay

Bus termination module

Diode module

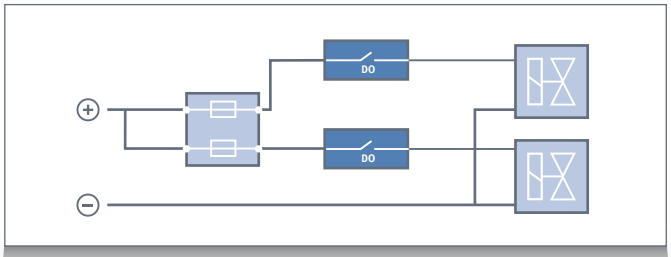
Resistor module



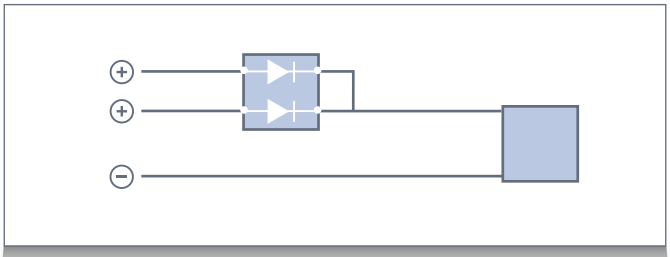
Dual diode module

Fuse module

Relay module



Example: solenoid driver loop



Example: redundant power supply

FIBER OPTICS BRIDGE LONG DISTANCES AT TOP SPEED

The PROFIBUS Fiber Optic Coupler and Repeater FOL 7250 converts PROFIBUS into fiber optic signals. Thus, great distances can be bridged at high transmission rates (1,000 m at 1.5 Mbit/s) while complete galvanic isolation between field and control room is maintained. The FOL 7250 can be used as a point-to-point coupler or in a redundant ring. It automatically adapts to the PROFIBUS transmission rate, detects line faults and performs an automatic redundancy switch-over. The FOL 7250 can be mounted in a Zone 1 hazardous area. In combination with the PROFIBUS Fiber Optic Coupler for assembly in Zone 2 or non-hazardous area, the FOL 7250 is suitable for a PROFIBUS connection of a Remote I/O System.

ELECTRONIC INSERT
Electronic insert encapsulated for harsh environment

EX-E TERMINALS
Terminals for power supply, PROFIBUS and diagnostics contact

FIBER OPTIC CABLE
Single/redundant bridging of long distances

POWER SUPPLY
Increased safety connection

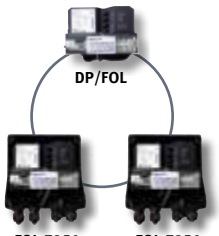
DIAGNOSTICS LEDS
PROFIBUS quality
Fiber optic quality

FUNCTION SELECTOR SWITCH
- Single/redundant operation
- Optical ring
- RS485 monitoring
- Fiber optic monitoring
- Bus termination on/off

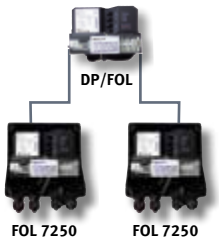
EX-E TERMINALS
for measuring optical power of ch2, ch3

DIAGNOSTICS CONTACT
Ex-e contact indicates transmission error

PROFIBUS
Ex-e connection to the PROFIBUS devices in Zone 1



Ring topology



Star topology

HOUSING TYPES


DIN-rail module


GRP polyester housing


Stainless steel housing

YOUR BENEFITS

- For any PROFIBUS interface, e.g., Remote I/O, Valves, Drives, Inverters, Controllers
- Full galvanic isolation between field and control room
- Very high noise immunity
- Intrinsically safe light energy
- Automatic baud rate detection
- Star, ring, or line topology selectable
- Automatic redundancy change-over
- Bus termination switch selectable

PROCESS AUTOMATION – PROTECTING YOUR PROCESS

For over a half century, Pepperl+Fuchs has been continually providing new concepts for the world of process automation. Our company sets standards in quality and innovative technology. We develop, produce and distribute electronic interface modules, Human-Machine Interfaces and hazardous location protection equipment on a global scale, meeting the most demanding needs of industry. Resulting from our world-wide presence and our high flexibility in production and customer service, we are able to individually offer complete solutions – wherever and whenever you need us. We are the recognized experts in our technologies – Pepperl+Fuchs has earned a strong reputation by supplying the world's largest process industry companies with the broadest line of proven components for a diverse range of applications.

1 Worldwide/German Headquarters
Pepperl+Fuchs GmbH
Mannheim · Germany
Tel. +49 621 776 2222
E-Mail: pa-info@pepperl-fuchs.com

2 Asia Pacific Headquarters
Pepperl+Fuchs PTE Ltd.
Singapore
Company Registration No. 199003130E
Tel. +65 6779 9091
E-Mail: pa-info@sg.pepperl-fuchs.com

3 Western Europe & Africa Headquarters
Pepperl+Fuchs N.V.
Schoten/Antwerp · Belgium
Tel. +32 3 6442500
E-Mail: pa-info@be.pepperl-fuchs.com

4 Middle East/India Headquarters
Pepperl+Fuchs M.E (FZE)
Dubai · UAE
Tel. +971 4 883 8378
E-mail: pa-info@ae.pepperl-fuchs.com

5 North/Central America Headquarters
Pepperl+Fuchs Inc.
Twinsburg · Ohio · USA
Tel. +1 330 486 0002
E-Mail: pa-info@us.pepperl-fuchs.com

6 Northern Europe Headquarters
Pepperl+Fuchs GB Ltd.
Oldham · England
Tel. +44 161 6336431
E-Mail: pa-info@gb.pepperl-fuchs.com

7 Southern/Eastern Europe Headquarters
Pepperl+Fuchs s.r.l.
Sulbiate (MB) · Italy
Tel. +39 039 62921
E-Mail: pa-info@it.pepperl-fuchs.com

8 Southern America Headquarters
Pepperl+Fuchs Ltda.
São Bernardo do Campo · SP · Brazil
Tel. +55 11 4007 1448
E-Mail: pa-info@br.pepperl-fuchs.com

www.pepperl-fuchs.com

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