

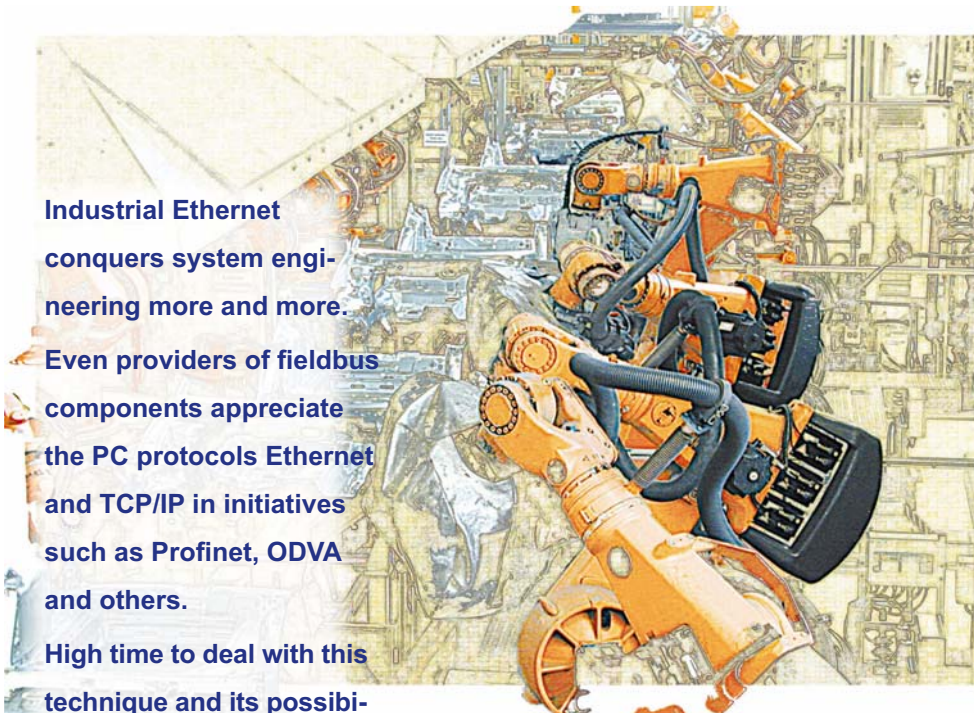
Chapter 6

Trainings

- ▶ **Ethernet I – Basics**
- ▶ **Ethernet II – Troubleshooting**
- ▶ **Realtime Ethernet**
- ▶ **OPC Plug 'n' Play**
- ▶ **Wireless LANs**
- ▶ **Modernization of S5 PLCs**

Seminar: Ethernet I – Basics of industrial networking

3-day seminar with theory and practice



**Industrial Ethernet
conquers system engi-
neering more and more.**

**Even providers of fieldbus
components appreciate
the PC protocols Ethernet
and TCP/IP in initiatives
such as Profinet, ODVA
and others.**

**High time to deal with this
technique and its possibi-
lities.**

Contents and goals:

The training is for employees in the field of design, project planning and maintenance, who want to connect their S7/S5 and other PLCs via Ethernet. You will be able to activate your Ethernet linked system in short time. In case of an error you will be able to locate and solve it fast.

In the first part of the training you will get an overview about the topic **Ethernet TCP/IP** and its meaning for automation. By building up an exercise network you will get to know the **basics of network engineering** in general as well as the **components of an industrial network** in particular.

Outlooks on the latest trends like the discussion about „**Ethernet as a fieldbus**“ will close the part of the training which deals with networks.

The PLC workshop focuses on **Ethernet communication with S7 and S5 PLCs**. How do I build an effective communication? What is the best way to debug? Which tools are available?

Topic overview:

► **Ethernet workshop**

- Components of an industrial network
- Design of a TCP/IP network with PCs and PLCs
- Ethernet basics
- TCP/IP protocol family
- Networking exercises

► **PLC networking workshop**

- Theory of PLC networking
- Ethernet communication with S7/S5
- Connection parameterization of the PLC by using the protocols TCP/IP, H1 and RFC1006
- Establish a Send/Receive communication between S7 and S5 PLCs
- Establish a Fetch/Write communication between client and S7 via OPC

► **Troubleshooting**

- Methodical search for faulty communication
- Telegram analysis through netrecords of the existing communication
- Insert of helpful network tools
- Insert of the protocol analyser INAT NetSpector

► **Outlooks on Ethernet in automation**

- Realtime Ethernet
- Adaption of Ethernet to the structural conditions in automation

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Special characteristics:

► Performances

- 3-day training with theory and practice part
- Seminar documents
- Seminar documents and network tools on CD
- Certificate of participation
- Lunch and coffee breaks
- Training language: English or German

► Requirements

- Basic PC knowledge

Learn in small groups:

In our seminars you are not just one number among many others. In order to provide an ideal learning atmosphere, the seminars are limited to a number of 8 participants. This guarantees a comprehensive, personal support, so that no question remains unanswered.



You'll say it too:

„Yes, when it comes to Industrial Ethernet I'm 100% fit“

Further seminars at INAT

► INDUSTRIAL ETHERNET

- Ethernet II: Troubleshooting in area networks
- Real-Time-Ethernet in automation

► PROFIBUS

- PROFIBUS – Technology
- PROFIBUS – Troubleshooting

► PROFINET

- PROFINET – Technology
- PROFINET – Certified Engineer

► MODERN COMMUNICATION

- OPC Plug'n' Play in automation
- OPC-User-Training
- OPC-Manufacturer-Training
- OPC Unified Architecture
- Wireless LANs in automation

► AROUND PLC

- Modernization of S5 PLCs

In-house training:

If you would like to have a training at your company, feel free to ask. We will create a customized offer for you.

**current dates
on
www.inat.de**

Order data:

Ethernet I: Basics of Industrial Networking

3-day seminar

Nuremberg / Person

Order No.: 110-1000-01

Seminar: Ethernet II Troubleshooting

2-day seminar: Troubleshooting in Industrial Ethernet



Contents and goals:

The training is for employees in the field of design, project planning and maintenance, who want to work with industrial Ethernet and TCP/IP. In case of an error you will be able to locate effects fast and solve them in short time.

With the help of an exercise network with working S7 and S5 communications you will get to know the common protocols used in automation: TCP/IP, ISO (H1), S7, S5, RFC1006 etc.

Furthermore you will get insight of the mode of operation of wide spread network services like SNMP, FTP, DHCP etc.

Error scenarios of Ethernet communication with S7 and S5 PLCs and network errors in general are in the focus of the troubleshooting workshop. You will learn the following:

- How do I proceed clever with fault analysis?
- Which tools are available for me?
- How do I use a network analyser efficiently?

Topic overview:

► Function of protocols & services

- Ethernet
- TCP/IP, ISO on TCP (RFC1006), Modbus on TCP
- ISO (H1)
- FTP, HTTP, DNS, DHCP, SNMP

► Functioning of the INAT NetSpector

- Overview of functions
- Interpretation of statistics
- Filter possibilities
- Automatical recording
- Application of triggers

► Troubleshooting

- Fault analysis in Send / Receive Direct communication between S7 and S5 PLCs
- Fault analysis in Fetch / Write communication between client and S7 or OPC
- Fault analysis in connection to higher ranked services
- Typical as well as rare error scenarios are run through

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Special characteristics:

► Performances

- 2-day seminar with theory and practice part
- Seminar documents
- Seminar documents and network tools on CD
- Certificate of participation
- Lunch and coffee breaks
- Training language: English or German

► Requirements

- Seminar: Ethernet I – Basics or similar
- Basic PC knowledge

Learn in small groups:

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You'll say it, too:

„Yes, I am 100% fit when it comes to Industrial Ethernet“

Further seminars at INAT

► INDUSTRIAL ETHERNET

- Ethernet I: Basics
- Real-Time-Ethernet in automation

► PROFIBUS

- PROFIBUS – Technology
- PROFIBUS – Troubleshooting

► PROFINET

- PROFINET – Technology
- PROFINET – Certified Engineer

► MODERN COMMUNICATION

- OPC Plug'n' Play in automation
- OPC-User-Training
- OPC-Manufacturer-Training
- OPC Unified Architecture
- Wireless LANs in automation

► AROUND PLC

- Modernization of S5 PLCs

In-house training:

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**Current dates
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Order data:

Ethernet II: Troubleshooting in Industrial Ethernet

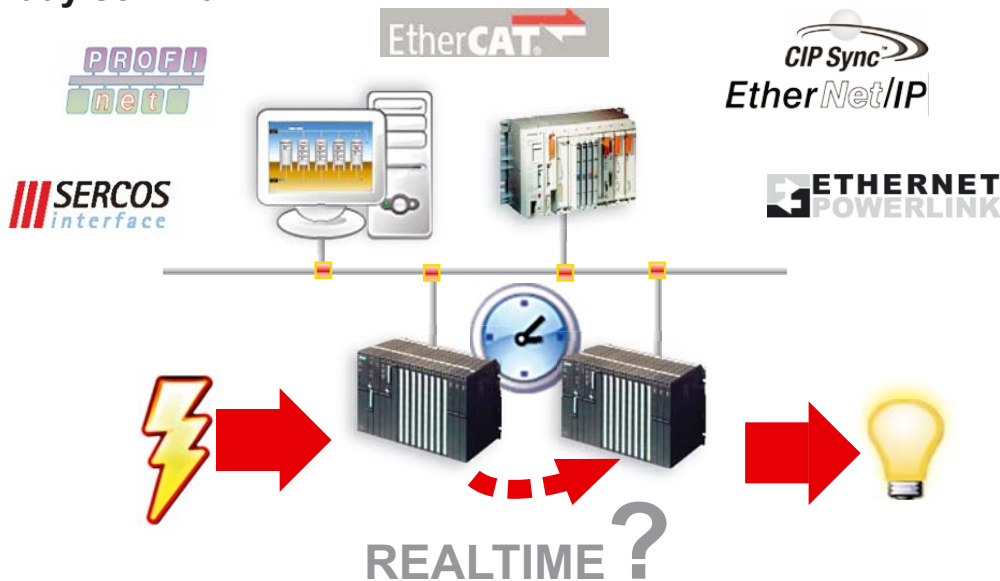
2-day seminar,

Nuremberg / Person

Order No.: 100-2290-02

Realtime Ethernet in Automation

1-day seminar



The chances and options with Ethernet are nearly unlimited. It is no surprise that it became accepted as the standard in the office world as well as in great parts of the industry. But Ethernet as fieldbus? What an attractive idea. All possibilities of modern office communication become applicable in production.

For a long time that seemed utopistic because of the lack of realtime capability of the classical Ethernet. First solutions, that based on Ethernet and at the same time complied the requirements for realtime were already presented in 2003.

But what is realtime Ethernet exactly? Powerlink, EtherCat, Sercos-III, Varan, Profinet or another of the many available systems? What are the differences and which organisation stands behind it? Are there convincing advantages compared to fieldbusses and are these products already available?

Contents and goals:

The one day workshop „Realtime-Ethernet in automation“ is for employees in planning, projecting and maintenance, that stand in front of the question: „Which real-time Ethernet fits the best to my tasks?“

Independent from manufacturer names the course offers an overview of the available solutions and there technical base.

The training is a well compiled mix of theory and practise. It mediates effectively background knowledge and shows the five most important realtime Ethernet systems in comparison.

Application examples show which possibilities already exist and what else is to expect in the future.

Topic overview:

- ▶ **What is realtime?**
 - Realtime in theory (definition)
 - Realtime in practise
 - Realtime in shared systems
 - Quality categories and parameters
- ▶ **Why does classical Ethernet not work in realtime?**
 - Media access and infrastructure components
 - examples
- ▶ **Overview of the current solutions**
 - Goals of realtime Ethernet systems
 - Application in practise
 - Norming stage
- ▶ **Realtime Ethernet systems in detail**
 - PROFINET
 - EtherNet/IP
 - Ethernet Powerlink
 - EtherCAT
 - SERCOS III
- ▶ **Application**



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Special characteristics:

▶ **Instructor**

Certified engineer Andreas Pfeiffer has worked for years in international norming groups among others on the fieldbus standard IED 61158 and realtime Ethernet standard IEC 61784-2. He is able to report at first hand.

▶ **Performances**

- Training documents
- CD-ROM with training documents
- Certificate of participation
- Lunch and coffee breaks
- Training language: English

▶ **Requirements**

- Basic knowledge in automation engineering
- Previous knowledge of Ethernet

Further seminars at INAT

▶ **INDUSTRIAL ETHERNET**

- Ethernet I: Basics
- Ethernet II: Troubleshooting in area networks

▶ **PROFIBUS**

- PROFIBUS – Technology
- PROFIBUS – Troubleshooting

▶ **PROFINET**

- PROFINET – Technology
- PROFINET – Certified Engineer

▶ **MODERN COMMUNICATION**

- OPC Plug´n´ Play in automation
- OPC-User-Training
- OPC-Manufacturer-Training
- OPC Unified Architecture
- Wireless LANs in automation

▶ **AROUND PLC**

- Modernization of S5 PLCs

Order data:

1-day seminar

Nuremberg / Person

Order No.: 110-1500-01

Learn in small groups:

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Trainer



DI Andreas Pfeiffer

In-house training:

If you would like to have a training at your company, feel free to ask. We will create a customized offer for you

Current dates
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Seminar: OPC Plug'n' Play in Automation

2-day seminar with theory and practice



Contents and goals:

The training is for engineering executives and project leaders that have already had first experiences with OPC technology or plan the application of OPC in an automation area in the future.

You will receive an overview of the OPC technology and its meaning in automation. OPC extensions such as Alarm & Event or currently intensely discussed OPC & XML are being described and classified.

During the practice part communication possibilities of OPC technology via Ethernet will be explained using typical OPC products such as e.g. visualization.

By establishing an OPC communication with S7 / S5 PLCs the configuration of the client and the server respectively will be shown.

An introduction to the development of a simple OPC Client with Visual basic, for connections to various data bases (Access) and/or for visualization of data, caps off the practical part of the seminar.

Topic overview:

- ▶ **Introduction to OPC**
 - OLE for Process Control
 - OPC foundation, activities
- ▶ **Basics of OPC**
 - Overview OPC specifications
 - OPC components (Client, Server)
 - Data Access 1.0 to 2.05
 - Alarm & Event
 - Historical batch data
 - Forecast: OPC, XML and OPC DX
- ▶ **OPC Performance**
 - Speed of the OPC communication
 - What will affect the performance?
- ▶ **OPC in Practice**
 - Configuration of Simatic.NET OPC Server
 - Configuration of INAT OPC Server
 - DCOM Configuration
- ▶ **OPC Interface**
 - Interfaces and methods of the interface specification OPC Data Access
 - Basics of programming OPC clients for the Automation Interface using Visual Basic
 - Tips to improve performance when accessing the OPC interface
- ▶ **Workshop: OPC Client Programming**
 - Typical development of an OPC client
- ▶ **Troubleshooting**
 - Diagnostic possibilities
 - Methodical search for faulty communication
 - Troubleshooting and elimination

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Special characteristics:

► Performances

- Two day training with theory and practice part
- Training documents
- CD-ROM with OPC specification version 2.05 and complete Visual Basic (.Net) examples
- Certificate
- Lunch and coffee breaks
- Training language: English

► Requirements

- PC knowledge
- Basic knowledge of programming
- Basic knowledge of Visual Basic

Learn in small groups:

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After these 2 days the participants are able to appraise every OPC Server or Client and start them up.

Further seminars at INAT

► INDUSTRIAL ETHERNET

- Ethernet I: Basics
- Ethernet II: Troubleshooting in area networks
- Real-Time-Ethernet in automation

► PROFIBUS

- PROFIBUS – Technology
- PROFIBUS – Troubleshooting

► PROFINET

- PROFINET – Technology
- PROFINET – Certified Engineer

► MODERN COMMUNICATION

- OPC-User-Training
- OPC-Manufacturer-Training
- OPC Unified Architecture
- Wireless LANs in automation

► AROUND PLC

- Modernization of S5 PLCs

In-house training:

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Order data:

OPC Plug'n'Play in Automation

2-day seminar

Nuremberg / Person

Order No.: 100-1030-01

Seminar: Wireless LANs in Automation

2-day seminar with theory and practice



Contents and goals:

The training is for employees from planning, design and maintenance who intend to build wireless networks or want to integrate wireless components into an existing network. You will get an overview about the topic WLANs and get to know a lot of WLAN components during the workshop.

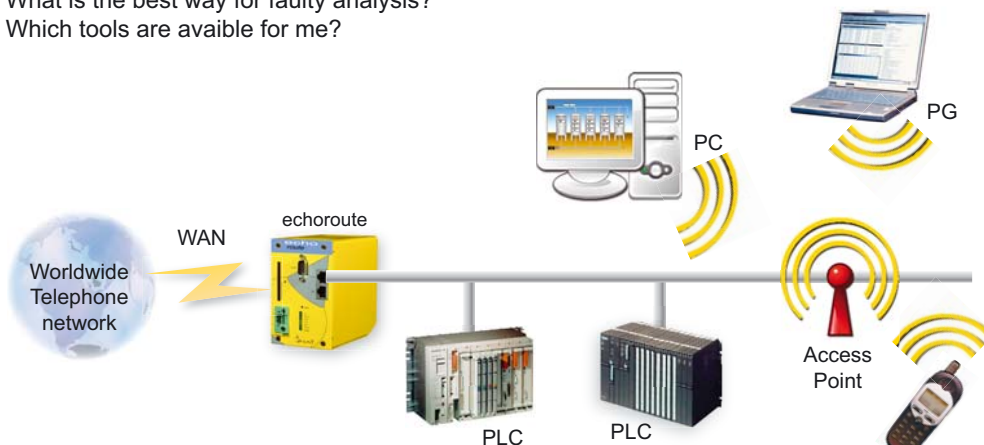
With an exercise wireless network communication to the S7- and S5 PLCs you will get to know the advantages and disadvantages of the use of WLAN technologies in the automation area.

The workshop is about establishing WLANs according to 802.11 specification and spotting failure scenarios all around Ethernet communication in the wireless network.

What is the best way for faulty analysis?
Which tools are available for me?

Topic overview:

- ▶ **Introduction WLANs**
 - getting started
 - WLAN and other wireless technology
 - legal basis
- ▶ **Network types**
- ▶ **Physical base**
 - transmitting media
 - 802.11 standards
 - Frequency-Hopping technology
 - Direct-Sequence-technology
- ▶ **Increase of range - antennas**
- ▶ **TCP/IP and Wireless LAN**
 - Roaming
 - MobileIP
 - TCP/IP in the WirelessLAN
- ▶ **Network analysis in wireless LAN**
- ▶ **Troubleshooting in wireless networks**
- ▶ **Security of wireless networks**
- ▶ **Industrial use of WLAN**
- ▶ **Future trends in WLANs**



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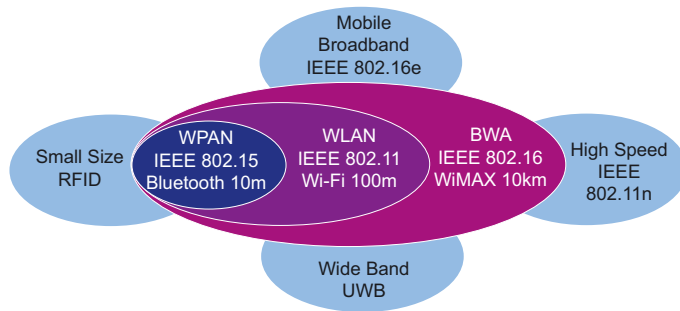
Special characteristics:

▶ Performances

- Seminar documents
- Seminar documents and network tools on CD
- Certificate of participation
- Lunch and coffee breaks
- Training language: English or German

▶ Requirements

- Completion of „Ethernet I“ seminar
- Basic PC knowledge and S5 / S7



Learn in small groups:

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This guarantees a comprehensive, personal support, so that no question remains unanswered.

**Wireless into the future
– INAT shows you the way**

Further seminars at INAT

▶ INDUSTRIAL ETHERNET

- Ethernet I: Basics
- Ethernet II: Troubleshooting in area networks
- Real-Time-Ethernet in automation

▶ PROFIBUS

- PROFIBUS – Technology
- PROFIBUS – Troubleshooting

▶ PROFINET

- PROFINET – Technology
- PROFINET – Certified Engineer

▶ MODERN COMMUNICATION

- OPC Plug´n´ Play in automation
- OPC-User-Training
- OPC-Manufacturer-Training
- OPC Unified Architecture

▶ AROUND PLC

- Modernization of S5 PLCs

In-house training:

If you would like to have a training at your company, feel free to ask. We will create a customized offer for you.

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Order data:

Wireless LANs in Automation

2-day seminar

Nuremberg / Person

Order No.: 100-1080-01

Seminar: Modernization of S5 PLCs

2-day PLC seminar with theory and practice



Contents and goals:

The course is for employees from planning, project design and maintenance who are interested in alternatives to the extensive change over of plants from S5 to S7 PLCs.

With various examples of SPS programs you will learn which aspects should be considered while implementing into X5/X7.

Which similarities and which differences are there between X5/S5 and X7/S7 CPUs?

You will gain insight the functioning of the RS5/RS7 software and learn on what kind of different platforms an „S5“ could be operated with.

You will learn that modules from the S5 program don't have to be reprogrammed in order to change over from S5 to S7 but how the S5 programs are accessed in a STEP 7 program.

Topic overview:

- ▶ Similarities of a Siemens CPU and a X5 with RS5/7 Flash
- ▶ Differences between a Siemens CPU and a X5 with RS5/7
- ▶ Connection options of Profibus, Interbus and L1-Bus on a X5 with RS5/7
- ▶ External modules in the S5 Rack
- ▶ Examples, exercises
- ▶ Decision criteria for the implementation of an existing S5 program
- ▶ Implementation of PLC programs of the CPUs 922 to 946/947 into an X5 with RS5
- ▶ Communication with guide systems / visualizations and with other PLCs
- ▶ Operation of multi-processors in X5 with RS5



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Special characteristics:

► Performances

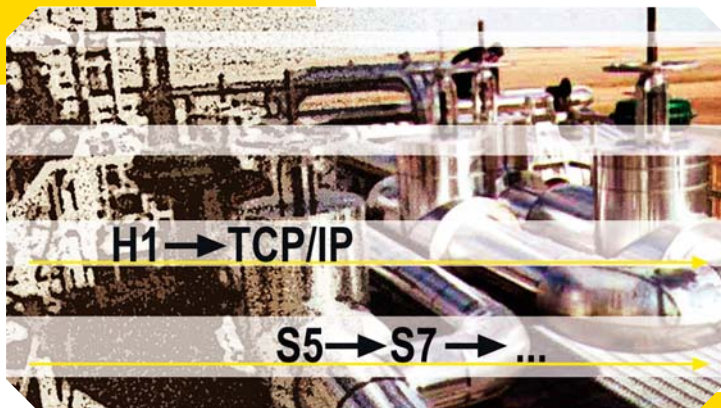
- Training documents
- CD-ROM with training documents and network tools
- Certificate
- Lunch and coffee breaks
- Training language: English or German

► Requirements

- Ethernet TCP/IP I Basics
- Basic PC and S5/S7 knowledge

Learn in small groups:

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Overview in the jungle of modernization

Further seminars at INAT

► INDUSTRIAL ETHERNET

- Ethernet I: Basics
- Ethernet II: Troubleshooting in Anlagennetzen
- Echtzeit-Ethernet in der Automatisierung

► PROFIBUS

- PROFIBUS – Technologie
- PROFIBUS – Troubleshooting

► PROFINET

- PROFINET – Technologie
- PROFINET – Certified Engineer

► MODERN COMMUNICATION

- OPC Plug´n´ Play in automation
- OPC-User-Training
- OPC-Manufacturer-Training
- OPC Unified Architecture
- Wireless LANs in automation

In-house training:

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Current dates
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Order data:

Modernization of S5 PLCs

2-day seminar,

Nuremberg / Person

Order No.: 110-1100-01