Industrial remote communication

Worldwide remote access to machines and systems

PHŒNIX CONTACT

INSPIRING INNOVATIONS

Industrial remote communication

Securely connecting distributed stations with the control room is made possible, thanks to the versatile possibilities of remote communication. Remote communication enables access as well as continuous process data monitoring from the central station.

Remote maintenance involves temporary access to a system or machine. In contrast to remote maintenance, remote control requires a permanent connection to a remote station in the vast majority of cases. Various alerting systems ensure the timely notification of a wide range of operating states and enable the reliable availability of your system.
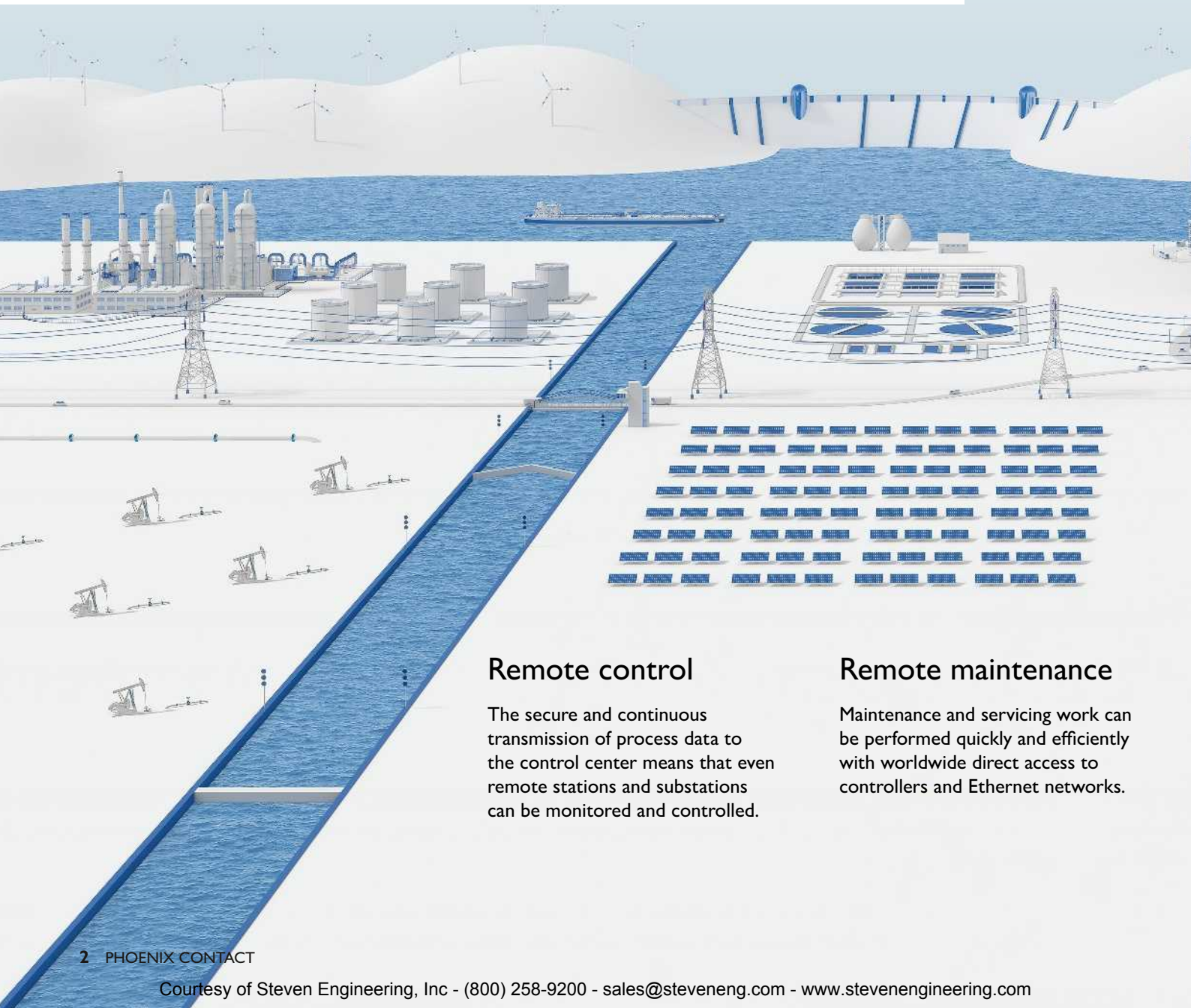
Remote control

The secure and continuous transmission of process data to the control center means that even remote stations and substations can be monitored and controlled.

Remote maintenance

Maintenance and servicing work can be performed quickly and efficiently with worldwide direct access to controllers and Ethernet networks.

Contents

Alerts

Errors are quickly eliminated and
production downtimes minimized
with proactive and precise early
warning messages via SMS or
e-mail.

Networking

WLAN, Bluetooth, and fiber optics
technologies enable the easy and
interference-free connection of
various system parts, remote
stations, and substations.

Remote control technology for every application

Remote control, alerts, and networking – we will provide you with tailored solutions for your challenge, whatever the application.

Our portfolio includes versatile possibilities for combining cable-based and wireless transmission media, as well as transmission protocols.

This brochure presents an overview of the possibilities and advantages offered by our portfolio.

Modular controllers and remote control stations
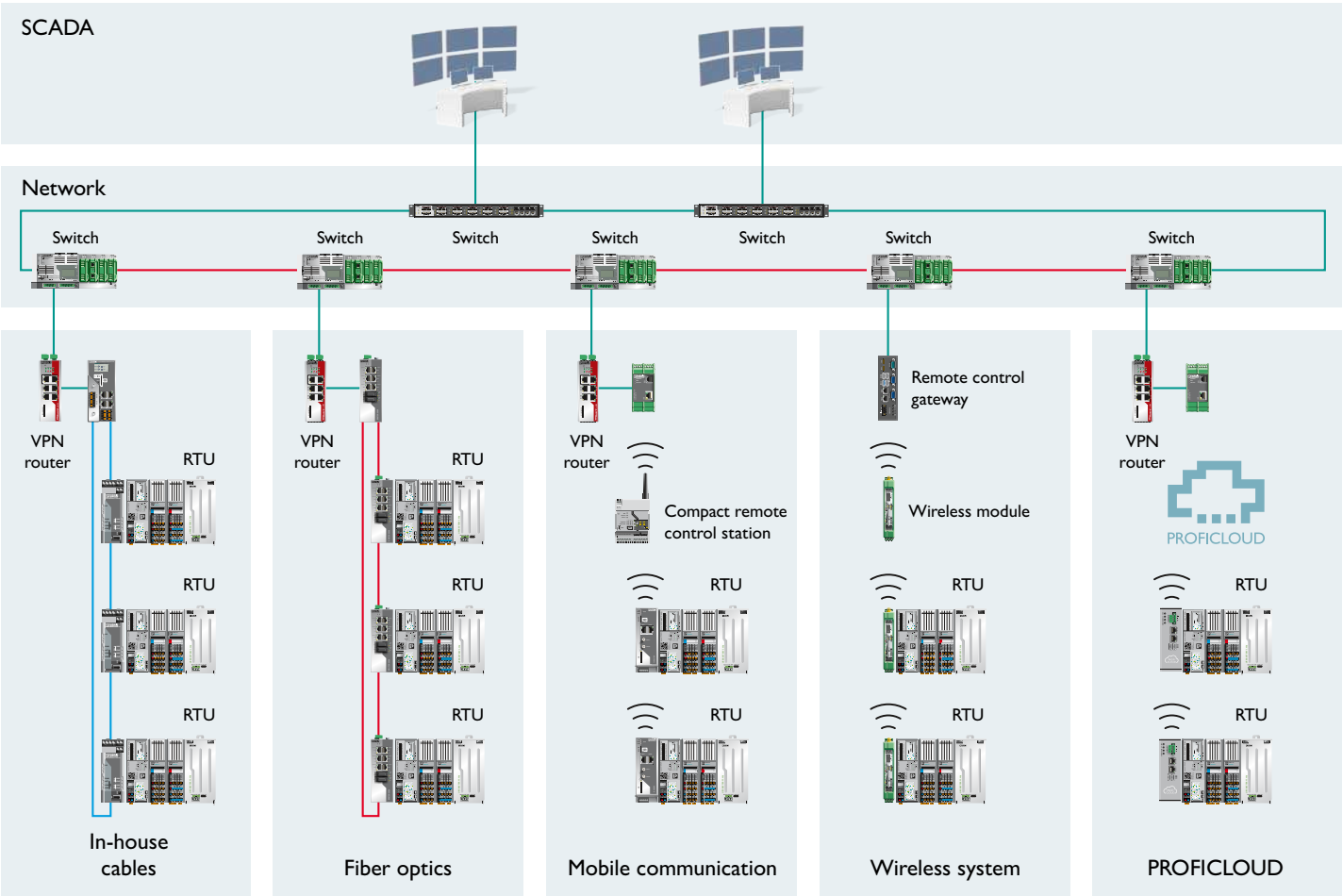
Cable-based communication technology

Network security

Wireless communication technology

Transmission media and communication protocols

Transmission protocols	Cable-based systems	Mobile network systems	Public telephone network	Wireless systems
Remote control protocols				
IEC 60870-5-101	●	●	●	●
IEC 60870-5-104	●	●	●	●
IEEE 1815 – DNP3	●	●	●	●
ODP – Open Data Port	●	●	●	●
Fieldbus protocols				
Modbus/RTU	●	●	●	●
Modbus/TCP	●	●	●	●
PROFIBUS	●	–	–	●
PROFINET	●	–	–	●

Remote control technology from the control system through to the field level

Modern control systems have a wide range of remote control technology interfaces, such as IEC 60870-5-104 and DNP3, for 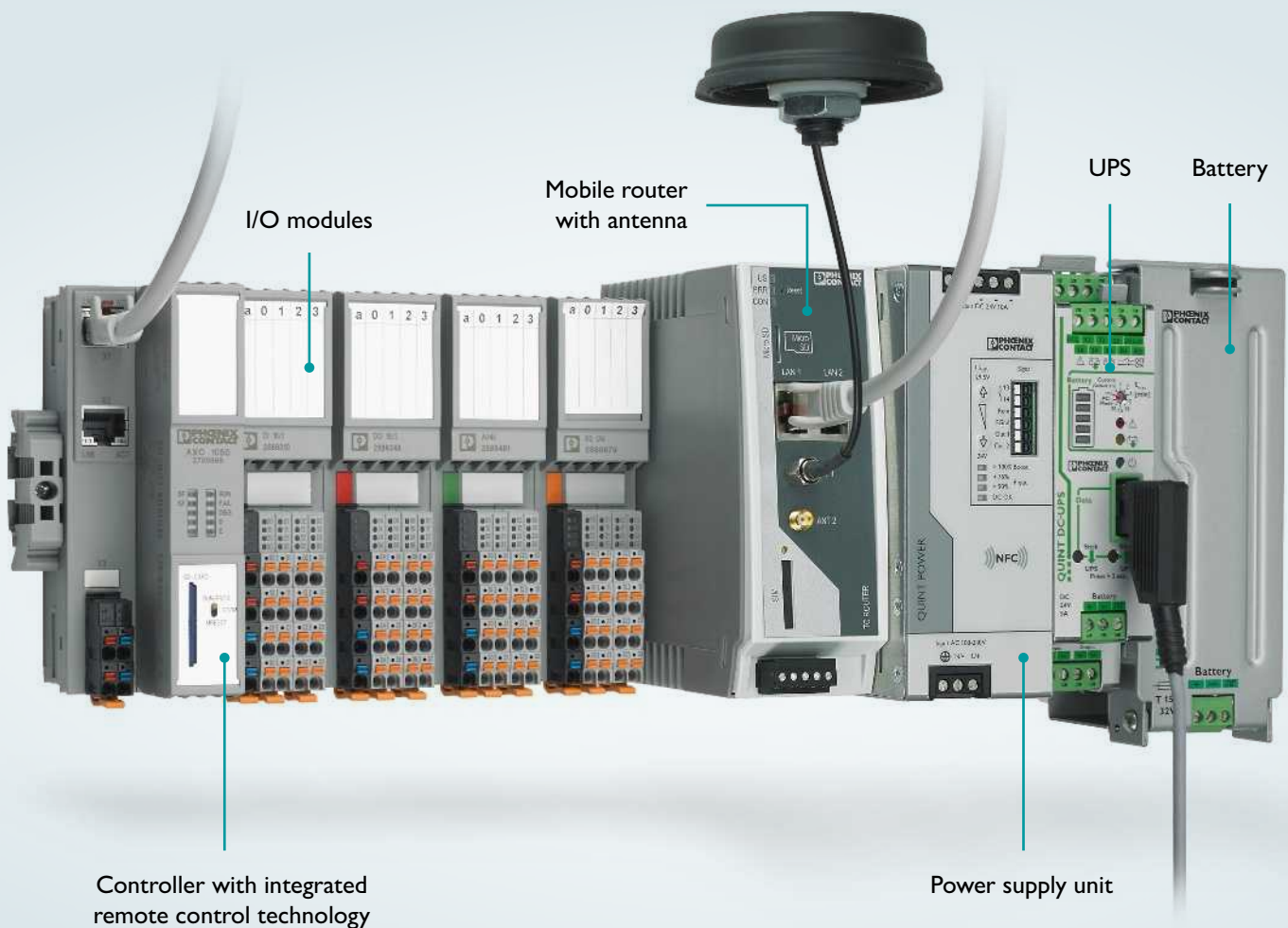example. Phoenix Contact offers you the communication infrastructure for efficiently coupling these protocols with your automation system. Modular remote control stations enable data transmission tailored to your application, e.g. in the supply of energy, water, gas, and district heating.

SCADA

Network

Switch   Switch   Switch   Switch   Switch   Switch   Switch

VPN router   VPN router   VPN router   Remote control gateway   VPN router

RTU   RTU   Compact remote control station   Wireless module   PROFICLOUD

RTU   RTU   RTU   RTU   RTU

RTU   RTU   RTU   RTU   RTU

In-house cables   Fiber optics   Mobile communication   Wireless system   PROFICLOUD

Solutions for remote control technology

Phoenix Contact provides modular remote control stations and application-specific systems for existing and new systems. The solutions take into consideration both industry-specific framework conditions and customer-specific requirements, in order to ensure ideal adaptation to the system structure. The application software ensures reliable operation and secure transmission to the control room. Data can be prepared and presented flexibly, thanks to visualization.

I/O modules

Mobile router with antenna

UPS

Battery

Controller with integrated remote control technology

Power supply unit

Individual remote control stations

Modular remote control station

AXC 1050	Ord. No. 2700988
ILC 151 GSM/GPRS	Ord. No. 2700977
ILC 191 ETH 2TX	Ord. No. 2700976
SD FLASH 2GB APPLIC A	Ord. No. 2701190

Remote control and automation in one: based on various controllers which form the intelligent head of the Remote Terminal Unit (RTU).
- Ideally tailored to individual requirements, as modular expansion is supported
- Versions for harsh industrial environments also available

Compact remote control station

TC MOBILE I/O X300 AC	Ord. No. 2903808
TC MOBILE I/O X300	Ord. No. 2903807

Compact GPRS remote control systems and signaling systems for mobile networks, for monitoring analog and digital values as well as for switching relay outputs remotely.
- Communication via ODP protocol
- SMS alerts in the event of voltage failure
- Large supply voltage range (AC or DC)

Function block libraries

RESY+	Ord. No. 2400295

Transmission of process data via Industrial Wireless, mobile network, fixed-line network, and Ethernet.
- Easy: transmit remote signals wirelessly
- Cost-effective: up to 20 km network connections via existing remote control cables
- Secure: thanks to the use of standardized protocols

Well automation

WellControl	Ord. No. 2403104

Control and regulation of groundwater wells.
- Configuration instead of programming
- Connection to the control center via the remote control protocol IEC 60870-5-104
- Straightforward connection of branch-specific field devices
- Reliable supply, thanks to an intelligent surge protection and power supply concept

Pump automation

PumpControl	Ord. No. 2403365

Operation and monitoring of single and dual pump stations.
- Standardized interfaces for integrating application-specific measuring technology
- Quick parameterization and simple diagnostics via an integrated touch panel
- Integrated remote control interface for transmitting data to the higher-level control system and for sending SMS messages

Pipeline leakage monitoring

Monitoring the operating parameters along the length of a pipeline.
- Secure data transmission via the Internet
- Generation of precise time stamps for the measurement data
- Measurement station time synchronization
- Integration of various measuring signals based on 4…20 mA signals, including from the Ex area

Remote control via in-house cables

Network remote communication devices easily and efficiently via any 2-wire cables. Use existing telephone or master cables, for example, to create a particularly economical network for Ethernet, PROFIBUS, or RS-232/RS-422/RS-485 communication.

Install Ethernet or PROFIBUS cables in combination with the extenders to extend the transmission range beyond the corresponding standard and up to as much as 20 km per extender segment.

Your advantages

- ☑ Ethernet, PROFIBUS, RS-232, RS-422, and RS-485 communication via any 2-wire cables up to 20 km
- ☑ Cost savings, thanks to the use of existing copper wires
- ☑ Time savings, thanks to quick and easy startup, in part via Plug and Play
- ☑ Excellent failsafe performance, thanks to path redundancy: point-to-point 4-wire, or in part via ring redundancy

PROFIBUS/serial extender

RS-232
RS-422
RS-485

Application description

Network remote serial fieldbus devices easily, efficiently, and cost effectively, via existing cables. Special PROFIBUS or RS-232/RS-422/RS-485 cables are not required for ranges up to 20 km.
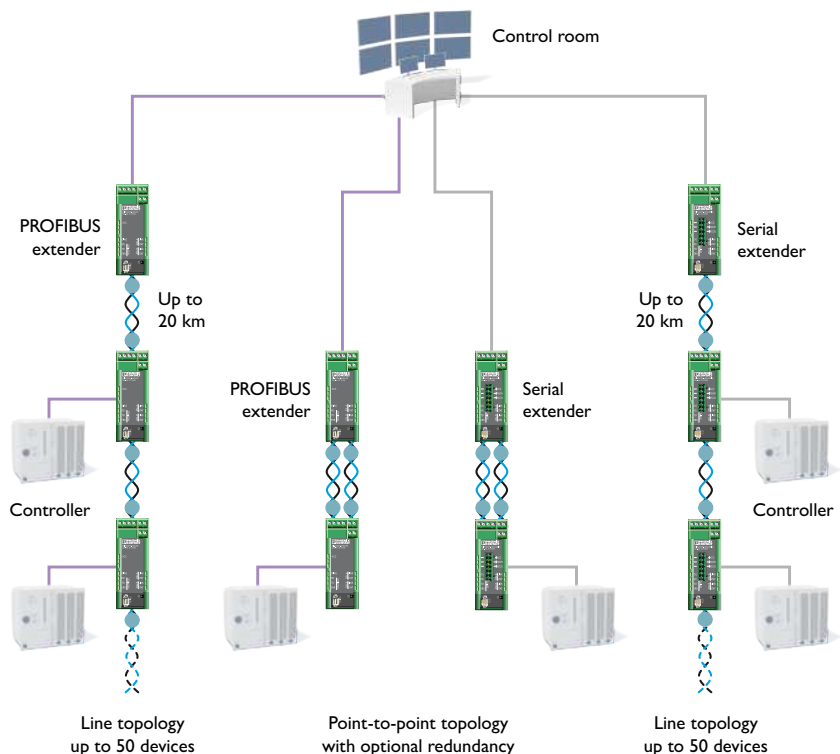
PROFIBUS extender

PSI-MODEM-SHDSL/PB

Ord. No. 2313656

- Point-to-point/line topology
- 2 SHDSL ports
- 1 PROFIBUS port
- 2- or 4-wire operation data rate of up to 15.3 Mbps
- Typical PROFIBUS data rate of 1.5 Mbps at approx. 1.5 km
- 4-wire redundancy operation possible

Serial extender

PSI-MODEM-SHDSL/SERIAL

Ord. No. 2313669

- Point-to-point/line topology
- 2 SHDSL ports
- RS-232, RS-422 or RS-485 can be selected
- 2 or 4-wire operation data rate of up to 15.3 Mbps
- RS-232 up to 230.4 kbps (automatic DTE/DCE switchover)
- RS-422/RS-485 up to 2000 kbps
- 4-wire redundancy operation possible

Serial fieldbus communication via any 2-wire cables up to 20 km

PROFIBUS extender
- PROFIBUS transmission with up to 1.5 Mbps over distances of approx. 1.5 km without using special cables
- 1 PROFIBUS port

Serial extender
- RS-232, RS-422 or RS-485 can be selected
- RS-232 up to 230.4 kbps (automatic DTE/DCE switchover)
- RS-422/RS-485 up to 2000 kbps
- Termination resistor, can be enabled/ disabled (RS-485 W2)

Control room

PROFIBUS extender

Up to 20 km

Controller

PROFIBUS extender

Serial extender

Serial extender

Up to 20 km

Controller

——— PROFIBUS
——— Serial
SHDSL (2-wire)
Surge protection

Line topology up to 50 devices

Point-to-point topology with optional redundancy

Line topology up to 50 devices

Intelligent Ethernet extender system

Managed Ethernet extender

TC EXTENDER 6004 ETH-2S

Ord. No. 2702255

- Remote diagnostics via IP: web-based or SNMP
- Point-to-point, line, and ring topologies
- 2 SHDSL ports
- 2-wire operation up to 15.3 Mbps
- 4-wire operation up to 30 Mbps
- 4 Ethernet ports
- Local diagnostics via display

Managed Ethernet extender

TC EXTENDER 4001 ETH-1S

Ord. No. 2702253

- Remote diagnostics via IP: web-based or SNMP
- Point-to-point topologies
- 1 SHDSL port
- 2-wire operation up to 15.3 Mbps
- 1 Ethernet port
- Local diagnostics via LED

Unmanaged Ethernet extender

TC EXTENDER 2001 ETH-2S

Ord. No. 2702409

- Point-to-point, line, and ring topologies
- 2 SHDSL ports
- 2-wire operation up to 15.3 Mbps
- 4-wire operation up to 30 Mbps
- 1 Ethernet port
- Local diagnostics via LED

Easy connection and monitoring of extended IP networks

Acting as an extender system, the devices not only connect simple point-to-point Ethernet applications, but also extended IP networks.

All extender paths and devices can be easily monitored remotely using a single managed device.

Managed Ethernet extender
- Alerts issued regarding all system results via SNMP
- Remote diagnostics via IP: web-based or SNMP
- Replaceable surge protection (state monitoring via SNMP)

Ethernet
SHDSL (2-wire)
Surge protection

Line topology

Ring-star topology
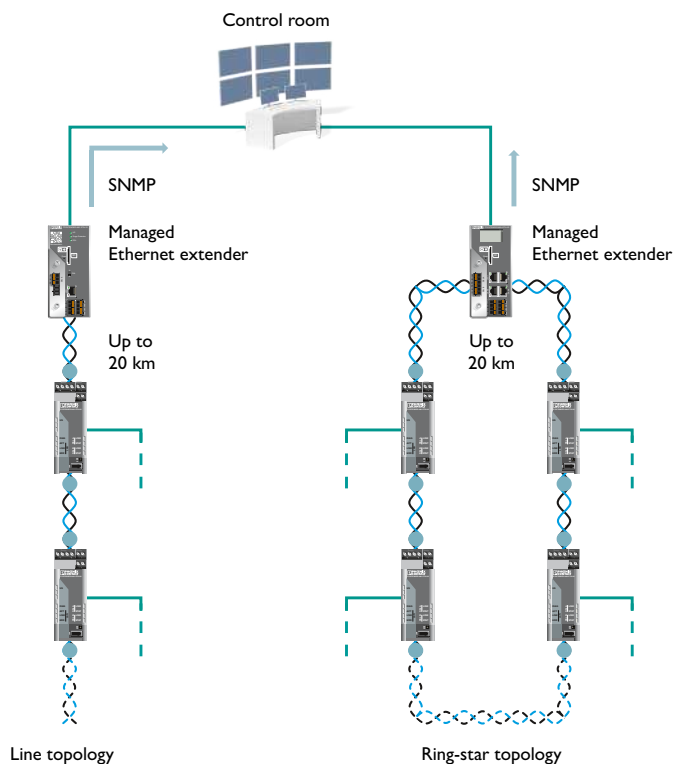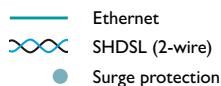
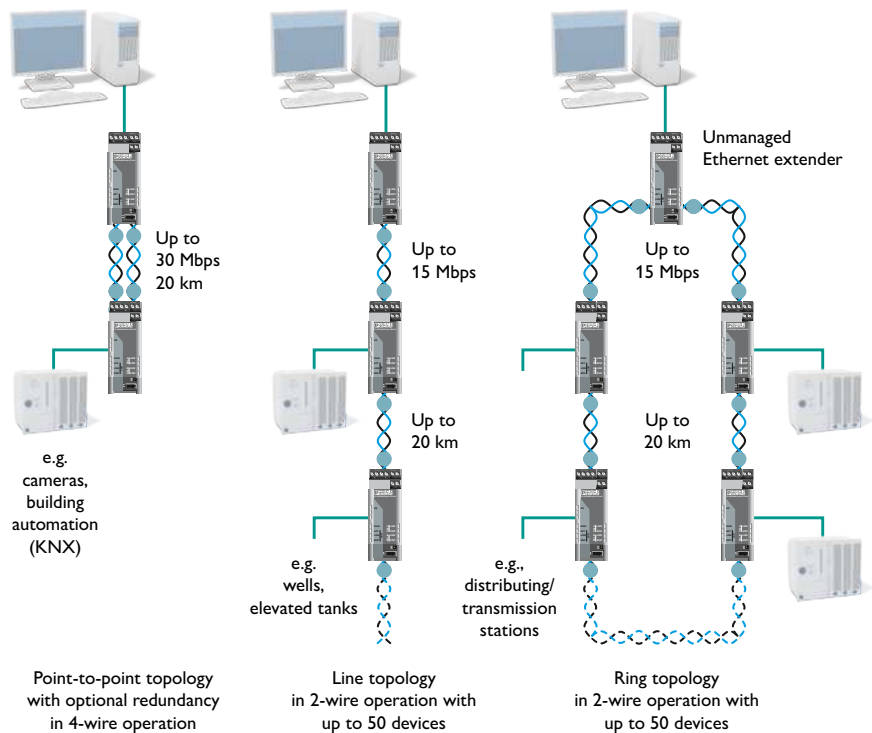## IP communication via any two-wire cables up to 20 km

Existing two-wire cables can be used for networking. The system can be extended during operation without causing any adverse impact.

Basic features of fast startup via Plug and Play:
- No configuration required
- Time and money can be saved thanks to the automatic topology and data rate detection
- Flexible use in point-to-point, line and ring topologies

Unmanaged Ethernet extender
- No separate IP address (no IP address and network configuration)
- Transparent transmission of all standard Ethernet protocols: EtherNet/IP, Modbus/TCP, PROFINET, PROFIsafe, EtherCAT, KNX and BACnet/IP

Up to
30 Mbps
20 km

e.g.
cameras,
building
automation
(KNX)

Point-to-point topology
with optional redundancy
in 4-wire operation

Up to
15 Mbps

Up to
20 km

e.g.
wells,
elevated tanks

Line topology
in 2-wire operation with
up to 50 devices

Unmanaged
Ethernet extender

Up to
15 Mbps

Up to
20 km

e.g.,
distributing/
transmission
stations

Ring topology
in 2-wire operation with
up to 50 devices

Using VLAN to virtually separate critical IP networks and make them secure
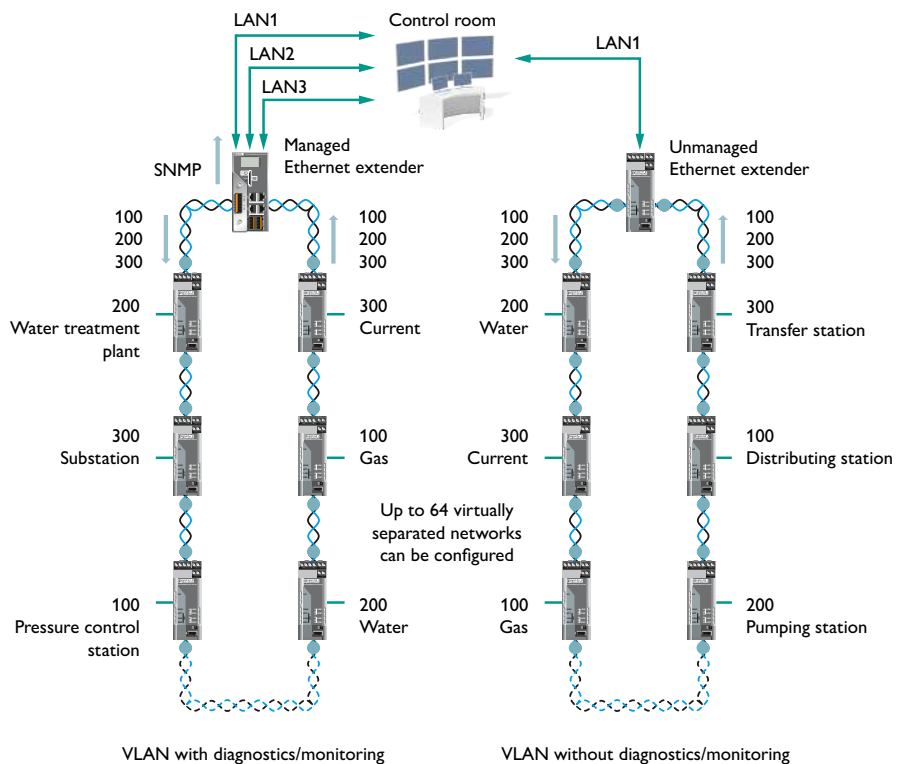
In firmware version v5.xx and later, VLAN (virtual local-area-network) can be used to virtually isolate critical IP networks and make them even more secure.

VLAN (virtually/logically separate IP networks):
By setting up virtual networks in the Ethernet extender system, you limit access to Ethernet end devices easily and individually, which increases the security throughout the entire IP network. As such, communication is only possible within a VLAN.

Startup without expert knowledge:
- VLAN configuration using a software wizard

LAN1
LAN2
LAN3
Control room
LAN1

SNMP
Managed
Ethernet extender
Unmanaged
Ethernet extender

100
200
300

100
200
300

100
200
300

100
200
300

200
Water treatment
plant

300
Current

200
Water

300
Transfer station

300
Substation

100
Gas

300
Current

100
Distributing station

Up to 64 virtually
separated networks
can be configured

100
Pressure control
station

200
Water

100
Gas

200
Pumping station

— Ethernet
⋈⋈ SHDSL (2-wire)
● Surge protection

VLAN with diagnostics/monitoring

VLAN without diagnostics/monitoring

Remote control with wireless systems

With wireless systems, you simply record measuring data and system information from distant or poorly accessible areas and transfer it to central points.

For remote control technology, this is a reliable and inexpensive alternative to new cable paths, particularly during the installation of new system components or the replacement of defective communication cables. The wireless modules have various interfaces and act as a gateway between local sensors and actuators of the process station and the control center.

Your advantages

- ☑ Quick and easy startup without programming
- ☑ Easy point-to-point or network connections (star, mesh)
- ☑ Can be extended with up to 32 I/O modules per station via DIN rail connectors (hot-swap capability)
- ☑ Adjustable wireless interface data rates
- ☑ 128-bit data encryption (AES)

It's easy with Radioline

Easy installation

Create a modular wireless station in the control cabinet and extend or replace it easily during operation.

Unique addresses for front modules

Set a unique address on the front module by simply turning the thumbwheel.
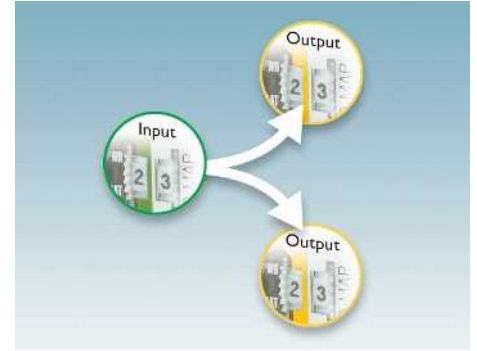
Distribute inputs and outputs

The thumbwheel on the I/O module is used to assign the inputs and outputs by creating pairs, thereby easily distributing the I/O signals in the system.

The Radioline system – Easy signal distribution with I/O mapping

Radioline is the Phoenix Contact transmission system for extended systems and networks with up to 250 stations. Special features include extremely easy assignment of inputs and outputs by simply turning the thumbwheel – without any programming.

Radioline features:
- Fast and easy startup without programming
- Easy point-to-point or network connections (line, star, mesh)
- Modular station structure with up to 32 I/O modules per station via DIN rail connectors
- Transmission of I/O signals and serial data
- Trusted Wireless technology
- Can be combined with RS-485 stations

The I/O extension modules feature:
- Easy I/O mapping via the thumbwheel with no need for programming
- Easy module replacement, even during operation (hot-swap capability)
- Channel-to-channel electrical isolation
- Extended temperature range: -40°C to +70°C

Product overview

Radioline wireless modules

Europe 868 MHz	Ord. No. 2904909
America, Canada 900 MHz	Ord. No. 2901540
Australia 900 MHz	Ord. No. 2702878
Worldwide 2400 MHz	Ord. No. 2901541
Japan 2400 MHz	Ord. No. 2702863

- Range up to 32 km
  (depending on frequency band)
- Suitable for large distances with obstacles
  (868/900 MHz)
- Transmission time typically 100 ms
  up to a few seconds (depending on
  frequency band, range, and network size)

Radioline extension modules

4 digital inputs	Ord. No. 2901535
8 digital inputs	Ord. No. 2901539
4 digital outputs	Ord. No. 2901536
8 digital outputs	Ord. No. 2902811
2 digital inputs, 2 digital outputs 1 analog input, 1 analog output	Ord. No. 2901533
4 analog inputs	Ord. No. 2901537
4 analog outputs	Ord. No. 2901538
PT100 temperature model	Ord. No. 2904035

## One device – A wide range of applications

Radioline is very versatile, thanks to
the fact that it can transmit I/O signals
as well as serial data – the Trusted Wireless
technology ensures reliable transmission
even in harsh industrial environments,
regardless of the protocol type. The
Radioline function blocks for PC Worx,
STEP 7, and TIA Portal enable easy
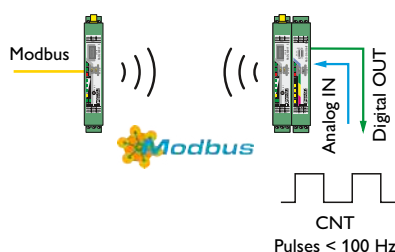I/O integration in the control level.

PC Worx/STEP 7 function blocks
- Free Radioline library
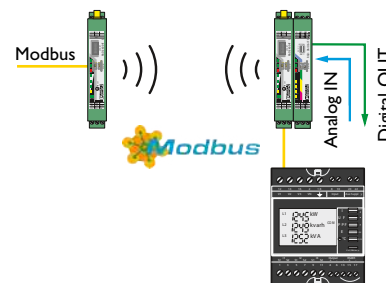- Central monitoring of wireless stations
  in the control system
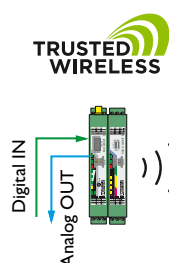
I/O data mode
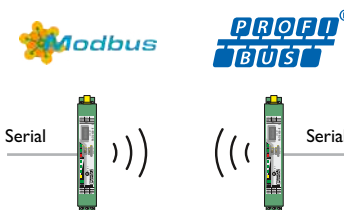
Serial data mode

PLC/Modbus RTU mode

CNT
Pulses < 100 Hz

PLC/Modbus RTU dual mode

Mobile set with antennas

ILB BT ADIO MUX-OMNI

Ord. No. 2884208

- Two permanently paired modules
- Ranges of up to 200 m outdoors
- 16 digital and 2 analog inputs and outputs
- No configuration or settings necessary
- Bluetooth 4.0 technology
- Transmission time typically 10 ms


Wireless set without antennas

ILB BT ADIO MUX

Ord. No. 2702875

- Two permanently paired modules
- Ranges of up to 400 m outdoors with directional antennas
- 16 digital and 2 analog inputs and outputs
- No configuration or settings necessary
- Bluetooth 4.0 technology
- Transmission time typically 10 ms

The wireless signal cable

The Wireless-MUX transmits 16 digital and two analog signals robustly and quickly, without any configuration.

Controller

Up to 400 m

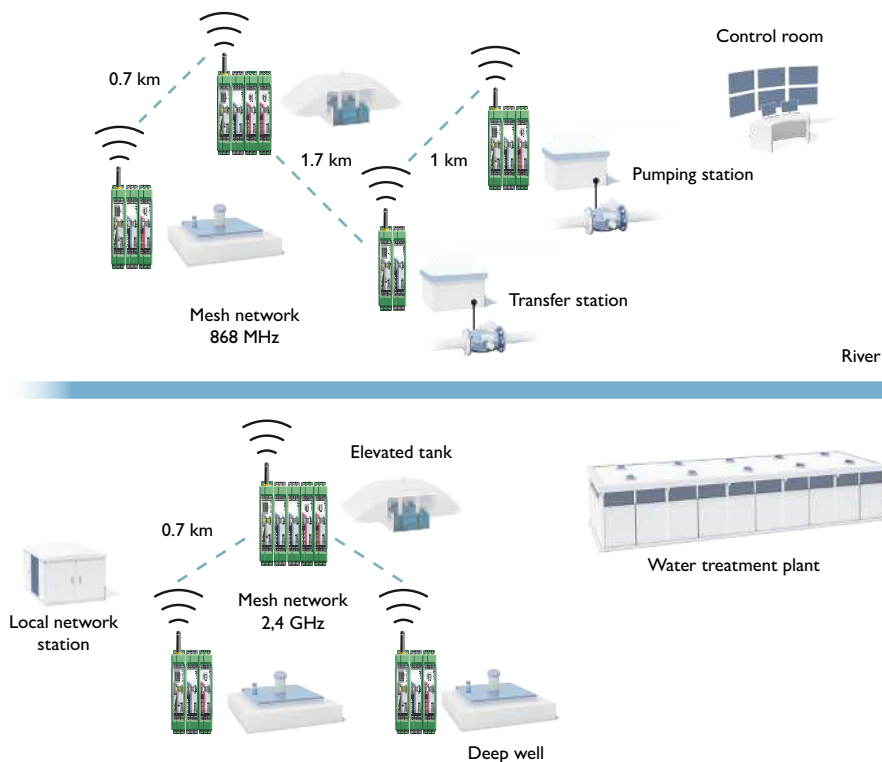Wireless set
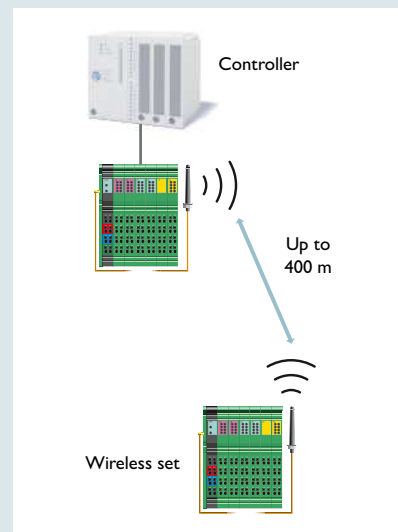
Application example

Within the peripheral, highly branched system structures, measured values and other operating information must be transmitted securely, fill levels monitored, and pump performance and flow rates logged continuously.

Application
- In the event of damaged grounding cables and extensive repair work
- Networking of external buildings with the control system (no line of sight)
- Recording standby messages, pump delivery volume, flow, fill level

Advantages
- Easy startup
- Private wireless network – provider-independent
- Time and cost savings compared to cable laying

0.7 km

Control room

1.7 km   1 km

Pumping station

Transfer station

Mesh network
868 MHz

River

Elevated tank

0.7 km

Water treatment plant

Local network station

Mesh network
2,4 GHz

Deep well

Remote control via the mobile network

For the continuous acquisition of your process data, Phoenix Contact offers mobile network devices which support all carrier technologies, from SMS texts through to data communication via GPRS/EDGE (2G), UMTS/HSPA (3G), and LTE (4G). With the globally available mobile network, the devices become a reliable communicator, even in areas with a weak infrastructure.

The smallest remote stations and entire system parks, such as remote pumping stations, can be connected to the control center using methods spanning from SMS over remote control protocols at low-data rates to broadband VPN connection, depending on the communication requirements.

Your advantages

- ☑ Can be used from any location, thanks to worldwide mobile network
- ☑ Scalable by SMS messages via streamlined IP remote control protocols up to LTE broadband connection
- ☑ Total network security, thanks to private APN, firewall, and VPN
- ☑ Mobile router, with extended temperature range for all infrastructure applications
- ☑ Compact mobile module, for economically connecting the smallest system parts

Broadband communication

Industrial mobile router	LTE, 4G		UMTS/HSPA, 3G		LTE, 4G (USA)	
Type	TC ROUTER 3002T-4G	TC ROUTER 2002T-4G	TC ROUTER 3002T-3G	TC ROUTER 2002T-3G	TC ROUTER 3002T-4G VZN	TC ROUTER 3002T-4G ATT
Ord. No.	2702528	2702530	2702529	2702531	2702532	2702533
Version	European version: firewall and VPN for secure communication	European version: firewall for secure Internet connection	European version: firewall and VPN for secure communication	European version: firewall for secure Internet connection	Version for Verizon Wireless mobile networks with a firewall and VPN	Version for AT&T mobile networks with firewall and VPN
VPN function	3 VPN connections via IPsec or OpenVPN	–	3 VPN connections via IPsec or OpenVPN	–	3 VPN connections via IPsec or OpenVPN	
Technology fallback	2G fallback (GPRS/EDGE) and 3G fallback (UMTS/HSPA)		2G fallback (GPRS/EDGE)		–	3G fallback (UMTS/HSPA)
Temperature range	-40°C … +70°C					
Signal contacts	2DI / 1DO					

Broadband connection for distributed systems

Mobile technology provides a secure communication solution for applications with a large data throughput. In an LTE network, monitoring images and server functions are made available to the control center from around the globe. The routers with VPN functionality enable closed communication on the Internet. The data traffic can be transmitted directly to the control room via VPN. Thus, for example, it is possible to connect wind turbine generators via camera applications, or to connect to the network of a sewage treatment plant. The routers without VPN functionality represent an alternative for applications that only need a simple Internet connection. They are also suitable for applications in which VPN is already installed in the downstream end device.
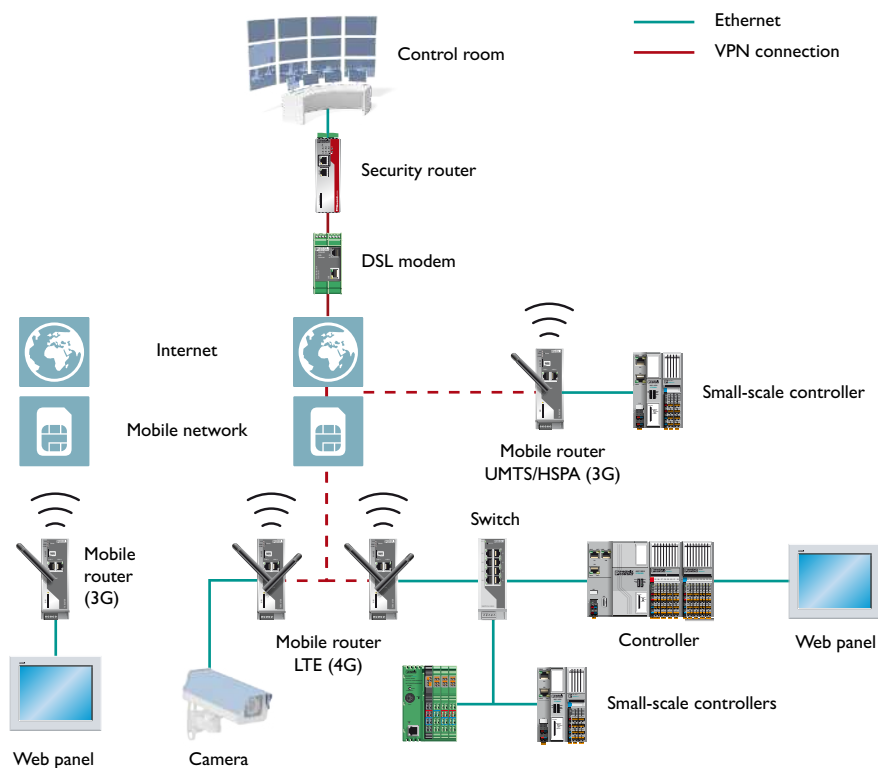
Data-minimizing communication

GPRS remote control system and signaling system

TC MOBILE I/O X300   Ord. No. 2903807

- Power supply: 10 … 60 V DC
- 2 analog and 4 digital inputs as well as 4 relay outputs
- Data is transmitted continuously or as historical values with time stamp
- Switching, alerts, and monitoring via ODP protocol GPRS (2G)
- User-friendly configuration via web browser and USB

GPRS remote control system and signaling system

TC MOBILE I/O X300 AC   Ord. No. 2903808

- Power supply: 93 … 250 V AC
- 4 digital inputs and 4 relay outputs
- Data is transmitted continuously or as historical values with time stamp
- Switching, alerts, and monitoring via ODP protocol GPRS (2G)
- User-friendly configuration via web browser and USB

Continuous communication

Small and widely distributed remote stations with just a few I/O points render cable-based communication networks economically unviable. Oftentimes, local wireless technologies may also be unable to cover the distances to the system. Mobile technology provides a compromise here between communication costs and system availability.

With the ODP (Open Data Port) remote control protocol, the data volume, and therefore the communication costs, can be scaled depending on the requirements. The protocol can be transmitted via the TC MOBILE I/O X300 compact remote control station or directly from a controller with mobile router. It can be used to integrate applications such as the switching of street lighting using hundreds of substations in an economically viable manner.

Event-controlled communication
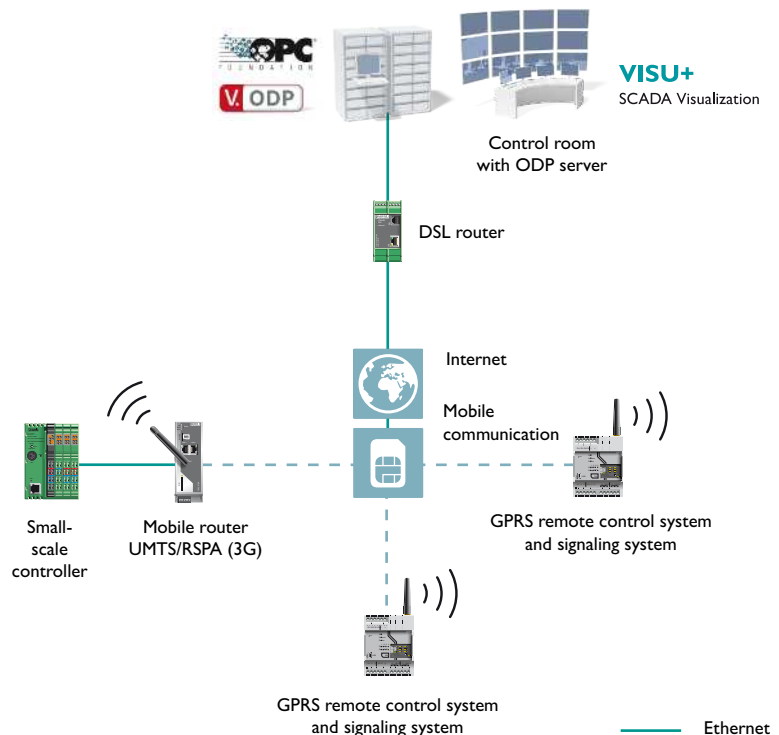
For certain distributed tasks, continuous communication via the ODP protocol is more than is required. SMS technology is ideally suited for a low number of switching operations or a large number of different actuators. A remote process can be controlled via SMS commands with a pre-paid card without being bound to a contract.

Using the SMS version of the TC MOBILE I/O X200 remote control system, access controls can be implemented with an ordinary mobile phone by activating the door lock releasing system or systems can be reactivated in the event of an error. The I/Os of a controller can be connected via SMS or the VPN tunnel can be initialized on demand through the existing software interface of the mobile router. This combines both advantages of continuous and event-controlled remote control.

Ethernet	
VPN connection	

Control room

Smart end devices

Security router

RESY+
Remote Control

Controller with
SMS remote
control library

Mobile router
UMTS/HSPA (3G)

DSL modem

Internet

Mobile network

I/O signals

Small-scale
controller

Mobile router
UMTS/HSPA (3G)

Small-scale
controller

Mobile router
UMTS/HSPA (3G)

Compact remote
control and
signaling system

Private network via mobile communication

Special security directives apply to critical applications, e.g. the distribution of water, gas, oil, and electricity. In such applications, communication via public networks is often completely prohibited.

Many providers offer SIM cards that use a private APN (Access Point Name). With this procedure, a private network can also be established via the mobile interface and a distributed LAN (Local Area Network) is created. Unlike the public mobile network, fixed IP addresses can be used, allowing direct communication between the substations. When using this approach, an attempted Internet attack on critical applications is impossible.

Ethernet	
General connection	

Control room

Mobile router
LTE (4G)

Small-scale
controller

Mobile router
UMTS/HSPA (3G)

Mobile network with
private APN

No Internet
access

Controller

Mobile router
LTE (4G)

Mobile router
UMTS/HSPA (3G)

Small-scale
controller

Remote control with PROFICLOUD

As an open, scalable IoT platform, Proficloud offers you intelligent communication, networked control technology, effective cloud services, comprehensive data analysis, and at the same time the highest degree of security.

Take advantage of the unlimited possibilities of a cloud-based solution for continuous transmission of process data to your control center. With Proficloud, you can network your distributed devices in the field easily and securely via the Internet. This lets you benefit from global status monitoring and controlling of your data.

Your advantages

- ☑ Maximum flexibility and availability, thanks to automation across borders from any location via the Internet
- ☑ Easy engineering, with distributed devices appearing in the local network
- ☑ Efficient automation, thanks to preconfigured and preprogrammed Proficloud products
- ☑ Secure and certified communication, thanks to TLS encryption

Cloud solutions for industry

Efficient remote control

Thanks to Proficloud and the corresponding components, you can create a secure connection for efficient remote control in a very short time. Integrate the Proficloud coupler into the local network of your control center. The coupler displays all devices which are located across the world and networked via the cloud as local network devices. The distributed controller connects to the Proficloud via the internet. It now appears as a local device in the network and can be used immediately without further configuration or programming. The I/O components connected to the distributed controller are started up automatically.

Control room

Proficloud coupler

PROFICLOUD

Distributed
PROFINET station
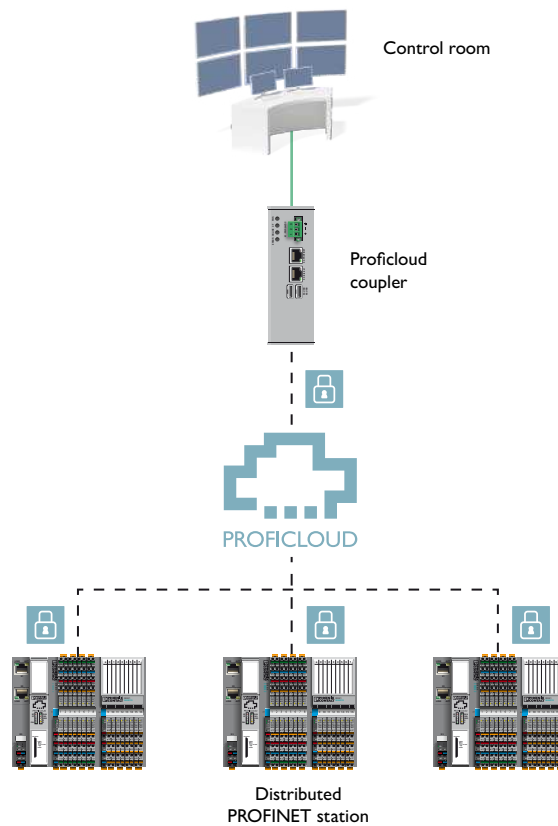
Data analysis, using the example of water and wastewater treatment

Current operating data such as the fill level, flow rate or power consumption of distributed infrastructures is analyzed in Proficloud and made comparable with other significant parameters. Thus, for example, a wastewater pumping station can be operated efficiently on demand.
Status and operational messages are sent to the control room via an Internet connection. Further information such as weather data can be received via the Proficloud from superordinate equipment to aid optimum operation. In addition, for example, pump operating data on lifecycle or energy management can be combined so that this information can be used efficiently for predictive maintenance.

Remote control technology for distributed wastewater pumping stations

Application examples in the remote control technology

Energy supply

Application
Municipal providers are also responsible for the stability of the grid. Comprehensive monitoring of the grids is needed if disruptions and malfunctions are to be avoided. Status, warning, and error messages must be communicated to the control room reliably. Data protection in particular plays an ever increasing role in this field. Due to system management in accordance with the German Renewable Energy Sources Act (EEG), an increasing amount of sensitive data must be transmitted to the control engineering center. As a result, the trend towards end-to-end encryption is already evident today.

Solution
Thanks to the combination of unmanaged and managed Ethernet extenders from Phoenix Contact, status, warning, and error messages can be sent automatically over SNMP (Simple Network Management Protocol) to the control center.

Summary
The interaction of the devices in combination with existing cables does not only make using the system easy and economical, but also satisfies the demand for intelligent and powerful networks.

Use of extenders in a combined heat and power plant

Solar power

Application
Distributed photovoltaic systems also need to play their part in high grid stability. The responsible grid operators specify in their grid connection conditions for photovoltaic systems the ranges to be maintained for network frequency and voltage, and for reactive power. Furthermore, the grid operator must also be in a position to reduce an oversupply of energy whenever necessary. These system regulations are transmitted by the grid operator to the corresponding PV feed-in controllers using remote control technology.

Solution
The Resy+ library function block from Phoenix Contact extends the feed-in management controller in PV systems with remote control technology protocols. The diverse demands of the grid operator can be implemented in connection with the modular control technology.

Summary
In the photovoltaics sector, Phoenix Contact does more than provide a platform concept for implementing PV power stations. It also adds remote control technology protocols to the feed-in management controller in the form of the Resy+ library function block.

Use of a feed-in management controller in a PV power station

Water and wastewater treatment

Application
Wastewater pumping stations play an important role in reliable wastewater disposal. Municipal wastewater companies have distributed wastewater pumping stations spread throughout their entire distribution network. These must, when necessary, transport the wastewater to higher-level sewage systems and function correctly around the clock. Current operating data is transmitted to the higher-level control system.

Solution
The turnkey PumpControl control cabinet solution takes over all control and regulation tasks of distributed wastewater pumping stations. Along with the controlled switching of pumps and recording of measurement values, important messages are sent to the higher-level control system via ODP as well as to the operating personnel via SMS.

Summary
Wastewater pumping stations can be controlled and regulated on demand by using the PumpControl solution. This saves costs and optimizes the use of resources. The integrated remote control interface enables efficient integration into the higher-level control system.

Use of the PumpControl solution in a wastewater pumping station

Oil and gas

Application
A processing plant often includes hundreds of valves, some of which are still operated manually. The subsequent monitoring of these valves through the retrofitting of position switches improves monitoring capabilities and the safety of the production operation.

Solution
Small control cabinets with an I/O system are positioned at the center of a valve group. Two sensors are installed on each valve, which are then connected to the cabinet via cable. The control cabinet in the field is connected wirelessly to the control center via the Radioline system from Phoenix Contact. Complex proprietary coding ensures secure transmission. An intelligent mesh network increases the system's immunity to interference.

Summary
Thanks to a modular design, and thanks to the capability of incorporating a high number of devices, this system can reliably monitor small to very large systems.

Measurement station sensors on the pipeline

Remote maintenance via the Internet and cloud

With Internet technologies, you have the capability to establish connections to your machines and systems anywhere and at any time. To safeguard your network connections against interference and manipulation, Phoenix Contact offers products featuring state-of-the-art security mechanisms such as VPN, IPsec encryption, and integrated firewalls.

The mGuard Secure Cloud securely connects service personnel and remote maintenance locations via the Internet. It offers a turnkey complete VPN solution for operators and companies that build machines and manufacture systems.
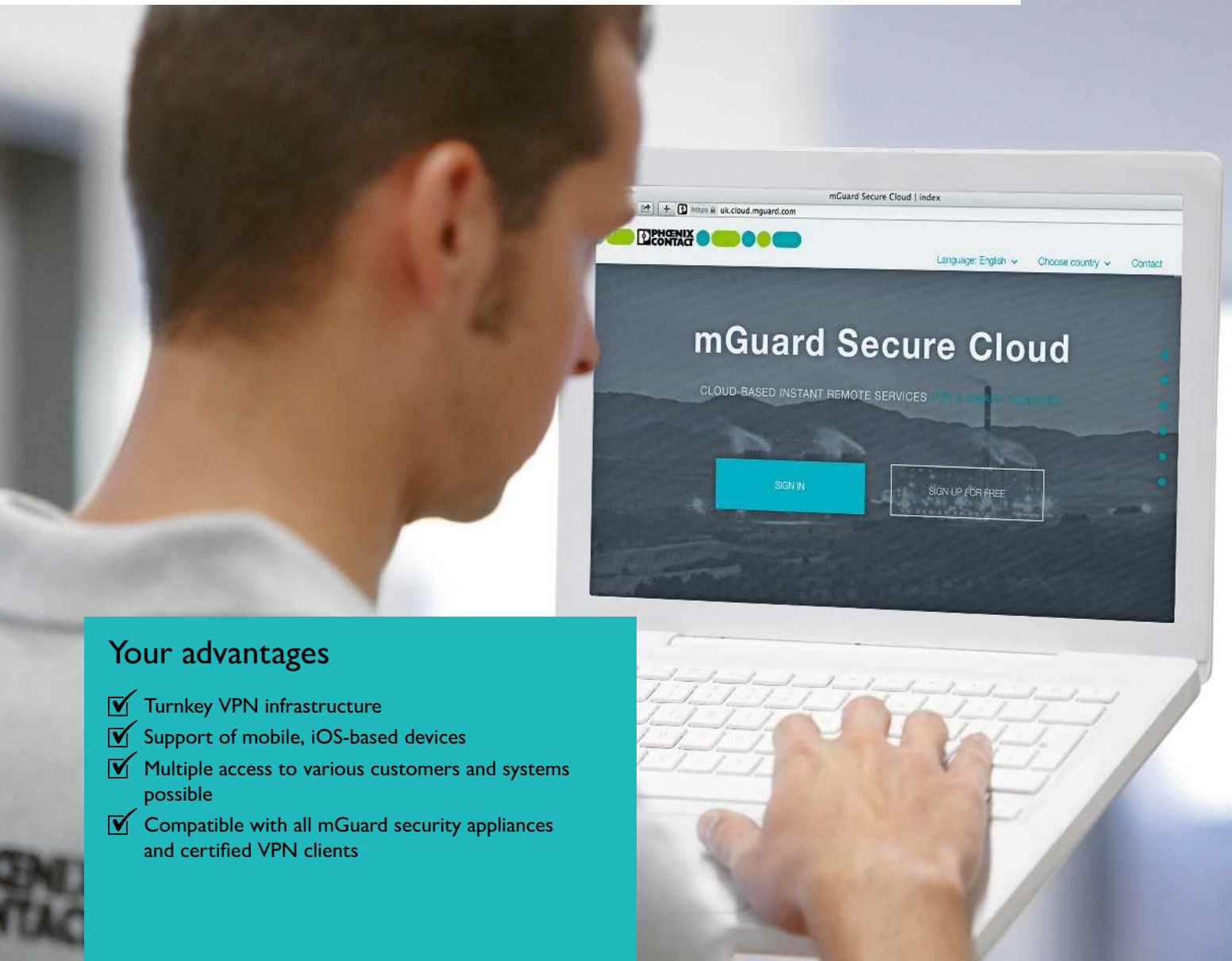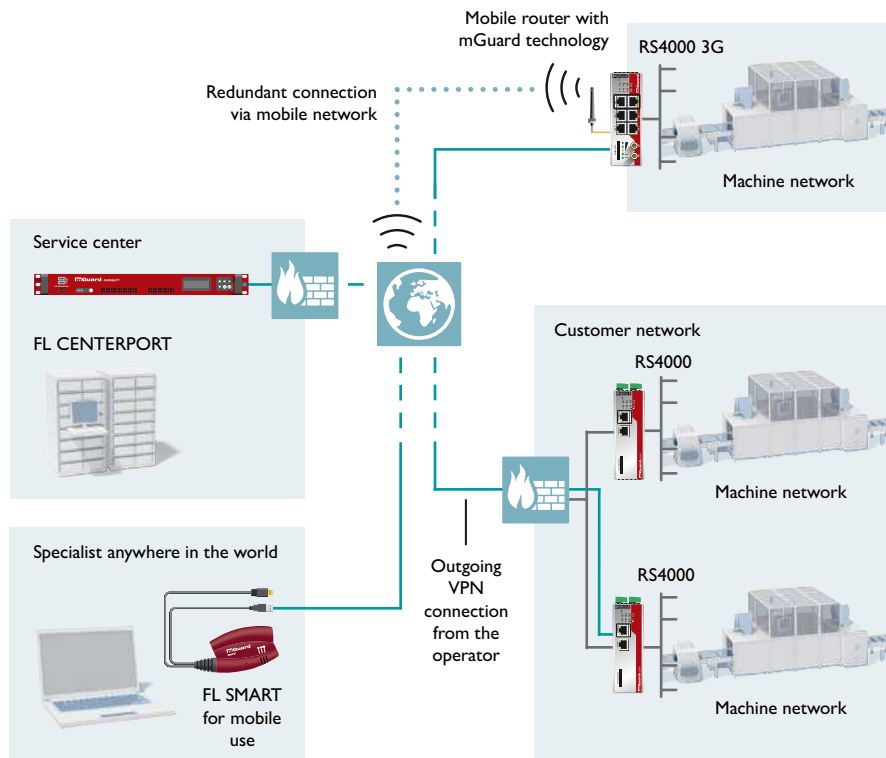
Your advantages

- ☑ Turnkey VPN infrastructure
- ☑ Support of mobile, iOS-based devices
- ☑ Multiple access to various customers and systems possible
- ☑ Compatible with all mGuard security appliances and certified VPN clients

Overview of remote maintenance systems

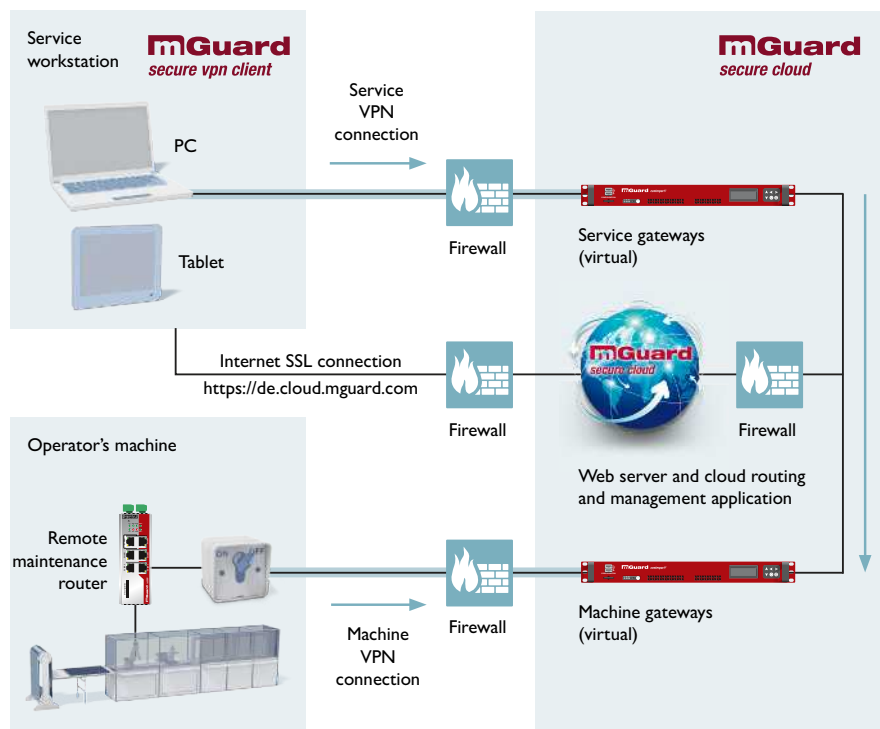## Secure industrial remote maintenance

mGuard products provide you with a tailored security solution for your automatic remote control solution. These robust and industrial security appliances include firewall, routing, and VPN functions to protect against malicious cyber attacks and inadvertent malfunctions. Furthermore, they enable secure remote maintenance via public networks. Phoenix Contact offers various hardware and software products, depending on the application: from DIN rail devices through to portable hardware right up to 19" devices, from security routers with integrated wireless interface through to central management software and the Secure VPN client.

Mobile router with mGuard technology

RS4000 3G

Redundant connection via mobile network

Machine network

Service center

FL CENTERPORT

Customer network

RS4000

Machine network

RS4000

Outgoing VPN connection from the operator

Machine network

Specialist anywhere in the world

FL SMART for mobile use

The functional components of the mGuard Secure Cloud

The mGuard Secure Cloud uses IPsec VPNs and ensures the confidentiality, authenticity, and integrity of data transmitted between the devices. It is operated in a high-availability computer center in Germany in accordance with the most stringent data protection standards. Particularly for small and medium-sized companies, the mGuard Secure Cloud provides a reliable VPN infrastructure via the Internet as an inexpensive service that is tailored to their needs.

Service workstation

mGuard secure vpn client

PC

Tablet

Service VPN connection

Firewall

Service gateways (virtual)

mGuard secure cloud

Internet SSL connection
https://de.cloud.mguard.com

Firewall

Firewall

Web server and cloud routing and management application

Operator's machine

Remote maintenance router

Machine VPN connection

Firewall

Machine gateways (virtual)

Scalable remote maintenance solutions

Industrial VPN gateways

TC CLOUD CLIENT …

…1002-TX/TX	Ord. No. 2702885
…1002-4G	Ord. No. 2702886
…1002-4G ATT	Ord. No. 2702888
…1002-4G VZW	Ord. No. 2702887

- High security, thanks to VPN tunnel to the mGuard Secure Cloud
- Pluggable configuration memory
- Worldwide use
- Connection for key switch
- Cloud-based device configuration

Secure VPN routers

FL MGUARD …

…RS2000 TX/TX VPN	Ord. No. 2700642
…RS2005 TX VPN	Ord. No. 2701875
…RS2000 4G VPN	Ord. No. 2903588
…RS2000 4G ATT VPN	Ord. No. 1010464
…RS2000 4G VZW VPN	Ord. No. 1010462

- Integrated firewall for protection of the machine network
- VPN tunnel to the mGuard Secure Cloud
- Connection for key switch
- Central device management

Secure VPN router
with extended range of functions

FL MGUARD …

…RS4000 TX/TX VPN	Ord. No. 2200515
…RS4004 TX/DTX VPN	Ord. No. 2701877
…RS4000 4G VPN	Ord. No. 2903586
…RS4000 4G ATT VPN	Ord. No. 1010463
…RS4000 4G VZW VPN	Ord. No. 1010461

- Extended firewall for complex security concepts
- VPN tunnel to the mGuard Secure Cloud
- Central device management

Compact, independent machines

Remote error correction, remote PLC program updating and additional remote support are desired for many machines. The mGuard Secure Cloud is a fast and secure solution for this remote access.

Simple connection to the mGuard Secure Cloud
TC Cloud clients are ideally suited for the remote maintenance of individual, compact machines with small IP networks. They connect the machine to the mGuard Secure Cloud securely via VPN.

The mobile version is particularly well suited to stand-alone machines without a network connection. With the LAN version, remote maintenance access can be easily retrofitted in existing networks. The TC Cloud clients can be integrated easily into an existing machine network.

Service workstation — VPN gateway — Switch — IPC — Controller

― Ethernet
― VPN connection
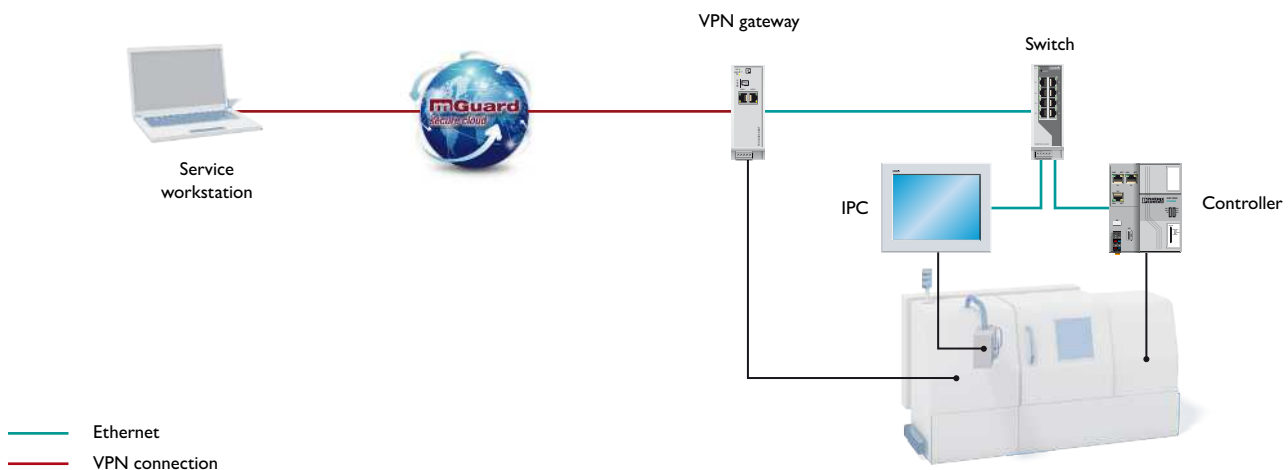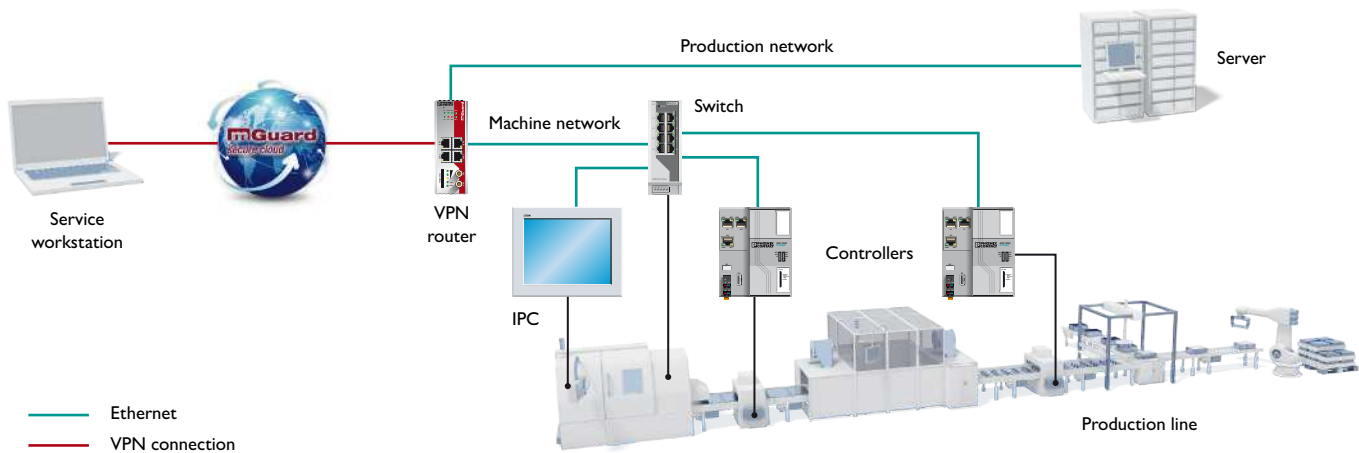
Integration into the production network

Protection against unauthorized access by people or malware is becoming increasingly more important for networked machines.

Protection of the network
FL MGUARD RS2000 mGuard products from Phoenix Contact use a powerful, flexible, and fast firewall to secure your machine network. This enables the regulation of access to the machine in the production network, e.g. in ERP systems, and the secure connection of the machine to the mGuard Secure Cloud via VPN. The remote maintenance connection is configured automatically in the cloud and imported into the FL MGUARD.

A key switch is ideal for starting the connection – the operator thus retains complete control of the VPN connection on site.

Production network

Server

Switch

Machine network

Service workstation

VPN router

IPC

Controllers

Production line

Ethernet
VPN connection

High network availability

When there is a high number of networked machines and systems, the availability of the machine network is of paramount importance. Detailed monitoring of the data traffic and complex security concepts are therefore necessary.

Monitoring the data traffic
The FL MGUARD monitors communication between the production and machine networks. The MGUARD RS4004 is also equipped with a DMZ (Demilitarized Zone) port. This enables, with the help of additional firewall rules, secure local maintenance access to the machine. A firewall monitors the incoming and outgoing data traffic at each port. Thus, communication to the production network is not possible during maintenance access to the machine.

Production network

Local maintenance access

VPN router

Machine network

Production line

Ethernet
VPN connection
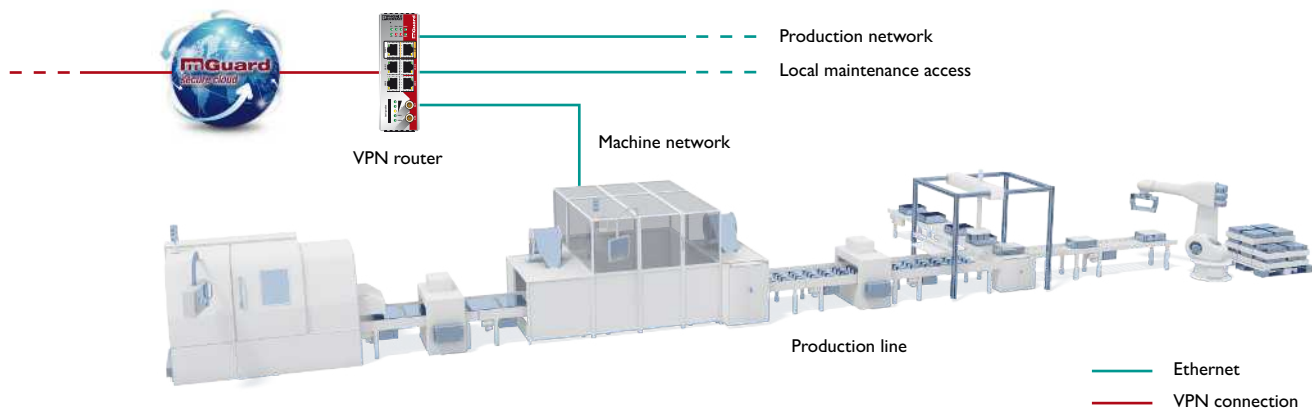
Remote maintenance
via the public telephone network

Phoenix Contact offers analog modems for temporary remote access to your remote machines and systems. They facilitate remote maintenance in the most far-flung corners of the world by the simplest means possible, namely, dial-up connection technology.

The analog telephone infrastructure allows the use of an ADSL broadband router. It connects industrial Ethernet or RS-232 devices to the Internet via a permanent DSL line. Via a high-speed Internet connection, you can access individual machines, systems or entire Ethernet networks anywhere in the world.

Your advantages

- ☑ The integrated Annex A/B/J switchover enables fast startup on site without extensive prior clarification of the local provider requirements
- ☑ Use as a DSL modem or DSL router can be set easily in the web-based management system
- ☑ Automatic signal conditioning from DSL to LAN
- ☑ Integrated functions such as a firewall, VPN, NAT

DSL router

DSL router/modem with firewall

TC DSL ROUTER X400 A/B

Ord. No. 2902709

- Can be used worldwide, thanks to Annex A/B/J support
- Quick and easy startup
- Optimized to the key functions of an industrial DSL broadband router/modem
- Integrated firewall

DSL router/modem with firewall, VPN, COMSERVER, I/Os

TC DSL ROUTER X500 A/B

Ord. No. 2902710

- Can be used worldwide, thanks to Annex A/B/J support
- VPN tunneling (IPsec, OpenVPN)
- Serial device server for 10/100Base-T(X) with RS-232
- Alarm inputs (sending e-mails)
- Switching outputs (web-based management)

Analog modems with RS-232 / USB connection

PSI-DATA/BASIC-MODEM/RS232

Ord. No. 2313067

- Worldwide data links via the public telephone network for the remote maintenance of machines and systems
- Password-protected access and call-back function
- High-quality electrical isolation
- Easy startup, thanks to plug and play

ADSL router for worldwide use

The ADSL broadband routers enable the high-speed connection of industrial Ethernet and RS-232 devices to the Internet, and also support all conventional ADSL standards.

Using the integrated Annex A/B/J switchover, the devices can be easily adjusted to the requirements of regional telecommunications providers. When functioning as a modem, the device operates as a simple converter from DSL to LAN. A separate, downstream router then handles router and firewall functions. When used as a router, however, the device itself handles these functions, meaning that no separate router is necessary.
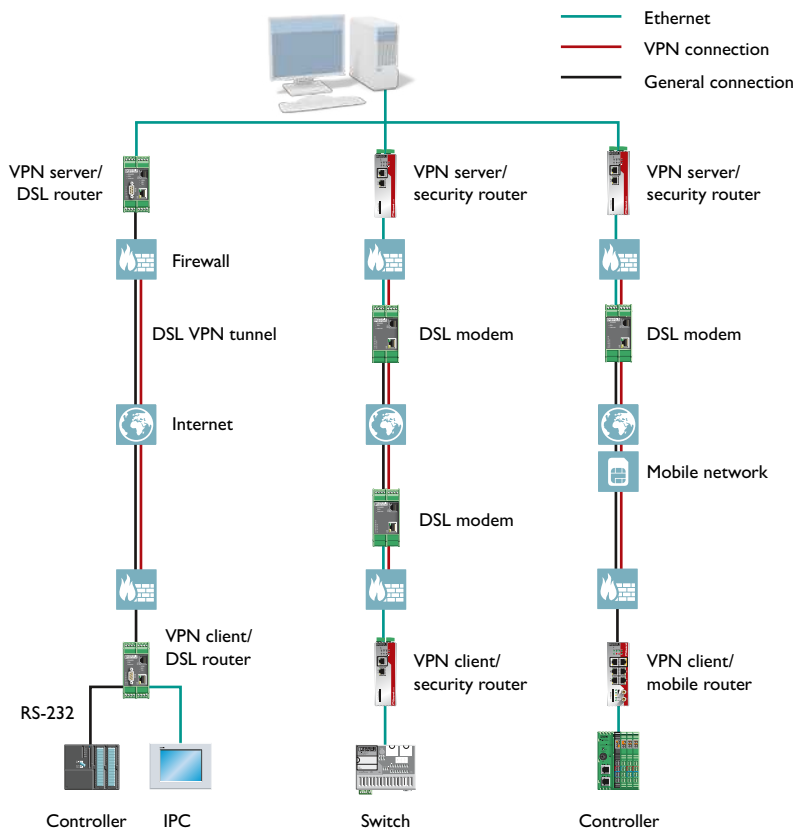
Alerts via the mobile network

Monitor analog and digital values easily and securely via the mobile network. The compact TC MOBILE I/O X200 remote control system keeps you up to date on the status or error state of your system, even in the field. The mobile router and the controller with integrated ILC 151 GSM/GPRS modem combine this capability in addition to their main task.

All solutions can be used to send text messages via SMS or e-mail, and to set one or more peer switching outputs, e.g. for activating the machine. Thus, you can prevent damage and downtimes, and avoid costly on-site servicing.

Your advantages

- ☑ Reduced machine and system downtimes, thanks to automatic alerts via SMS and e-mail
- ☑ Decreased communication costs, thanks to event-driven alerts
- ☑ A conventional mobile phone can serve as a peer
- ☑ Mobile networks are available worldwide
- ☑ Integration into existing control systems
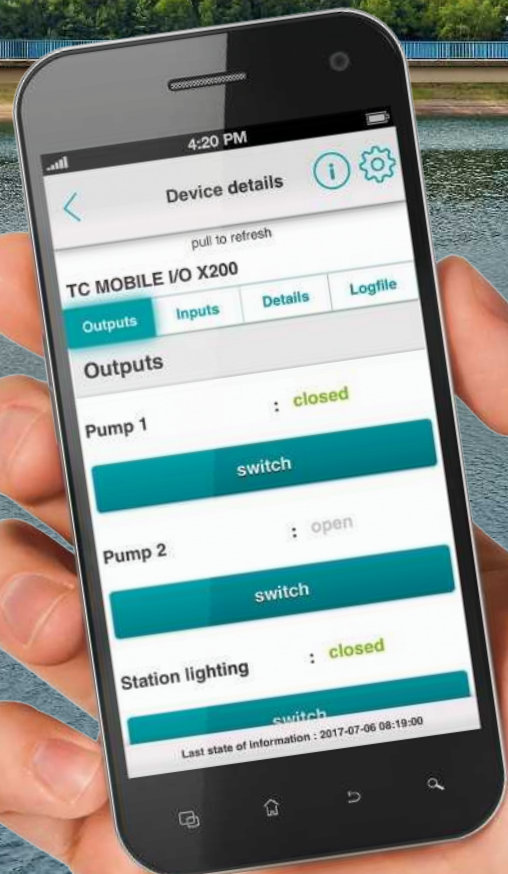
Scalable alerting solutions

PLC with integrated GSM/GPRS modem

ILC 151 GSM/GPRS   Ord. No. 2700977

- 1 INTERBUS interface and 1 Ethernet interface
- 512 kB program memory and 512 kB mass storage
- 48 kB non-volatile mass storage
- 16 direct inputs and 4 direct outputs
- Integrated web/FTP server
- OPC functionality
- Modbus/TCP integrated

Compact remote control and signaling system

TC MOBILE I/O X200   Ord. No. 2903805
2G (GSM/GPRS)

TC MOBILE I/O X200-4G   Ord. No. 1038567
4G (LTE Cat1) with 2G fallback (GSM/GPRS)

- 2 analog and 4 digital inputs as well as 4 relay outputs
- Voltage range: 10 … 60 V DC
- SMS notification in the event of voltage failure
- Query the device status and switch outputs via SMS or app

Compact remote control and signaling system

TC MOBILE I/O X200 AC   Ord. No. 2903806
2G (GSM/GPRS)

TC MOBILE I/O X200-4G AC
                        Ord. No. 1038568
4G (LTE Cat1) with 2G fallback (GSM/GPRS)

- 4 digital inputs and 4 relay outputs
- Voltage range: 93 … 250 V AC
- SMS notification in the event of voltage failure
- Query the device status and switch outputs via SMS or app

One network via SMS

It is often the case that an SMS alarm message should not only be sent to a mobile phone, but also to the alarm management of a control system. This is possible using a controller and a mobile router from Phoenix Contact. Using the Resy+ function block, SMS messages can be received and also forwarded to a control system using an OPC interface, for instance.

TC Mobile I/O app
This app allows you to switch your outputs conveniently and easily check the status of your device at any time. The TC Mobile I/O app makes it even easier to use the TC Mobile I/O X200, and saves you having to write an SMS text. Alerts, however, are still sent as usual via SMS and e-mail. This ensures the best accessibility in the field.
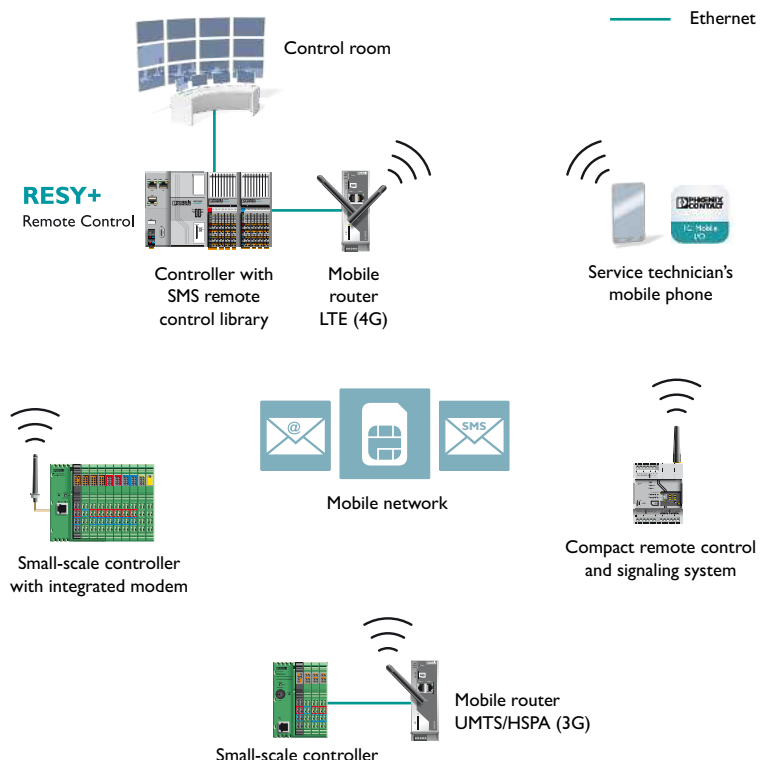
Networking with fiber optics

Our FO converters support conventional communication protocols used in remote control technology, such as PROFIBUS, Modbus/RTU, Ethernet, and the RS-232 and RS-485 interfaces. The main advantages compared to conventional copper-based data transmission are the electromagnetic immunity, the high-quality electrical isolation of the optical path, and the achievable distances of up to 45 km. Benefit from these advantages in your sophisticated remote control application.

Your advantages

- ☑ Automatic monitoring and display of the optical signal quality
- ☑ Warning of failure via floating switch contact
- ☑ Operating state indicated via diagnostics LED
- ☑ Robust devices with extended temperature range
- ☑ Device-specific approvals: ATEX, UL HazLoc, operation at altitudes of up to 5,000 m

Serial FO converters

PSI-MOS FO converters for PROFIBUS

1 FSMA port	Ord. No. 2708290
2 FSMA ports	Ord. No. 2708287

• Polymer/HCS up to 400 m

1 ST port	Ord. No. 2708274
2 ST ports	Ord. No. 2708261

• Multimode up to 3.3 km

1 SC port	Ord. No. 2708559
2 SC ports	Ord. No. 2708892

• Single mode up to 45 km
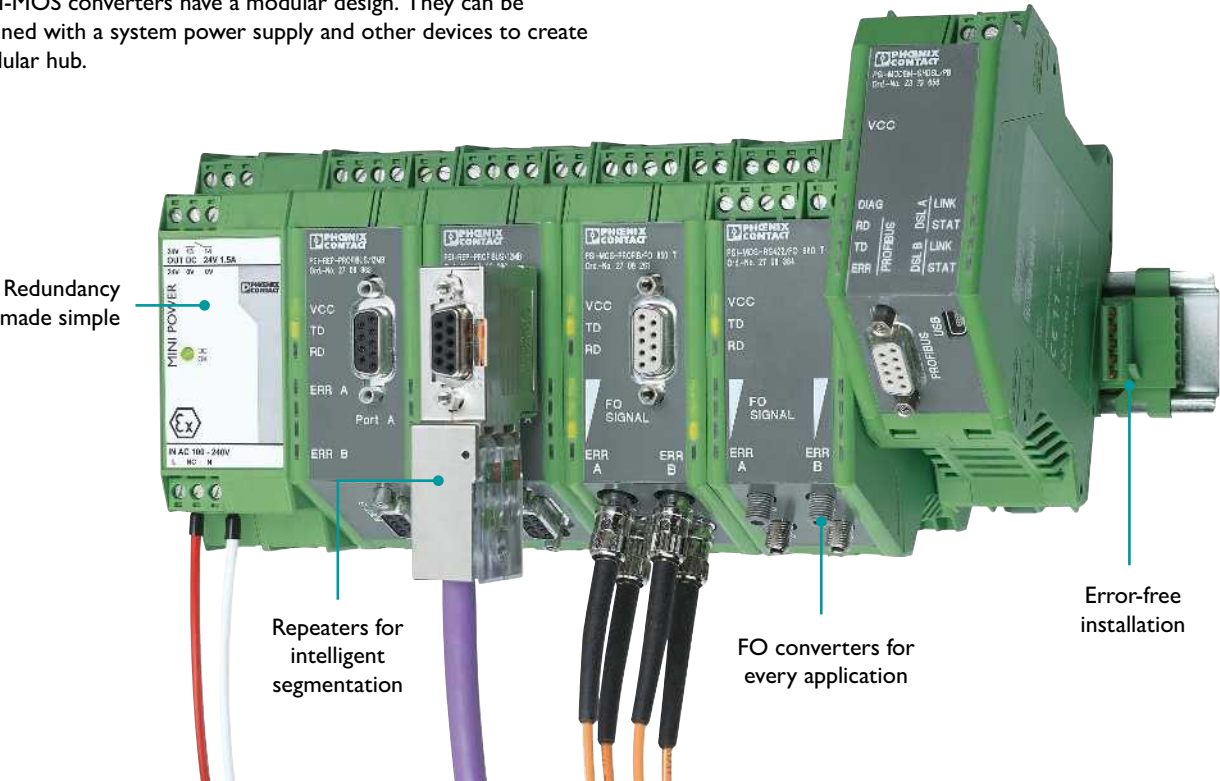
PSI-MOS FO converters for serial interfaces

1 FSMA port	Ord. No. 2708313
2 FSMA ports	Ord. No. 2708300

• Polymer/HCS up to 800 m

RS-485, 1 ST port	Ord. No. 2708339
RS-485, 2 ST ports	Ord. No. 2708326

• Multimode up to 4.2 km

RS-485, 1 SC port	Ord. No. 2708562

• Single mode up to 45 km

PSI-MOS FO converters for serial interfaces

1 FSMA port	Ord. No. 2708368
2 FSMA ports	Ord. No. 2708410

• Polymer/HCS up to 800 m

RS-232, 1 ST port	Ord. No. 2708371
RS-232, 2 ST ports	Ord. No. 2708423

• Multimode up to 4.8 km

RS-232, 1 SC port	Ord. No. 2708588

• Single mode up to 45 km

Modular PSI-MOS hub

All PSI-MOS converters have a modular design. They can be combined with a system power supply and other devices to create a modular hub.
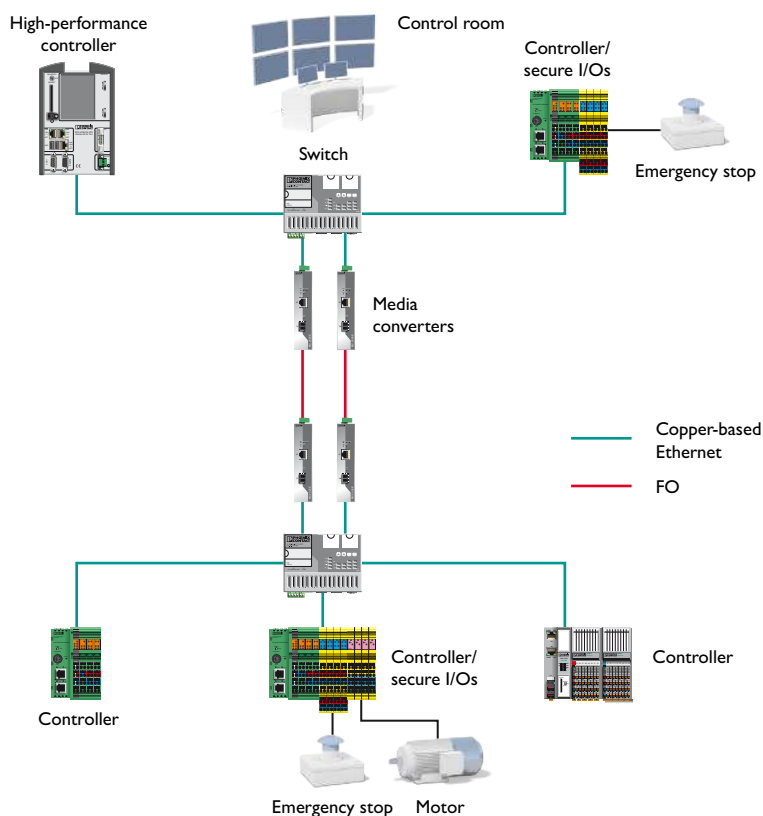
Redundancy made simple

Repeaters for intelligent segmentation

FO converters for every application

Error-free installation

Ethernet media converters

| Media converters for ...	Standard requirements		IEC 61850-3 / IEEE1613n		Special approvals		
Type	FL MC 1000 SC	FL MC 1000 ST	FL MC 2000E LC	FL MC 2000E SM40 LC	FL MC EF 1300 MM SC	FL MC EF 1300 MM ST	FL MC EF 1300 SM SC
Ord. No.	2891320	2891321	2891056	2891156	2902853	2902854	2902856
Supply voltage	12 V DC … 48 V DC		12 … 57 V DC (redundant)		18 V DC … 30 V DC		
Temperature range	0°C … +60°C		-40°C … +75°C		-40°C … +65°C		
Light wavelength	1310 nm						
Transmission	Multimode fiberglass		Multimode fiberglass	Single mode fiberglass	Multimode fiberglass		Single mode fiberglass
Connection method	SC duplex	B-FOC (ST®)	LC duplex		SC duplex	B-FOC (ST®)	SC duplex
Range	Up to 9.6 km		Up to 9.6 km	Up to 40 km	Up to 10 km		Up to 36 km
Special features	Autonegotiation and MDI (x)		4 kV insulation voltage, protection for high EMC		Approvals: ATEX, UL and DNV Backplane bus for redundant or alternative power supply		

Fast diagnostics in the event of a malfunction

In addition to numerous diagnostics LEDs, the media converter also features the link management function (link fault pass through). This ensures permanent connection monitoring. Both sides of the network connection can therefore detect a lost link immediately. The entire connection over the optical path is therefore just as transparent as it would be with purely copper-based communication. In the event of a network interruption, the transmission path is switched off. Redundancy mechanisms can be used directly.

In addition, when the FEF (far end fault) function signals a lost link to the media converters, this also enables the faulty segment to be localized.

Realtime protocols				Single-fiber transmission			PROFINET, T-couplers	
FL MC 2000T SC	FL MC 2000T ST	FL MC 2000T SM20 SC	FL MC 2000T SM40 SC	FL MC EF WDMSET SC	FL MC EF WDMA SC	FL MC EF WDMB SC	FL MC ETH/FO 660 T	FL MC EF 660 SCRJ
2891315	2891316	2891317	2891318	2902660	2902658	2902659	2313164	2702944
12…48 V DC (redundant)				18 V DC…30 V DC			18.5 V DC…30.5 V DC	
-40°C…+75°C				-40°C…+65°C			–	
1310 nm				1310/1550 nm			660 nm	
Multimode fiberglass		Single mode fiberglass		Full duplex data transmission across one fiber Multimode and single mode fiberglass			Polymer fibe PCF	
SC duplex	B-FOC (ST®)	SC duplex	SC duplex	SC simplex			SC-RJ	
Up to 9.6 km		Up to 20 km	Up to 40 km	Up to 38 km			Up to 100 m	
Store-and-forward and pass through mode can be selected with a short latency time of 835 ns using a DIP switch. These can therefore be used for real-time Ethernet protocols.				Converters A and B	Converter A	Converter B	T-coupler with two FO conn. and two RJ45 sockets	Single-port media converter

Communication via fiber optics to remote systems

One advantage of optical data transmission is the increase in the maximum range. Only distances of one hundred meters between two devices can be achieved with copper-based Ethernet communication. This distance is sufficient for small systems, but is much too short for communication to remote systems. With fiber optic cables and industrial media converters or switches, on the other hand, distances of several kilometers can reached without difficulty for a point-to-point connection.
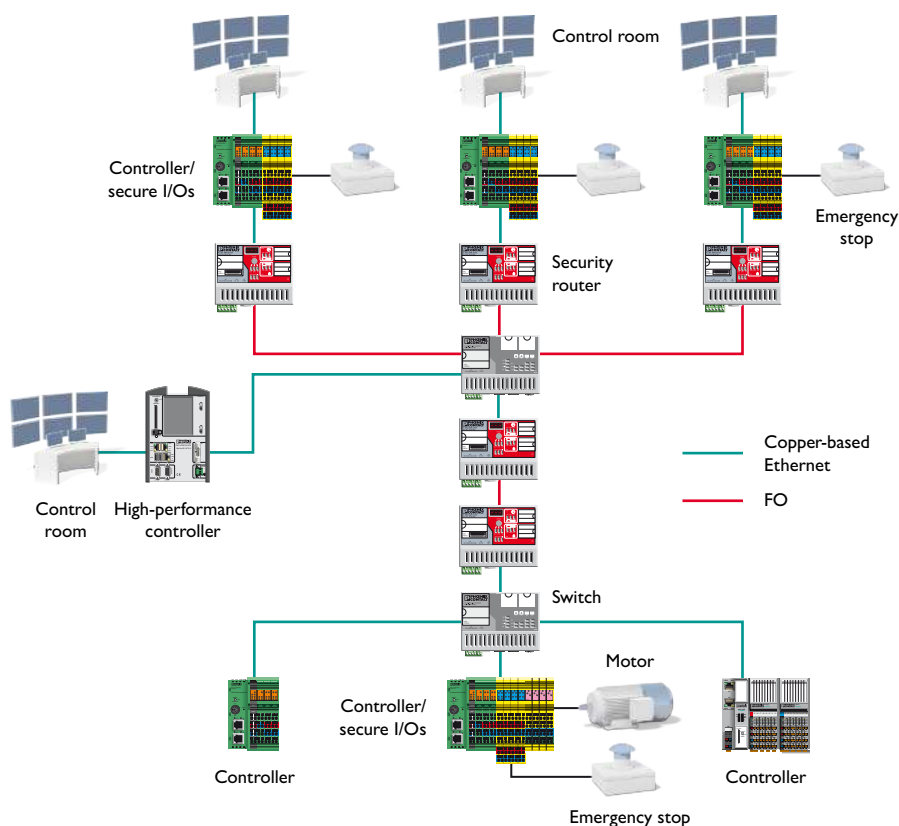
Networking with WLAN and Bluetooth

When it comes to the automation of your factory, benefit from the possibilities offered by wireless network communication and reliable industrial components from Phoenix Contact. Wireless Ethernet enables you to implement consistent network solutions in widespread systems and integrate mobile devices along safe, high-performance, and easy-to-maintain lines.

Your advantages

- ☑ Seamless and inexpensive integration into existing networks, thanks to flexible installation and configuration concepts
- ☑ High level of reliability and availability with optimum properties for industrial applications
- ☑ Versatile use, from voice-over-IP to safety, thanks to Ethernet being used as the common communication standard

Wireless modules for WLAN and Bluetooth

WLAN access point

| FL WLAN 5110 | Ord. No. 1043193 |
| FL WLAN 5111 (US) | Ord. No. 1043201 |

- WLAN access point/client, repeater
- 2 x RJ45, 10/100 Mbps,
- IEEE 802.11 b/g/a/n (2.4/5 GHz)
- MIMO with 2 x RSMA antenna connection
- Cluster management
- Security: 802.11i, WPA2, WPA-PSK, 802.1x, WEP, TKIP, AES

WLAN access point

FL WLAN 1100	Ord. No. 2702534
FL WLAN 1101 (US)	Ord. No. 2702538
FL WLAN 2100	Ord. No. 2702535
FL WLAN 2101 (US)	Ord. No. 2702540

- WLAN access point/client, repeater
- 1x RJ45, 10/100 Mbps
- IEEE 802.11 a/b/g/n (2.4/5 GHz)
- MIMO with 2 integrated antennas
- IP54 for WLAN 1100, IP66/67/IP68 for WLAN 2100
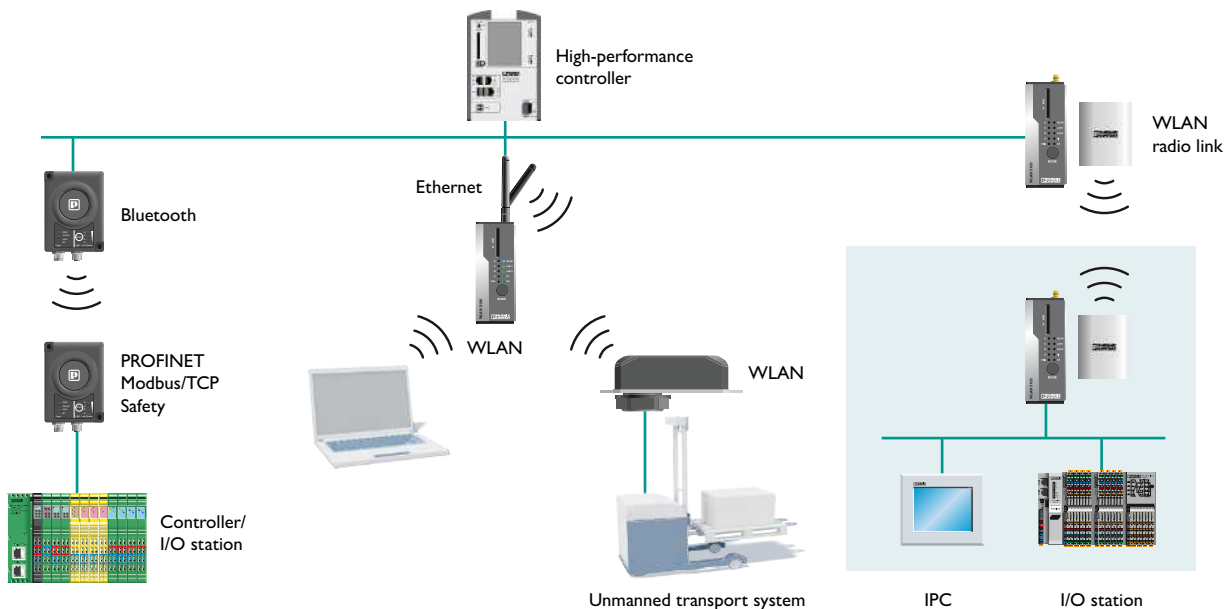- Security: 802.11i, WPA2, WPA-PSK, TKIP, AES, MAC filter

WLAN and Bluetooth adapter

FL BT EPA 2	Ord. No. 1005869
FL EPA 2	Ord. No. 1005955
FL EPA 2 RSMA	Ord. No. 1005957

- Ethernet wireless module with Bluetooth and WLAN access point/client (FL BT EPA 2, Bluetooth only)
- Bluetooth 2.1+EDR/4.0
- EPA 2 and BT EPA: internal antenna
- EPA RSMA: external antenna connection

Wireless network communication capabilities

Wireless Ethernet from Phoenix Contact can be used to implement consistent network solutions:

- Integration of moving devices
- Functionally safe communication
- Fast communication connections, including with remote devices

High-performance controller

WLAN radio link

Ethernet

Bluetooth

WLAN

PROFINET Modbus/TCP Safety

WLAN

WLAN

Controller/ I/O station

Unmanned transport system

IPC

I/O station

Service and support

Regardless of the task at hand, the technological solution you are searching for to meet your objective or the products you would like to use, our specialists are always on hand no matter where you are. With our flexible service concept, we provide support for any queries you may have regarding automation technology – from applications and systems to cyber security and safety. Our experts have extensive knowledge of the relevant industries and technology. This, combined with Phoenix Contact's wide range of products, means we always have the right solution for you.

Your advantages

☑ Short response times, thanks to a global network of service experts

☑ Save time and resources, thanks to comprehensive advice for the overall system

☑ Access to expert knowledge, thanks to a wide range of consulting and training services

☑ Free system hotline with 24-hour product support

We are there for you

Consulting

We will be happy to advise you regarding the planning and optimization of your machine or system.

Application and system
Ideally tailored to your application, we consolidate control, visualization, PROFINET, and other protocols.

ICS security and industrial Ethernet
Whether failsafe networks, concepts for secure remote maintenance or high-performance wireless networks, we will find the right solution for you.

Training and workshops

Thanks to our comprehensive training packages and the expertise of our trainers, you are always kept right up to date.

Application and system
We have the right training package for you to answer any questions you may have about our control and visualization technology.

ICS security and industrial Ethernet
Through instruction and practical training, we bring you and your employees up to speed on failsafe networks and the latest standards and directives.

Engineering

Benefit from our experience and our network of project engineers and system partners in all phases of your project.

Application and system
We support you throughout the implementation of your application or partial application with Phoenix Contact.

ICS security and industrial Ethernet
We provide support during the configuration and startup of your network and show you where optimizations can be made.

Support

Our service network is on hand worldwide to assist you during installation, startup, and operation.

ICS security and industrial Ethernet
If your network is not working according to your expectations, we will eliminate any faults. We will analyze your network, assist with configuration modifications, and make recommendations regarding interaction with other components.

Contact us for more information

Whether by phone, via remote access or on site – Phoenix Contact is there for you.

24-hour hotline: **+ 49 (0) 52 81 9 46 28 88**
E-mail: **automation-service@phoenixcontact.com**
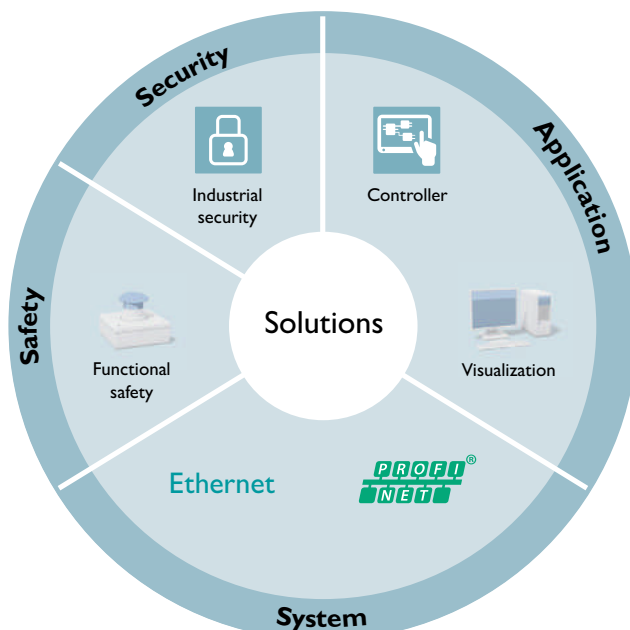
In dialog with customers and partners worldwide

Phoenix Contact is a globally present, Germany-based market leader. Our group is synonym for future-oriented components, systems, and solutions in the fields of electrical engineering, electronics, and automation. A global network across more than 100 countries, and 16,500 employees ensure a close proximity to our customers, which we believe is particularly important.

The wide variety of our innovative products makes it easy for our customers to find future-oriented solutions for different applications and industries. We especially focus on the fields of energy, infrastructure, process and factory automation.

You will find our complete product range at:

phoenixcontact.com

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PHOENIX CONTACT

INSPIRING INNOVATIONS

Printed in Germany
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ION03-18.000.L3
MNR 1030776/2018-10-01/01