



**SIEMENS**



**SIMATIC S7-based  
Telecontrol via the  
DNP3 Protocol**

CP 1243-1, CP 1542SP-1 IRC, TIM 1531 IRC

<https://support.industry.siemens.com/cs/ww/en/view/87447188>

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# Table of contents

	<b>Legal information</b> .....	<b>2</b>
<b>2</b>	<b>Solution</b> .....	<b>5</b>
	2.1 Overview.....	5
	2.2 Components used .....	9
<b>3</b>	<b>Basics of DNP3</b> .....	<b>10</b>
	3.1 DNP3 addresses .....	10
	3.2 DNP3 classes.....	11
	3.2.1 Static data (class 0).....	11
	3.2.2 Events.....	12
	3.3 Group and variation.....	13
	3.4 Conformity level / Implementation level .....	13
	3.5 Assigning terms.....	13
<b>4</b>	<b>Program overview</b> .....	<b>15</b>
	4.1 STEP 7 V17 project (DNP3 stations) .....	15
	4.2 WinCC project (DNP3 master) .....	15
	4.3 Overview of data points.....	16
	4.4 Addresses in the example .....	17
<b>5</b>	<b>DNP3 configuration in the TIA Portal</b> .....	<b>18</b>
	5.1 Device configuration.....	18
	5.1.1 WinCC V7.5 as DNP3 master .....	19
	5.1.2 Station S7-1200 with CP 1243-1 or ET 200SP with CP 1542SP- 1 IRC .....	22
	5.1.3 Station S7-1500 with TIM 1531 IRC.....	26
	5.2 Server Redundancy Setup .....	28
<b>6</b>	<b>DNP3 configuration for the DNP3 master</b> .....	<b>30</b>
<b>7</b>	<b>Installation</b> .....	<b>39</b>
<b>8</b>	<b>Commissioning</b> .....	<b>41</b>
<b>9</b>	<b>Operation of the application example</b> .....	<b>42</b>
<b>10</b>	<b>Appendix</b> .....	<b>43</b>
	10.1 Service and support .....	43
	10.2 Industry Mall .....	44
	10.3 Links and literature .....	44
	10.4 Change documentation .....	45

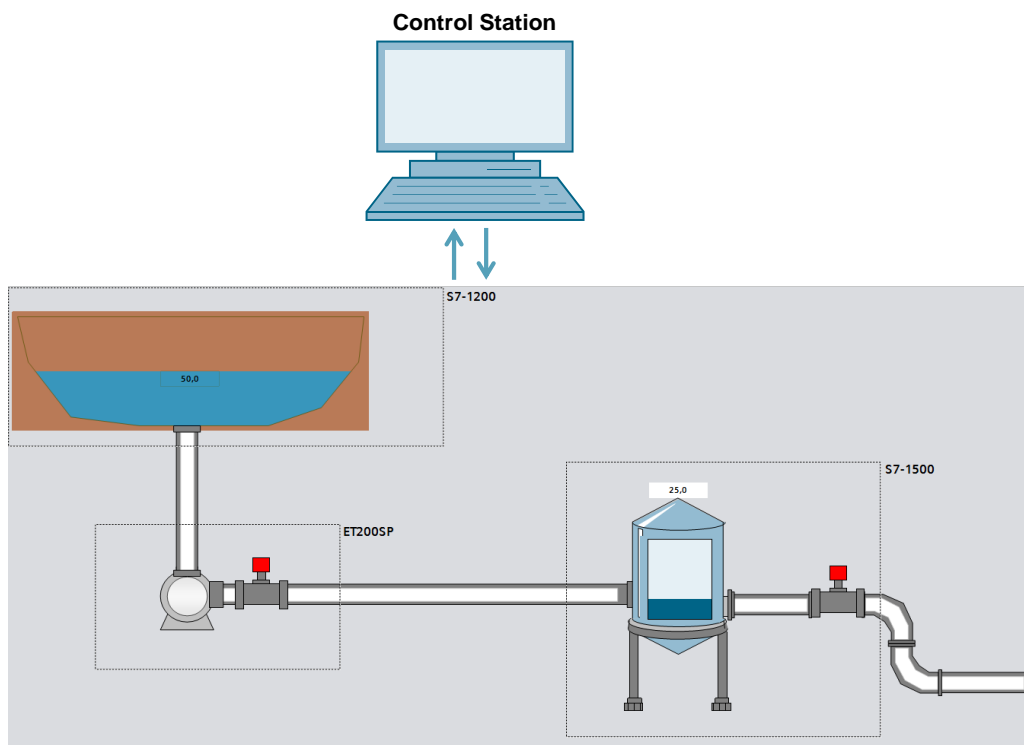
# 1 The task

## Overview of the automation task

The outstations "rain overflow basin", "pump station" and "elevated tank" are connected to a central control station.

The following figure provides an overview of the automation task.

Figure 2-1



## Description of the automation task

An elevated tank that, for example, is responsible for supplying water to a town, is monitored by a SIMATIC S7-1500. If the level falls below the minimum, the pumping station is activated until the elevated tank is completely filled again.

The pumping station is monitored and controlled by an ET 200SP.

The stormwater overflow tank is monitored by a SIMATIC S7-1200. The level is transmitted to the control station, as is an alarm if the minimum or maximum level is reached.

## The requirements based on the automation task

1. The control center must be able to request process data from the outstations.
2. The control station must be able to send commands and setpoints spontaneously to the outstations.
3. The outstations must be able to send process data spontaneously to the control station.
4. Process data must be stored in the outstations and sent to the master when the connection is re-established in the event of a disconnection.
5. A standardized protocol must be used for the implementation.

## 2 Solution

### 2.1 Overview

The control station communicates with the outstations via Ethernet using the DNP3 telecontrol protocol.

The following types of message frames were configured in the application example.

- Commands (binary command)
- Measured value (analog input event)
- Binary messages (binary input event)

Events of the DNP3 event classes 1 and 2 were configured for this purpose.

The integration of TeleControl configuration into the TIA Portal V17 simplifies engineering. In addition, cross-communication between the outstations is now possible:

- S7-1200 with
  - CP 1243 1 or
  - CP 1243 7 LTE or
  - CP 1243-8 IRC
- ET 200SP with CP 1542SP-1 IRC
- S7-1500 with TIM 1531 IRC

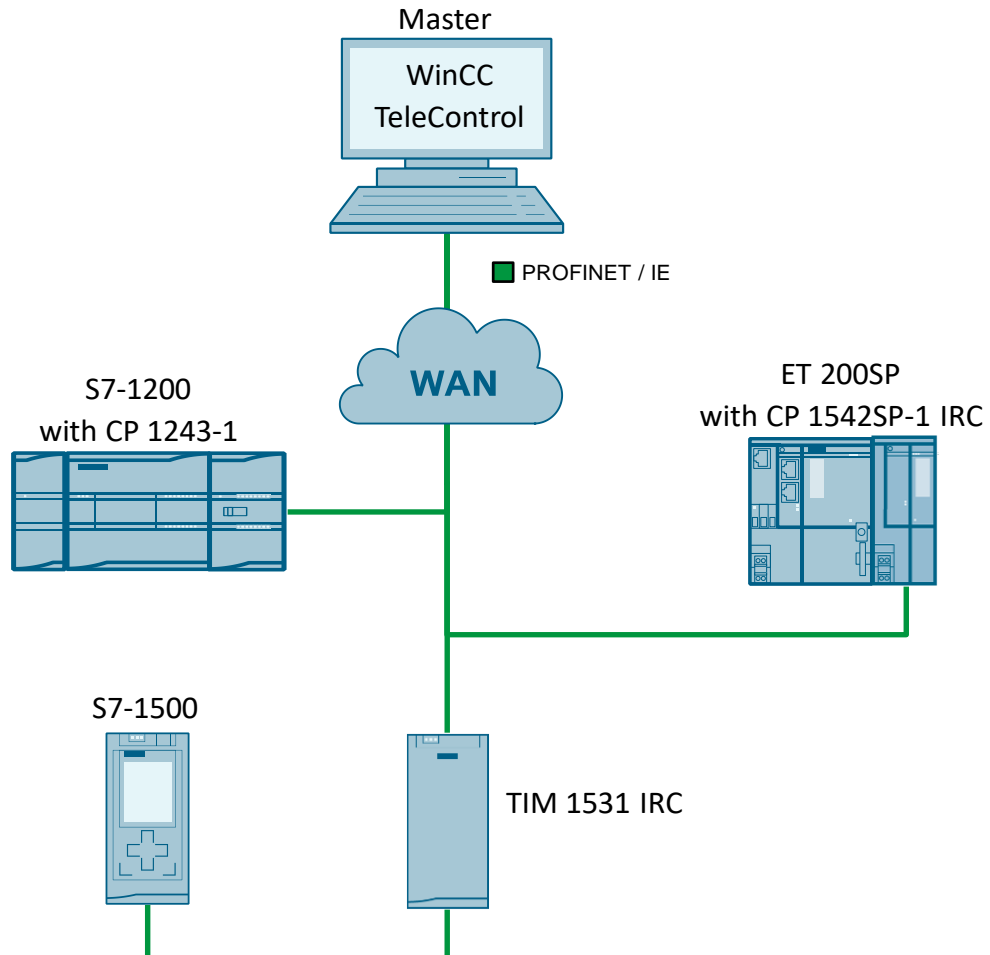
**Note**

The scenario is typically put into operation with VPN tunnels. The configuration required for this is not covered in this document.

## Diagram

The following diagram shows the most important components of the configured solution:

Figure 2-1



The outstations are available in 3 versions:

- S7-1500 with TIM 1531 IRC
- S7-1200 with CP 1243-1
- ET 200SP (based on S7-1500) with CP 1542SP-1 IRC

The WinCC TeleControl software is installed at the control station, making the control station the DNP3 master.

A SIMATIC S7-1500 CPU with the TIM 1531 IRC as DNP3 station is installed on the outstation "elevated tank".

The outstation "stormwater overflow tank" consists of a SIMATIC S7-1200 CPU and a CP 1243-8 IRC installed as DNP3 station.

The outstation "Pumping station" consists of a SIMATIC ET 200SP CPU and a CP 1542SP-1 IRC installed as DNP3 station.

## Benefits

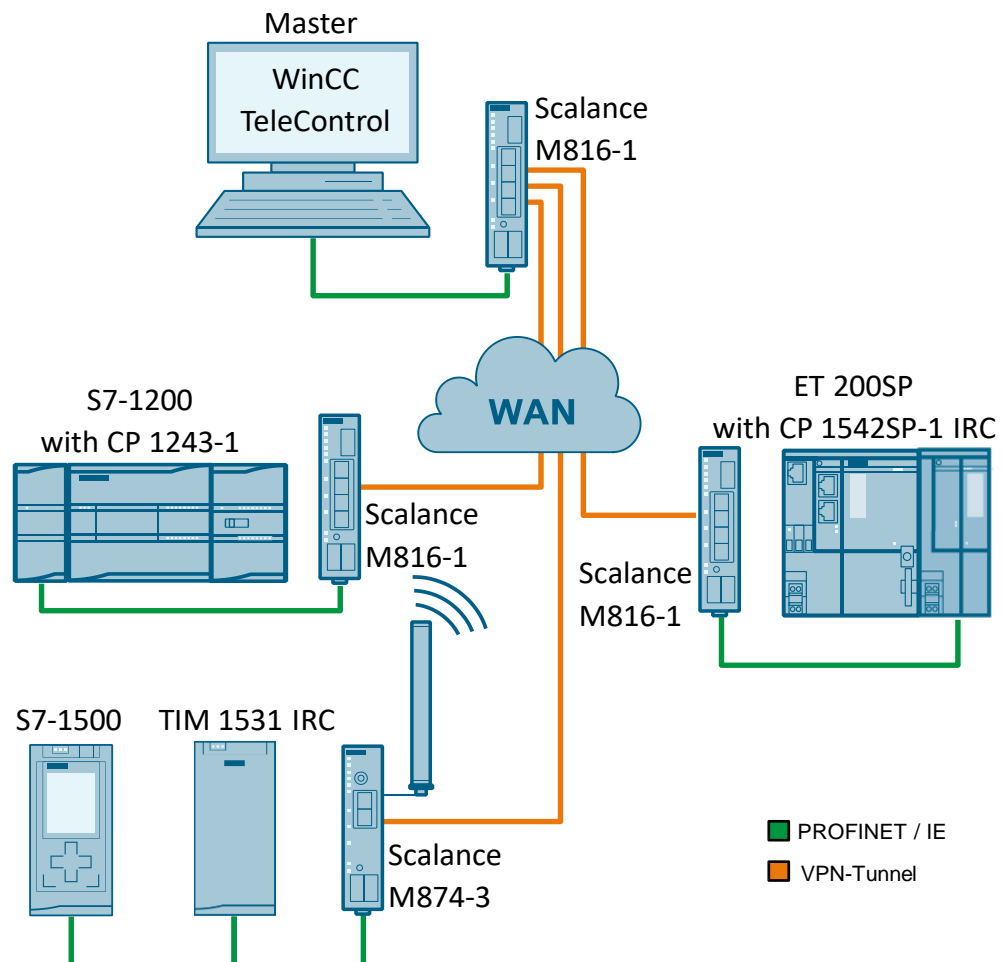
The solution presented in this document offers you the following advantages:

- Use of a standard DNP3 protocol.
- Efficient and safe monitoring and control of process plants.
- Homogeneous SIMATIC solution, as the SIMATIC portfolio offers software and hardware for DNP3 masters and outstations.
- Connection to all standardized DNP3 master systems.

## Typical configuration with VPN tunnels

It is also possible to secure communication via VPN tunnels. The hardware structure could look like the following figure:

Figure 2-2



### Note

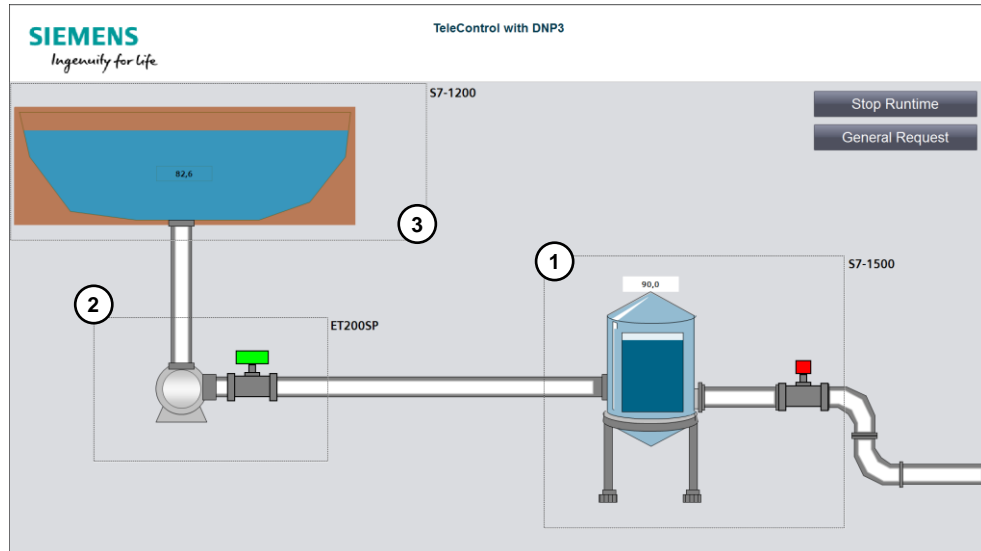
The configuration is not described further in this application example. An overview document of the various configuration options can be found under the following link

<https://support.industry.siemens.com/cs/ww/en/view/26662448>.

## Scenario

The application example is operated via the WinCC Runtime. The user interface is shown in the following figure.

Figure 2-3



1. The filling level is simulated in the station "elevated tank" (S7-1500). This is transferred to the master when changes are made. If the level falls below a minimum ( $\leq 10\%$ ), an alarm is sent to the master. The pumping station must be activated by the operator to fill the elevated tank. If the maximum is reached ( $\geq 90\%$ ), an alarm is sent again to the operator that intervention is required to prevent the elevated tank from overflowing. The operator can drain water from the elevated tank via a valve.
2. In the station "Pumpstation" (ET 200SP) a valve can be controlled by the operator. Depending on the valve position, the pump is activated or deactivated.
3. In the station "stormwater overflow tank" (S7-1200) the filling level is simulated and if there is a value change it is sent to the master.



## 2.2 Components used

This application example has been created with the following hardware and software components:

Table 2-1

Component	Number	Article number	Note
SIMATIC Field PG M6	1	6ES7718-0....-0...	
CPU 1511-1 PN	1	6ES7511-1AK01-0AB0	Firmware V2.6 or higher
TIM 1531 IRC	1	6GK7543-1MX00-0XE0	Firmware V2.0 or higher
CPU 1214C DC/DC/DC	1	6ES7214-1AG40-0XB0	Firmware V3.0 or higher
CP 1243-1	1	6GK7243-1BX30-0XE0	Firmware V3.1 or higher It can also be a CP 1243-7 LTE (Firmware V3.3 or higher) or a CP 1243-8 IRC (Firmware V3.0 or higher).
CPU 1510SP-1 PN	1	6ES7512-1DJ01-0AB0	Firmware V2.6 or higher
CP 1542SP-1 IRC	1	6GK7542-6VX00-0XE0	Firmware V2.0 or higher
WinCC V7.5 SP1	1	6AV6381-2CB07-5AX0	Service Pack 1 for WinCC V7.5 : <a href="https://support.industry.siemens.com/cs/ww/en/view/109772879">https://support.industry.siemens.com/cs/ww/en/view/109772879</a>
SIMATIC TeleControl 7.4 for WinCC Basic Engineering	1	6DL5000-7AA47-0XA5	
SIMATIC TeleControl 7.4 for WinCC Server Runtime (6 Stations)	1	6DL5002-7AA47-0XA0	
TeleControl DNP3 Driver	1	6DL5101-8EX00-0XB0	Patch 2 <a href="https://support.industry.siemens.com/cs/ww/en/view/109774012">https://support.industry.siemens.com/cs/ww/en/view/109774012</a>
STEP 7 PROF V17	1	6ES7822-1AA07-0YA5	

### Example files and projects

This application example consists of the following components:

Table 2-2

Component	File name	Note
Documentation	87447188_DNP3_Telecontrol_DOC_V40_en.pdf	This document
Project	87447188_DNP3_Telecontrol_CODE_V40.zip	This compressed file contains: <ul style="list-style-type: none"> <li>STEP 7 V17 Project</li> <li>WinCC 7.5 SP1 Project</li> </ul>

## 3 Basics of DNP3

DNP3 is a telecontrol protocol that enables the transmission of process data via serial or IP-based communication. This protocol has been standardized by the DNP Users Group and is often used in the water/waste water and energy distribution industries.

In contrast to IEC 60870-5 and SINAUT ST7 protocol, which are common in Europe, DNP3 is often used in the USA and Asia.

An important aspect of the DNP3 protocol is the high compatibility and interoperability between devices from different manufacturers.

**Note**

An overview of the DNP3 protocol can be found in the "DNP3 Protocol Primer" [www.dnp.org](http://www.dnp.org) and in the manuals of the respective DNP3 assemblies.

### 3.1 DNP3 addresses

The DNP3 protocol defines a master, e.g. the computer from which the service personnel can operate and monitor the plant, and the outstations, the remote stations, often also called RTU (Remote Terminal Unit).

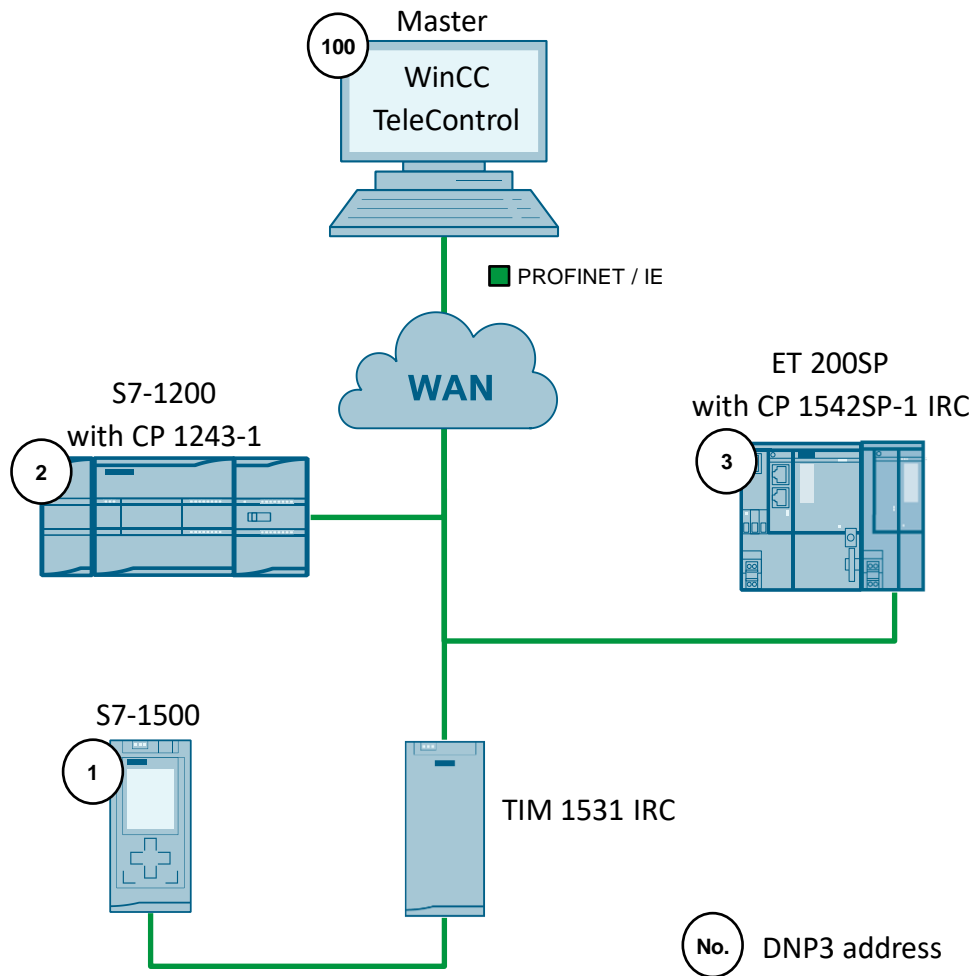
Each DNP3 device must have a unique address. Using this address, the message frames can be sent to the correct partner.

The source and destination addresses of a message frame are sent with the process data, so the receiver knows to whom it must respond.

In this application example, process data is sent and received between four devices. The communication takes place between the master and the S7-1500 Station / S7-1200 Station / ET 200SP Station.

The addresses are assigned in this application example as shown in the following figure.

Figure 3-1



You can select an address between 1 and 65520.

**Note** The DNP3 configuration of the master is done in the WinCC Explorer. The DNP3 configuration of the stations is carried out in the TIA portal. During the connection configuration the configured master address must be specified.

## 3.2 DNP3 classes

The DNP3 protocol classifies the process data into static data and events.

### 3.2.1 Static data (class 0)

Static data are all analog and binary values present in DNP3 stations, such as messages, measured values or counter values.

Only the current values/states are transmitted at the request of the master. Intermediate values or values that occur during a connection failure are not buffered.

### 3.2.2 Events

An event is a message, alarm, reading, etc. where a significant change takes place. With binary input, for example, it can be a change from 0 to 1. With a measured value, an event occurs when the analog value exceeds a threshold value. The DNP3 protocol defines two options for transmitting the stored events:

- The DNP3 master can query the stored events of one or all event classes and read them like static data.
- The station can transmit events spontaneously.

Whether the station reports spontaneous events is determined during the configuration of the DNP3 master. The spontaneous sending of events by the station is initiated by the master via a corresponding control message frame to the station.

#### Note

In order for the data to be sent spontaneously, the function "unsolicited transfer" must be activated in STEP 7 V17 and "Unsolicited Responses" in WinCC TeleControl.

Events are divided into the following three classes:

#### Class 1

This class is recommended for critical events. All changes to a process value are stored in the event memory and immediately sent to the master.

#### Class 2

Class 2 events are handled in the same way as Class 1 events, i.e. all changes to a process value are stored in the event memory and immediately sent to the master.

#### Class 3

Class 3 event handling is a proprietary solution for the DNP3-TIMs and CP 1243-1. Only the last change of a process value is stored in the event memory. The current, changed value is transmitted to the central unit when the central unit queries the class 3 events.

Class 3, for example, is suitable for the transmission of meter readings, since only the last counter value is of interest.

#### Index

The DNP3 protocol specifies the index to identify a single data point within a DNP3 object group. There are the following groups:

- Binary input
- Analog input
- Counter input
- Control output
- Analog output

Within a DNP3 object group, each individual process value is addressed via a unique index. The DNP3 index is assigned sequentially during configuration, starting with index 0.

### Index allocation in the TIA Portal

In the TIA Portal, the index is automatically incremented when creating data points of the same type. You can also change the index manually. The TIA Portal checks that the index is assigned only once per DNP3 object group.

## 3.3 Group and variation

### Group

The DNP3 protocol specifies object groups. In the TIA Portal, the object group is under "Type of data point".

The data objects are used to address individual data or groups of data that differ according to data type (binary, analog, command, etc.) and send or receive direction.

### Variation

The DNP3 object group defines the associated data types. Within some data objects the variation concretizes the data format of the process value. Each object group has a typical set of variations. The most important variations define the following data formats:

- Counters, binary and analog values: With or without time stamp
- Analog value formats: 16 or 32 bit, fixed point number or floating point value

## 3.4 Conformity level / Implementation level

The DNP3 protocol specifies implementation levels for the implementation of the protocol with the different DNP3 devices.

- Level 1 is the lowest level where only basic functions are supported.
- Level 2 supports more groups and variations than Level 1.
- Level 2 and 3 also support time stamping and buffering for binary inputs.
- Level 4 and Level 5 additionally support time stamping and buffering for analog input and counter input.

In the "DNP3 Device Profile" of each DNP3 assembly, you will find information about the highest level that that assembly supports. When configuring the stations, the highest conformity level supported by the master must be entered.

## 3.5 Assigning terms

In the TIA Portal and in WinCC TeleControl, different names are sometimes used for the same parameters. To facilitate configuration, a table with the names of the parameters in German and a table in English are available.

### German terms

Table 3-1

WinCC TeleControl	TIA Portal (STEP 7 V17)
Connection address Link address	Station address Master station address
Is not displayed	DNP3 level
Tag	Data point
Class	Event class
Index	Data point index

WinCC TeleControl	TIA Portal (STEP 7 V17)
Group	Data point type
Variation	Is not displayed
Data processing mode	Is not displayed because it is recognizable from the "Datapoint type"
Unsolicited responses	Spontaneous transfer

#### English terms

Table 3-2

WinCC TeleControl	TIA Portal (STEP 7 V17)
Link address	Station address Master station address
Is not displayed	DNP3 level
Tag	Data point
Class	Event class
Index	Datapoint index
Group	Datapoint type
Variation	Is not displayed
Data processing mode	Is not displayed because it is recognizable from the "Datapoint type"
Unsolicited responses	Unsolicited transfer

## 4 Program overview

This chapter briefly explains the program structure of the application example. The supplied code contains the following files:

STEP 7 V17 project

WinCC V7.5 SP1 project

### 4.1 STEP 7 V17 project (DNP3 stations)

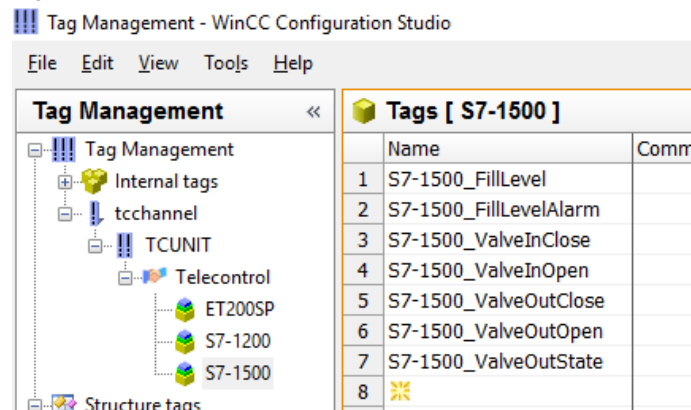
The DNP3 stations are configured in the STEP 7 project. The focus of the application example is on the configuration of the devices in the TIA Portal. The configuration of the devices is described in [Chapter 5](#). To illustrate the functions of the DNP3 protocol, a simulation based on a water/wastewater application (greatly simplified) was created.

<b>CAUTION</b>	This application example can only be used for test purposes!
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### 4.2 WinCC project (DNP3 master)

The HMI system is configured in SIMATIC WinCC. In addition, the add-on software WinCC TeleControl is used to configure the DNP3 master. The DNP3 configuration of the master is described in detail in [Chapter 6](#). For the process data, a group was created for each station in the "Tag Management". The names of the tags do not have to match the names of the objects in the station configuration, but it is important that the configuration of the objects matches the station (group, variation, class, etc.).

Figure 4-1



### 4.3 Overview of data points

The following tables provide an overview of the data points that are configured in this application example.

The data points of the DNP3 master are provided with a prefix.

The data point type indicates which objects/data points are commands, binary or analog values. The class indicates whether they are static data or events.

#### Data points S7-1200

Table 4-1: Data points station S7-1200

STEP 7	WinCC	Data point type	Transmission method	Index
FillLevel	S7-1200_FillLevel	Analog Input Event (32)	Class 1	0
OpenValve	S7-1200_OpenValve	Binary Command (12)	Class 1	1
CloseValve	S7-1200_CloseValve	Binary Command (12)	Class 1	2

#### Data points S7-1500

Table 4-2: Data points station S7-1500

STEP 7	WinCC	Data point type	Transmission method	Index
FillLevel	S7-1500_FillLevel	Analog Input Event (32)	Class 1	0
FillLevelAlarm	S7-1500_FillLevelAlarm	Binary Input Event (2)	Class 1	1
ValveOutOpen	S7-1500_ValveOutOpen	Binary Command (12)	Class 2	2
ValveOutClose	S7-1500_ValveOutClose	Binary Command (12)	Class 2	3
ValveOutState	S7-1500_ValveOutState	Binary Input Event (2)	Class 1	4
ValveInOpen	S7-1500_ValveInOpen	Binary Command (12)	Class 2	5
ValveInClose	S7-1500_ValveInClose	Binary Command (12)	Class 2	6
ValveInState	S7-1500_ValveInState	Binary Input Event (2)	Class 1	7



**Data points ET 200SP**

Table 4-3: Data points station ET 200SP

STEP 7	WinCC	Data point type	Transmission method	Index
PumpActivated	ET200SP_PumpActivated	Binary Input Event (2)	Class 1	0
OpenValve	ET200SP_ValveInOpen	Binary Command (12)	Class 2	1
CloseValve	ET200SP_ValveInClose	Binary Command (12)	Class 2	2
ValveState	ET200SP_ValveInState	Binary Input Event (2)	Class 1	3

**4.4 Addresses in the example**

The following IP and DNP3 addresses are used to configure the example in the LAN.

Table 4-4: Addresses

Station	Module	IP address	Subnet mask	DNP3 addresses	
DNP3 Master	SIMATIC PC station	192.168.1.100	255.255.255.0	100	
S7-1500	TIM 1531 IRC	Port 1	192.168.0.11	255.255.255.0	1
		Port 2	192.168.1.1	255.255.255.0	
		Port 3	192.168.2.1	255.255.255.0	
S7-1200	CP 1243-1	192.168.1.2	255.255.255.0	2	
ET 200SP	CP 1542SP-1 IRC	192.168.1.3	255.255.255.0	3	

## 5 DNP3 configuration in the TIA Portal

The configuration of the hardware and the DNP3 configuration for the clients takes place in STEP 7 V17. No additional tool is required.

### 5.1 Device configuration

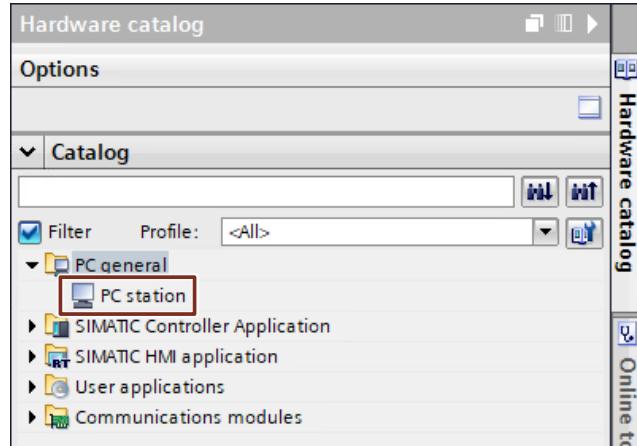
In the "Device configuration" both the hardware and the DNP3 parameters, which are relevant for the whole station, are configured. Make the settings as follows:

**Note**

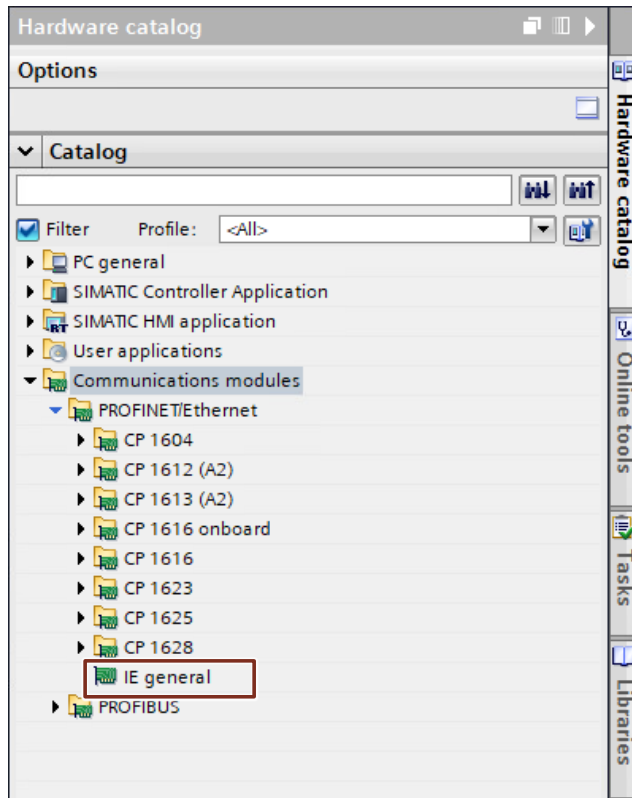
The following description assumes that the WinCC runtime is started on the programming computer.

### 5.1.1 WinCC V7.5 as DNP3 master

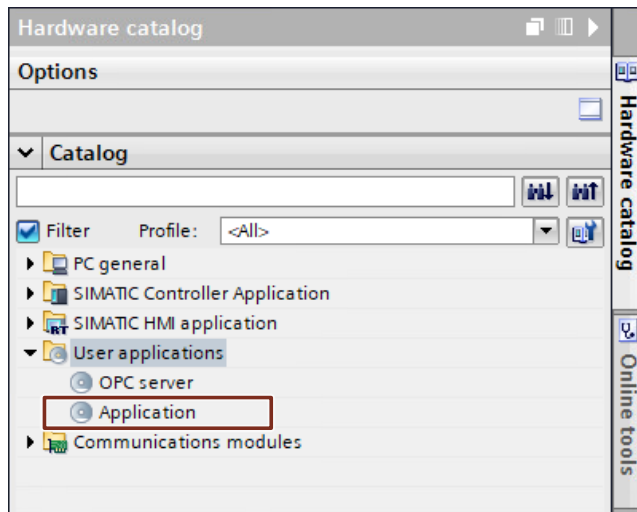
1. Add a "PC station" to your project.



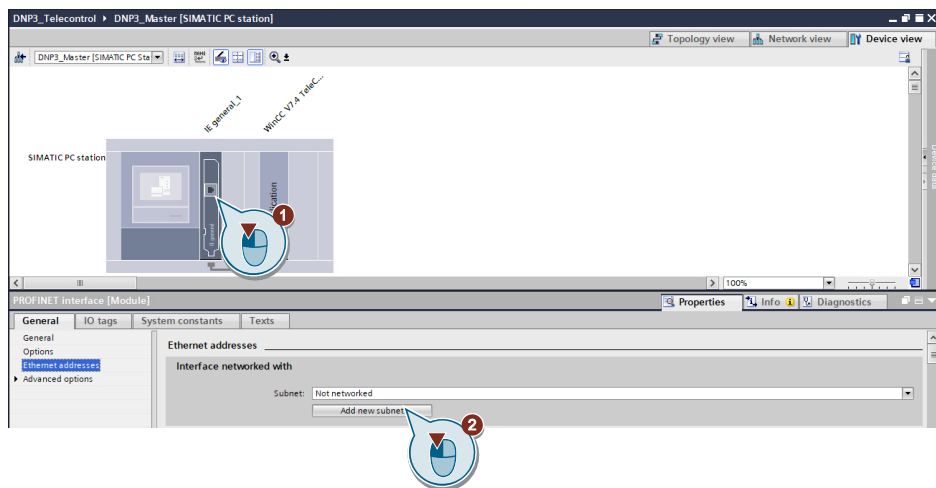
2. Add a communication module "IE general".



3. Add a user application "Application"

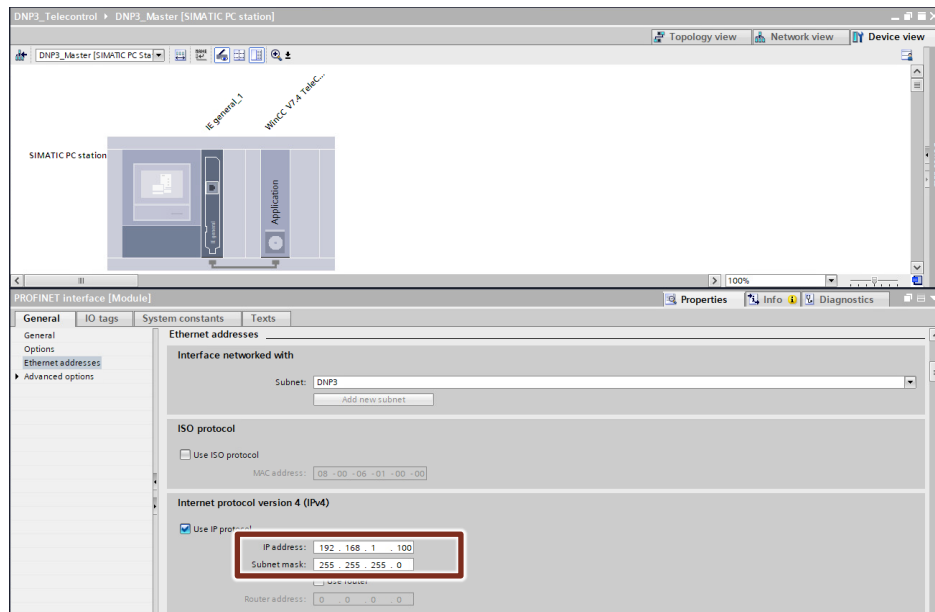


4. Network the communication module with a new subnet "DNP3"  
"IE general > Properties > Ethernet addresses > Interface networked with > Add new subnet").

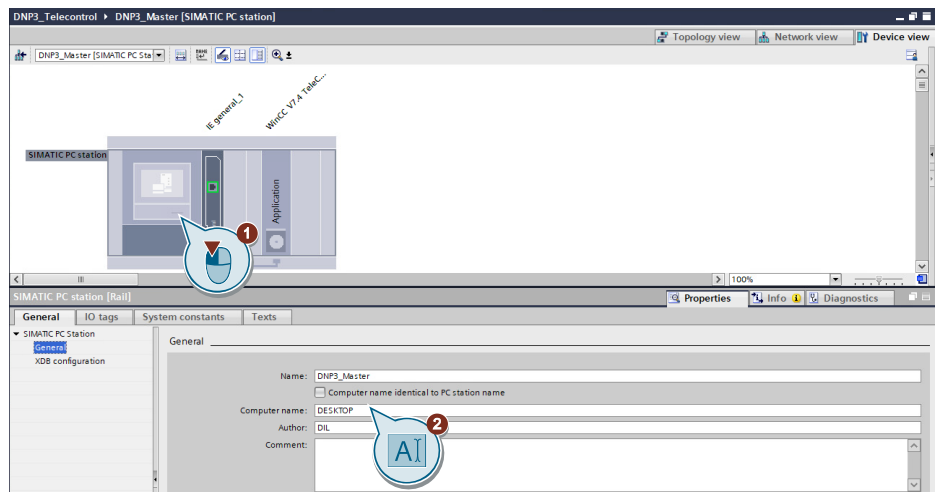


## 5 DNP3 configuration in the TIA Portal

- Adjust the IP address and subnet mask according to [Table 4-4](#).



- Give the PC station a meaningful name and translate the PC station "SIMATIC PC station > General > Computer name".

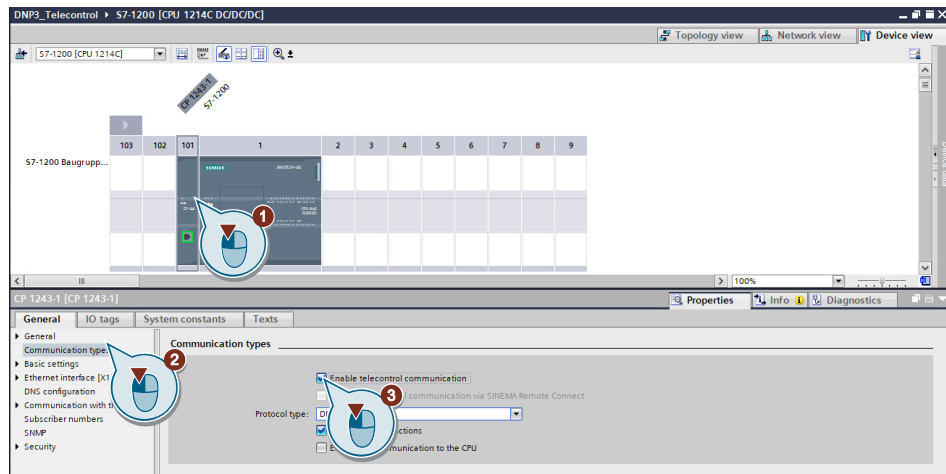


### 5.1.2 Station S7-1200 with CP 1243-1 or ET 200SP with CP 1542SP-1 IRC

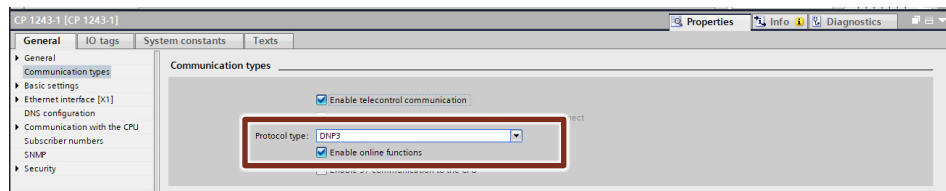
In order for an S7-1200 or an ET 200SP CPU to work as a DNP3 station, some settings must be followed. These are described in the following chapter using an S7-1200 as an example.

#### Hardware configuration

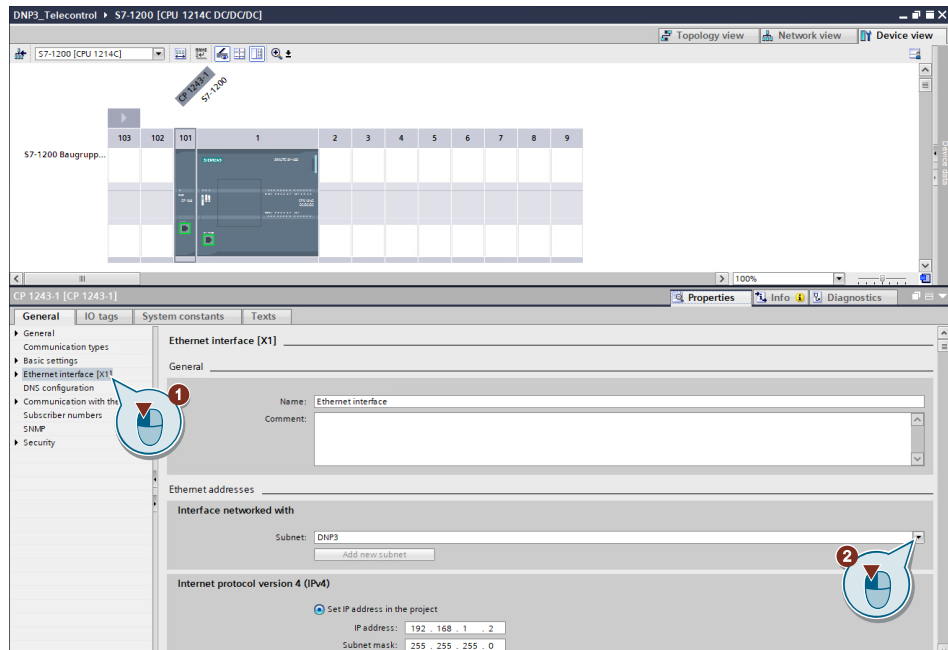
1. Add your SIMATIC S7-1200 CPU with a CP 1243-1 to the project "Communication modules > Industrial Remote Communication > CP 1243-1".
2. Activate the "Telecontrol communication"  
"CP 1243-1 > Properties > Communication types > Enable telecontrol communication".



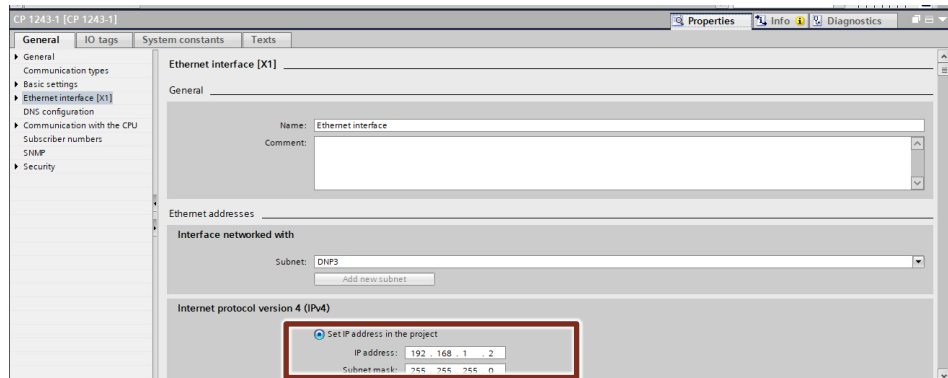
3. Select "DNP3" from the "Protocol type" drop-down list.
4. Enable the online functions  
"CP 1243-1 > Properties > Communication types > Enable online functions".



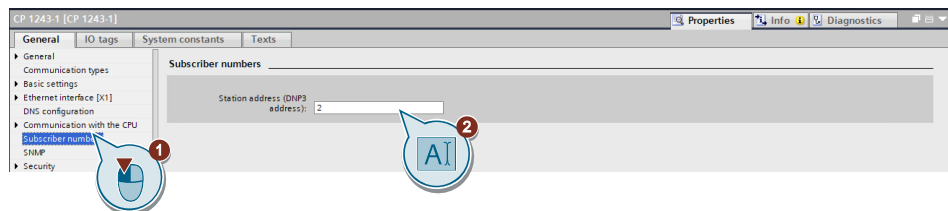
5. Add the "Ethernet interface [X1] to the subnet "DNP3"  
"CP 1243-1 > Properties > Ethernet interface [X1] > Interface networked with".



6. Adjust the IP address and subnet mask according to [Table 4-4](#).



7. Enter an DNP3 address for the DNP3 station (e.g. 2)  
"CP 1243-1 > Properties > Subscriber numbers > Station address(DNP3 address)".



**Note**

The DNP3 address assigned here must be entered in the configuration of the master station.

### Configuring the TeleControl connection

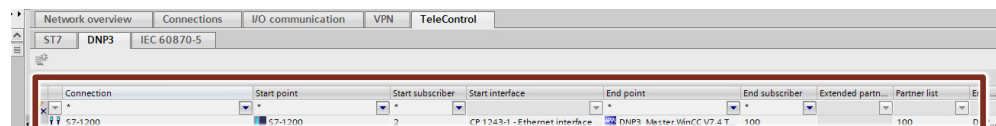
1. Change to the network view.
2. Open the "Network data" editor and switch to the "TeleControl" tab.
3. Now switch to the "DNP3" tab and add a new connection.



4. Select the S7-1200 station as start point and the CP 1243-1 as start interface.
5. Select the application of the PC station as the end point and the IE interface of the PC station as the end interface.
6. Enter the end subscriber number (e.g. 100). This number is the subscriber number of the master station.
7. Under partner list, enter the subscriber number of the S7-1200.

#### Result:

The TeleControl connection is now configured for the client station.



### Data point configuration

1. Create a data block that contains all tags that are to be exchanged with the DNP3 master.
2. Open the data point settings via the project navigation "S7-1200 > Local modules > CP 1243-1" and double-click on "Data points".
3. Add a new data point. Link it to a tag of the previously created data block.

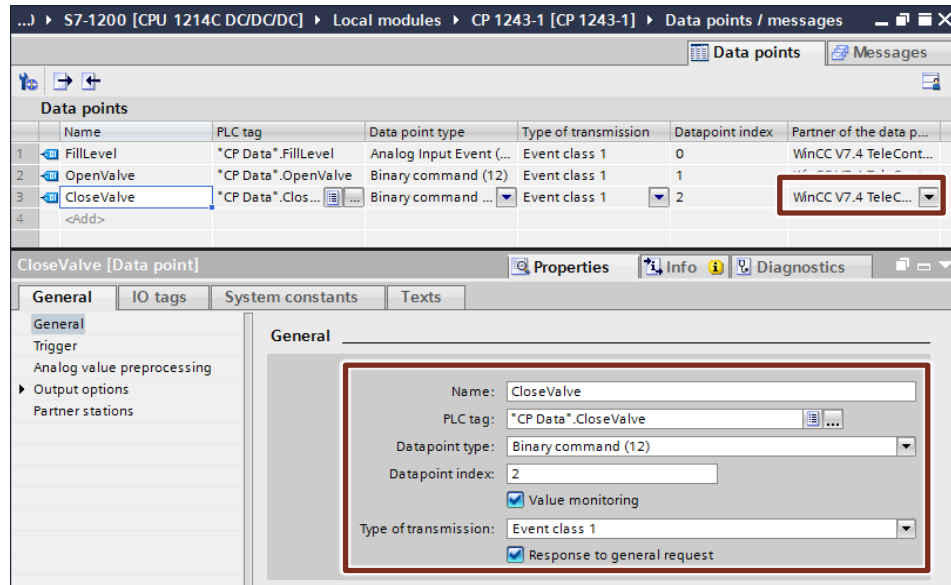
#### Note

1. The "Datapoint index" is assigned automatically. You need the index number for the configuration of the variable on the DNP3 master.
4. Assign the desired type to the data point and activate value monitoring so that the type of transmission (class) can be selected. The DNP3 object group is displayed in brackets next to the data point type.



## 5 DNP3 configuration in the TIA Portal

5. Select the DNP3 master as partner of the data point.



6. Adjust the options under "Trigger" and "Output options".

**Note**

The settings made here must match the data point configuration in the DNP3 master.

7. Repeat the configuration for all required data points.
8. Compile and load the configuration into your device.

**Note**

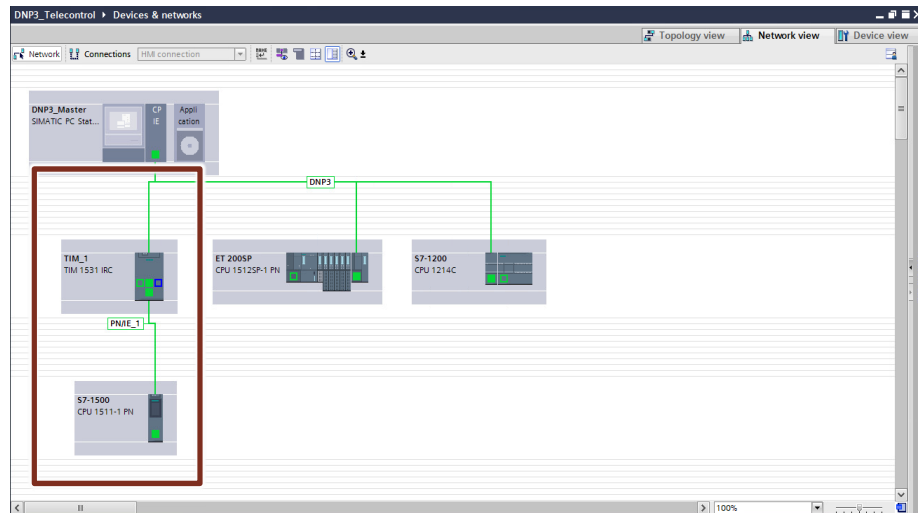
The configuration of the ET 200SP is analogous to the S7-1200.

### 5.1.3 Station S7-1500 with TIM 1531 IRC

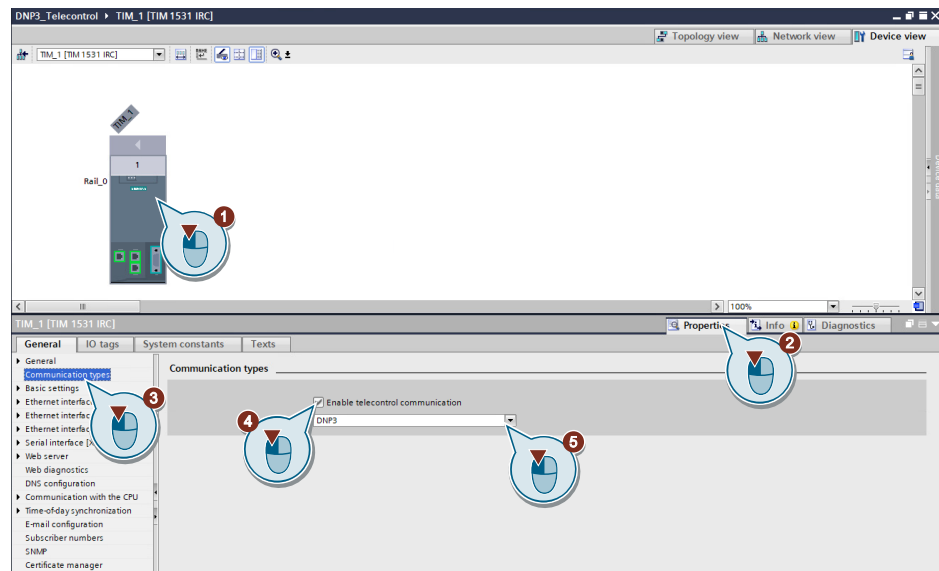
To operate an S7-1500 as a DNP3 station, you need a TIM 1531 IRC. The TIM is not configured like a classic CP, but as an independent device.

#### Device configuration

1. Add a S7-1500 CPU and a TIM 1531 IRC to your project.
2. Connect the S7-1500 to a TIM interface (e.g. in the network view of the device configuration). Connect another interface of the TIM with the subnet "DNP3".

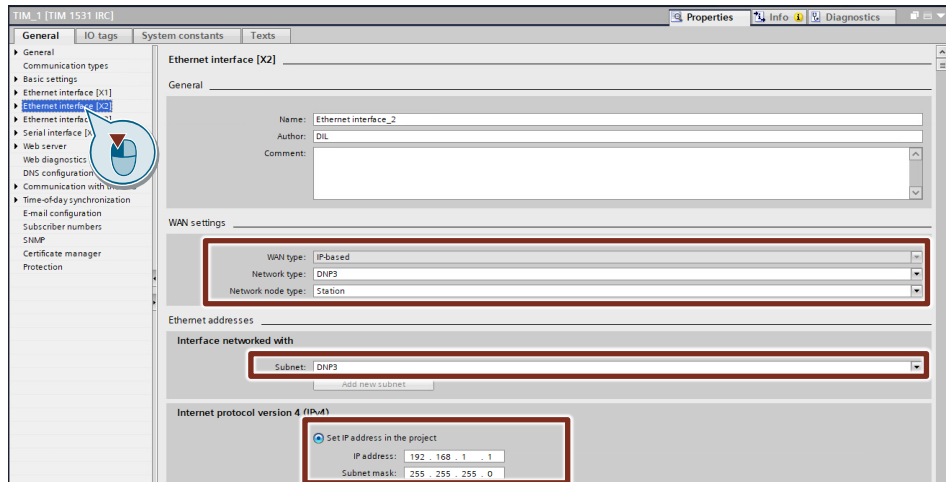


3. Activate the "Telecontrol communication"  
"CP 1243-1 > Properties > Communication types > Enable telecontrol communication".
4. Select "DNP3" from the "Protocol" drop-down list.

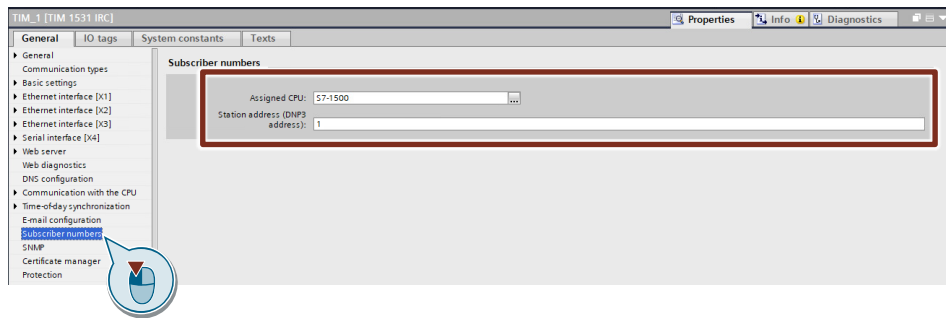


5. Switch to "Ethernet interface [X2]".
6. Under "WAN settings" select "DNP3" as the network type and "Station" as the network node type.
7. Add the interface to subnet "DNP3".

- Adjust IP address and subnet mask according to [Table 4-4](#).



- Switch to "Subscriber numbers".
- Select the S7-1500 as "Assigned CPU".
- Assign a station address (e.g. 1).



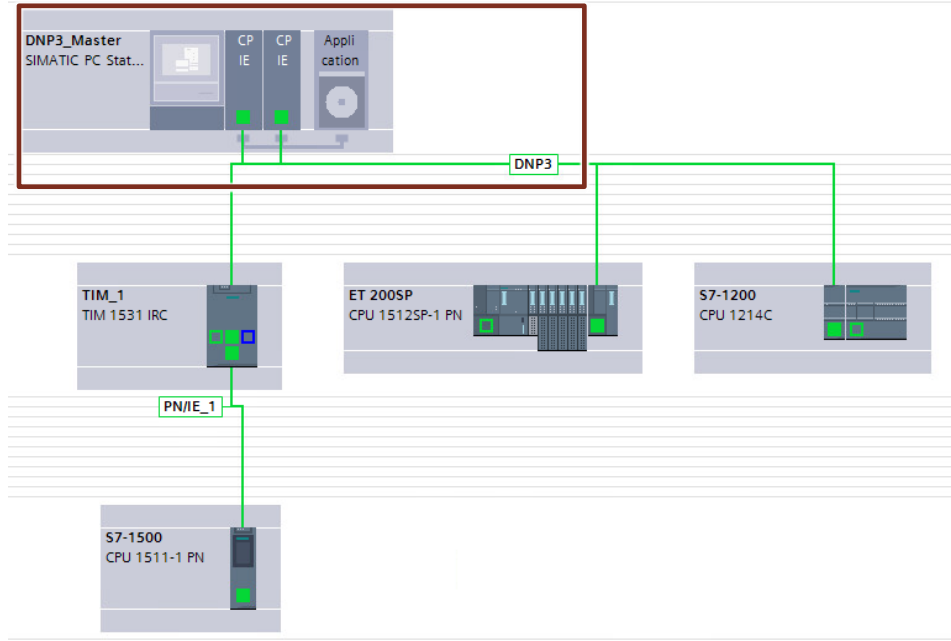
**Note** The DNP3 address assigned here must be entered in the configuration of the master station.

The configuration of the TeleControl connection and the configuration of the data points is identical to the S7-1200 or ET 200SP. Use the configuration steps in [Chapter 5.1.2](#).

## 5.2 Server Redundancy Setup

If you want to create server redundancy, you can do so as follows.

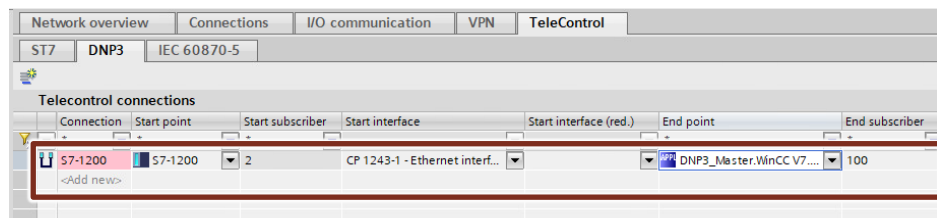
1. Create a DNP3 master with 2 Ethernet interfaces and network them with the subnet "DNP3". A detailed description of this can be found in [Chapter 5.1.1](#).



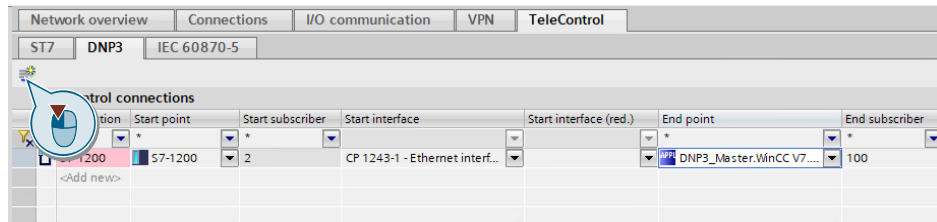
2. Change to the network view.
3. Open the "Network data" editor and switch to the "TeleControl" tab.
4. Now switch to the "DNP3" tab and add a new connection.



5. Select the S7-1200 station as start point and the CP 1243-1 as start interface.
6. Select the application of the PC station as the end point.



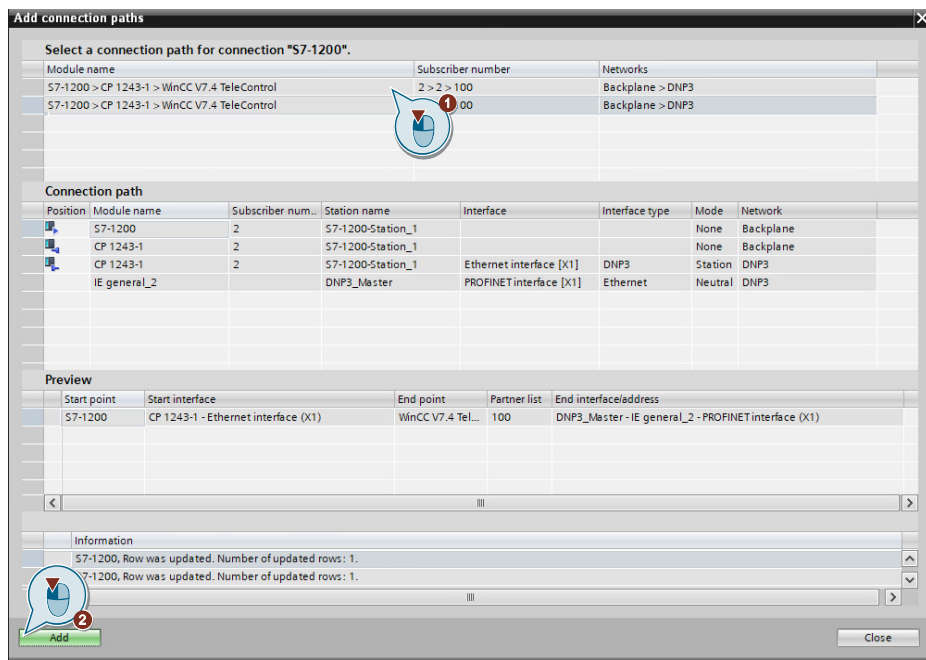
7. Start the "Add connection path" dialog.



**Result:**

Two connection paths are displayed.

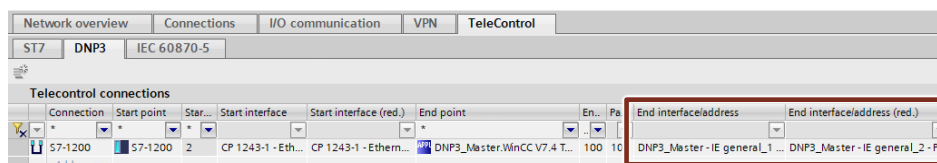
8. Select the first connection path and add it.



9. Repeat this procedure for the second connection path.

**Result:**

Both routes are created and the interfaces are entered automatically.



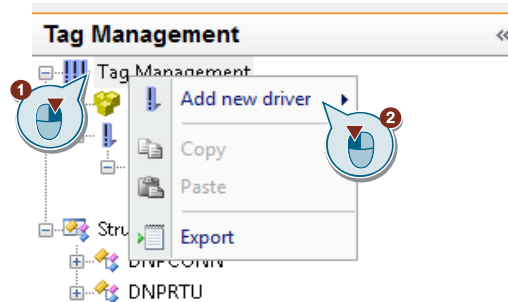
10. Perform these steps for the other devices as well.

## 6 DNP3 configuration for the DNP3 master

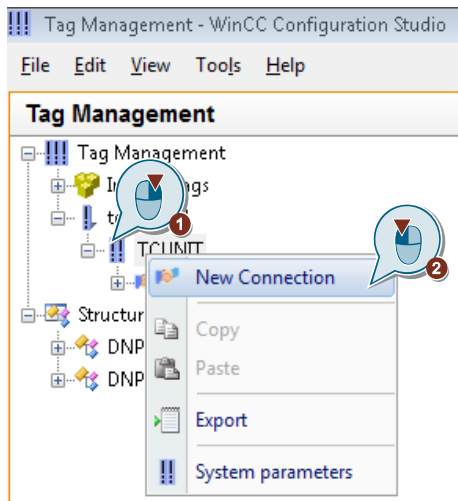
The DNP3 configuration of the master is done in the SIMATIC WinCC Explorer. The WinCC TeleControl add-on software is required for this. Make the settings in WinCC as described in the following chapters.

### 6.1 Inserting the DNP3 driver

1. Open WinCC Explorer and create a new project.
2. Open the Task Management.
3. Add the TeleControl channel "tcchannel".

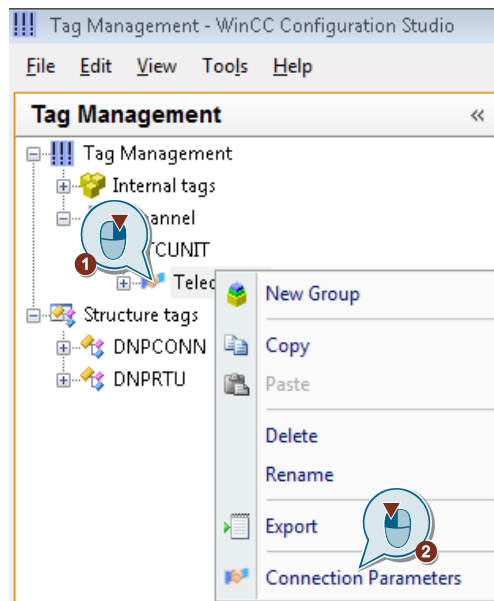


4. Add a new connection.



## 6 DNP3 configuration for the DNP3 master

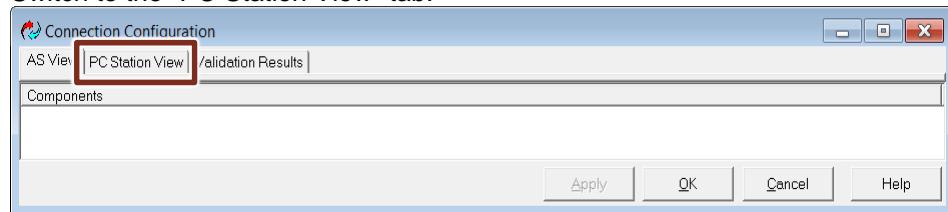
5. Open the connection configuration.



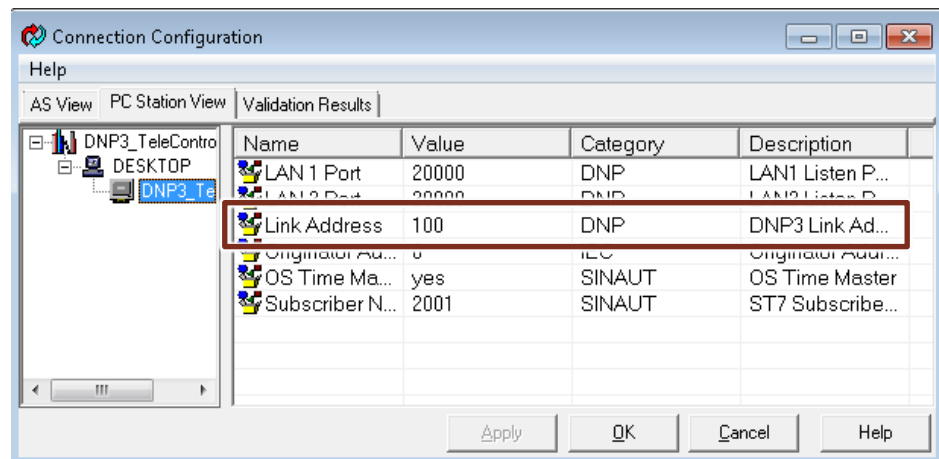
### Result:

The "Connection configuration" window opens.

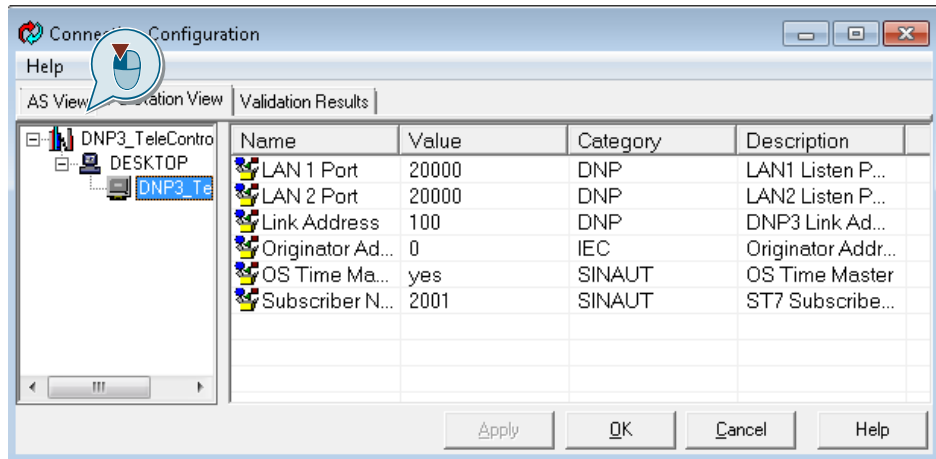
6. Switch to the "PC Station View" tab.



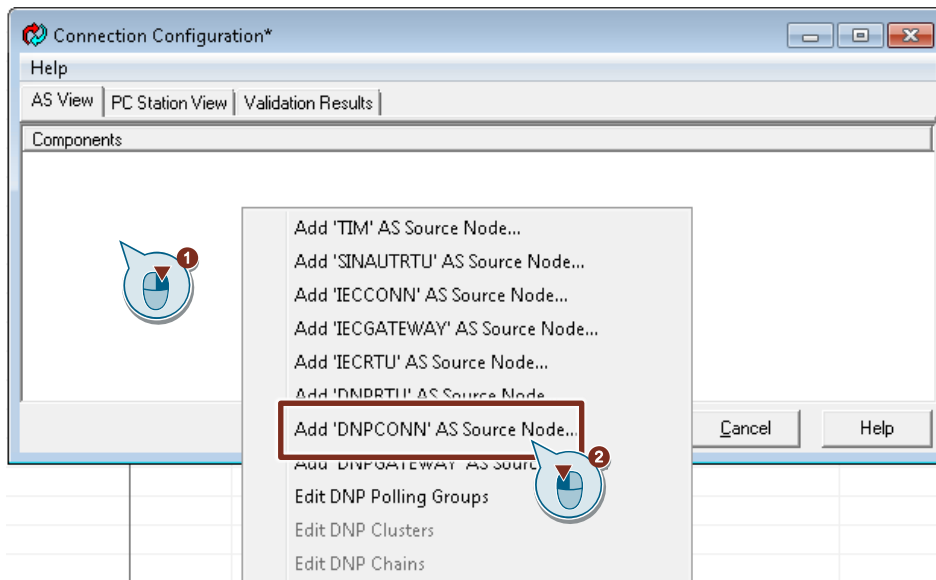
7. Adjust the DNP3 address to [Table 4-4](#).



8. Then switch to the AS View tab.



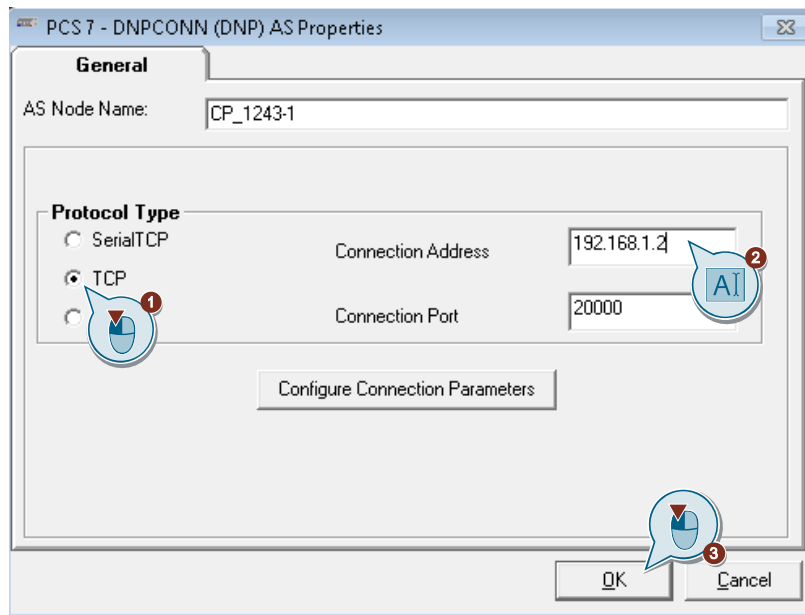
9. Create a DNP3 connection ("DNPCONN" node) for the S7-1200 station.



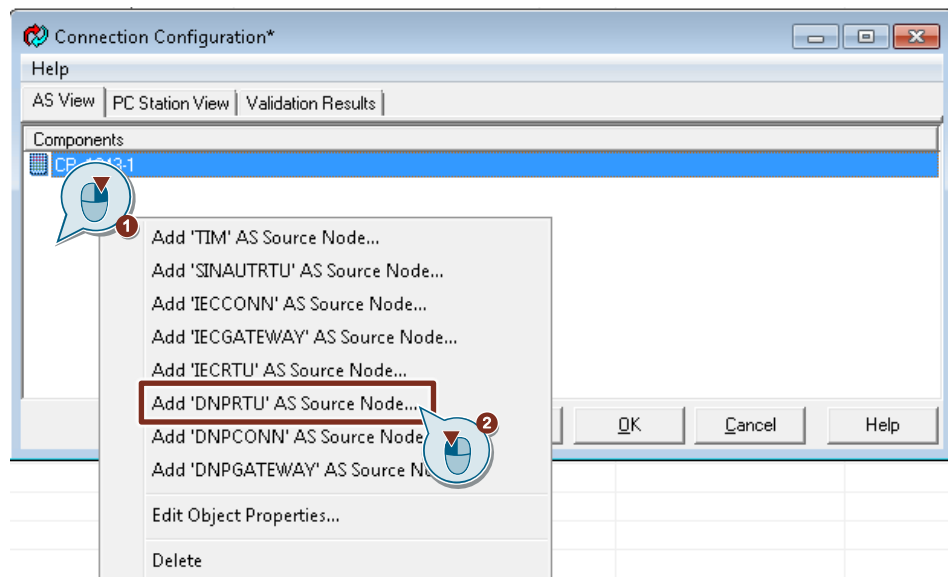


## 6 DNP3 configuration for the DNP3 master

10. Select "TCP" as protocol.
11. Enter the IP address of the CP 1243-1.
12. Confirm your settings with "OK".

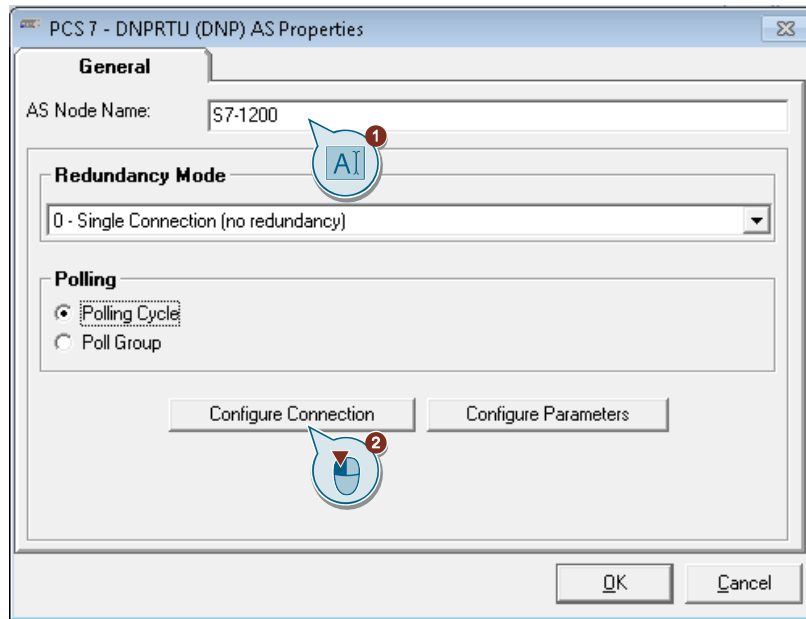


13. Now add a node for the RTU "S7-1200" (DNPRTU).

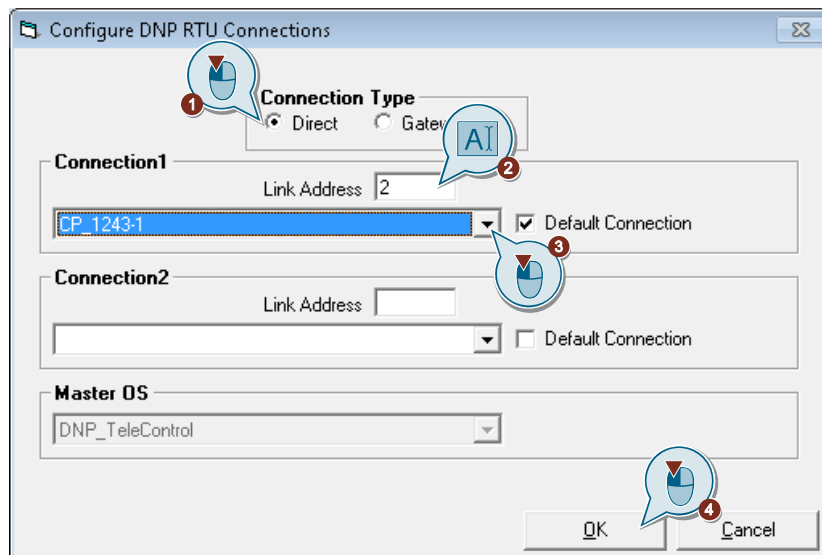


## 6 DNP3 configuration for the DNP3 master

- Assign a node name.
- Open the connection configuration.



- Select "Direct" as the connection type.
- Enter the DNP3 address of the station.
- Select the previously created connection ("CP\_S7-1200") from the drop-down list.
- Confirm your settings with "OK".



20. Now open "Configure Parameters".
21. Activate the function "Unsolicited Responses" for classes 1, 2 and 3.

The screenshot shows the 'Configure DNP RTU Parameters' dialog box with the following settings:

- Integrity Poll:**
  - General Request (GR): 1, 2, 3 Class (checked)
  - Integrity Poll on Startup: checked
  - Integrity Poll on Restart Bit set: checked
  - Integrity Poll on Overflow Bit set: checked
  - Integrity Poll on Class x Data Bit set: checked
  - Integrity Poll on Local Bit set/reset: checked
- Options:**
  - Automatic Class Assignment: unchecked
  - Automatic Read of Dataset structures: unchecked
  - Automatic Time Sync if NeedTime Bit set: checked
- Authorization:**
  - Username: [empty field]
  - Password: [empty field]
- Time Stamp Mode:**
  - 2 - Use RTU Time (UTC Format) (selected)
- Polling Cycle:**
  - Poll Cycle (Event Class data): 10 sec
  - Poll Cycle (Static Class data): 600 sec
  - Event Poll Object Limit (Serial): 100
  - Event Poll Object Limit (TCP/IP): 500
- Unsolicited Responses (highlighted):**
  - Unsolicited Responses: 1, 2, 3 Class (checked)
  - Automatic Read Current Value After CMD/SP: unchecked
- Timing (Seconds):**
  - Response Timeout: 10
  - GR Start Timeout: 10
  - GR End Timeout: 120
  - Future Deviation: 5
  - Past Deviation: 86400
  - Time Sync Cycle (minutes): 5
  - Link Test Cycle: 15
  - Link Test Timeout: 5
  - Time Delay Measurement: unchecked

Buttons: Use Factory Defaults, OK, Cancel

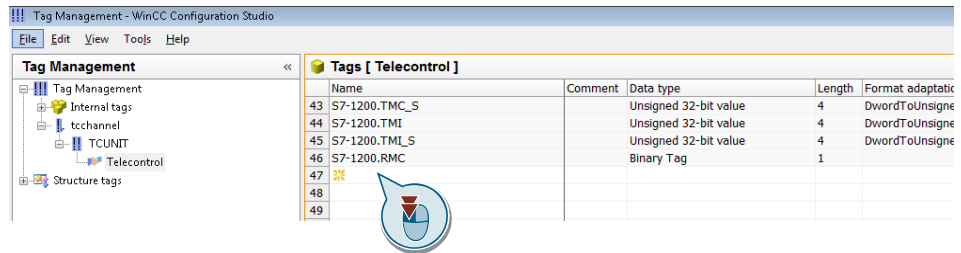
22. Confirm the settings twice with "OK".
23. Repeat the configuration for each additional DNP3 station and then close all windows with "OK".

**Note** The system tags are created automatically after the TIM (or CP) and CPU have been configured in the System Parameters tab. The description of these tags can be found in the "User Manual for WinCC TeleControl", which is delivered with the WinCC TeleControl software.

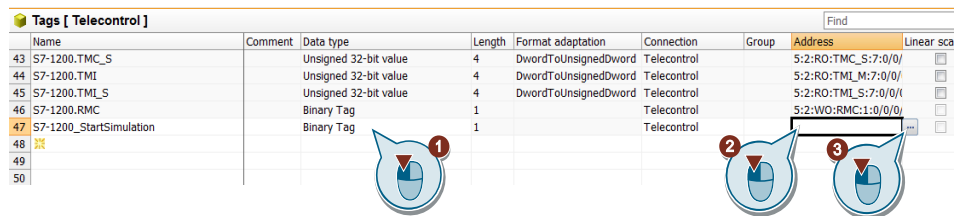
## 6.2 Tag configuration

So that the DNP3 objects can be sent and received by the master, they must be configured in WinCC "Tag Management". Make the settings for this as follows:

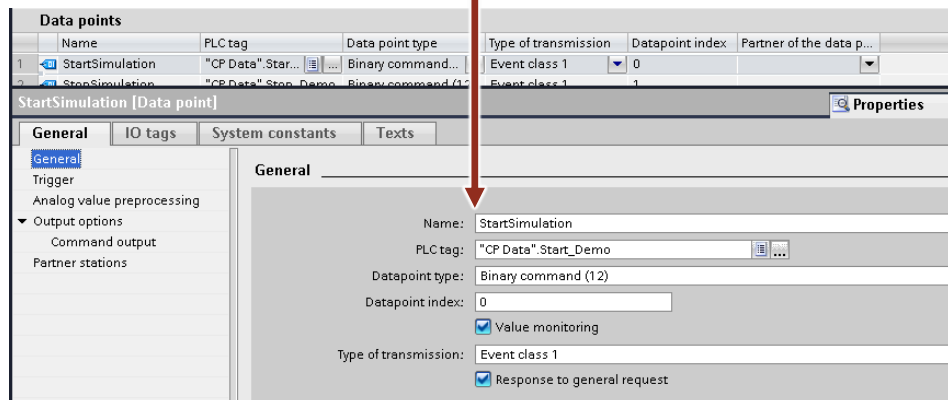
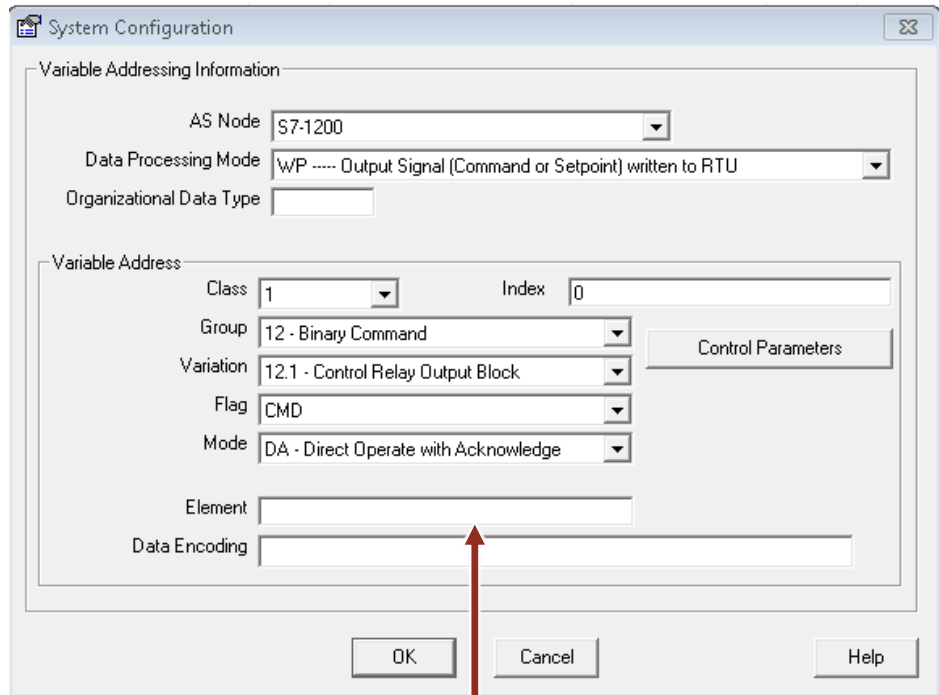
1. Open WinCC Tag Management.
2. Create a new tag by double-clicking on it and assign it a unique name.



3. Select the data type and then open the address configuration.



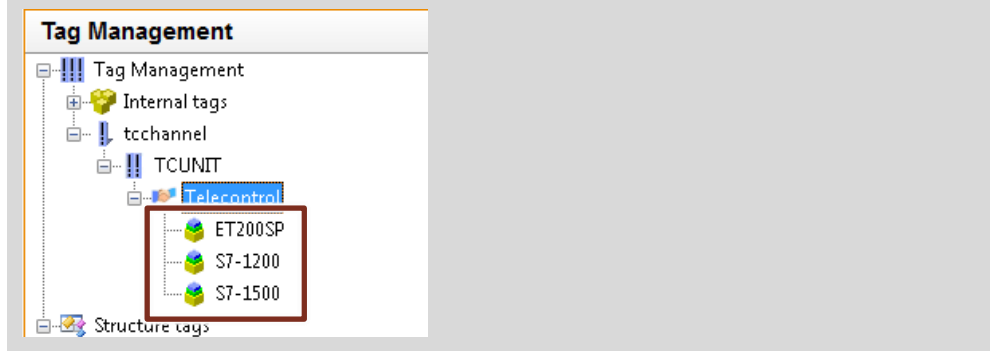
- Adjust the settings to the configuration of the corresponding data point in the CPU.



- Repeat steps 2 to 4 for the other data points.

**Note**

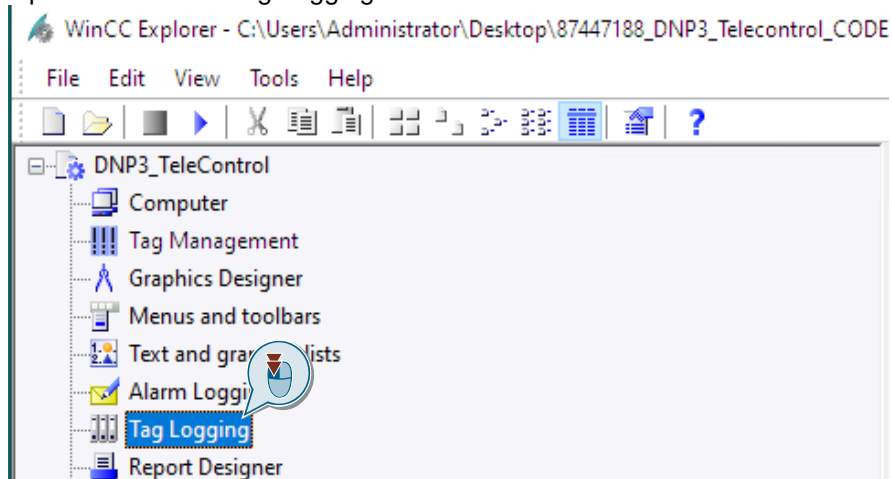
Tag Management offers you a grouping of tags. This increases the clarity for a large number of tags.



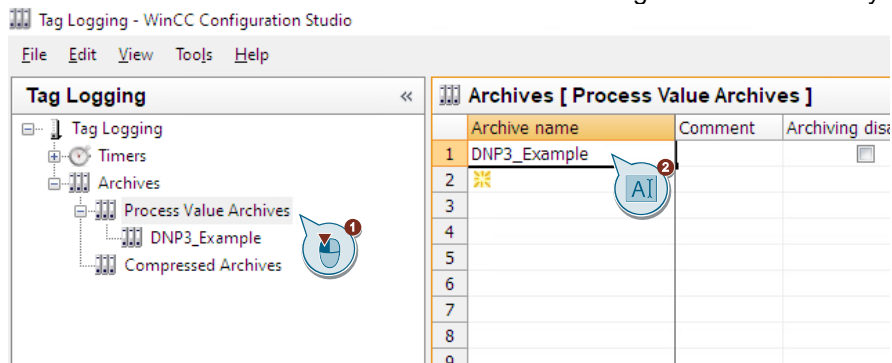
### 6.3 Setting up the Tag Logging

To ensure that the DNP3 objects can be completely archived and displayed by the master, you have to make some settings in the WinCC.

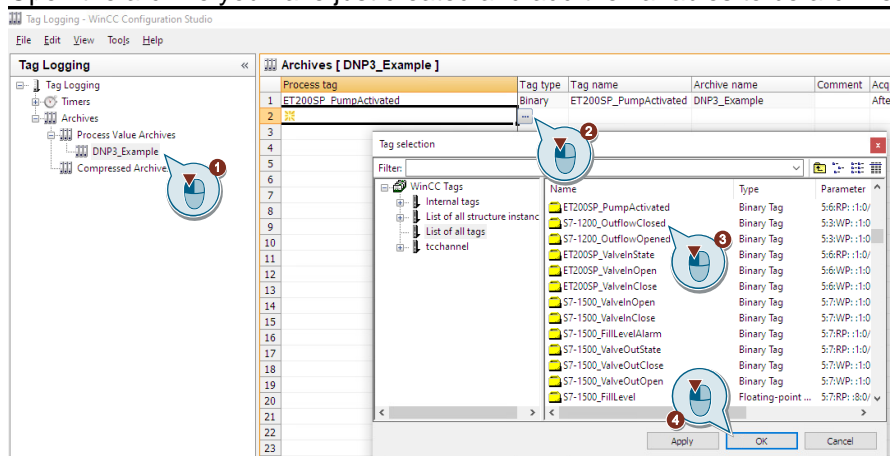
1. Open the WinCC "Tag Logging".



2. Create a new "Process Value Archive". Further settings are not necessary.



3. Open the archive you have just created and add the variables to be archived.



4. Adjust the "Acquisition type" and the "Archiving/display cycle".

Process tag	Tag type	Tag name	Archive name	Acquisition type	Acquisition cycle	Archiving/display cycle
1 ET200SP_PumpActivated	Binary	ET200SP_PumpActivated	DNP3_Example	After every change	500 ms	1 day
2 S7-1200_OutflowClosed	Binary	S7-1200_OutflowClosed	DNP3_Example	After every change	500 ms	1 day
3						
4						

# 7 Installation

This chapter provides installation instructions for the hardware and software required to operate this example application.

## 7.1 Hardware installation

The hardware components can be found in [Chapter 2.2](#). Proceed as follows for the hardware setup:

1. Mount the individual modules on a suitable carrier.
2. Connect the components to a 24 V DC power source.

**NOTE** Make sure the polarity is correct.

3. Connect all components to the power supply.

**NOTE** The CP 1243-1 is supplied via the CPU.

4. When all stations are configured and loaded, they connect the devices according to the configuration as described in [Figure 2-1](#).

**NOTE** Only switch on the power supply after you have completed and checked the assembly!

**NOTE** The installation guidelines for the installation of all components must generally be observed.

## 7.2 Installing the software

In this application example, the configuration computer is also used as DNP3 master at the same time.

If you use separate computers for project engineering and for the DNP3 master, the following software must be installed on the DNP3 master computer:

- SIMATIC WinCC Server Runtime V7.5 SP1
- SIMATIC TeleControl Server V7.4 with Patch 2

### Installation sequence

Install the software listed in [Table 2-1](#). Make sure that WinCC TeleControl cannot be installed until SIMATIC WinCC has been installed.

#### NOTE

Follow the instructions for installing the software in the manuals for the respective software.

## 7.3 Installing the application software

Follow the steps below to install the sample code.

1. Download the code for this application example from the corresponding article page.
2. Unzip the file "87447188\_DNP3\_Telecontrol\_CODE\_V40.zip" and open the project.
3. Log in with the following user data:  
User name: "administrator"  
Password: "administrator"



## 8 Commissioning

Download the zipped project file from the article page and unzip it.

### Downloading stations

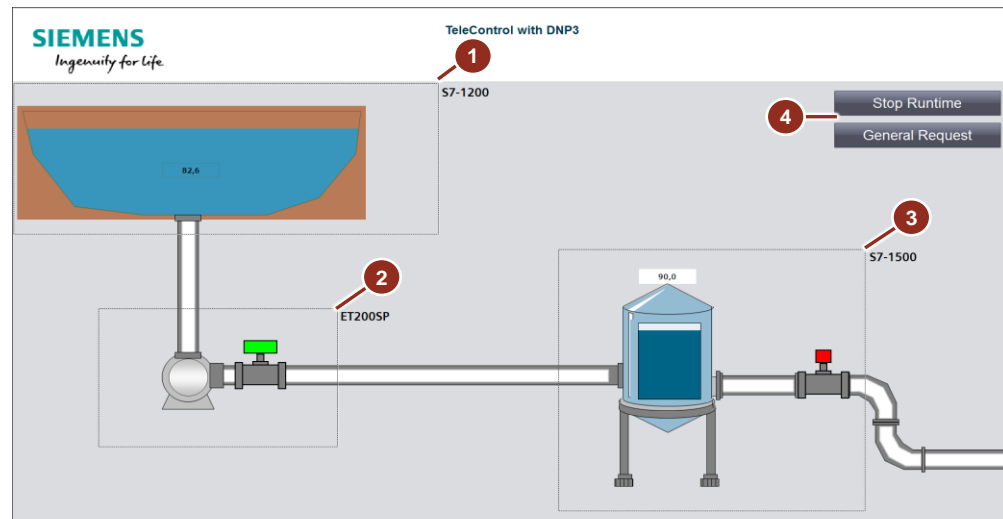
Download the configuration to the stations as described.

1. Assign the IP address from [Table 4-4](#) to your DNP3 master.
2. Open the TIA Portal project.
3. Load the S7 stations.

## 9 Operation of the application example

If the stations are configured and loaded, the application example can be operated. Start the WinCC Runtime for this.

Figure 9-1



1. Outstation "stormwater overflow tank".  
This is controlled/simulated by a SIMATIC S7-1200. The filling level fills up automatically to 100 %. When the pumping station is activated, water is taken from the tank. There is no direct operating option.
2. Outstation "pumping station".  
This is controlled/simulated by an ET 200SP. The valve can be activated to fill the elevated tank. The pump is controlled depending on the valve status.
3. Outstation "elevated tank".  
This is controlled/simulated by a SIMATIC S7-1500. The valve can be activated to empty the elevated tank. If the level drops below 10% or rises above 90%, an alarm is sent to the server and the level indicator flashes red.
4. End the runtime or perform a general interrogation of all data points.

# 10 Appendix

## 10.1 Service and support

### Industry Online Support

Do you have any questions or need assistance?

Siemens Industry Online Support offers round the clock access to our entire service and support know-how and portfolio.

The Industry Online Support is the central address for information about our products, solutions and services.

Product information, manuals, downloads, FAQs, application examples and videos – all information is accessible with just a few mouse clicks:

[support.industry.siemens.com](https://support.industry.siemens.com)

### Technical Support

The Technical Support of Siemens Industry provides you fast and competent support regarding all technical queries with numerous tailor-made offers – ranging from basic support to individual support contracts.

Please send queries to Technical Support via Web form:

[siemens.com/SupportRequest](https://siemens.com/SupportRequest)

### SITRAIN – Digital Industry Academy

We support you with our globally available training courses for industry with practical experience, innovative learning methods and a concept that's tailored to the customer's specific needs.

For more information on our offered trainings and courses, as well as their locations and dates, refer to our web page:

[siemens.com/sitrain](https://siemens.com/sitrain)

### Service offer

Our range of services includes the following:

- Plant data services
- Spare parts services
- Repair services
- On-site and maintenance services
- Retrofitting and modernization services
- Service programs and contracts

You can find detailed information on our range of services in the service catalog web page:

[support.industry.siemens.com/cs/sc](https://support.industry.siemens.com/cs/sc)

### Industry Online Support app

You will receive optimum support wherever you are with the "Siemens Industry Online Support" APP. The app is available for iOS and Android:

[support.industry.siemens.com/cs/ww/en/sc/2067](https://support.industry.siemens.com/cs/ww/en/sc/2067)

## 10.2 Industry Mall



The Siemens Industry Mall is the platform on which the entire Siemens Industry product portfolio is accessible. From the selection of products to the order and the delivery tracking, the Industry Mall enables the complete purchasing processing – directly and independently of time and location:

[mall.industry.siemens.com](https://mall.industry.siemens.com)

## 10.3 Links and literature

Table 10-1

No.	Topic
\1\	Siemens Industry Online Support <a href="https://support.industry.siemens.com">https://support.industry.siemens.com</a>
\2\	Link to this entry page of this application example <a href="https://support.industry.siemens.com/cs/ww/en/view/87447188">https://support.industry.siemens.com/cs/ww/en/view/87447188</a>
\3\	Overview: Secure Remote Access with VPN <a href="https://support.industry.siemens.com/cs/ww/en/view/26662448">https://support.industry.siemens.com/cs/ww/en/view/26662448</a>
\4\	SIMATIC TeleControl V7.4 use with WinCC V7.5 SP1 <a href="https://support.industry.siemens.com/cs/ww/en/view/109774012">https://support.industry.siemens.com/cs/ww/en/view/109774012</a>
\5\	SIMATIC NET: S7-1500 - TeleControl TIM 1531 IRC <a href="https://support.industry.siemens.com/cs/ww/en/view/109748454">https://support.industry.siemens.com/cs/ww/en/view/109748454</a>
\6\	SIMATIC NET: ET 200SP - Industrial Ethernet CP 1542SP-1, CP 1542SP-1 IRC and CP 1543SP-1 <a href="https://support.industry.siemens.com/cs/ww/en/view/109741690">https://support.industry.siemens.com/cs/ww/en/view/109741690</a>
\7\	SIMATIC NET: S7-1200 - TeleControl CP 1243-1 <a href="https://support.industry.siemens.com/cs/ww/en/view/103948898">https://support.industry.siemens.com/cs/ww/en/view/103948898</a>
\8\	WinCC V7.5 SP1: Working with WinCC <a href="https://support.industry.siemens.com/cs/ww/en/view/109773058">https://support.industry.siemens.com/cs/ww/en/view/109773058</a>
\9\	Service Pack 1 for WinCC V7.5 : <a href="https://support.industry.siemens.com/cs/ww/en/view/109772879">https://support.industry.siemens.com/cs/ww/en/view/109772879</a>
\10\	DNP3 Protocol Primer <a href="http://www.dnp.org">www.dnp.org</a>

## 10.4 Change documentation

Table 10-2

Version	Date	Modifications
V1.0	05/2014	First version
V2.0	09/2019	Complete revision.
V3.0	01/2021	Update to TIA Portal V16 and addition of chapter 5.2
V3.1	02/2021	New chapter 6.3
V4.0	11/2022	Update to TIA Portal V17 and WinCC 7.5 SP1