KAESER
KOMPRESSOREN

Technical Description   E

SIGMA AIR MANAGER

SEND/RECEIVE via OPC

GL number: 7_7760_0-OPC_02E

Contents

1 General

The **SEND/RECEIVE option package** is conditional for the control of certain functions in SIGMA AIR MANAGER by networked peer to peer communications (remote control), for example by a PC, a workstation or a control centre. In addition, the compressed air system's process data are transferred to the networked communications peer via the SEND/RECEIVE interface and are available there for visualisation or monitoring.

The transfer of control and process data between SIGMA AIR MANAGER and the communications peer uses the SEND/RECEIVE communications protocol via an Ethernet TCP/IP network with RFC 1006 (ISO on TCP). The SEND/RECEIVE interface was developed by Siemens to communicate with an S5 automation system via Ethernet and is therefore S5 compatible.

To create the communications link the SEND/RECEIVE option must be enabled on SIGMA AIR MANAGER by entering the registration code provided by KAESER. When this has been done SEND/RECEIVE on SIGMA AIR MANAGER can be activated.

The Ethernet interface of the communications peer (PC) is configured and operated with communications software from SIMATIC NET (Siemens) that then emulates the SEND/RECEIVE protocol. PCs can then be linked using standard network cards available in the trade, or the SIMATIC NET CP 1613 communications module (better performance). To allow access to the control and process data of SIGMA AIR MANAGER in Windows, the communications software makes the SEND/RECEIVE interface available as a DLL (dynamic link library) and the OPC server interface available for SEND/RECEIVE.

The configuration of the SEND/RECEIVE communication between SIGMA AIR MANAGER and a networked PC in Microsoft Windows is described in detail in this document and explained with the aid of an example project.

1.1 System Requirements

1.1.1 SIGMA AIR MANAGER

The SEND/RECEIVE option package can only be used with SIGMA AIR MANAGER's Ethernet interface and not with the RS 232 or modem link.

SEND/RECEIVE can run on almost all SAM models delivered at present. Exceptions are the SAM basic and the old SAM model 4/4 delivered until 2004, which are not fitted with an Ethernet interface.

A further condition for SEND/RECEIVE is that SIGMA AIR MANAGER is provided with certain software versions. Old software must be updated.

SEND/RECEIVE can only run if SIGMA AIR MANAGER's operating system is at least version 1.01 (109) and the KAESER software is at least version STEP5 v0.13. In addition, SEND/RECEIVE can only run through a standard network card with STEP5 v0.16 software and upwards. Independent of this it is recommended to update to the current software versions of operating system and KAESER software.

1.1.2 Communications peer

The communications peer (PC) must be networked with SIGMA AIR MANAGER via Ethernet and be in the same network. The standard system requirements for TCP/IP networks must be conformed with.

SIGMA AIR MANAGER represents a peer in TCP/IP networks. Its IP address, subnet mask and, if necessary, the IP address of a router can be set and therefore adapted to the existing network (see SIGMA AIR MANAGER service manual).

To allow the communications peer to run SEND/RECEIVE on TCP/IP, the corresponding communications software from SIMATIC NET (Siemens) must be installed and configured for SEND/RECEIVE (see 2.2).

A **standard Ethernet network card** can be used as a hardware basis for SEND/RECEIVE, whereby the accompanying NDIS driver must be at least version 3.1. In this case, communications software **SOFTNET-S7** is needed. SOFTNET 7 emulates the SEND/RECEIVE protocol on the PC's CPU. This has the disadvantage that communication performance is dependent on the performance capability and workload on the PC used.

The second method of installing SEND/RECEIVE on PCs is the use of the SIMATIC NET **CP 1613** communications module. The CP 1613 is connected to the internal PCI bus. In this case, communications software **S7-1613** is needed. S7-1613 runs the SEND/RECEIVE protocol directly on the CP 1613, providing better communication performance because the PC's CPU is hardly loaded.

1.2 Limitations

Only one SEND/RECEIVE link with a communications peer can be made simultaneously from SIGMA AIR MANAGER. Only when the existing link is disconnected (project planning setting), can another communications peer create a new link. Therefore redundant systems with several communications peers are not supported. SIGMA AIR MANAGER ever represents a **passive participant** from a communications point of view.

The communications project (TSAP) is fixed implemented in the SIGMA AIR MANAGER and therefore cannot be modified.

Concerning the project planning of the communications peer (PC), it is recommended to establish one „Write active" and one „Fetch active" connection. The essential steps for this are described in detail in this document (see 3.2.3). These connection types have the advantage over a connection in the "Send/Receive" mode in that they allow access to arbitrary data blocks of the S5 data modules released for this.
However, the TSAP setting is at none of the connection types freely selectable.
It must be „W-KAESER" and „F-KAESER" or „S-KAESER".

A **user data record of maximum 240 data bytes** (120 data words) is supported by SIGMA AIR MANAGER. In general, this limitation has to be respected by the communications peer, for example, during the execution of a FETCH command.

The maximum data transfer rate is 10 Mbit/s.

The ISO transport protocol is not supported by SIGMA AIR MANAGER.

2 Interfaces

2.1.1 SIGMA AIR MANAGER

An 8-pole RJ 45 socket (see SIGMA AIR MANAGER service manual) is available on SIGMA AIR MANAGER (models 8/4 upwards, see 1.1.1) for the Ethernet connection. The maximum data transfer rate is 10 Mbit/s. Standard network cable can be used for the link.

2.1.2 Network card

If a standard network card is used for the communications peer, then ensure that the NDIS driver is at least version 3.1. Information on the installation, connection and driver installation of the network card is found in the relevant technical documentation.

2.1.3 CP 1613

If the SIMATIC NET CP 1613 communications module (see 1.1.2) is chosen as a peer, then the following technical data apply:

- Installation: 1 PCI slot
- Interfaces: - RJ 45 socket, ITP (10/100 Mbit/s)

                          - 15-pole SUB-D socket, AUI (10 Mbit/s)
- Power consumption: - 600 mA at DC 5 V

                          - 500 mA at DC 12 V
- Power loss: 4 W
- Operating temperature: +5 °C to +40 °C
- Number of connections: 120 with SEND/RECEIVE (TCP/IP)

More details on the CP 1613 can be found in the accompanying technical documentation.

2.2   Protocol handling

2.2.1 SIGMA AIR MANAGER

SIGMA AIR MANAGER supports the SEND/RECEIVE communications protocol that uses the **Ethernet TCP/IP network with RFC 1006** (ISO on TCP) that was developed by Siemens for exchange of data with S5-compatible automation systems. The communications peer (PC) can access certain, released S5 data modules from SIGMA AIR MANAGER; it can write to control data and read process data. SIGMA AIR MANAGER supports the protocol options "FETCH/WRITE" and "SEND/RECEIVE". It is recommended to use „FETCH/WRITE" because „FETCH/WRITE" allows flexible access to data blocks (see 1.2 and 3.1).

SIGMA AIR MANAGER represents a **passive participant** from a communications point of view that accepts and carries out commands (WRITE, FETCH).

The ISO transport protocol is not supported by SIGMA AIR MANAGER.

2.2.2 Network card and SOFTNET-S7

If the SEND/RECEIVE protocol is to run with a standard Ethernet network card, then the SOFTNET-S7 communications software from SIMATIC NET is required.

SOFTNET-S7 contains (as does S7-1613) all the necessary project planning and configuration tools for the PC station and the SEND/RECEIVE link to SIGMA AIR MANAGER. These tools are integrated in the "Advanced PC Configuration" software package.

- The **Commisioning Wizard** guides the user through the individual configuration, planning and design stages up to the status of an operational PC station.

- The **Configuration Console** is the central tool for the configuration settings and diagnosis of the hardware components and software applications.

- With **NCM-PC**, the PC station can be designed and planned as in S7.
  A planning wizard for user guidance is also integrated.

The PC with its network card represents a **active participant** from a communications point of view that sends commands (WRITE, FETCH) to SIGMA AIR MANAGER.

SOFTNET S7 emulates the SEND/RECEIVE protocol on the PC's CPU (in contrast to S7-1613). This has the disadvantage that communication performance is dependent on the performance capability and workload on the PC used. The integration of a SOFTNET-S7 project within the ISO/OSI layers model for data communication is shown below. SOFTNET-S7 uses the network card ODI/NDIS driver (layer 2) that must be at least version 3.1 and makes the SEND/RECEIVE interface available for PC applications on layer 4 (programming interface and OPC server).

Layer	Function	Communications components
7	Application layer	User application
6	Presentation layer	
5	Session layer	SEND/RECEIVE interface
4	Transport layer	SEND/RECEIVE interface
3	Network layer	**SOFTNET-S7-Project**
2b	Link layer	(Emulation on PC-CPU)
2a		ODI/NDIS driver
1	Physical layer	Ethernet interface

2.2.3 CP 1613 and S7-1613

If the SEND/RECEIVE protocol on the PC is to run via the SIMATIC NET communications processor CP 1613, then communications software S7-1613 from SIMATIC NET (Siemens) is required.

S7-1613 contains (as does SOFTNET S7) all the necessary project planning and configuration tools to configure the PC station and the SEND/RECEIVE link to SIGMA AIR MANAGER. These tools are integrated in the "Advanced PC Configuration" software package.

- The **Commisioning Wizard** guides the user through the individual configuration, planning and design stages up to the status of an operational PC station.

- The **Configuration Console** is the central tool for the configuration settings and diagnosis of the hardware components and software applications.

- With **NCM-PC**, the PC station can be designed and planned as in S7. A planning wizard for user guidance is also integrated.

The PC with CP 1613 represents an **active participant** from a communications point of view that sends commands (WRITE, FETCH) to SIGMA AIR MANAGER.

Together with CP 1613, S7-1613 supports multi-protocol operation, i.e. simultaneous use of other types of link in the network as well as SEND/RECEIVE. Further details can be found in the technical documentation supplied.

S7-1613 runs the SEND/RECEIVE protocol directly on the CP 1613. This has the advantage that communications performance is to a large degree independent of the workload on the PC used. The integration of an S7-1613 project within the ISO/OSI layer model for data communications is shown below. S7-1613 loads the S7-1613 project in the CP 1613. Layers 1 to 4 then run directly on the CP 1613. In layer 4, the SEND/RECEIVE interface (programming interface and OPC server) is available for PC applications.

Layer	Function	Communications components
7	Application layer	User application
6	Presentation layer	
5	Session layer	SEND/RECEIVE interface
4	Transport layer	SEND/RECEIVE interface
3	Network layer	**S7-1613 project**
2b	Link layer	(run on CP 1613)
2a		
1	Physical layer	Ethernet interface

2.3 Integration in Applications

2.3.1 SEND/RECEIVE programming interface

A SEND/RECEIVE programming interface for integration in its own applications program under Windows is included in the two SOFTNET-S7 and S7-1613 communications software packages as a **DLL** (Dynamic Link Library). Their functions can be integrated in any source code program and allow access to SIGMA AIR MANAGER's released control and process data independent of the programming language used. This allows certain functions to be controlled and SIGMA AIR MANAGER's operational status and process data on the online compressors to be read out, visualised and monitored.

Appropriate **example programs** are included in the communications software's scope of delivery. They are written in "C" (programming language) and are intended to clarify the working principle of the SEND/RECEIVE programming interface.

A **task library** is still used. It is written in "C" and can be integrated directly into one's own C-programs. The tasks can then be used directly.

Multi-device operation is possible with the SEND/RECEIVE programming interface. One or more application programs can simultaneously address one or more network cards in one's own PC. And, every network card can be addressed through one or more "application access points".

The procedure for integrating the functions of the DLL in one's own program is described in detail in the SEND/RECEIVE programming interface manual supplied.

2.3.2 SEND/RECEIVE OPC server interface

A SEND/RECEIVE OPC server interface is contained in the two SOFTNET-S7 and S7-1613 communications software packages to allow easy integration of the active SEND/RECEIVE data from SIGMA AIR MANAGER into Windows applications, for example in Microsoft Office applications (Excel, Access) with Visual Basic (VBA). Further SIMATIC NET OPC server interfaces, e.g. for S7-compatible communication, are irrelevant as far as SIGMA AIR MANAGER is concerned, but can be used as well if required (multi-protocol operation).

OPC is short for **O**LE for **P**rocess **C**ontrol and is a **manufacturer-independent standard** interface for accessing process data for communication in automation technology. OPC is based on the standard OLE2 from Microsoft. The basis for all OLE mechanisms is **COM**, the **C**omponent **O**bject **M**odel from Microsoft. COM defines the creation of objects as complete units in Windows. These COM objects can be integrated into any development environment or programming language and are principally available for all applications under Windows, even external to computer limits, i.e. within a network.

In line with the basic OPC specification for **OPC data access**, the **SIMATIC NET OPC server** makes methods available with the help of a class model that allow read, write and the definition of process variables. **OPC Alarms & Events**, the OPC specification for handling events is **not available** for SEND/RECEIVE communication (only for S7-compatible communication).

Client applications that are based on a script language such as **Visual Basic or VBA** (MS Office) have to use the so-called **Automation Interface** of the SIMATIC NET OPC server. The automation interface allows data access according to OPC Data Access, but not event handling according to OPC Alarms & Events, which is generally sufficient for most applications. Applications in C/C++ can use the higher performance **Custom Interface** that supports both specifications. The OPC server class model, its allocated characteristics and

methods (interfaces) for data access and appropriate application examples are included in the SIMATIC NET OPC manual supplied. In addition, some example programs for client applications in Visual Basic and C++ are included.

For communication between an OPC client, e.g. the OPC Scout supplied or an own Visual Basic application and SIGMA AIR MANAGER, the **SEND/RECEIVE OPC server interface** is used. From the point of view of communication with SIGMA AIR MANAGER, this interface has the following features:

- Supports the WRITE command (SEND with WRITE function)

- Supports the FETCH command (readout of process data)

- Access to data packets (data areas in SIGMA AIR MANAGER)

- Definition of variables within a data packet

- Display and monitoring of the link status

- Browser functionality with reference to defined variables

- Saving of communications parameters in a text file

Further information on the planning of the SEND/RECEIVE server, especially with regard to the construction of the text file (link parameters, access points, symbolic variables) can be found in the SIMATIC NET OPC server manual supplied.

In view of minimum possible system loading by the OPC server it is imperative that variables (items) are meaningfully integrated in OPC groups during the creation of own OPC client applications and that no individual variables (items) are accessed in read or write but only in groups (OPC groups).

An OPC client application for SIGMA AIR MANAGER in Visual Basic (VBA) is included in Annex A as an example for use of the SEND/RECEIVE OPC server interface.

2.3.3 OPC Scout

A complete OPC client with a graphic user interface is included in the two SOFTNET-S7 and S7-1613 communications software packages. This program example is a Visual Basic application and can be used to test communication with the help of the communications peer via the OPC server interface (see 3.2.4). The OPC Scout offers the following:

- Creation of OPC groups (meaningful integration of OPC items)

- Addition of OPC items (process variables) to OPC groups

- Read/write of OPC items

3 Start-up

3.1 SIGMA AIR MANAGER

First, the SEND/RECEIVE option package must be registered at KAESER. To do this, the "Release Code Request" form supplied is to be filled out fully by the customer and faxed or e-mailed to KAESER. KAESER then registers SEND/RECEIVE and grants a single license for the customer's SIGMA AIR MANAGER according to the license conditions attached in that KAESER provides the customer with the **registration code** (release code). The Registration code is needed to unlock the SEND/RECEIVE software on SIGMA AIR MANAGER.

The registration code is to be entered in SIGMA AIR MANAGER once only. The appropriate menu option is accessed through "Main menu" ► Settings ► System ► Communication ► "SEND/RECEIVE". When the registration code has been entered correctly, SEND/RECEIVE can be activated in the same menu option by choosing the protocol option "FETCH/WRITE" or "SEND/RECEIVE".

"FETCH/WRITE" allows access to arbitrary data blocks of the S5 data modules released for this. With **"SEND/RECEIVE"** the data blocks are fixed implemented in the SIGMA AIR MANAGER (process images and remote control data). It is possible, however, to set if the process images of the linked SIGMA CONTROL compressors in the data modules 64 to 79 ("SAM+SC") should be sent in addition to the process image of the SIGMA AIR MANAGER in the data module 31 ("SAM"). **In this case ("SAM+SC"), the communications peer has to determine, on the basis of the data word 91, to which participant the received process image is related. For this, the low significant (right) byte of the data word 91 containing the slave address must be evaluated. It is "2" in case of SIGMA AIR MANAGER and "compressor number + 2" in case of SIGMA CONTROL compressors.**

The process images of the SIGMA AIR MANAGER (DB 31) and the SIGMA CONTROL compressors (DB 64 ... 79) as well as the available remote control data (DB 34) must to be taken from the separately delivered Technical Descriptions 7_7725_PAGEN_* (SAM) and 7_7000_PASNDRCV_* (SC).

As communication via SEND/RECEIVE is based on Ethernet and TCP/IP, SIGMA AIR MANAGER and the communications peer (PC) must be networked in Ethernet and lie in the same TCP/IP network. In addition, SIGMA AIR MANAGER's IP address, subnet mask and, if required, the IP address of a router can be set up. The appropriate menu option is accessed through "Main menu". ► Settings ► System ► Interfaces ► Ethernet. This menu option has to be left afterwards.

SIGMA AIR MANAGER must be restarted to activate the SEND/RECEIVE and the TCP/IP settings that were made.

Turn off the power supply to SIGMA AIR MANAGER and then turn it on again (using the cut-out in the control cabinet or the user's power switch).

The remote control functions via SEND/RECEIVE are only effective when SIGMA AIR MANAGER is running in remote control mode. If remote control mode is ended, the current mode (OFF/ON, Manual/Automatic, Clock OFF/ON) is kept and the local settings are effective again.

Remote control mode is switched on or off with the REMOTE key and indicated by the LED (see SIGMA AIR MANAGER service manual).

3.2   Communications peer

A standard Ethernet network card or the SIMATIC NET communications module CP 1613 can be used as the hardware basis for SEND/RECEIVE in PCs. The planning of the PC station and the communication is carried out with the SOFTNET S7 or S7-1613 software package. Both software packages are similarly structured and have the same tools (see 2.2.2 and 2.2.3).

3.2.1 Information and ordering from Siemens

Current and detailed information on CP 1613 as well as the software packages SOFTNET-S7 and S7-1613 are to be found in the Siemens online catalogue under https://mall.ad.siemens.com/de/guest/guiRegionSelector.asp.

Current valid ordering information is shown below:

- For standard network cards:

    SOFTNET-S7 for 64 links (6GK1704-1CW63-3AA0) **or**
    SOFTNET-S7 LEAN for 8 links (6GK1704-1LW63-3AA0)

Artikel-Nr.	Artikelbeschreibung
6GK1704-1CW63-3AA0	SIMATIC NET IE SOFTNET-S7/2005 SW F. S7-,S5-KOMP.-KOMM.,OPC, PG/OP-KOMM.,NCM PC,BIS 64 VERB. SINGLE LICENSE F.1 INSTALLATION R-SW, SW + ELEKTR. HB AUF CD LICENSE KEY AUF FD, KLASSE A 2-SPRACHIG (D,E); FUER 32BIT WINDOWS XP PRO, 2000 PRO/SV; WINDOWS 2003 SERVER; FUER CP 1512 / CP 1612/ CP7515
6GK1704-1LW63-3AA0	SIMATIC NET IE SOFTNET-S7 LEAN/ 2005;SW F.S7-,S5-KOMP.KOMM.,OPC PG/OP-KOMM.,NCM PC,BIS 8 VERB. SINGLE LICENSE F.1 INSTALLATION R-SW, SW + ELEKTR. HB AUF CD LICENSE KEY AUF FD, KLASSE A 2-SPRACHIG (D,E); FUER 32BIT WINDOWS XP PROFESSIONAL, 2000 PRO/SV; WIN 2003 SERVER FUER CP1512/ CP1612/ CP7515

- For communications module CP 1613:

    Communications module **CP 1613** (6GK1161-3AA01) **and**
    communications software **S7-1613** (6GK1716-1CB63-3AA0)

Artikel-Nr.	Artikelbeschreibung
6GK1161-3AA01	SIMATIC NET, IE, CP 1613 A2 PCI-KARTE (32BIT; 33MHZ/66MHZ; 3,3V/5V UNIVERSAL KEY) ZUM ANSCHLUSS AN IND. ETHERNET (10/100MBIT/S) MIT ITP UND RJ 45-ANSCHLUSS UEBER S7-1613 UND S7-REDCONNECT. INKL. TREIBER F. MS WINDOWS (32BIT), 2000PRO/SERV, XP PRO, 2003 SERVER
6GK1716-1CB63-3AA0	SIMATIC NET IE S7-1613/2005 SW F. S7-,S5-KOMP.-KOMM., OPC, PG/OP-KOMM.,NCM PC,BIS 120 VERB SINGLE LICENSE F.1 INSTALLATION R-SW, SW + ELEKTR. HB AUF CD LICENSE KEY AUF FD, KLASSE A 2-SPRACHIG (D,E); FUER 32BIT WINDOWS XP PRO, 2000 PRO/SV; WIN 2003 SERVER; FUER CP1613, CP 1613 A2

3.2.2 Installation of the communications software

Installation of the SOFTNET-S7 and S7-1613 software packages is user-guided. The relevant installation instructions must be observed. Product authorisation is to be transferred with the authorisation program "AuthorsW" (Windows start button ► Simatic ► AuthorsW) from the authorisation disk to the PC.

3.2.3 Planning the PC station and communication

The procedure described below is a non-binding example of the configuration of a SEND/RECEIVE link to SIGMA AIR MANAGER. It refers to a PC with CP 1613 and the S7-1613 communications software. The planning of a PC with a standard Ethernet network card with the help of SOFTNET-S7 can be carried out in the same way as in the example shown. Settings that lie within the judgement of the user are not explained further in this example.

The SIMATIC NET **Commissioning Wizard** will guide the user through the individual planning steps up to the status of an operational PC station. It can be called up in the Windows Start menu.
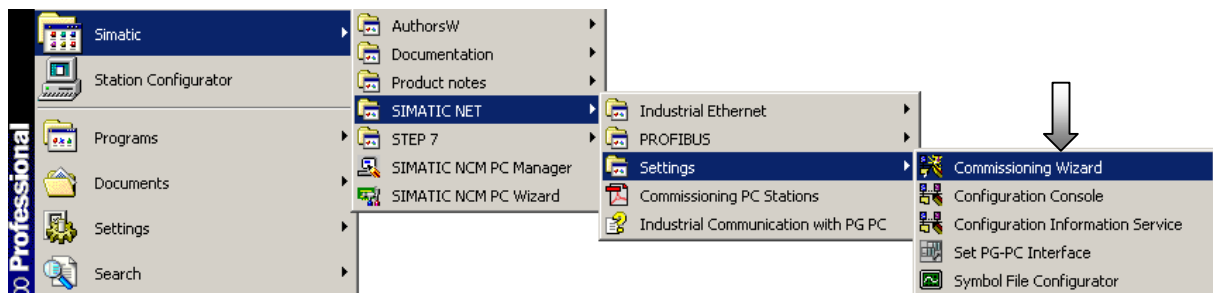
The next step is selected in step 1 of the Commissioning Wizard.
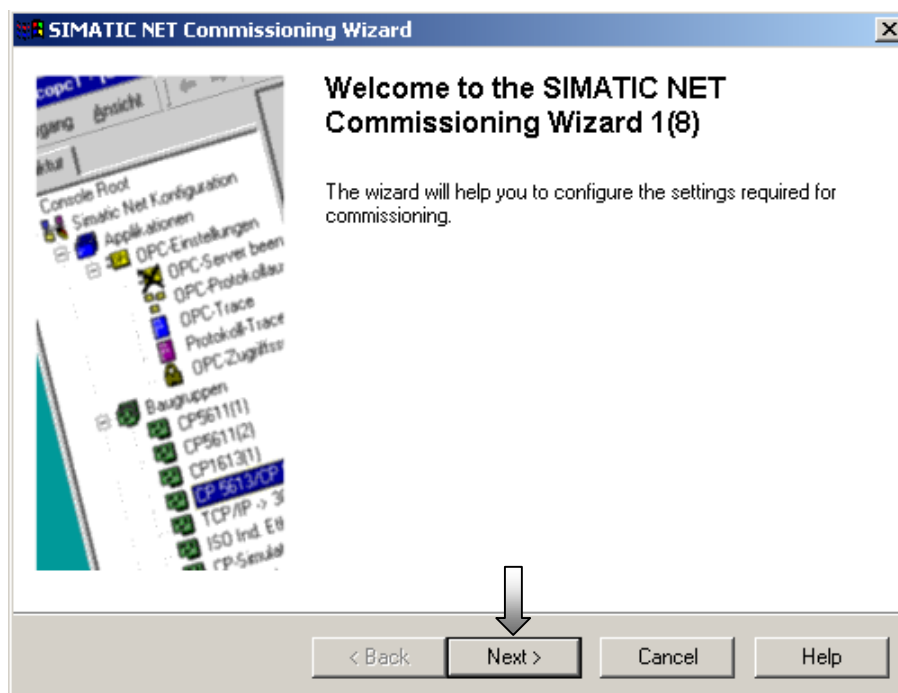
In step 2 the productive operation mode for the CP 1613 and a fictive slot index (same as S7) - here for example "2" - is set.
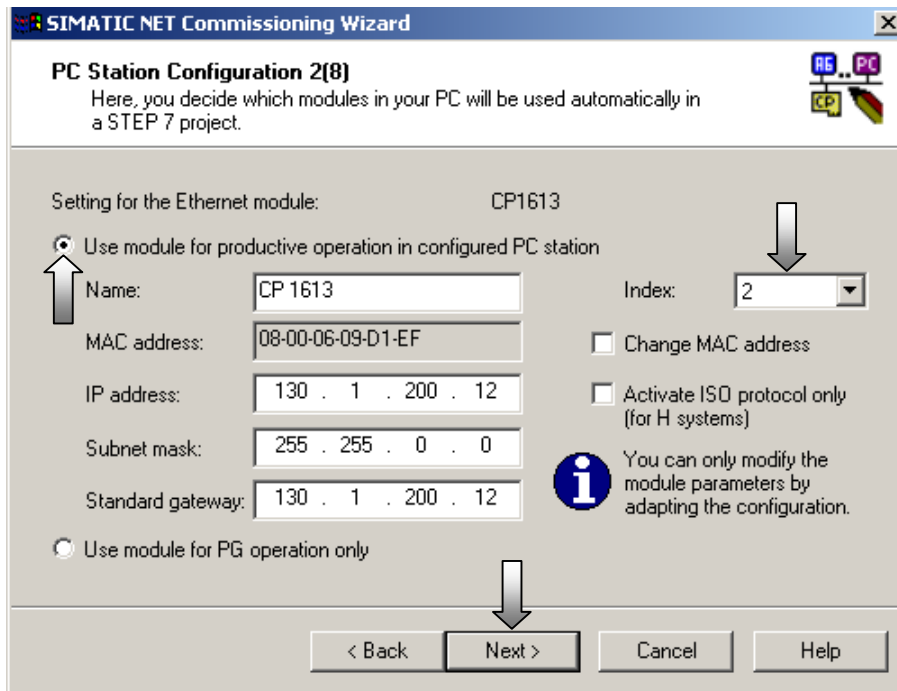
In step 4 the SIMATIC NET OPC server is activated and a fictive slot index - here for example "1" - is set.
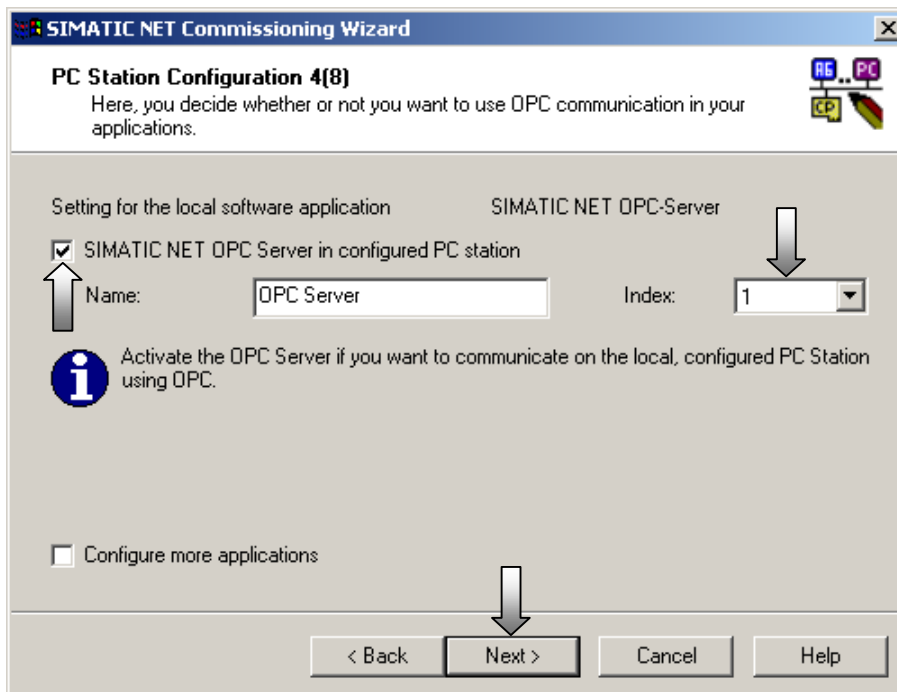
In step 5 pressing the "Next" button saves the module configuration.
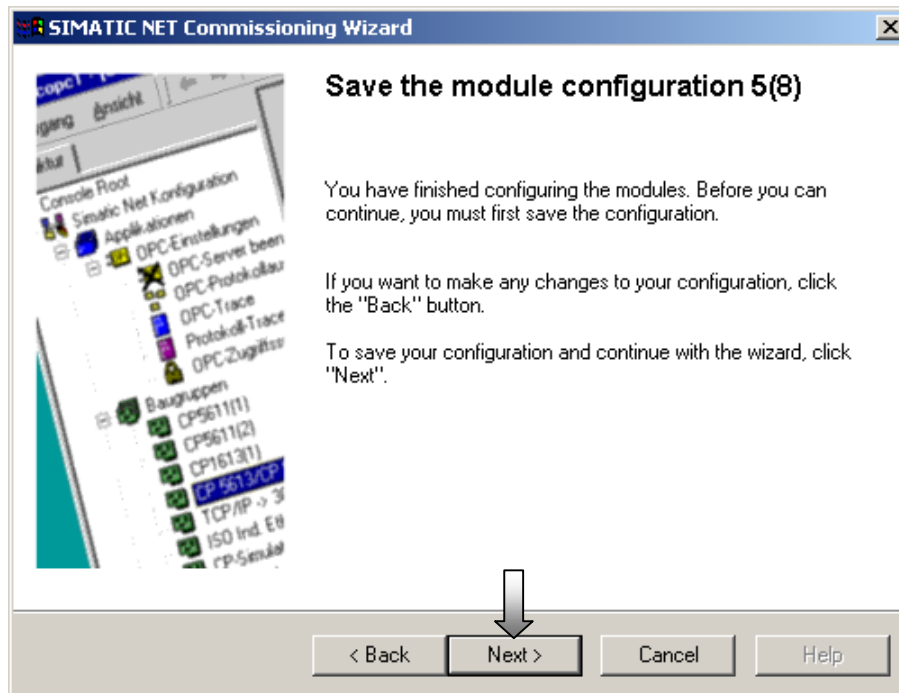
Press the OK button in the following note.
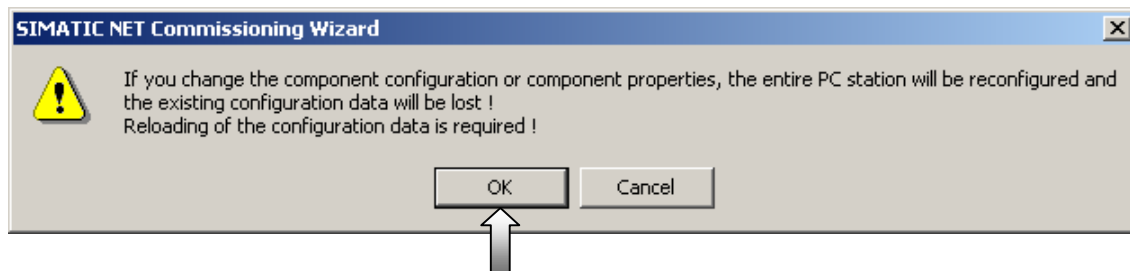
The next step is selected in step 6 of the Commissioning Wizard.
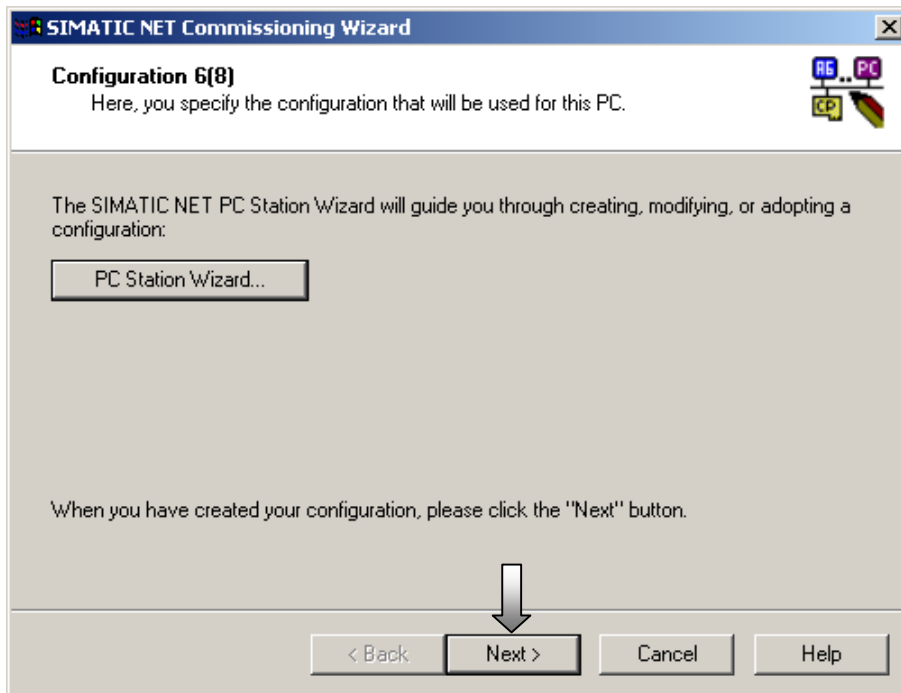
In step 7 no symbol file is specified. The next step is selected.
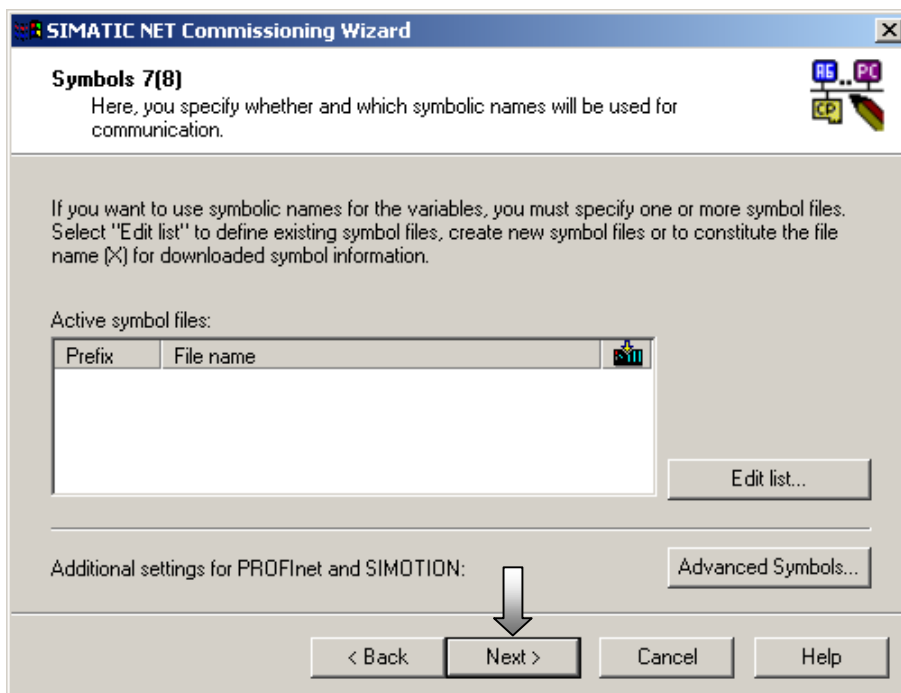
In step 8 startup of the PC station is initially finalised.
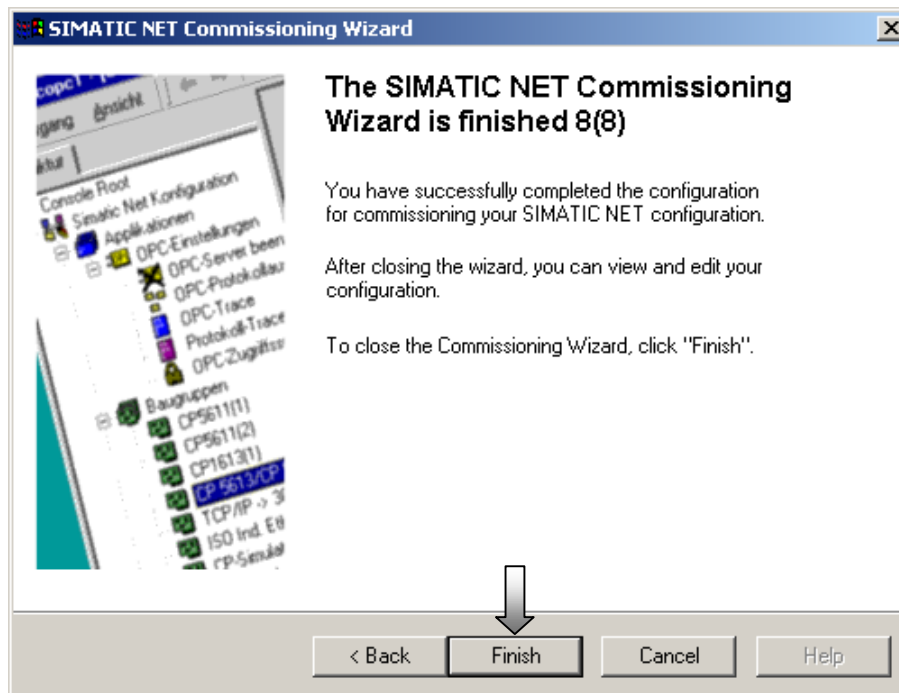
After closing down the Commissioning Wizard the **Configuration Console**, in which the settings for the PC station (hardware and software) can be checked or changed, opens. In "Select OPC protocol", "SR" must be selected for the SEND/RECEIVE link to SIGMA AIR MANAGER. Protocols that are not needed should be deselected.
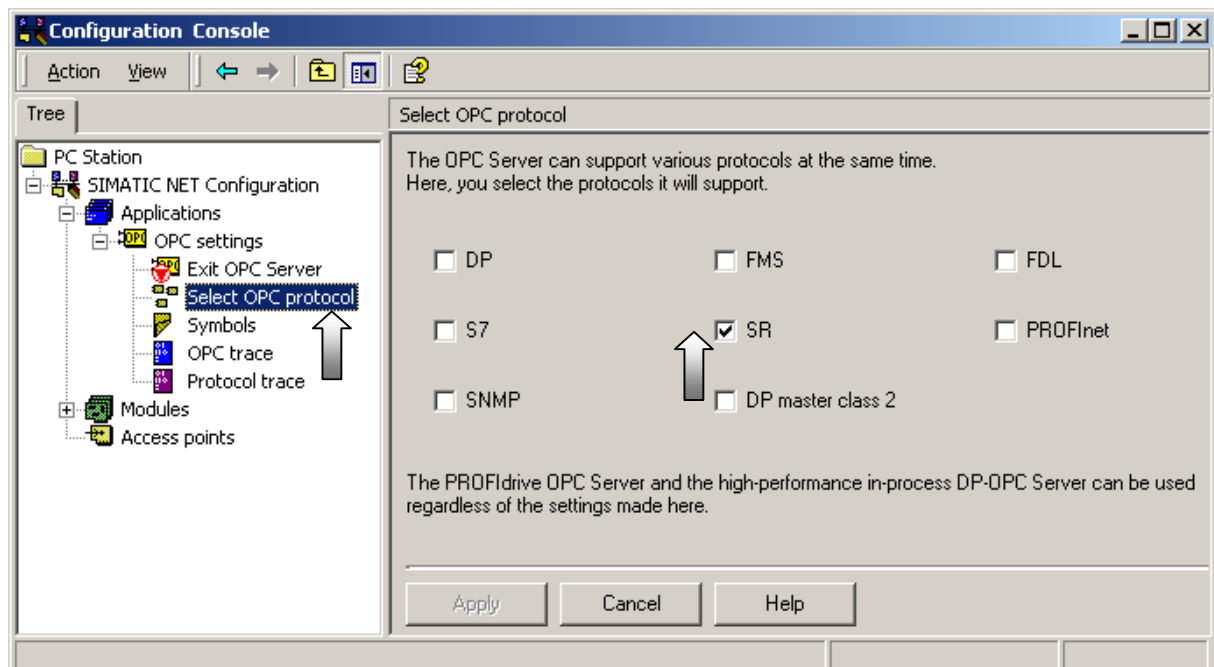
In access point "CP_H1_1" the "CP1613 (RFC1006)" interface parameter assignment must be selected for the CP 1613 module. The Configuration Console can then be closed.
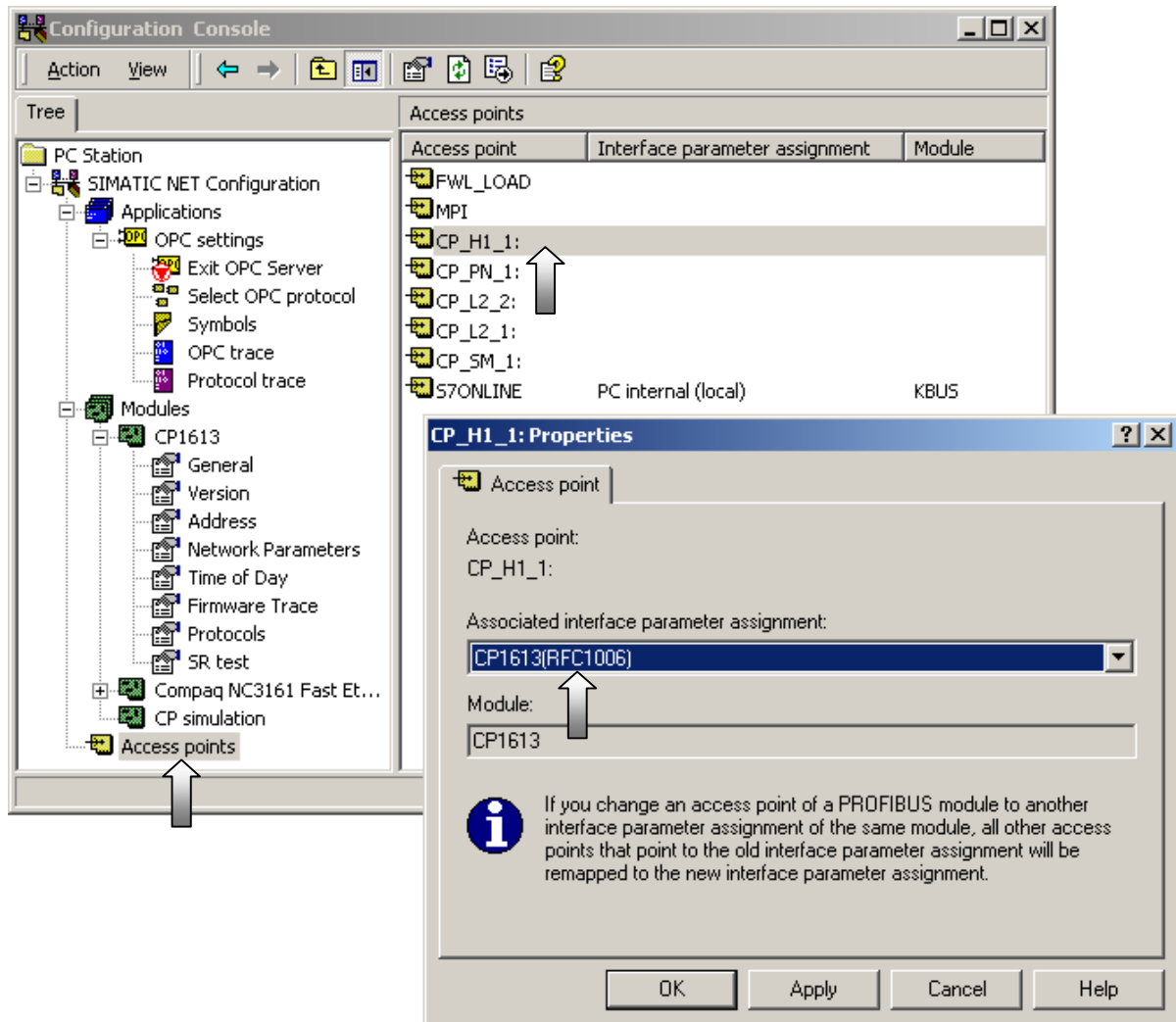
The PC station is then configured further as for S7 with SIMATIC **NCM PC Config** (module addresses, networking, connections). The associated SIMATIC **NCM PC Station Wizard** is selected from the Commissioning Wizard.
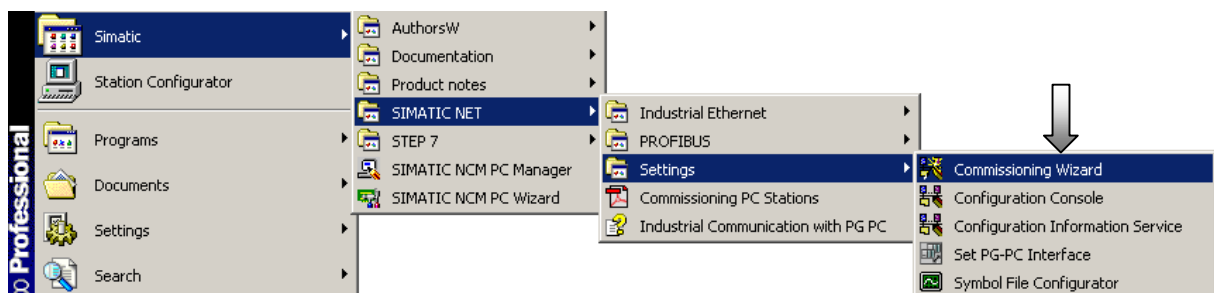
The next step is selected in step 1 of the Commissioning Wizard.
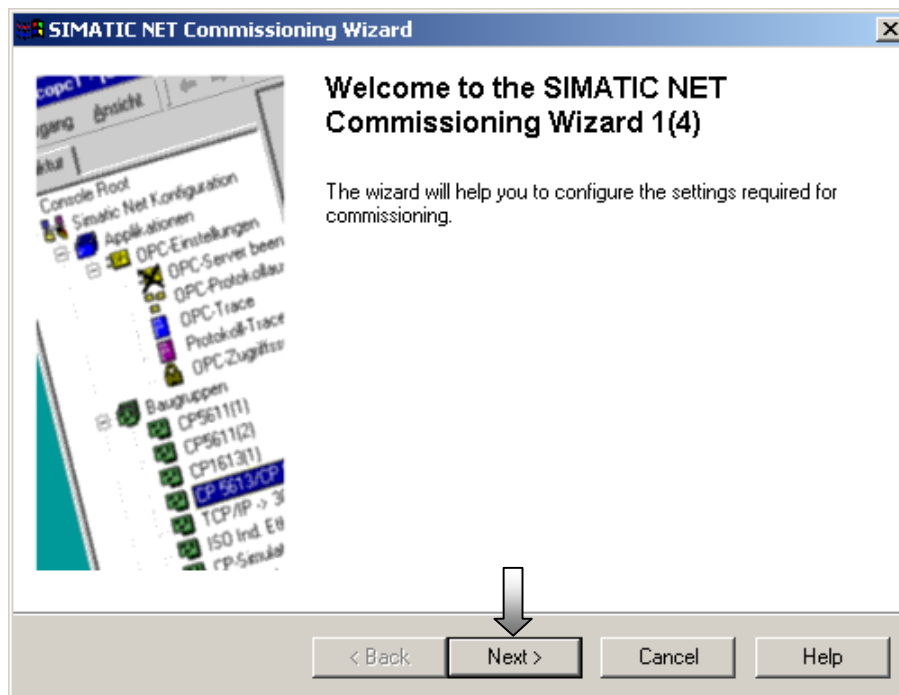
In step 2 the **PC Station Wizard** is selected.
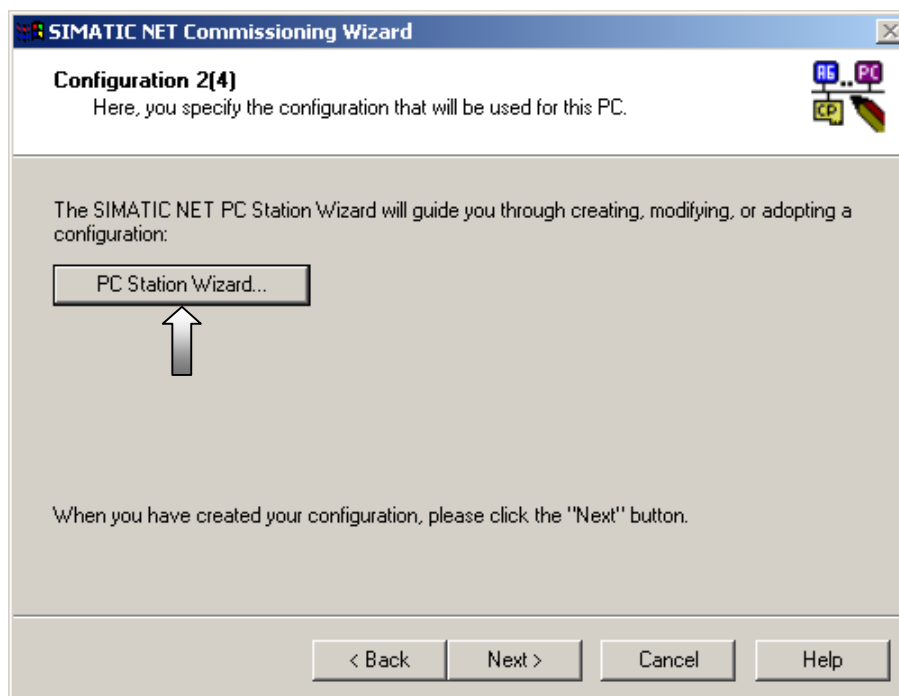
The menu option for creation of a new project is selected.
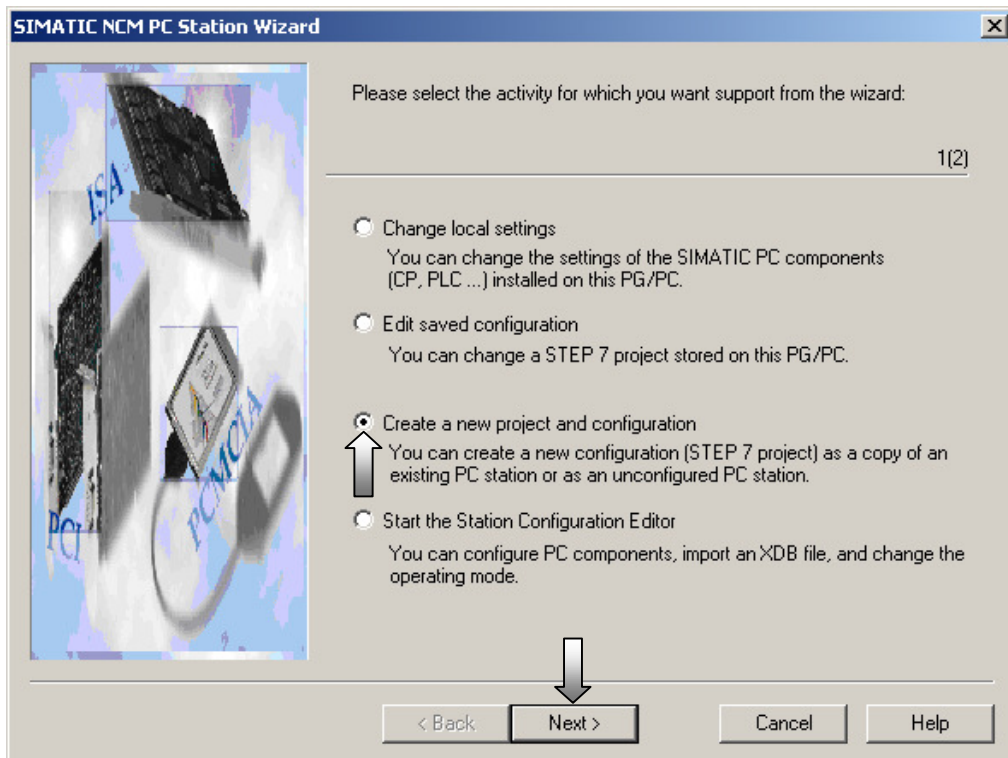
The project name is entered. The previously made settings are accepted in that a copy of the local PC station is saved.
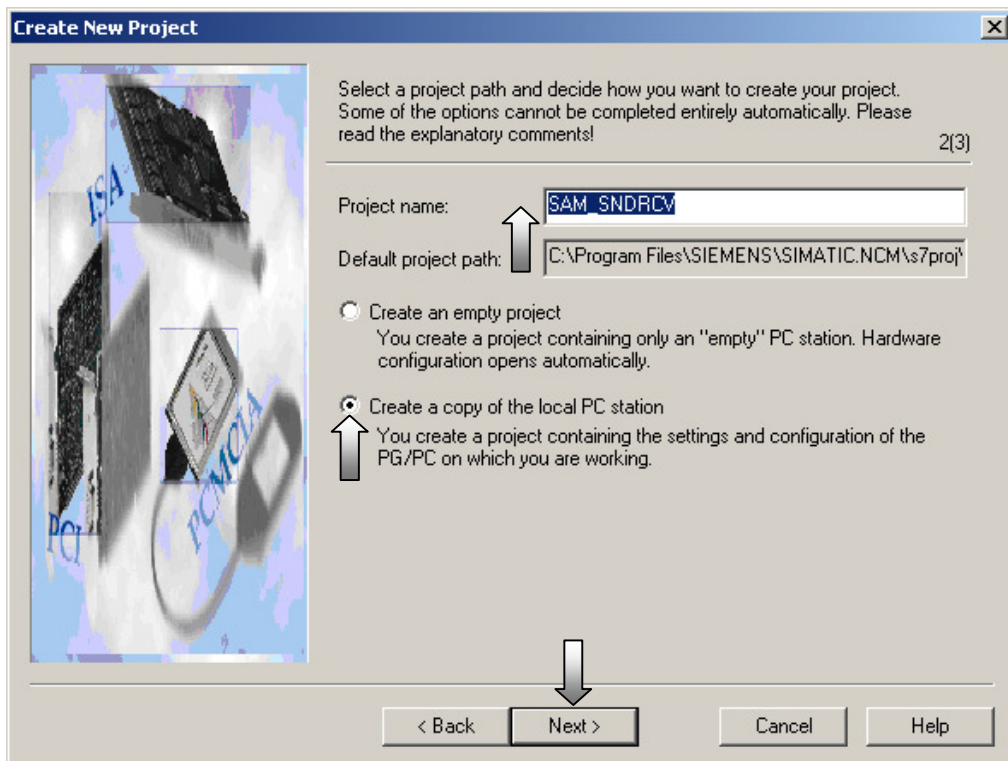
The menu selection changing the hardware configuration based on the local PC station is made here and these initial settings are entered.
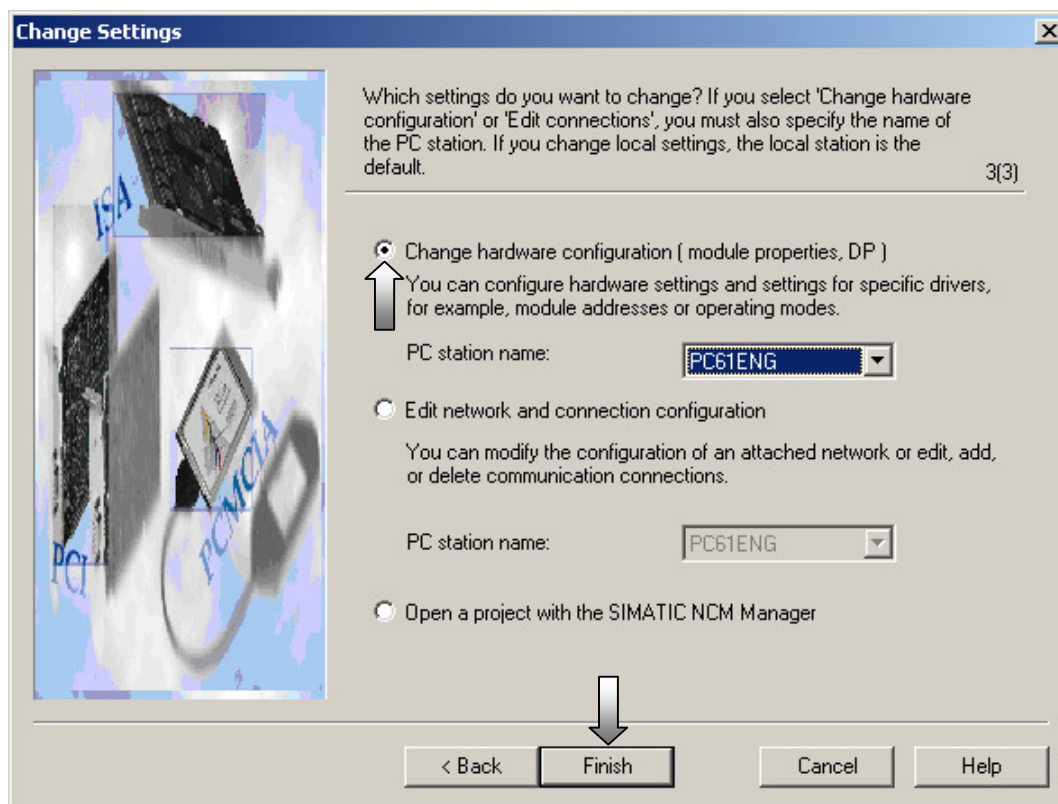
When the PC Station Wizard has closed, SIMATIC **NCM PC Config** opens with the previous PC station settings. Here the required object properties of the modules (IP addresses, networking) are set - in the example initially for the CP 1613.
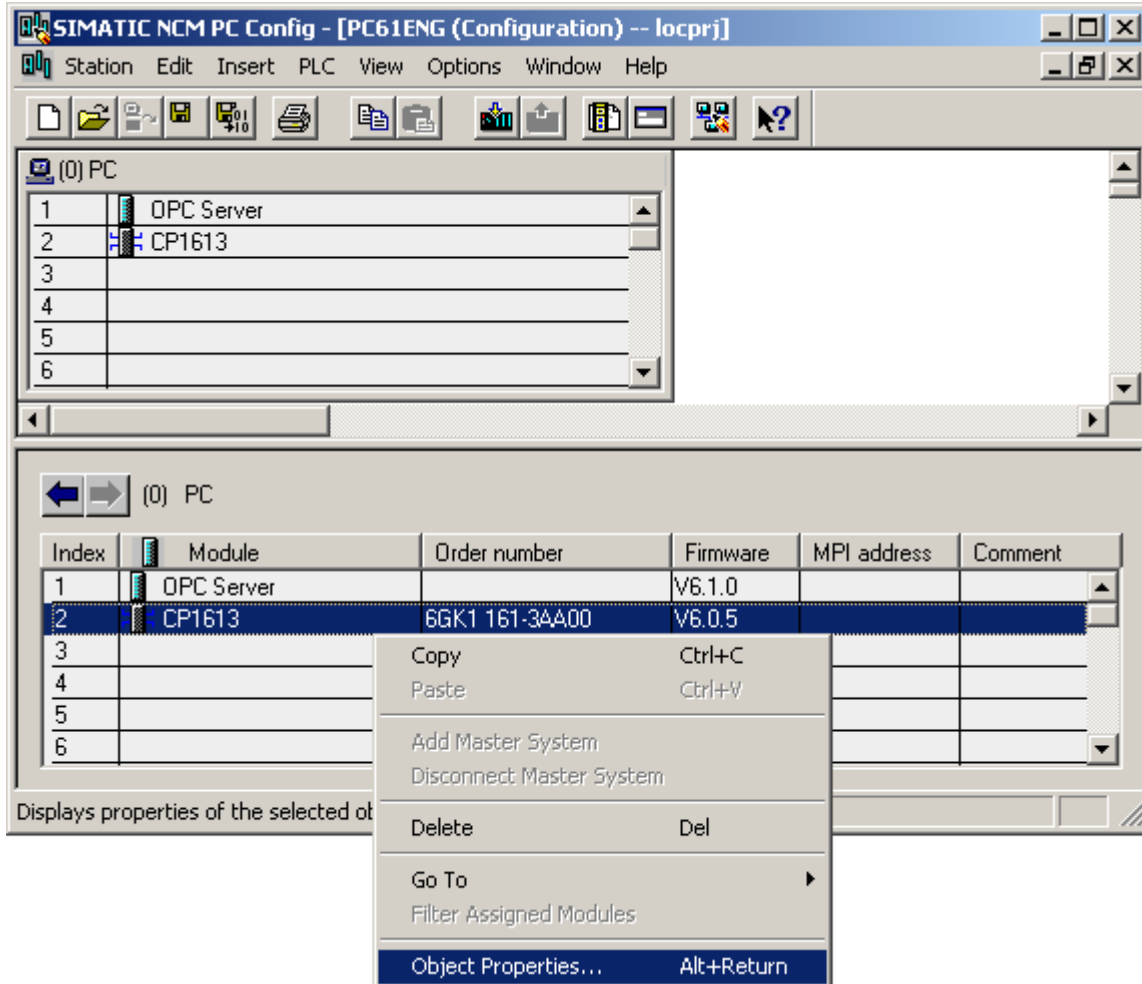
The CP 1613 can be renamed and a comment inserted. Afterwards, the properties of the Ethernet interface (IP addresses, networking) have to be parameterised.
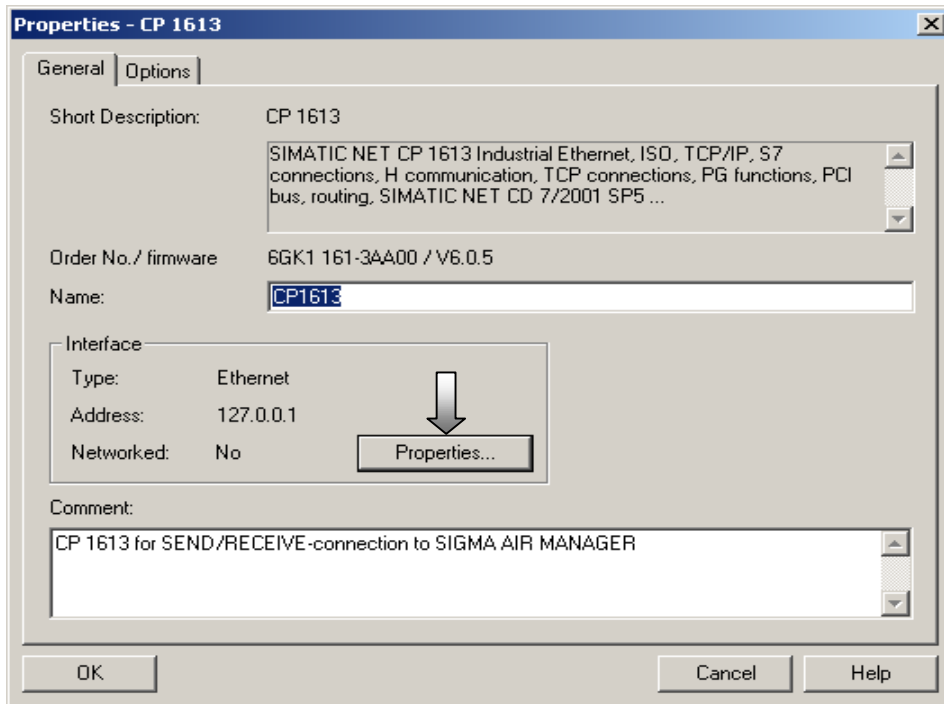
The setting for the MAC address must be deactivated. The IP address and the subnet mask have to be entered for the existing network and/or SIGMA AIR MANAGER (common TCP/IP network). Afterwards, a new subnet must be created to allow the CP1613 to be networked with SIGMA AIR MANAGER.
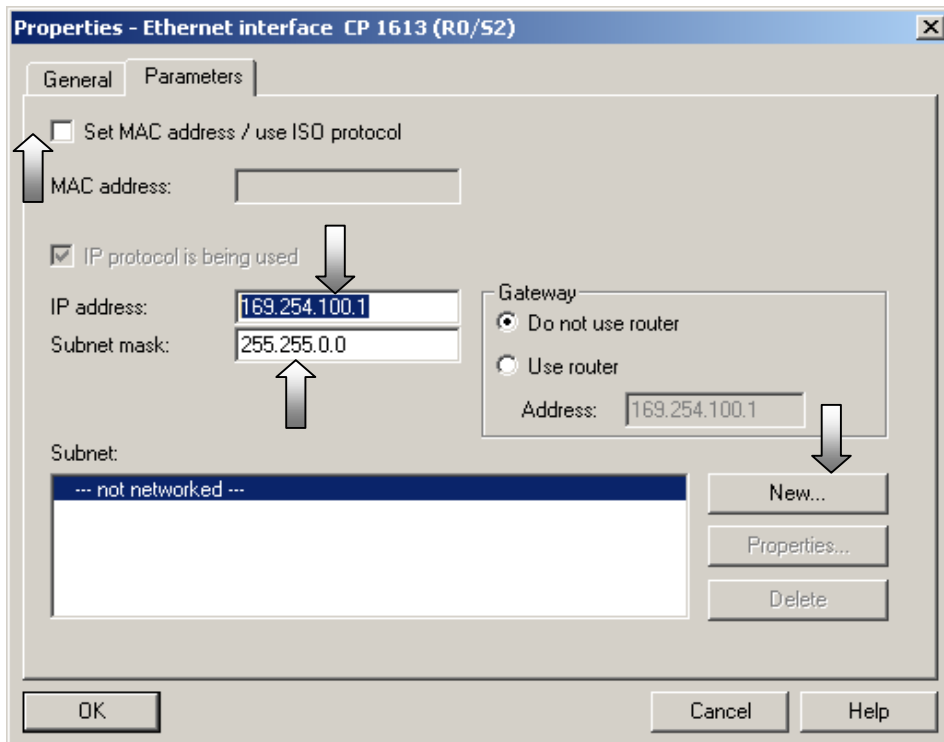
The new subnet can be renamed and a comment made. Confirm the settings with OK.
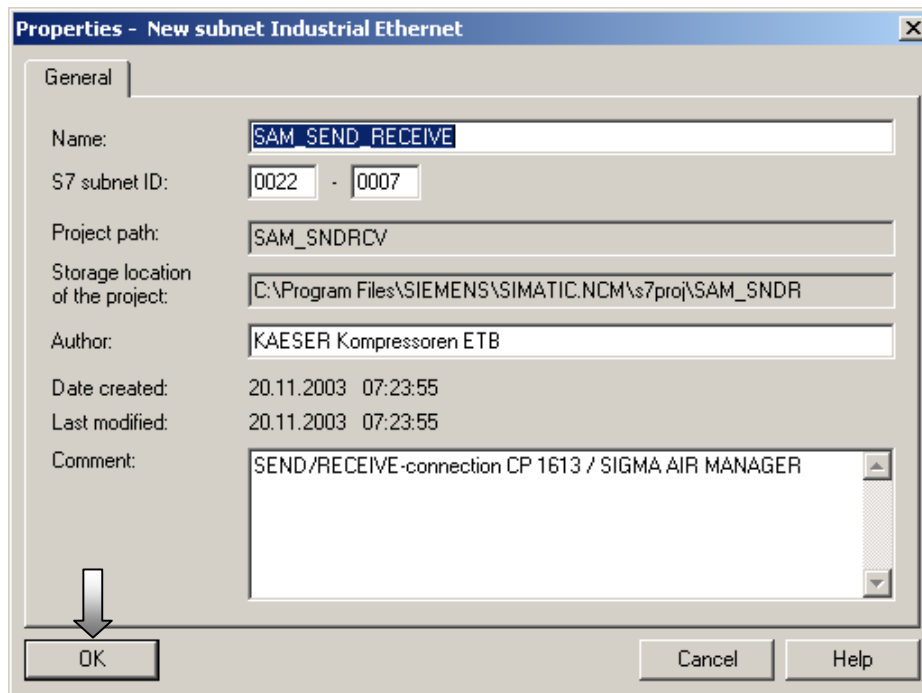
The Ethernet interface is now parameterised. All the settings are confirmed again by clicking OK twice.
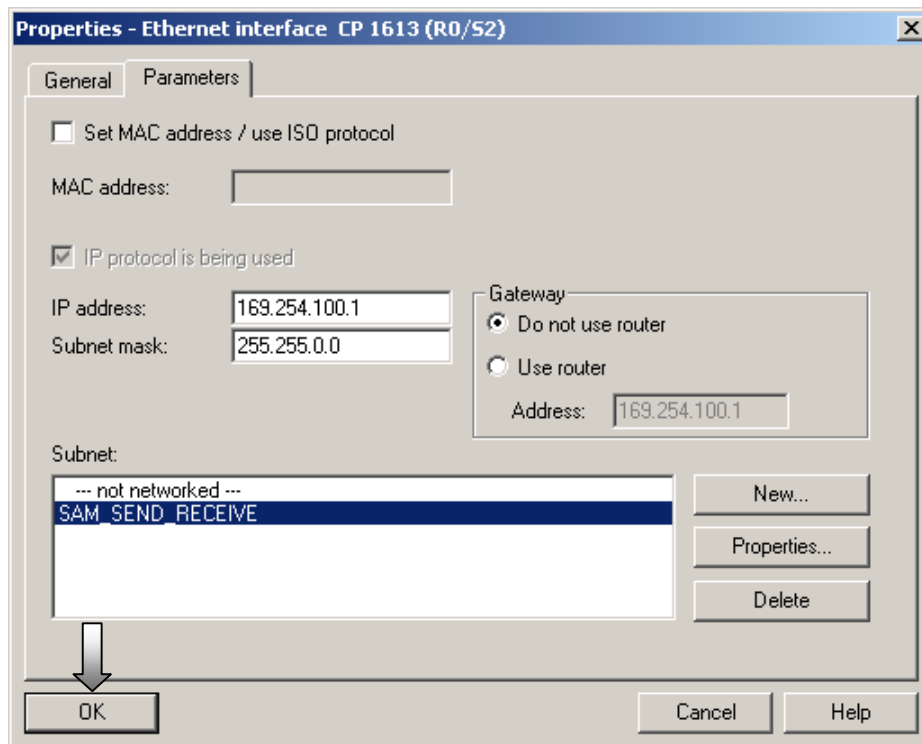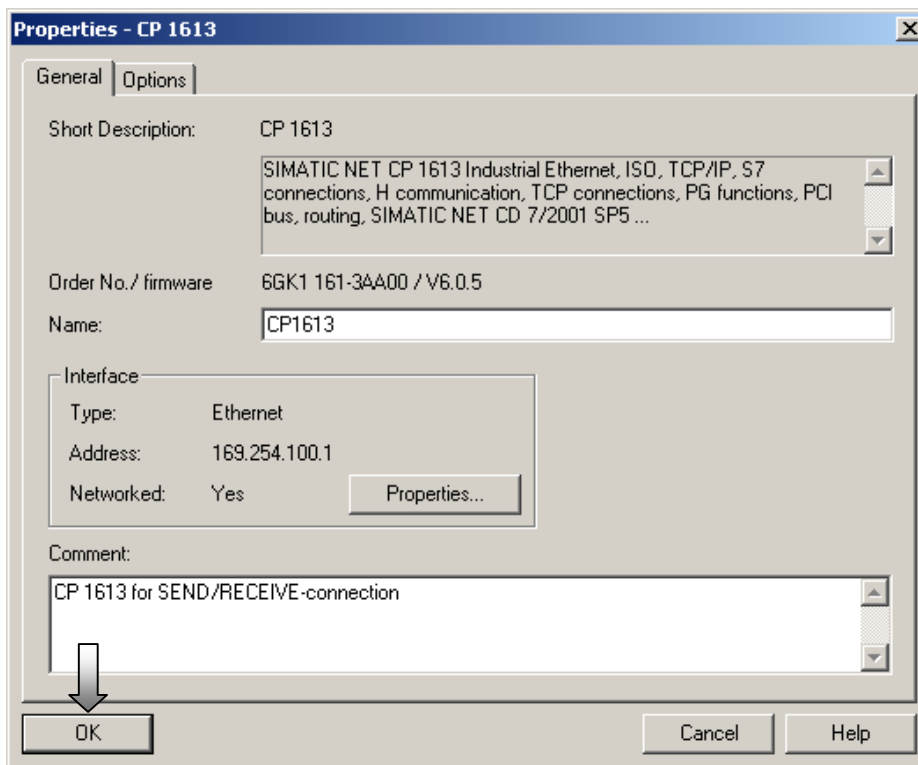
NetPro (network configuration) is now started from SIMATIC NCM PC Config to create two ISO-on-TCP connections (TCP/IP with RFC1006) for the OPC server and to parameterise them as required to allow active WRITE and FETCH access to SIGMA AIR MANAGER's control and process data.
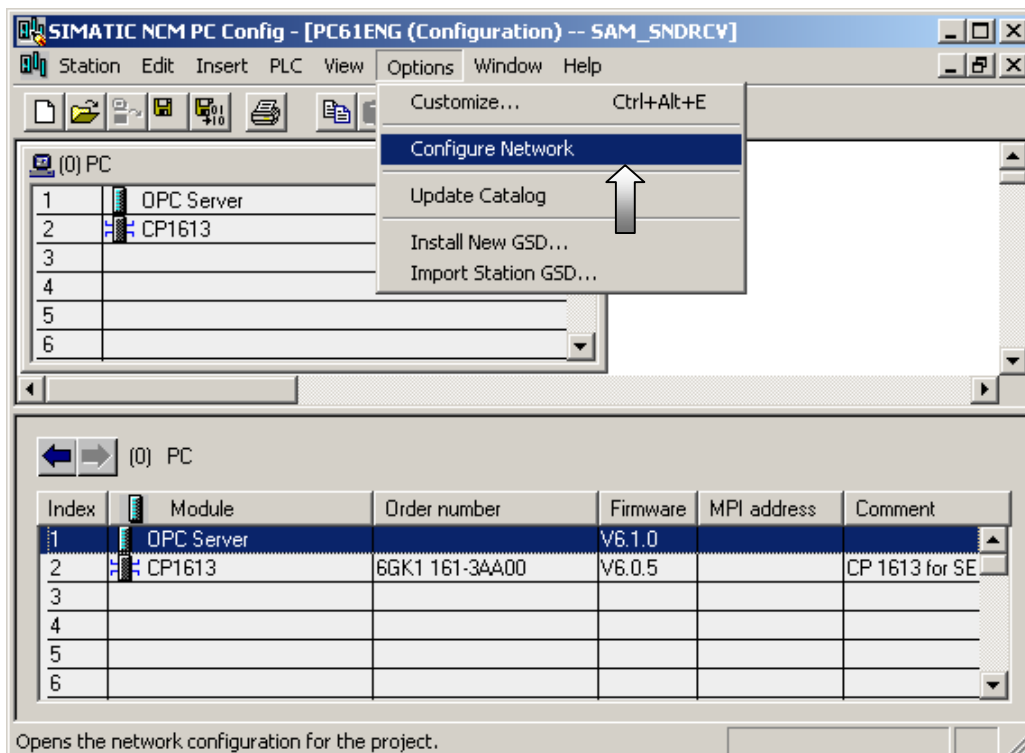
A new connection is created by marking the OPC server in the PC station block diagram and then double-clicking an empty line in the lower window (list of connections).
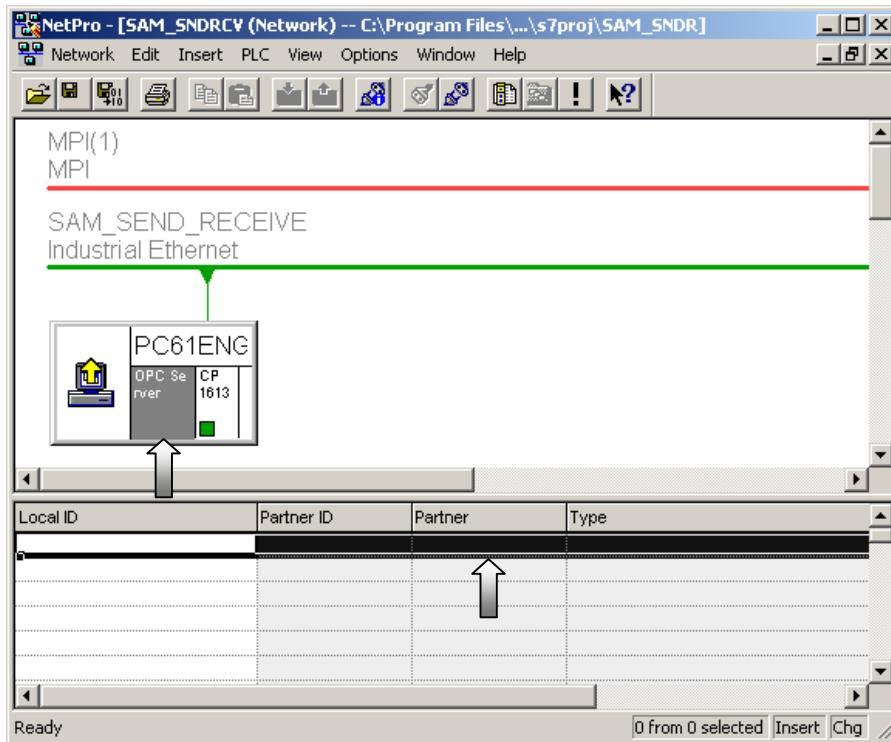
The connection partner must be "(Unspecified)" and "ISO-on-TCP connection" selected. Confirm the settings with OK.
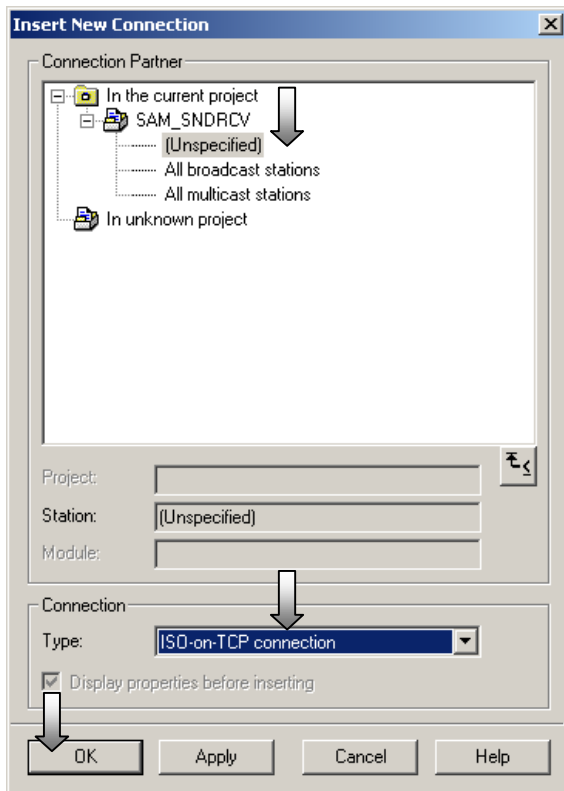
Press the OK button in the following note.
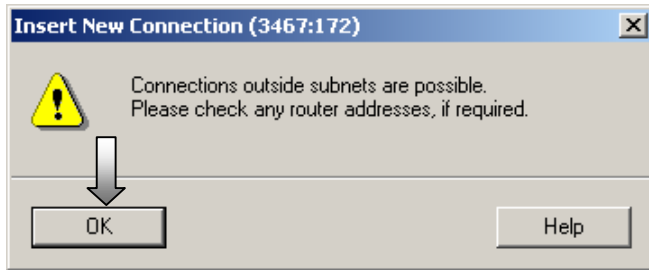
The new connection can be renamed. The connection must be actively established via the OPC server. After which the establishment details are determined.
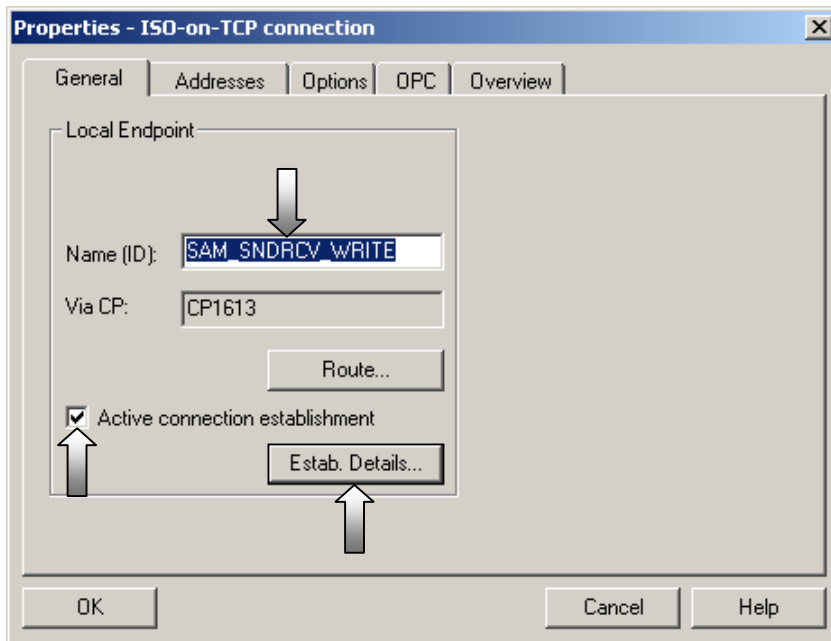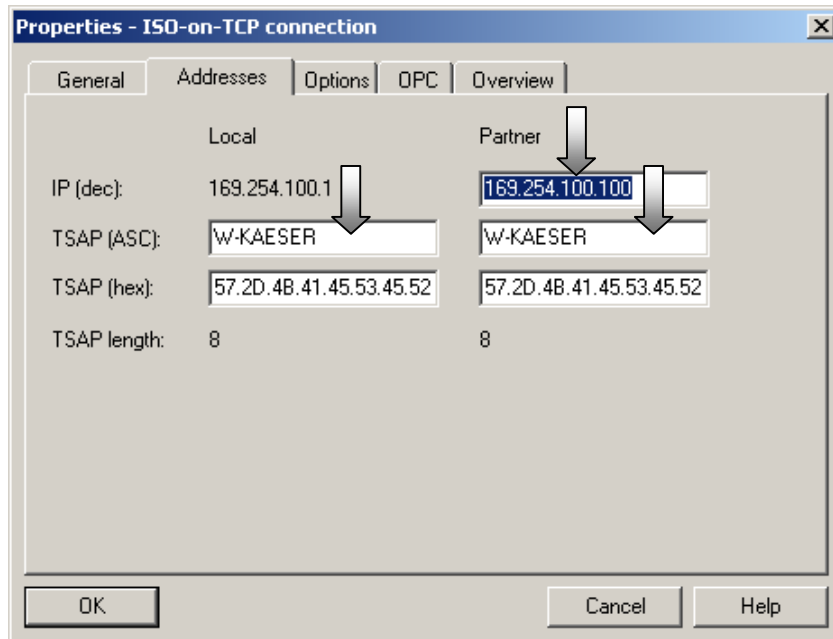

The connection must be selected as a permanent connection. Confirm this setting with OK.
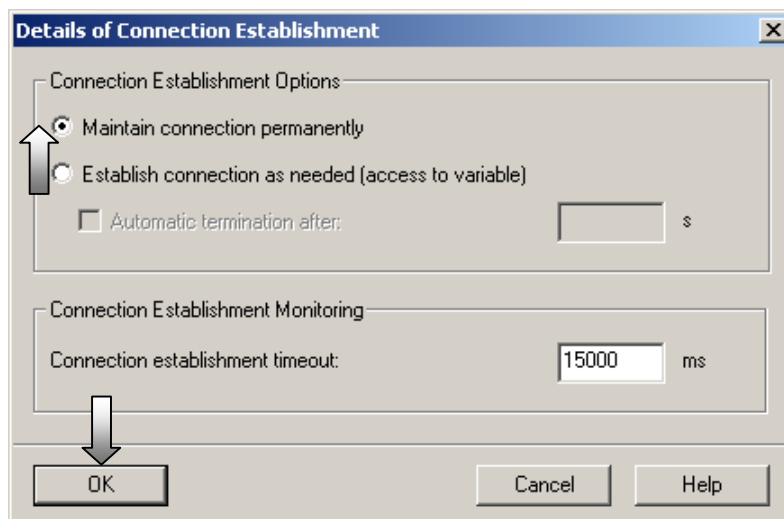
The IP address of the partner is SIGMA AIR MANAGER's IP address. As the local TSAP and the partner's TSAP must be entered "W-KAESER" to allow write access (WRITE active).
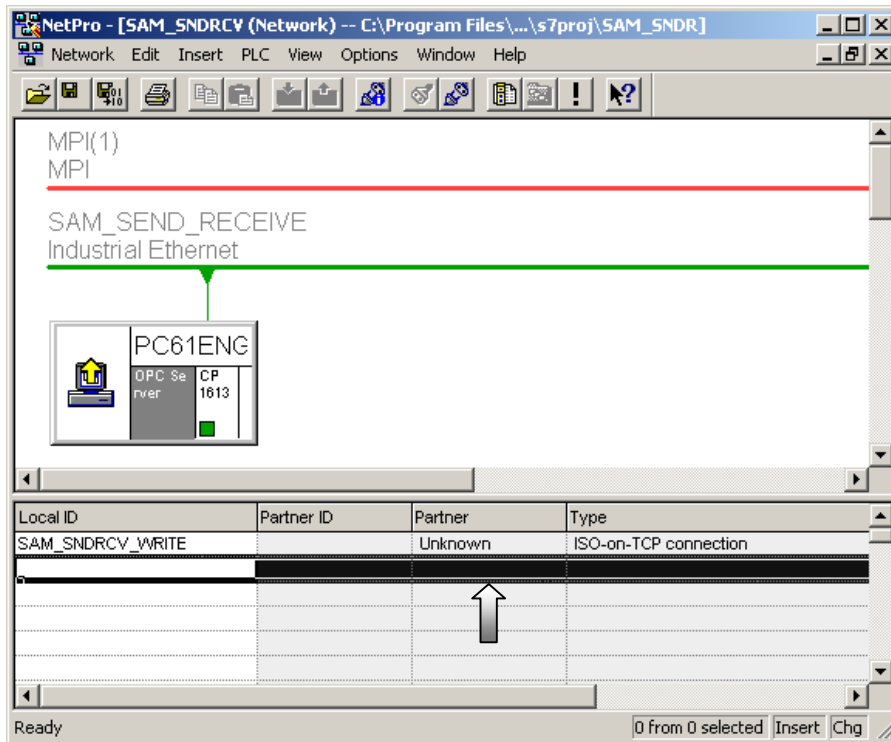

"Write active" connection mode must be selected to allow write access. The WRITE connection is now parameterised sufficiently. All the settings are confirmed with OK.
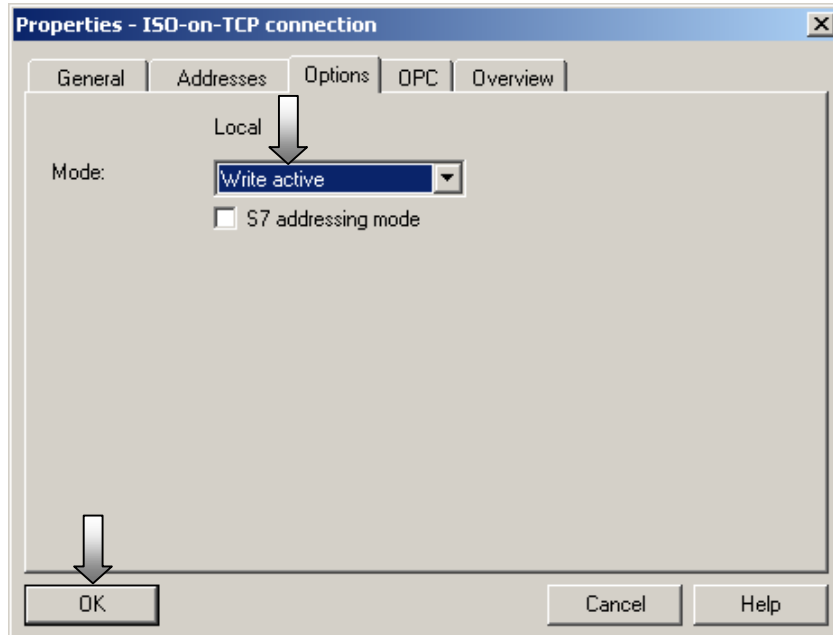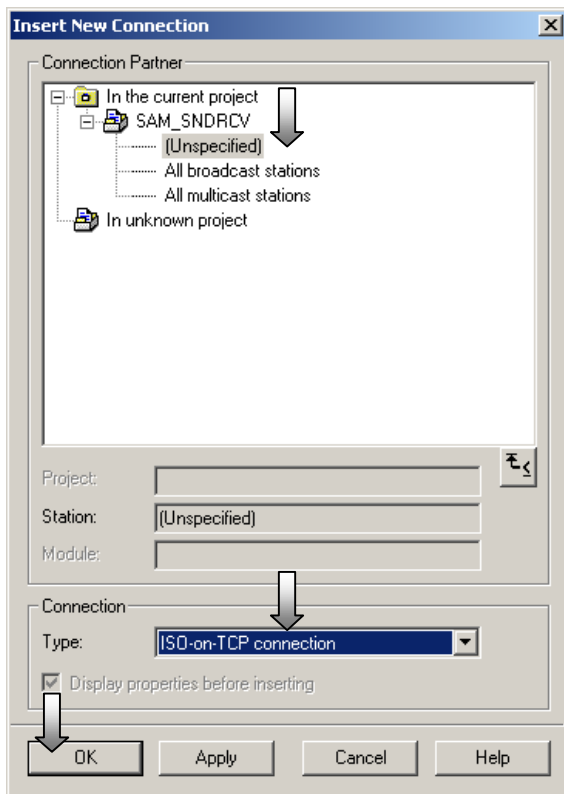
The completed WRITE connection is shown in the lower window (list of connections).
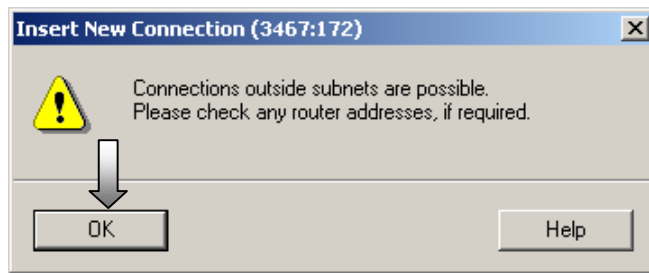Another new connection is now created by double-clicking on a vacant line.

The connection partner must be "(Unspecified)" and "ISO-on-TCP connection" selected.
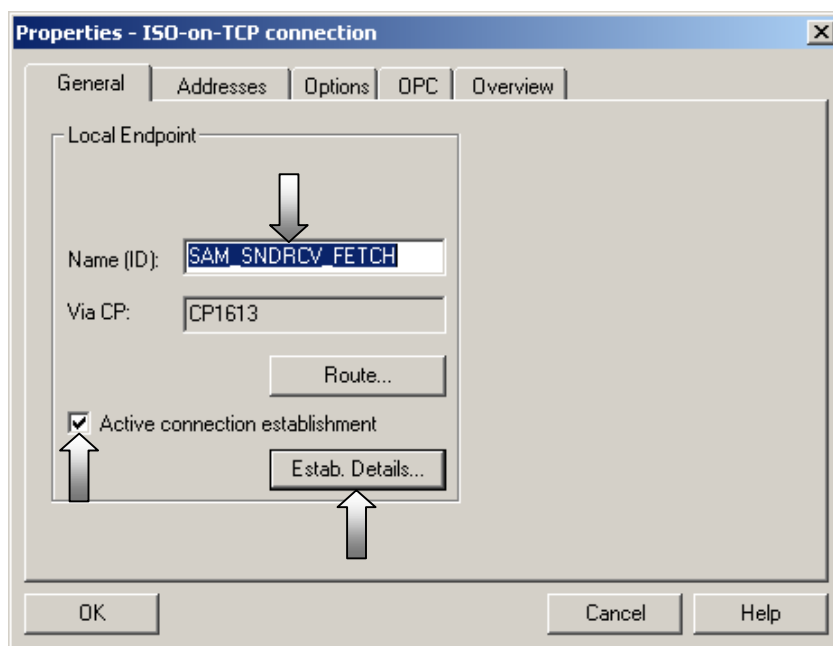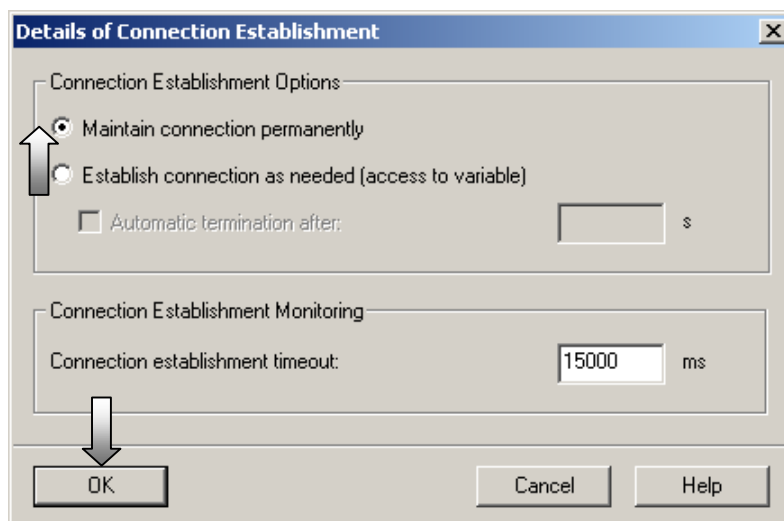Confirm the settings with OK.

Press the OK button in the following note.

The new connection can be renamed. The connection must be actively established
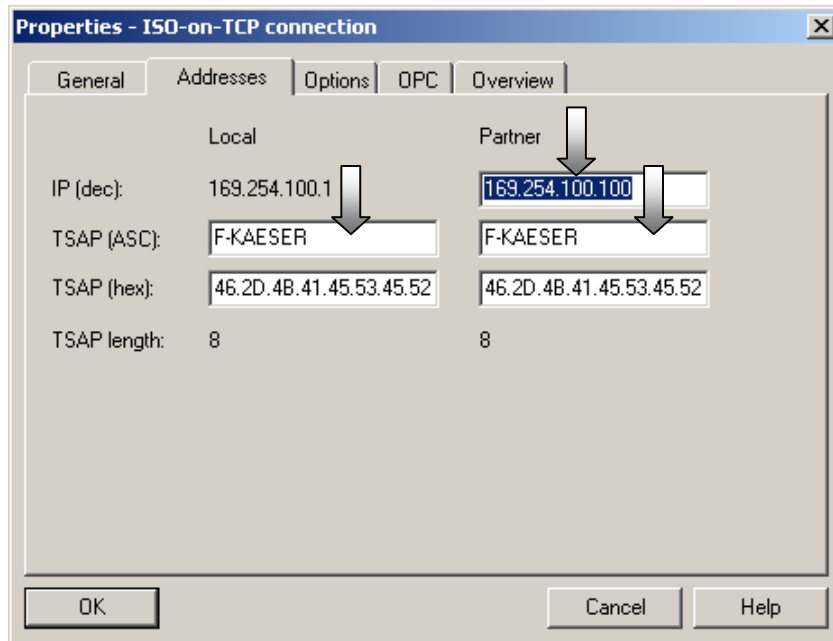the OPC server. After which the establishment details are determined.

The connection must be selected as a permanent connection. Confirm this setting with OK.
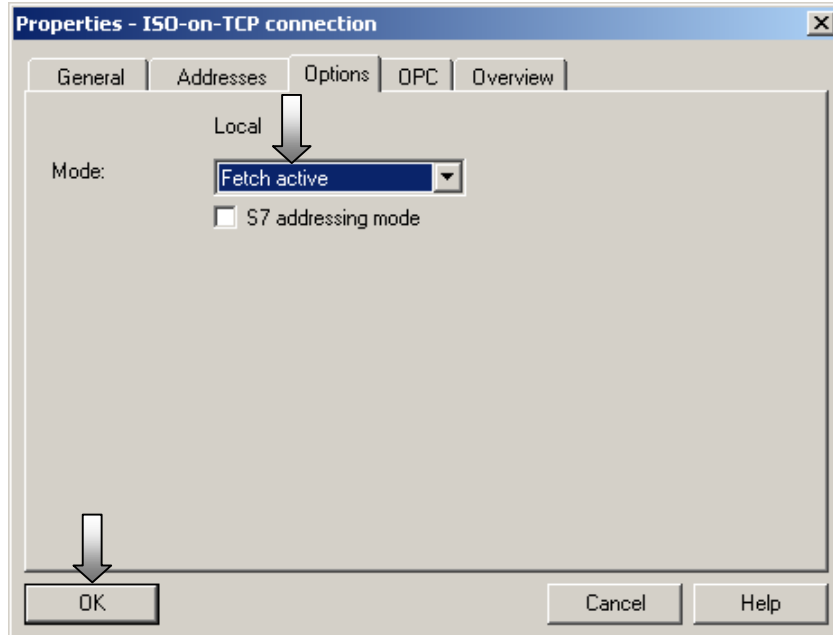
The IP address of the partner is SIGMA AIR MANAGER's IP address. As the local TSAP and the partner's TSAP must be entered "F-KAESER" to allow fetch access (FETCH active).
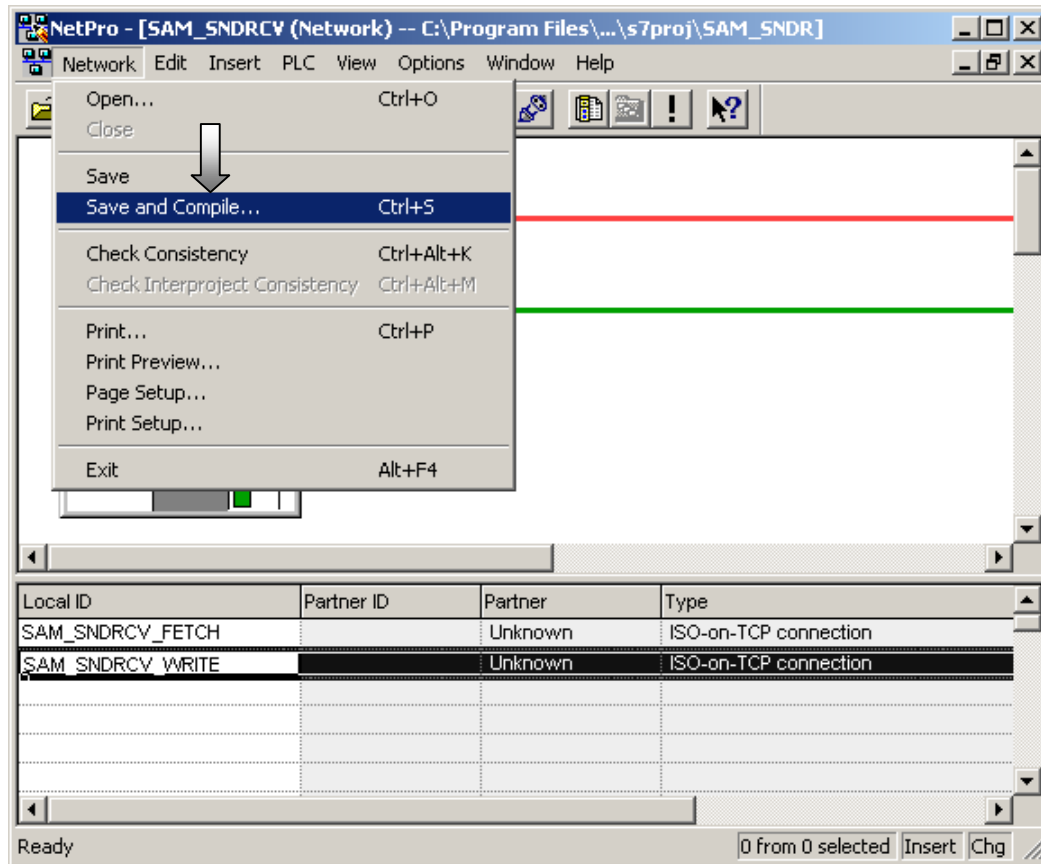

"Fetch active" connection mode must be selected to allow read access. The FETCH connection is now parameterised sufficiently. All the settings are confirmed with OK.
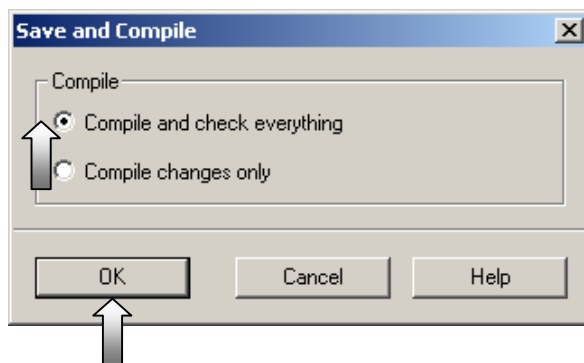
The completed FETCH connection is shown in the lower window (list of connections).
This network configuration is now saved and compiled.

The complete network configuration should be compiled. Confirm this setting with OK.
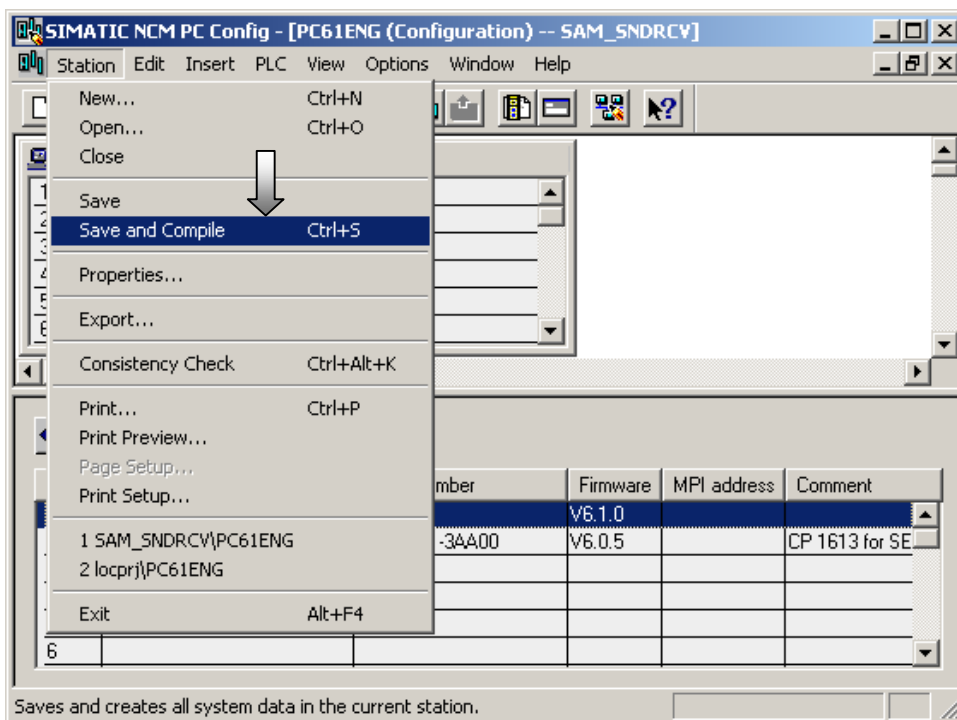
When the compilation has been correctly executed, NetPro is closed, returning to SIMATIC NCM PC Config.
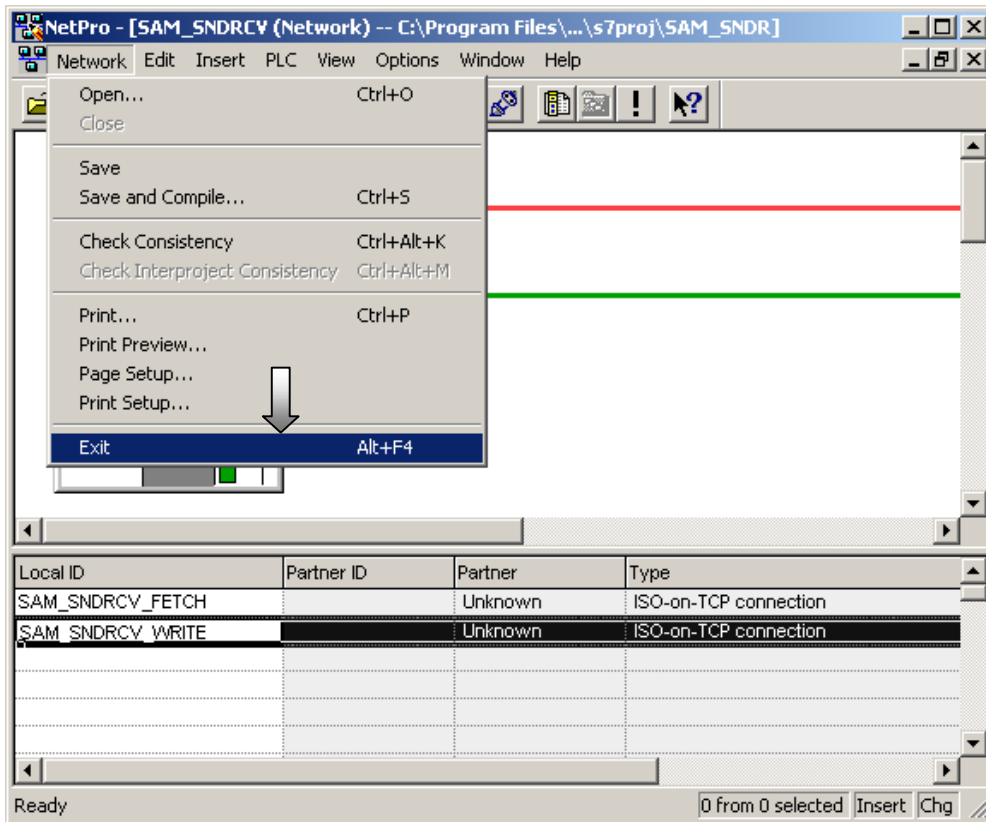
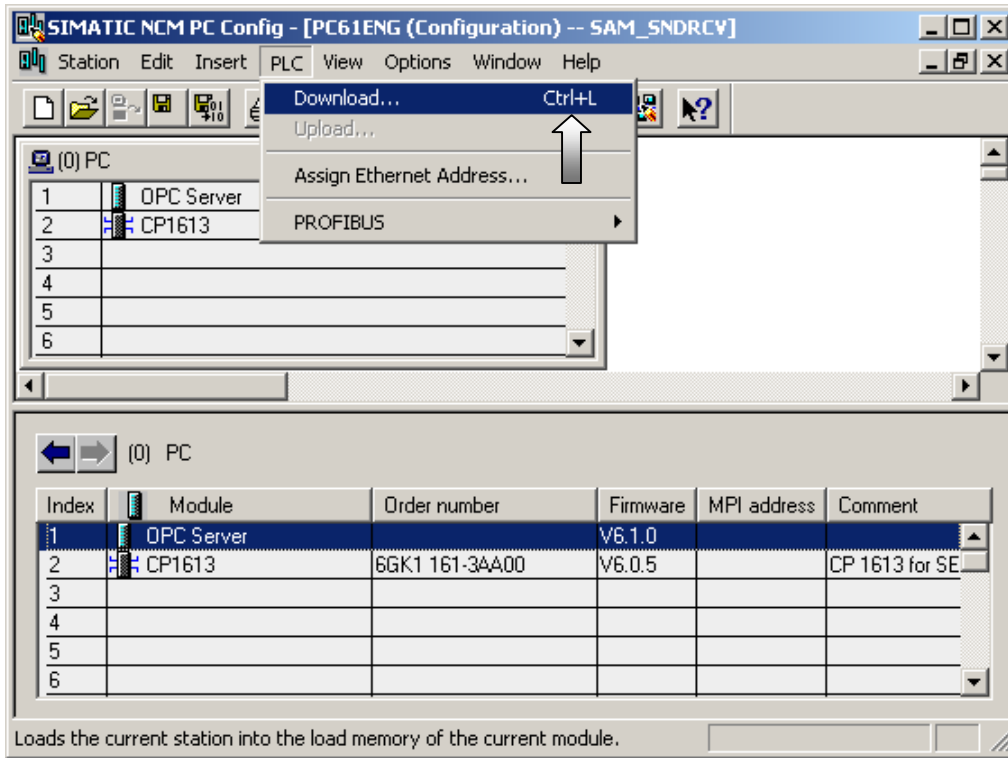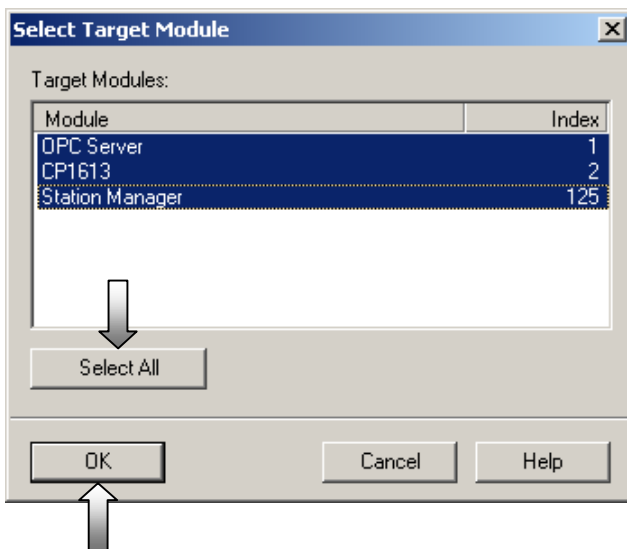The complete PC configuration is now saved and compiled.

The compiled PC configuration is loaded into the participating modules the same as for S7 projects.

All participating modules are selected for the download.

The next windows are confirmed the same as for S7 projects.

Select node address

Over which station address is the programming device connected to the module Station Manager?

Rack: 0

Slot: 125

Target Station: ○ Local
○ Can be reached by means of gateway

Enter connection to target station:

Index	Module type	Station name	CPU name	Plant designation
125	Stationma...			

Accessible Nodes

View

OK   Cancel   Help

Select node address

Over which station address is the programming device connected to the module Station Manager?

Rack: 0

Slot: 125

Target Station: ○ Local
○ Can be reached by means of gateway

Enter connection to target station:

Index	Module type	Station name	CPU name	Plant designation
125	Stationma...			

Accessible Nodes

1	OPC Server
2	CP161-3
125	Stationman...

Update

OK   Cancel   Help

Stop Target Modules

The following modules will be stopped for loading of the system data.

Module	Index
CP1613	2

OK   Cancel   Help

The PC station is now configured and prepared for SEND/RECEIVE communication with SIGMA AIR MANAGER. SIMATIC NCM PC Config and the PC Station Wizard now close and the Commissioning Wizard starts again.
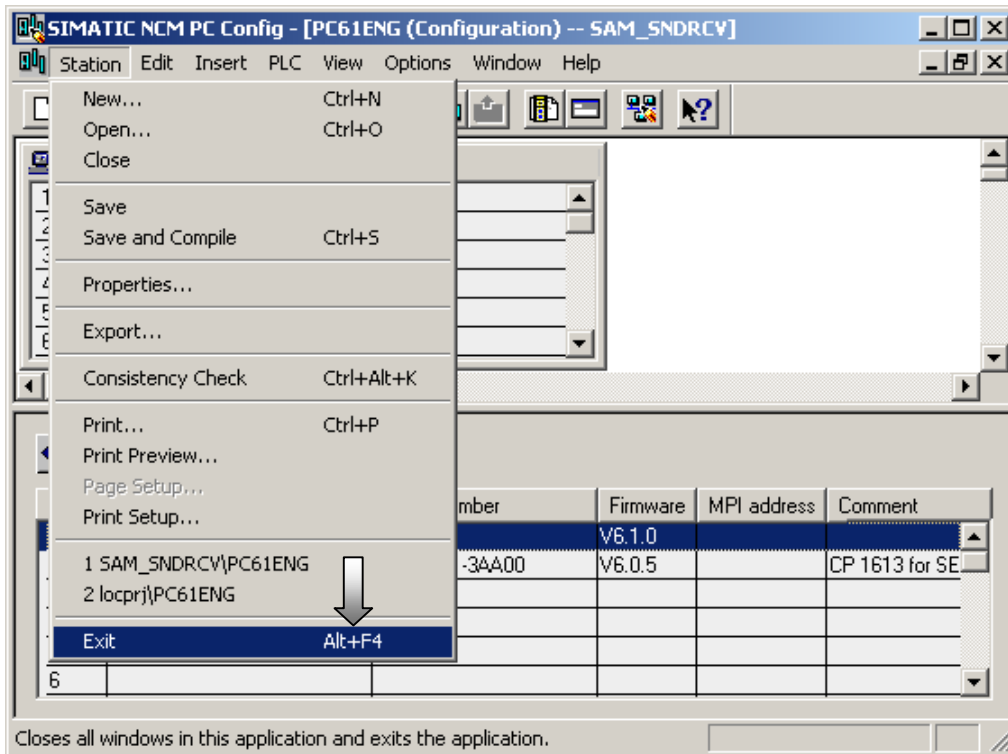
Now move to the next step in the Commissioning Wizard.
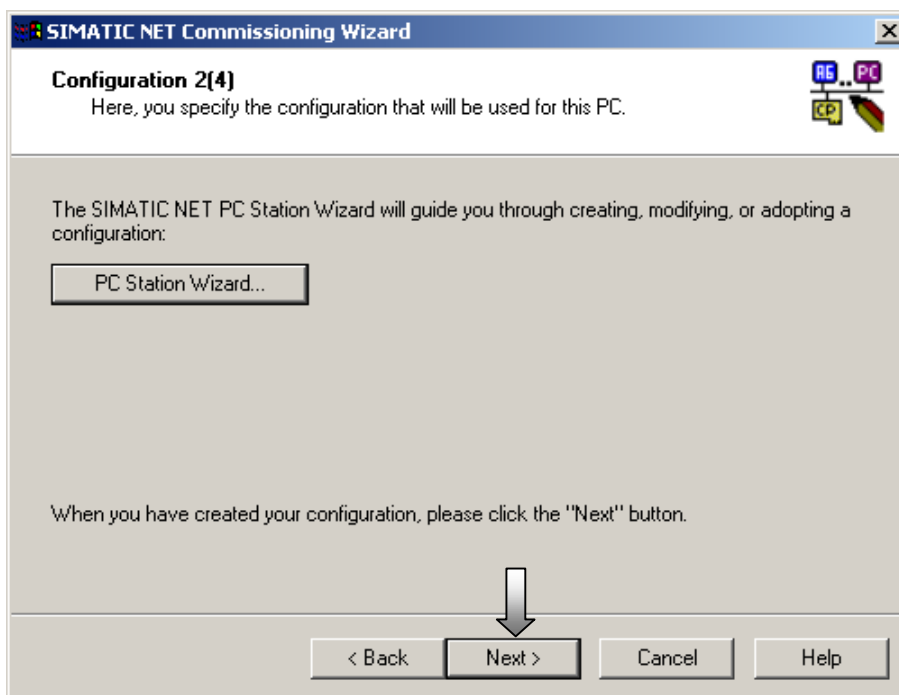
The next step is selected in step 3 of the Commissioning Wizard.
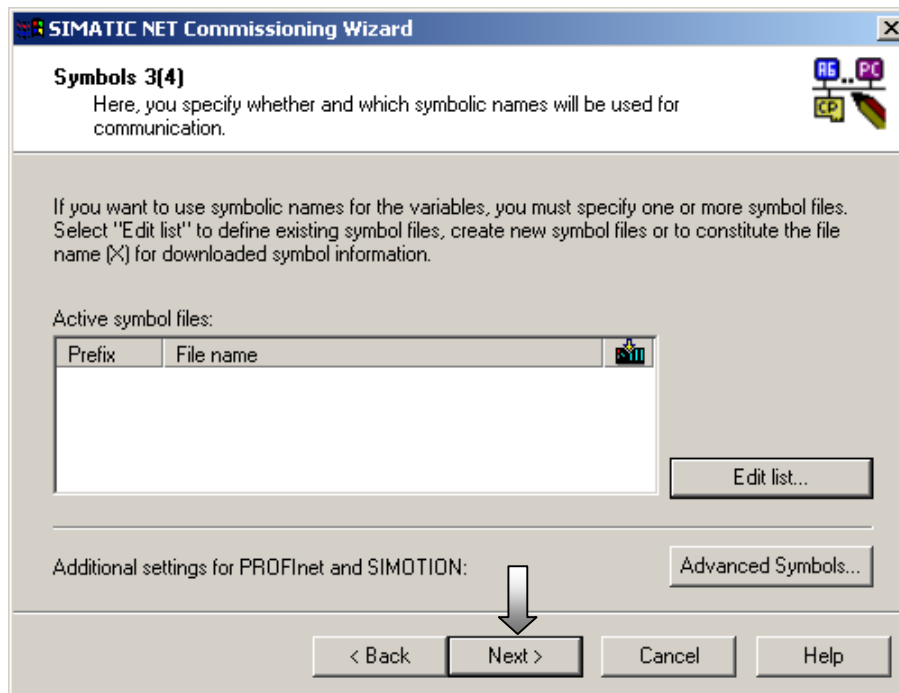
In step 4 the commissioning of the PC station is finalised.
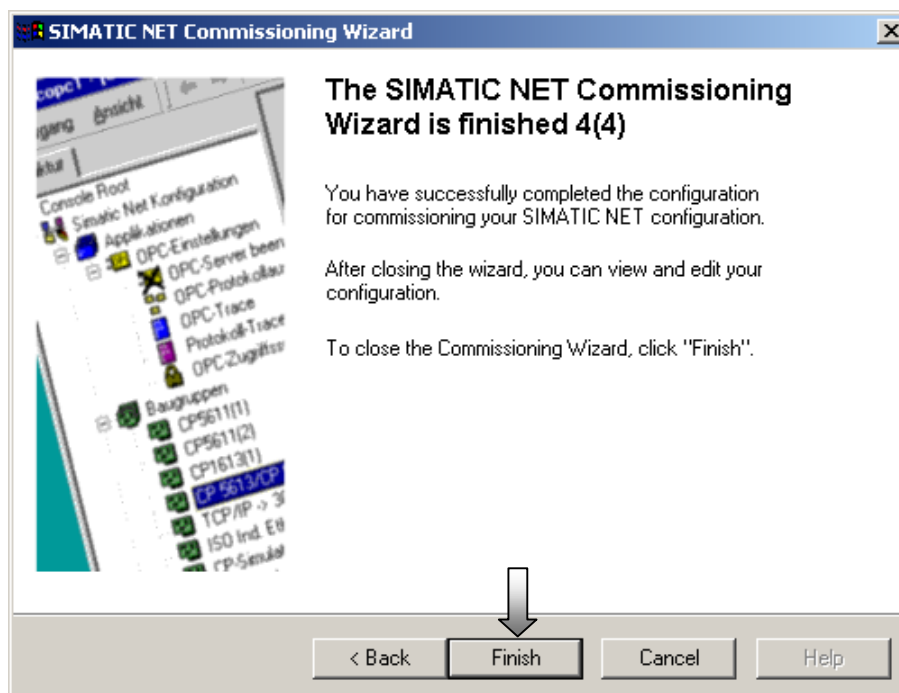
3.2.4 Testing communication with OPC Scout

The procedure described below is a general test of an established SEND/RECEIVE connection using the OPC Scout, a graphic OPC client supplied with SEND/RECEIVE.

The **OPC Scout** can be called up in the Windows Start menu.
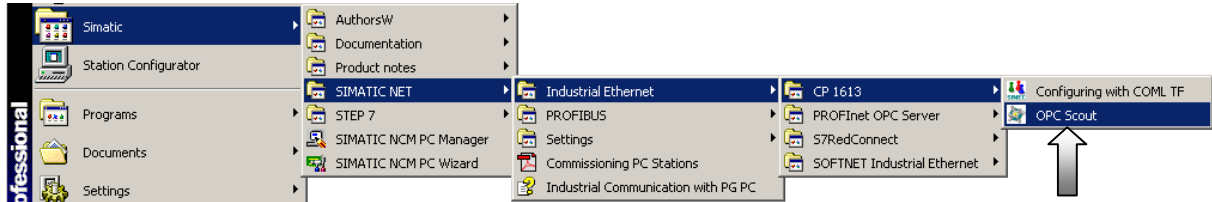
The SIMATIC NET OPC Server is marked in the list of local servers and the connection to this server is made.
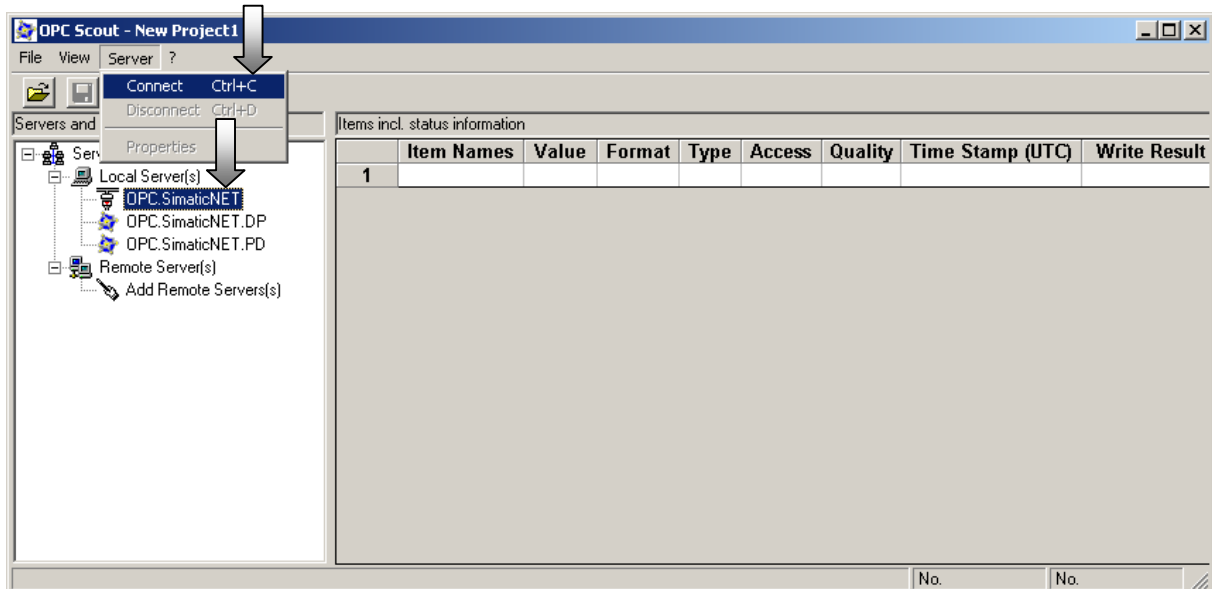
In the following dialog window the name of a new OPC group and the associated update rate is entered. Confirm the settings with OK.
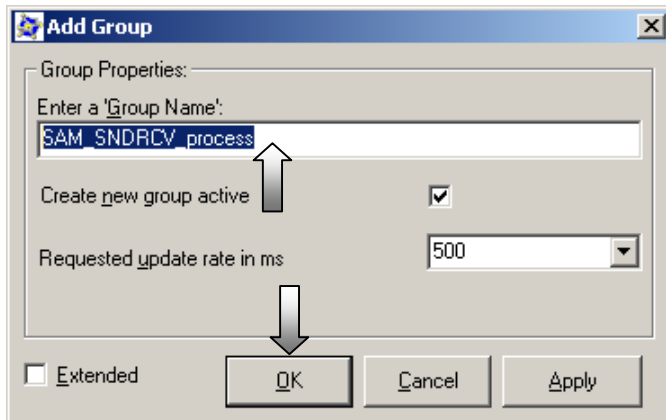
The new OPC group now appears under the SIMATIC NET OPC server. Mark the group and add your items (process variables).
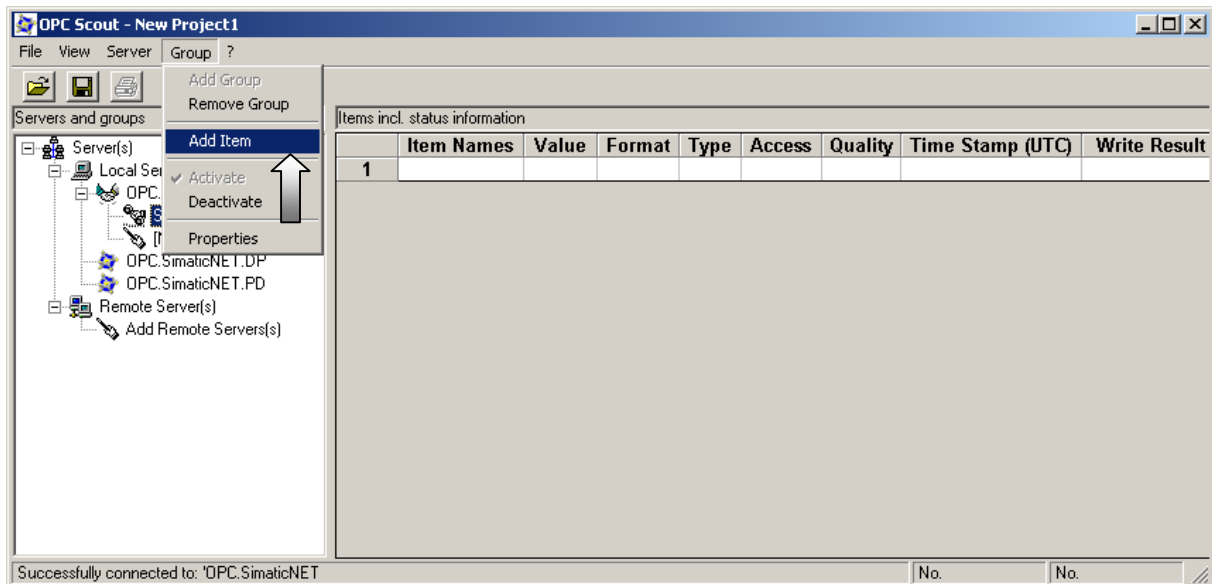
The OPC Navigator opens and shows a list of the links that have been planned with NetPro (see 3.2.3) – here, for example, a FETCH and a WRITE connection to SIGMA AIR MANAGER. First the FETCH connection and then the two corresponding standard items are marked in the centre window.
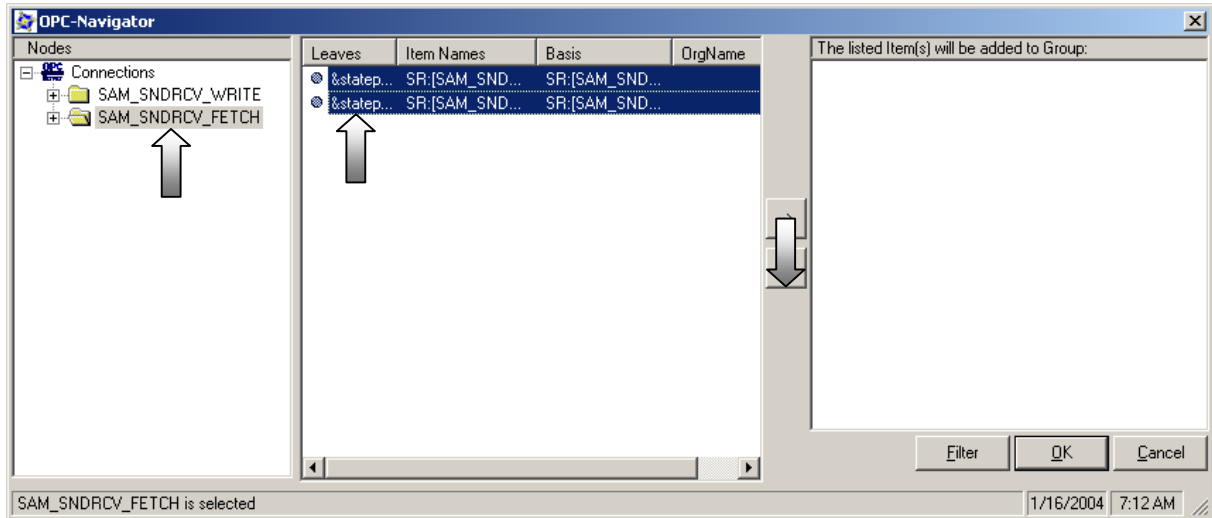
The two marked standard items are added to the new OPC group by clicking on the upper arrow button.
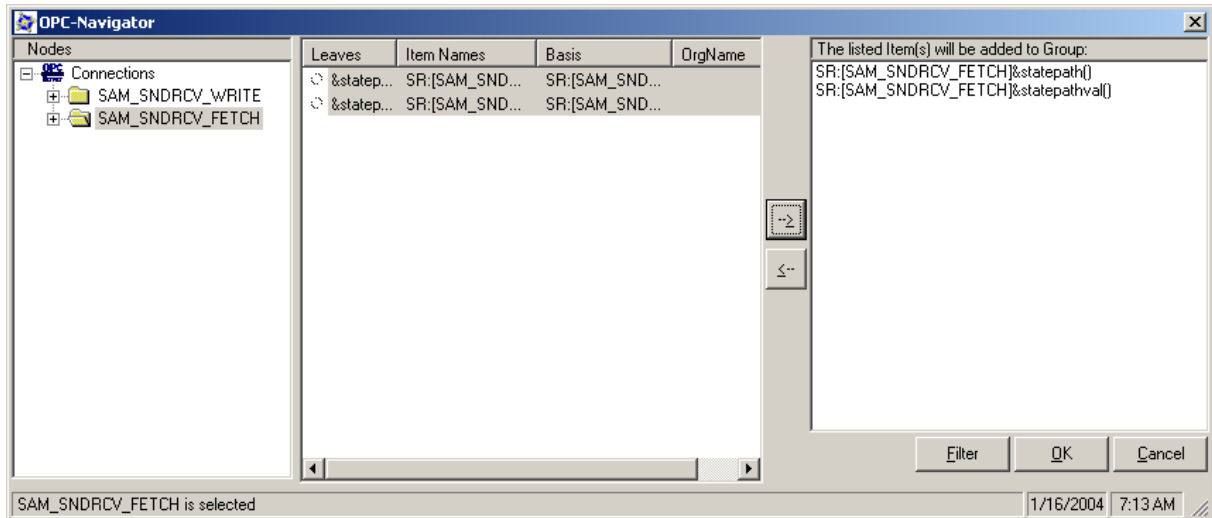
Now the WRITE connection and then the two corresponding standard items are marked in the centre window.
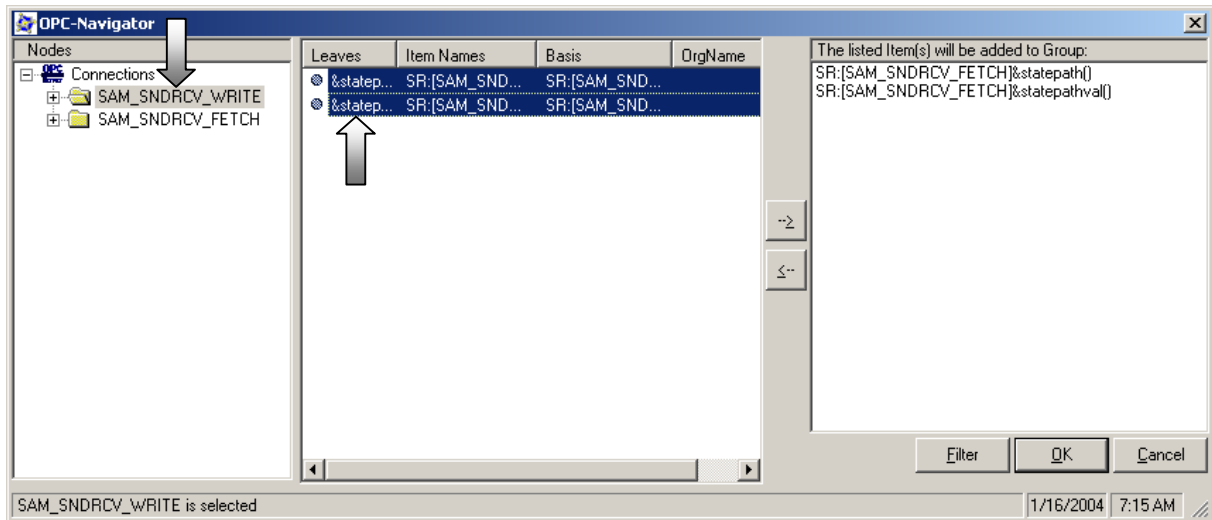
The two marked standard items are added to the new OPC group by clicking on the upper arrow button.
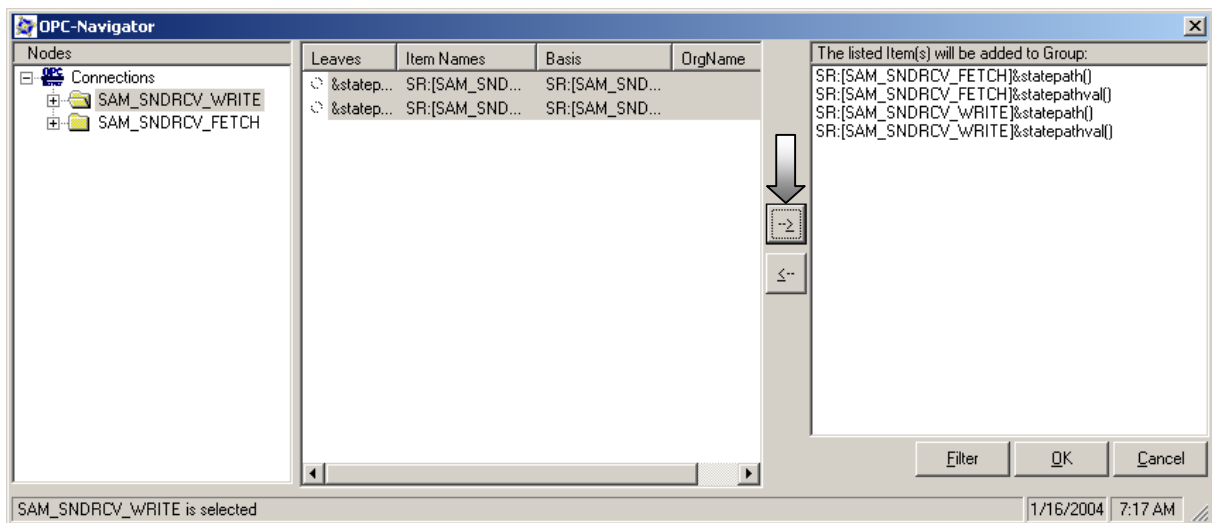
One FETCH standard item in the OPC group is marked with the right mouse button and "Add Item" is selected in the context menu.
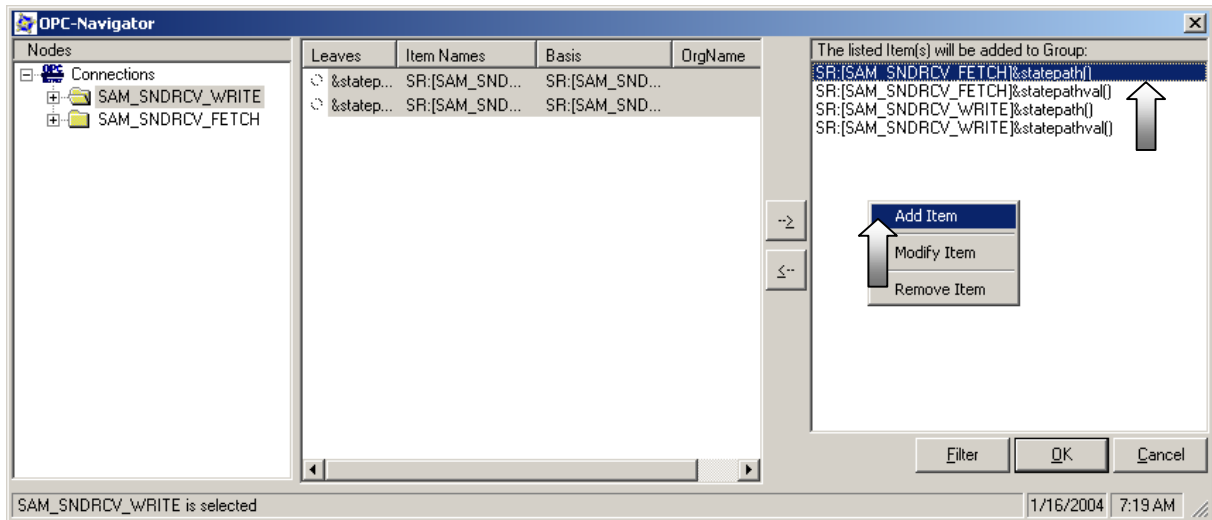
The variable name (Item ID) is then given as per the syntax rules (db..,w..,*wordnum*) and as a result the process variable(s) to be read are selected. Afterwards, this variable (item) is added to the OPC group.
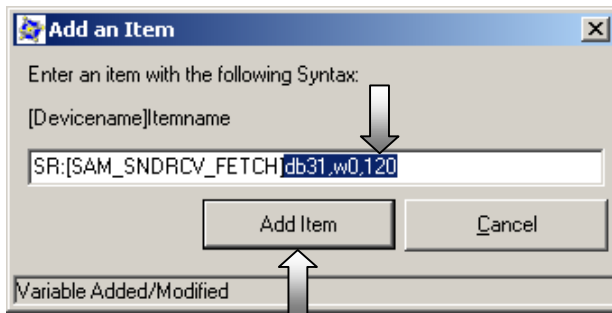
The added FETCH variable (FETCH item) now appears in the item list (right-hand window). Now one WRITE standard item in the OPC group is marked with the right mouse button and "Add Item" is selected in the context menu.
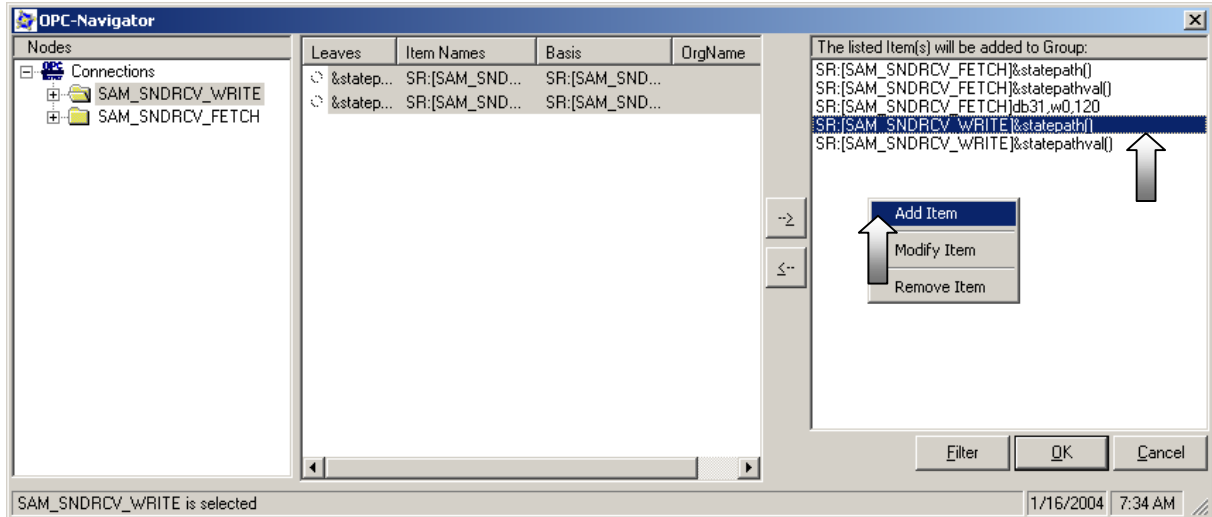
The variable name (Item ID) is then given as per the syntax rules (db..,w..,*wordnum*) and as a result the process variable(s) to be read are selected. Afterwards, this variable (Item) is added to the OPC group.
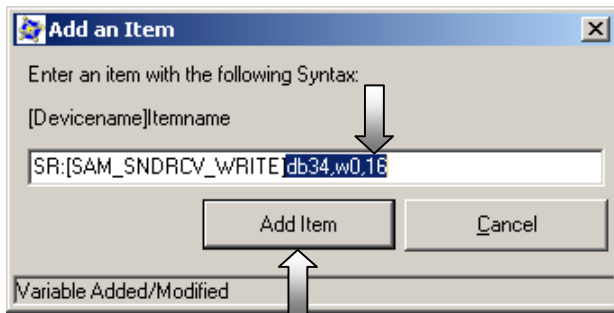
The added WRITE variable (WRITE item) now appears in the item list (right-hand window). In this way, a concrete FETCH item and a concrete WRITE item are added to the OPC group. Then the OPC Navigator is closed.
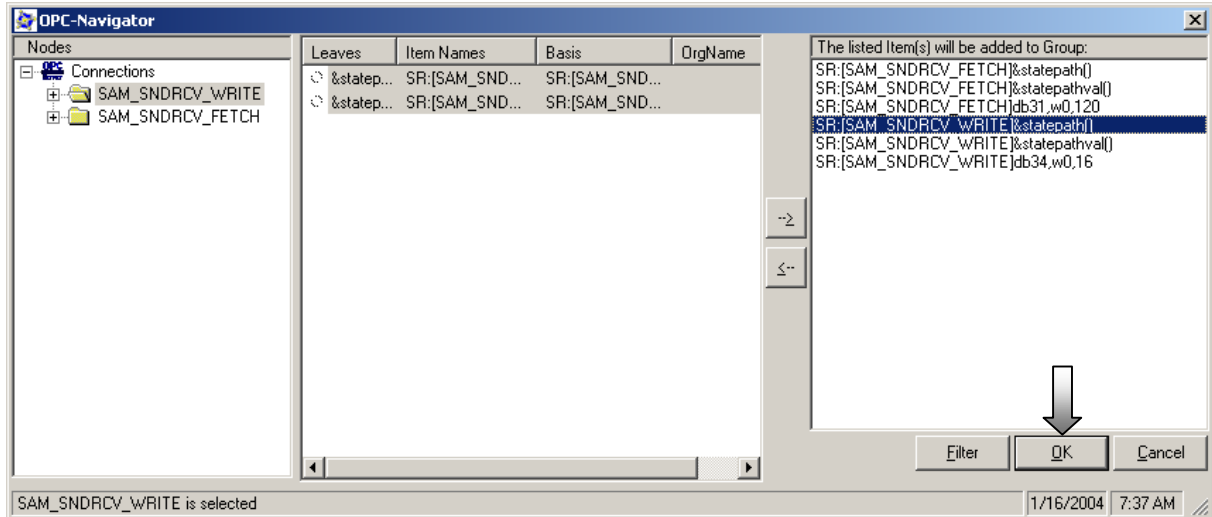
All the items and their values in the OPC group are shown in the OPC Scout, especially the transfer quality via the SEND/RECEIVE connection. Values can be given to writeable items (WRITE items, access rights) and transferred to the partner. The OPC Scout can be closed if no longer needed.
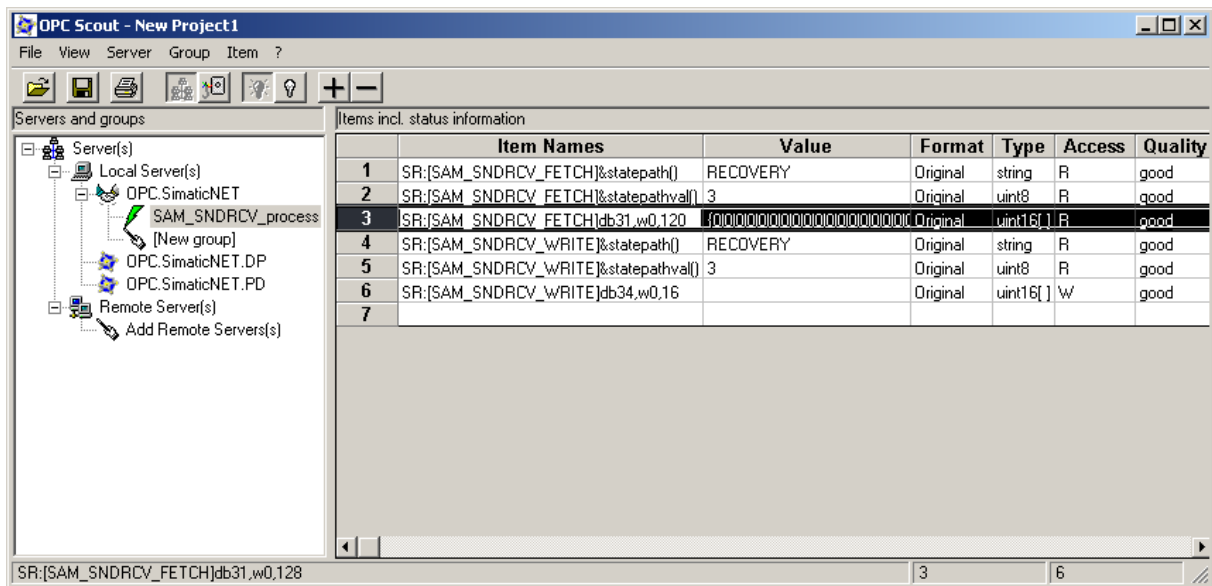
4 Data Interface

4.1 Monitoring the Link

The SEND/RECEIVE link between SIGMA AIR MANAGER and the communications peer (PC) can be monitored in remote control mode. This is made possible by a **handshake** program that is stored in SIGMA AIR MANAGER and activated and used by the communications peer. The parameters for the handshake program are the activating bit, the handshake bit and the handshake period that can all be preset via SEND/RECEIVE. The handshake period is 10 to 9990 seconds. The corresponding remote control data (DB 34) have to be taken from the separately delivered Technical Description 7_7725_PAGEN_*.

When handshake is activated (activating bit), the communications peer must set the handshake bit cyclically in, for example, an OPC client application. SIGMA AIR MANAGER resets the handshake bit and at the same time starts the handshake period. The handshake bit must be recognised as being set again before the period expires. Otherwise SIGMA AIR MANAGER reports a SEND/RECEIVE fault, closes down all remote control functions and reverts back to LOCAL settings (SAM-internal settings).

4.2 Remote Control Functions

The requirements for the remote control of SIGMA AIR MANAGER functions are that SEND/RECEIVE is activated by choosing the protocol option "FETCH/WRITE" or "SEND/RECEIVE" and then restarted again, and that remote control mode is activated.

The control functions via SEND/RECEIVE have a higher priority than corresponding operative functions on SIGMA AIR MANAGER or input functions (control by digital inputs). If, for example, the command "System ON" is sent, then the air system cannot be switched off, neither by pressing the OFF key on SIGMA AIR MANAGER nor via the "Remote OFF/ON" input function. A corresponding remark is displayed on SIGMA AIR MANAGER every time the operator presses the deactivated ON/OFF key. To switch off the air system on SIGMA AIR MANAGER, stop remote control mode by pressing the REMOTE key and then switch off the system by pressing the ON/OFF key.

The following remote control functions are available as well as the handshake function for link monitoring (see 4.1):

- **Compressed air system OFF/ON function**
- **Toggling between "Manual" and "Automatic" modes**
- **Clock mode ON/OFF**
- **Reset of current alarms, service and warning messages**
- **Selection and de-selection of online compressors (each compressor)**
- **Selection and de-selection of standby compressors (each group)**
- **Preset of pressure setpoint (in millibar)**
- **Preset of group sequence**

There is an **activating bit** for every remote control function and one or more **control bits** or **control values**. The activating bit activates the respective function and deactivates the respective local setting (SAM-internal setting). The control bits and control values control the function itself.

Remote control data that have been released are in S5 data module 34 and have to be taken from the separately delivered Technical Description 7_7725_PAGEN_*. Other data may not be overwritten. If other data are overwritten the internal data structure will be damaged and function errors or failure of SIGMA AIR MANAGER will occur. KAESER will not accept any liability or provide any warranty for such damage.

When the protocol option "FETCH/WRITE" has been chosen in SIGMA AIR MANAGER, separate data words or blocks of the remote control data module 34 can be written on by the communications peer (OPC client).

When the protocol option "SEND/RECEIVE" has been chosen, the remote control data module 34 must be written on in all (15 data words).

4.3   Process Data

The requirements for readout of SIGMA AIR MANAGER's process data are that SEND/RECEIVE is activated by choosing the protocol option "FETCH/WRITE" or "SEND/RECEIVE" and then restarted again. Remote control mode does not have to be activated in order to read out data.

The process data are continually actualised (PLC–cyclic) and contain all the relevant operational states and process values of SIGMA AIR MANAGER and the online compressors. The following process data are available:

- **Process image of SIGMA AIR MANAGER in the S5 data module 31 (see separately delivered Technical Description 7_7725_PAGEN_*)**

- **Process images of the linked SIGMA CONTROL compressors in the S5 data module 64 to 79 (see separately delivered Technical Description 7_7000_PASNDRCV_*)**

When the protocol option "FETCH/WRITE" has been chosen in SIGMA AIR MANAGER, it is possible to access arbitrary data blocks of the process data modules by the communications peer (OPC client).

**When the protocol option "SEND/RECEIVE" has been chosen, each process data module must be read completely (each with 120 data words).
It is possible, however, to set if the process images of the linked SIGMA CONTROL compressors in the data modules 64 to 79 ("SAM+SC") should be sent in addition to the process image of the SIGMA AIR MANAGER in the data module 31 ("SAM").
In this case ("SAM+SC"), the communications peer has to determine, on the basis of the data word 91, to which participant the received process image is related. For this, the low significant (right) byte of the data word 91 containing the slave address must be evaluated. It is "2" in case of SIGMA AIR MANAGER and "compressor number + 2" in case of SIGMA CONTROL compressors.**

4.4 Status Bits

The current status of the SEND/RECEIVE communication is indicated in one S5 data word, which can separately be read via the protocol option "FETCH/WRITE". The respective status bits are listed in the table below (DB = data block, DW = data word, bit = bit number):

Meaning	status		
	DB	DW	Bit
SEND/RECEIVE is activated on SIGMA AIR MANAGER (activated in the menu option).	36	56	0
SIGMA AIR MANAGER is running in remote control mode.	36	56	3
SIGMA AIR MANAGER is ready for execution of SEND/RECEIVE remote control functions. (SEND/RECEIVE and remote control mode active)	36	56	4
The handshake for link monitoring is active.	36	56	8
The handshake for link monitoring is running correctly.	36	56	10
Handshake error: the handshake bit was not recognised (local settings are operative).	36	56	11
Handshake error: the handshake period is inadmissible (local settings are operative).	36	56	12

Annex A: OPC-Client Application in VBA (Excel)

The VBA application described below is a non-binding example of an OPC client. It contains the most important steps in the creation and removal of a client-server link and principally shows the procedure for access to SIGMA AIR MANAGER's system data via the SIMATIC NET OPC Server's (DLL with OPC Server object structure) **automation interface** (and how this interface is connected). All program steps are explained by a comment line (in italics). The commands "Find OPC server" / Connect" / "Disconnect" / "SyncWrite" are initiated by buttons.
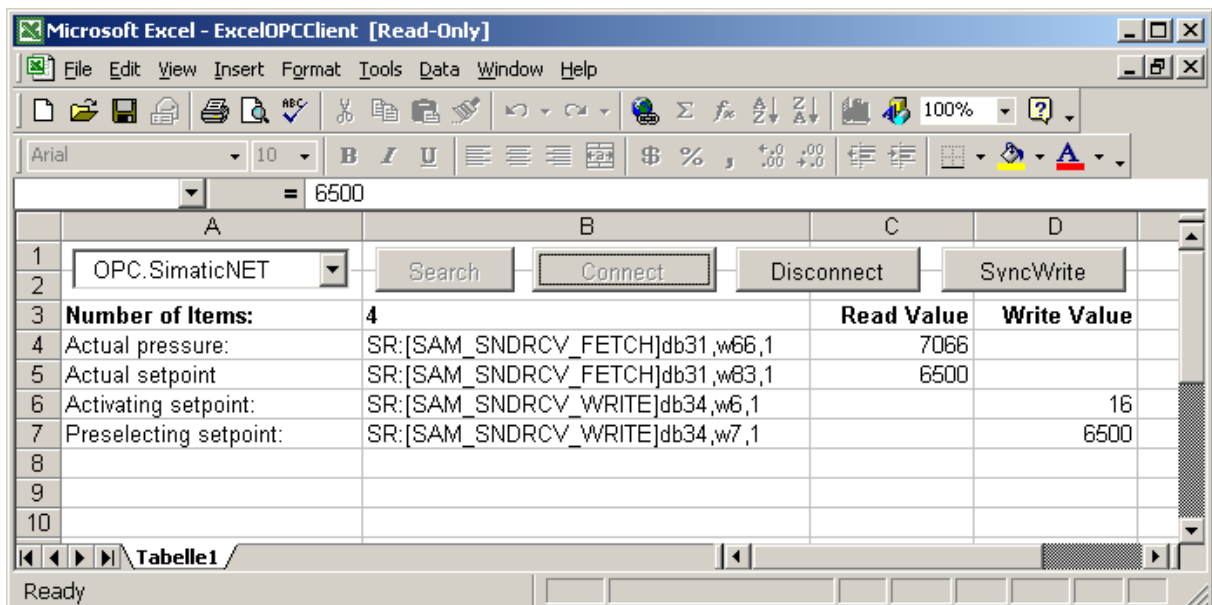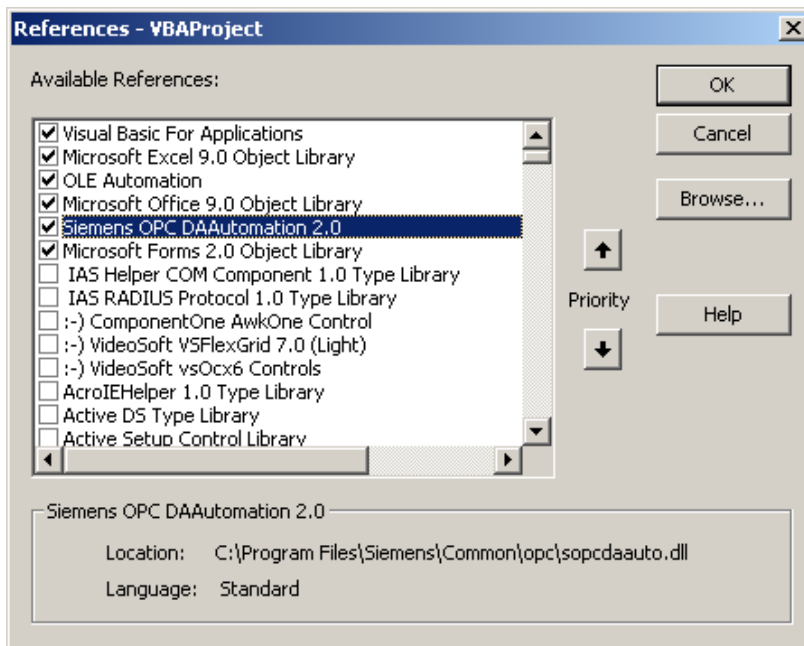
```
Private Sub Workbook_Open()
    Tabelle1.cmdSearch.Enabled = True
    Tabelle1.cmdConnect.Enabled = False
    Tabelle1.cmdDisconnect.Enabled = False
    Tabelle1.cmdSyncWrite.Enabled = False
End Sub
```

```
Option Explicit
Option Base 1
```

'Declare variable of OPC server object type
```
Private myOPCServer As OPCServer
```
'Declare variable of OPC group object type
```
Private WithEvents myOPCGroup As OPCGroup
```
'Size the cell for server handles
```
Dim ServerHandles() As Long
```
Size the variable for item count
```
Dim NumItems As Long
```

'Procedure ("Search" command button) for finding the locally registered OPC server
'and entry of the OPC server name in the ComboBox (list of OPC servers)
```
Private Sub cmdSearch_Click()
```
'Size the cell for the OPC server name
```
Dim ServerNames() As String
```
'Variant element for For-Each-Next loop
```
Dim ServerName As Variant
```
'Go to on runtime errors
```
    On Error GoTo errorhandler
```
'New OPC server object type entity
```
    Set myOPCServer = New OPCServer
```
'Delete the ComboBox (list of OPC servers) content
```
    Call cmbServerNames.Clear
```
'Determine OPC server and save OPC server name
```
    ServerNames() = myOPCServer.GetOPCServers()
```
'Enter OPC server name in the ComboBox (list of OPC servers)
```
    For Each ServerName In ServerNames
        cmbServerNames.AddItem (ServerName)
    Next ServerName
```
'Enable, block other procedures (Command Buttons)
```
     cmdConnect.Enabled = True
Exit Sub
```
'Display dialog window (message box) if runtime error occurs
```
errorhandler:
    Call MsgBox(Err.Description, vbCritical)
End Sub
```

'The procedure ("Connect" command button) for connecting to the selected OPC server
'and for the creation of an OPC group (object) with several items
```
Private Sub cmdConnect_Click()
```
'Variable for the selected OPC server name
```
Dim strServerName As String
```
'Size the fields required for the items
```
Dim ItemIDs() As String
Dim CltHandels() As Long
Dim Errors() As Long
```
'Size the loop variable
```
Dim i As Long
```
'Go to on runtime errors

```
      On Error GoTo errorhandler
```
'Connect to selected OPC server
```
      strServerName = cmbServerNames.Text
      If strServerName = "" Then Exit Sub
      Call myOPCServer.Connect(strServerName)
```
'Set the update rate for new OPC groups to 1000 ms
```
      myOPCServer.OPCGroups.DefaultGroupUpdateRate = 1000
```
'Create new OPC group on the OPC server
```
      Set myOPCGroup = myOPCServer.OPCGroups.Add("MyGroup")
```
'Deactivate creation of events (value change)
```
      myOPCGroup.IsActive = False
```
'Size cells for items according to number of items (table cell)
```
      NumItems = Cells(3, 2)
      ReDim ItemIDs(NumItems)
      ReDim CltHandels(NumItems)
```
'Read in item IDs from the table cells and number the client handles
```
      For i = 1 To NumItems
          ItemIDs(i) = Cells(3 + i, 2)
          CltHandels(i) = i
      Next
```
'Add items with the read-in item IDs (identification of process variables)
```
      Call myOPCGroup.OPCItems.AddItems(NumItems, ItemIDs, CltHandels,
ServerHandles, Errors)
```
'If an error occurs display dialog window (message box) with corrupt item ID and error string
```
      For i = 1 To NumItems
          If Errors(i) <> 0 Then
              Call MsgBox(ItemIDs(i) & ": " &
myOPCServer.GetErrorString(Error(i)), vbCritical)
          End If
      Next
```
'Delete cell with error codes
```
      Erase Errors
```
'Activate creation of events (value change)
```
      myOPCGroup.IsActive = True
      myOPCGroup.IsSubscribed = True
```
'Enable, block other procedures (command buttons)
```
      cmdSearch.Enabled = False
      cmdConnect.Enabled = False
      cmdDisconnect.Enabled = True
      cmdSyncWrite.Enabled = True
Exit Sub
```
'Display dialog window (message box) if runtime error occurs
```
errorhandler:
      Call MsgBox(Err.Description, vbCritical)
End Sub
```

'Procedure (command button "Disconnect") for disconnecting the selected OPC server
'for deleting all OPC groups (objects) and items
```
Private Sub cmdDisconnect_Click()
```
'Go to on runtime errors
```
      On Error GoTo errorhandler
```
'Delete cell with server handles
```
      Erase ServerHandles
```
'Delete all OPC groups and items on the OPC server, cancel object reference
```
      Call myOPCServer.OPCGroups.RemoveAll
      Set myOPCGroup = Nothing
```
'Disconnect selected OPC server, cancel object reference
```
      Call myOPCServer.Disconnect
      Set myOPCServer = Nothing
```

'Enable, block other procedures (command buttons)
```
    cmdSearch.Enabled = True
    cmdConnect.Enabled = False
    cmdDisconnect.Enabled = False
    cmdSyncWrite.Enabled = False
Exit Sub
```
'Display dialog window (message box) if runtime error occurs
```
errorhandler:
    Call MsgBox(Err.Description, vbCritical)
End Sub
```

'Procedure (command button "SyncWrite") for synchronising the writing of values for certain created
'items (default values in the table) of the OPC group
```
Private Sub cmdSyncWrite_Click()
```
'Size the variable for the number of items to be written (default value in the table)
```
Dim myNum As Long
```
'Size the cell for server handles for the items to be written (default value in the table)
```
Dim SrvHandles() As Long
```
'Size the cell for the values to be written
```
Dim Values() As Variant
```
'Size the cell for error codes
```
Dim Errors() As Long
```
'Size the loop variable
```
Dim i As Long
```
'Go to on runtime errors
```
    On Error GoTo errorhandler
```
'Size cells for items according to number of items (table cell)
```
    ReDim Values(NumItems)
    ReDim SrvHandles(NumItems)
```
'Determine the number of items with default value, read in the values from the table cells and integrate
'the appropriate server handles from all server handles
```
    myNum = 0
    For i = 1 To NumItems
        If Cells(3 + i, 4) <> "" Then
            myNum = myNum + 1
            SrvHandles(myNum) = ServerHandles(i)
            Values(myNum) = Cells(3 + i, 4)
        End If
    Next
```
'Synchronised write of the values read in for corresponding items (server handles)
```
    If myNum > 0 Then
        Call myOPCGroup.SyncWrite(myNum, SrvHandles, Values, Errors)
```
'If an error occurs display dialog window (message box) with error string
```
        For i = 1 To myNum
            If Errors(i) <> 0 Then
                Call MsgBox(myOPCServer.GetErrorString(Errors(i)),
vbCritical)
            End If
        Next
```
'Delete cell with error codes
```
        Erase Errors
    End If
Exit Sub
```
'Display dialog window (message box) if runtime error occurs
```
errorhandler:
    Call MsgBox(Err.Description, vbCritical)
End Sub
```

'Procedure (event controlled) for reading in the created items of the OPC group
```
Private Sub myOPCGroup_DataChange(ByVal TransactionID As Long, ByVal
NumItems As Long, ClientHandles() As Long, ItemValues() As Variant,
Qualities() As Long, TimeStamps() As Date)
```
'Size the loop variable
```
Dim i As Long
```
'Go to on runtime errors
```
    On Error GoTo errorhandler
```
'Write the values read in to the table cells
```
    For i = 1 To NumItems
        Cells(3 + ClientHandles(i), 3) = ItemValues(i)
    Next
Exit Sub
```
'Display dialog window (message box) if runtime error occurs
```
errorhandler:
    Call MsgBox(Err.Description, vbCritical)
End Sub
```