

SYSTEMS TC

DOCUMENTATION



All possible measures have been taken to ensure the accuracy and completeness of this documentation. Since, unfortunately, errors can never be completely avoided - despite all due care - we are grateful at any time for tips and suggestions.

We expressly point out that the software and hardware designations and brand names of the respective companies used in the manual are generally subject to trademark protection, brand protection or patent protection.

CHANGE LOG

Date	Version	Name	Change
29.06.2021	1.0.0.0	M. Seffer	Creation
16.07.2021	1.0.1.0	M. Seffer	Extension: Ribbon and Advanced Settings
26.08.2021	1.0.2.0	M.Seffer	Adaption CODESYS SP

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1. General

1.1 Product Description

The SystemsTC offers an efficient solution for modelling and creating a telecontrol application. The CODESYS package consists of a plug-in in the device tree and an IEC 61131-3 library.

1.2 Programming System

Programming System	CODESYS Development System V3.5.16.0 or newer
Runtime System	CODESYS Control V3.5.16.0 or newer
Supported Platforms / Devices	CODESYS Runtime SL Systems Note: Use the "Device Reader" project to find out the supported functions of your device. The "Device Reader" is available free of charge in the CODESYS Store.
Additional Requirements	-
Restrictions	The connector with the interface "Common.PCI" must be present in the CODESYS device description file of the target device. Alternatively, the interface "3Systems.TC" can also be added to the connector.

Licensing	<p>Single Device License: The licence can be used on the target device/PLC on which the CODESYS Runtime System SL is installed. Licences are activated on a software-based licence container (soft container) that is permanently connected to the controller. Alternatively, the licence can be stored on a CODESYS key (USB dongle). By changing the CODESYS Key, the licence can be used on any other control.</p> <p>Note: In demo mode, the software runs for half an hour without a licence. After that, the server is stopped.</p>
Required Accessories	CODESYS Runtime Key or SoftContainer

1.3 Copyright Protection

This documentation is subject to copyright protection. Any reuse or further processing of the texts or illustrations is not permitted. Infringement of copyright may lead to a claim for damages.

1.4 Safety

1.4.1 General Safety Regulations

Operation of the software is only permitted if the system requirements and licence conditions are met.

In the context of the manufacture and/or introduction of products into the European Single Market, the manufacturer must carry out a risk analysis in order to first determine what risks the product may entail. After carrying out the risk analysis, he shall evaluate these risks and, if necessary, take appropriate measures to effectively eliminate or minimise the risks (risk assessment). This documentation does not release the user from this responsibility.

Improper use of the products is not permitted, which is given in particular in the following cases:

- (a) Non-observance of the intended use.
- (b) Use of the products in areas of particular risk which require fault-free continuous operation and in which failure or operation of the software can lead to an immediate danger to life, limb or health or to considerable damage to property or the environment (such as the operation of nuclear power plants, weapons systems, aircraft and motor vehicles).

Compliance with the applicable laws, standards, regulations, local rules, the state of the art and the rules of technology at the time of installation is mandatory.

1.4.2 Personnel Qualification

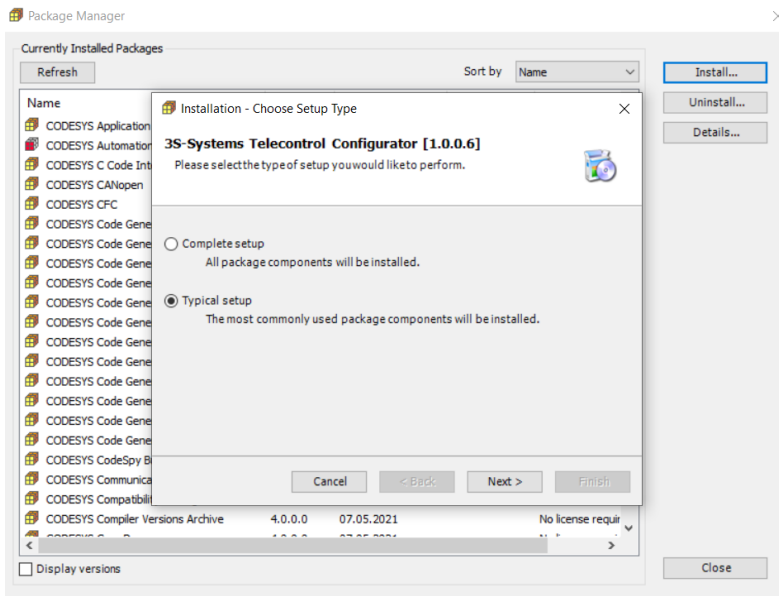
All work steps in connection with the use of 3S Systems software may only be carried out by specialists who have sufficient knowledge of the system in use.

Work steps that result in files being created or changed on the system may only be carried out by specialists who, in addition to the above-mentioned, also have sufficient knowledge in the administration of the system used.

Work steps that result in the behaviour of the system in a network being changed may only be carried out by specialists who, in addition to the above-mentioned, also have sufficient knowledge of the administration of the respective network used.

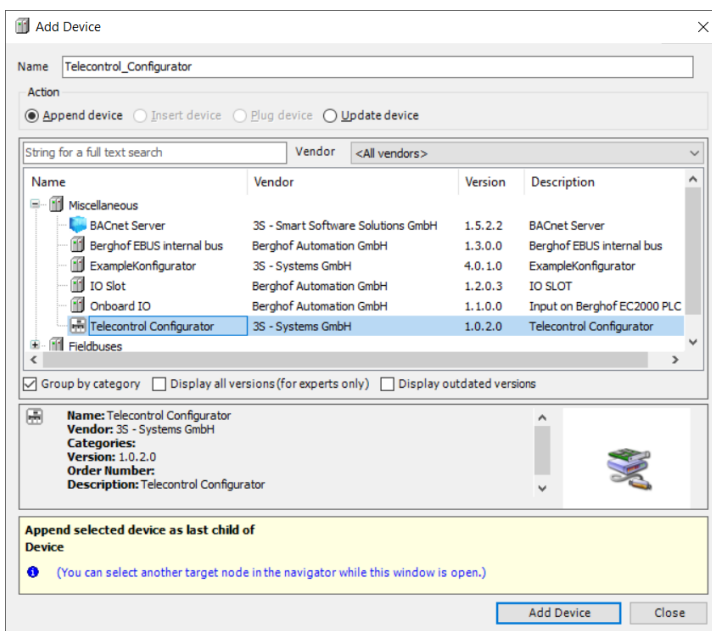
1.5 Installation

Start CODESYS and open the Package Manager. Select the current *SystemsTC* package and install it.



PACKAGE INSTALLATION

CODESYS must be restarted after installing the package. After the CODESYS restart, create a new project and add the **TELECONTROL_CONFIGURATOR** to the project.



ADDING THE TELECONTROL_CONFIGURATOR

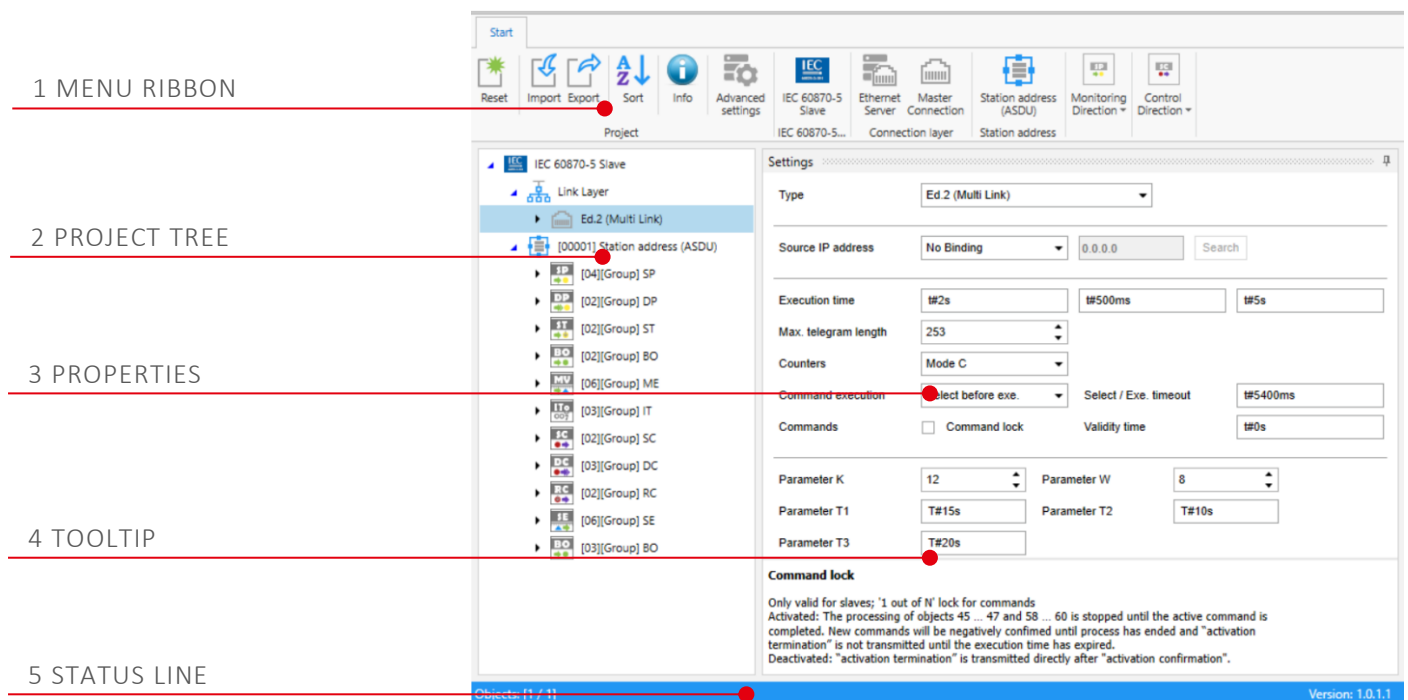
2. Telecontrol Configurator

2.1 Overview

In the main view of the **TELECONTROL_CONFIGURATOR** (abbreviated: TC-C) within CODESYS, the following areas are displayed:

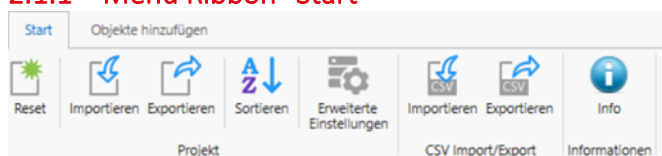
- Ribbon
- Project tree (work area)
- Properties (dock bar)
- Status bar









The properties window below the menu ribbon can be organised variably via dockable control panels.



Number	Region	Description
1	Menu Ribbon	Menu ribbon for importing/exporting and adding objects.
2	Project Tree	Current IEC 60870-5-104 server configuration. All objects are added to this tree. When selecting an object, specific properties can be configured.
3	Properties	Specific parameters of the selected object can be set or changed.
4	Tooltip	Additional information of the currently edited property.
5	Status Line	Version information of the PlugIn. Depending on the object selection, the current and maximum number of configurable objects are displayed, e.g. OBJECTS [2/5]








2.1.1 Menu Ribbon "Start"











Button	Function	Description
	Reset	Discards the current configuration and creates a new configuration. All standard objects are added.
	Import	Importing a project file in the format *.3STC.
	Export	Export the project as a *.3STC file. The file contains the complete configuration.
	Sort	Sort IEC 60870-5-104 objects by address in all groups.
	Advanced Settings	Opens a window with general settings for the IEC 60870-5-104 server.
	CSV Import	Import of an IEC 60870 CSV file. To ensure the appropriate structure, it is recommended to have the import file generated by the TC-C. During the import, all objects of the CSV file are always read in and added to the current project.
	CSV Export	Export of IEC 60870 objects to a CSV file. When exporting an ASDU, all objects assigned to the ASDU are exported. If only one group is selected, only the objects of this group are exported.
	Info	Opens a window with the change log and version information.

2.1.2 Menu Ribbon "Add Objects"

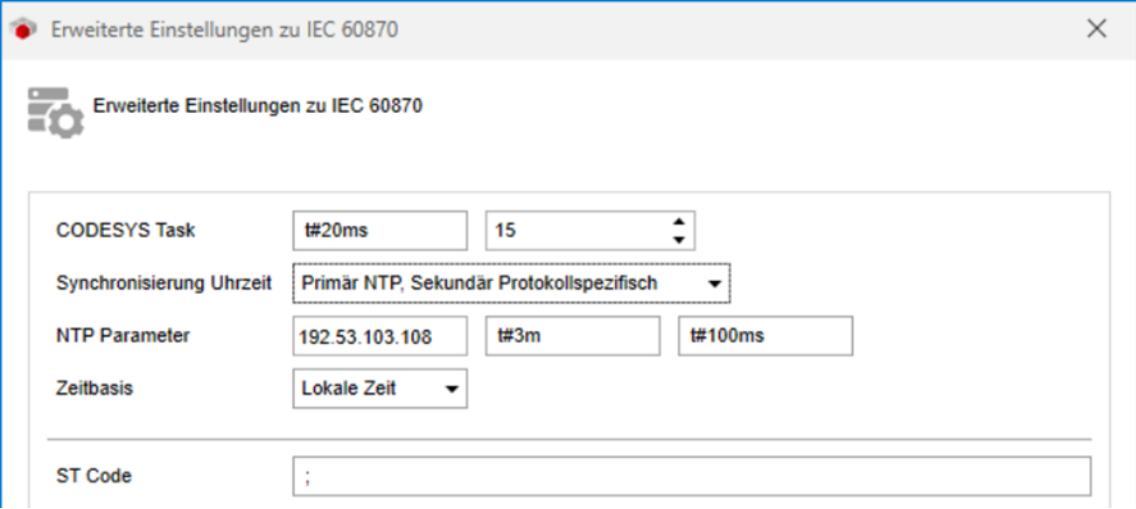


	IEC 60870-5-104 Slave	Add an IEC 60870-5-104 server. Communication is created via transport protocol 104 (Ethernet Interface).
	Ethernet Server	Depending on the type selection, the server can be operated with several parallel client connections according to IEC60870-5-104 Edition 1 or redundant client connections according to IEC60870-5-104 Edition 2.
	Client Connection	Add an IEC60870-5-104 client connection. Setting the TCP/IP port and IP address of the possible client connections.
	Station Address ASDU	Add an ASDU with its own station address to the selected server.
	Single-Point Information	Add single-point information to the selected ASDU. Message direction: The single-point information is sent to the connected client in the event of a change or can be queried via a general query.
	Double-Point Information	Add double-point information to the selected ASDU. Message direction: The double-point information is sent to the connected client in the event of a change or can be queried via a general query.
	Step-Point Information	Add step-point information to the selected ASDU. Monitoring Direction: The step-point information is sent to the connected client in the event of a change or can be queried via a general query.

	Bitstring 32 Bit	<p>Add bitstrings 32 bit to the selected ASDU.</p> <p>Monitoring Direction: The bitstring 32 Bit is sent to the connected client in the event of a change or can be queried via a general query.</p>
	Measured Value	<p>Add measured values to the selected ASDU.</p> <p>The measured value can be added as "normalised", "scaled" or "floating point number".</p> <p>The type of the inserted measured value is predefined on the button itself, whereby the icon on the button symbolises the selected measured value type: Normalised "N", Scaled "S" or Floating Point Number "X.X".</p> <p>Monitoring Direction: The measured value is sent to the connected client in the event of a change or can be queried via a general query.</p>
	Integrated Totals	<p>Adding integrated totals to the selected ASDU.</p> <p>Control Direction: Depending on the selected configuration, integrated totals are either transmitted spontaneously to the client or actively queried by the client via client object 101 (counter query C_CI_NA). (For details on the configuration of the counter values, see below).</p>
	Single Command	<p>Add single command to the selected ASDU.</p> <p>Control Direction: The single command is sent from the connected client to the server.</p>
	Double Command	<p>Add double command to the selected ASDU.</p> <p>Control Direction: The double command is sent from the connected client to the server.</p>
	Step Command	<p>Add step command to the selected ASDU.</p> <p>Control Direction: The step command is sent from the connected client to the server.</p>
	Set Point Command	<p>Add set point control command of type "normalised", "scaled" or "float" to the configuration.</p> <p>The set point can be added as "normalised", "scaled" or "floating point number".</p> <p>The type of the inserted measured value is predefined on the button itself, whereby the icon on the button symbolises the selected measured value type: Normalised "N", Scaled "S" or Floating Point Number "X.X".</p> <p>Control Direction: The setpoint control command is sent from the connected client to the server.</p>
	Set Point Bitstring 32 Bit	<p>Add set point bitstring 32-bit to the selected ASDU.</p> <p>Control Direction: The set point bitstring 32-bit is sent from the connected client to the server.</p>

2.1.3 IEC 60870-5-104 Server

2.1.3.1 Advanced Settings



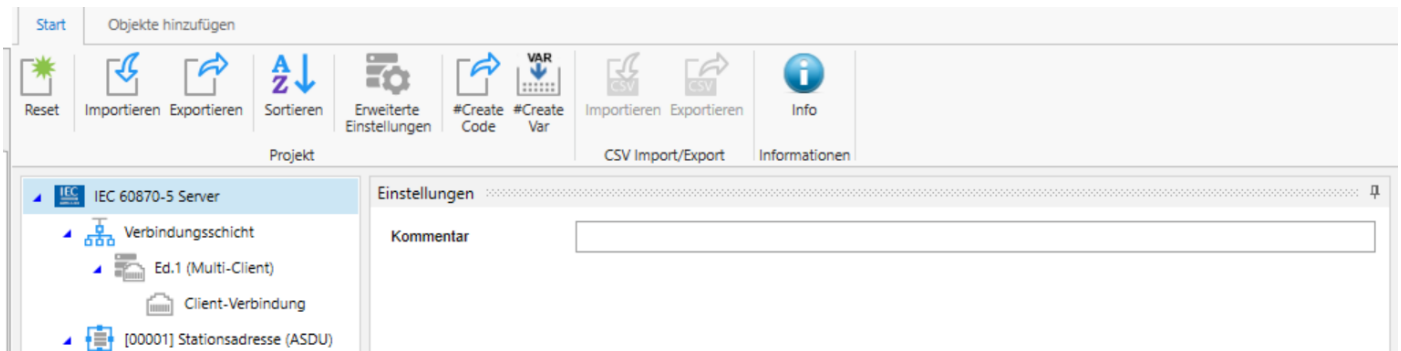
The screenshot shows a dialog box titled "Erweiterte Einstellungen zu IEC 60870". It contains the following settings:

- CODESYS Task:** Cycle time is set to "#20ms" and priority to "15".
- Synchronisierung Uhrzeit:** Set to "Primär NTP, Sekundär Protokollspezifisch".
- NTP Parameter:** IP address is "192.53.103.108", update interval is "#3m", and timeout is "#100ms".
- Zeitbasis:** Set to "Lokale Zeit".
- ST Code:** A text field containing a semicolon ";".

Dialogue "Advanced Settings"

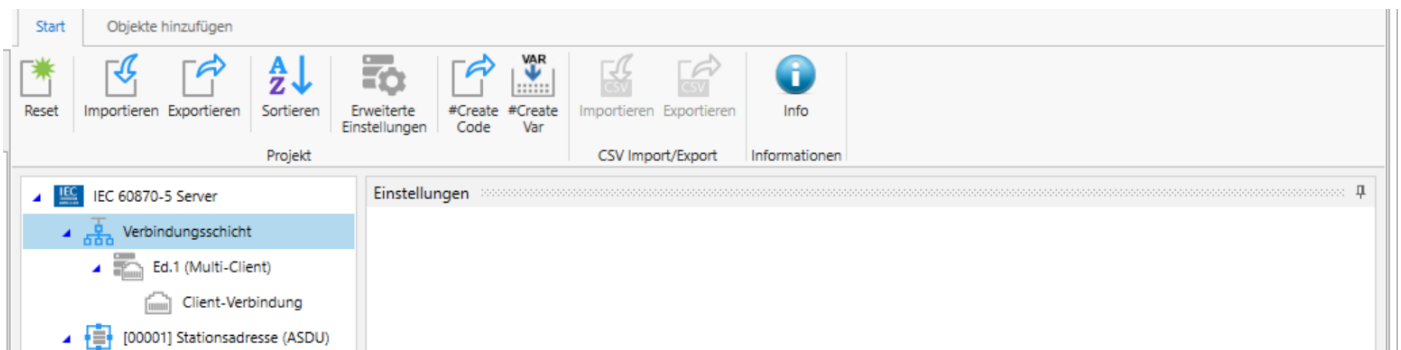
Property	Description
CODESYS Task	When compiling (F11) the CODESYS project, a telecontrol task (SysTelecontrol_Task) is automatically created. The cycle time and priority of the generated task can be set here. The telecontrol stack runs in this automatically generated task.
Synchronisation Time	Setting for synchronising the internal time of the PLC. Possible settings are: System Time Only (No Synchronisation): No time synchronisation is carried out. Cyclic time synchronisation is then deactivated. Primary NTP: The Network Time Protocol is used for time synchronisation. The necessary settings are made directly in this dialogue. The IP address of the NTP server, the update time and the timeout are required. If no response is received from the NTP server within the set timeout time, the time is marked as "invalid" (IV bit). Primary Protocol-Specific: The time synchronisation is carried out cyclically by the client by means of object C_CS_NA with the type identifier "103" Client. Primary NTP, Secondary Protocol-Specific: The Network Time Protocol is primarily used for time synchronisation (see above for settings). If the time synchronisation via NTP fails, the time received from the client is used.
NTP Time Server IP	IP address of the NTP time server. Default: 192.53.103.108 Physical-Technical Federal Institute (PTB)
NTP Interval	Query interval of the time synchronisation with the NTP time server.
NTP Timeout	Maximum time between NTP request and response. If the latency of the network connection is high, the time should be increased.
Time Base	Time base at the sender of the IEC 60870 objects: <ul style="list-style-type: none"> • Local Time • UTC
ST Code	Additional, user-owned ST code, which is added automatically. The ST code STRING is not checked for validity. The ST code call is added at the beginning of the generated telecontrol task and enables the user to add his own code to the telecontrol application. If necessary, it makes sense to call up a separate programme module, e.g. "prg_UserApp();".

2.1.3.2 IEC 60870-5-104 Server



Definition of a comment is possible.

2.1.3.3 Connection Layer



No settings required at this level.

2.1.3.4 Ethernet-Server

Einstellungen ⌵

Typ Ed.1 (Multi-Client)

Ausführungszeit t#2s t#500ms t#5s

Max. Telegrammlänge 253

Zählwerte Betriebsart C

Befehlsausführung Direkte Ausfüh.

Befehle Befehlsverriegelung Gültigkeitsdauer t#0s

Parameter K 12 Parameter W 8

Parameter T1 T#15s Parameter T2 T#10s

Parameter T3 T#20s

Property	Description
Type	<p>Ed.1 (Multi-Master): With multi-client, up to 4 client connections can be added. Each client connection uses an exclusive buffer memory, i.e. each client receives the same information, e.g. about value changes, from the server. In addition, each active client can send queries and commands to the server.</p> <p>Ed.2 (Multi-Link): With multi-link, several clients use the same buffer memory. In this configuration, several clients can be connected to the server on the link level, but only one of these connections is active for data exchange. If the connection to the previously active client is interrupted, a previously inactive client can take over the data exchange.</p>
Execution Time	Setting the time for the execution of the single and double commands. The execution times can be set separately for (1) standard, (2) short, and (3) long execution time.
Max. Telegram Length	Enter the maximum telegram length in bytes. Permissible range 64 ... 253 byte.
Counters	<p>Set the counter value behaviour according to IEC 60870.</p> <p>Mode A: Local restoring, spontaneous transmission. The count values are cyclically relocated in the server and then spontaneously transmitted to the client (with the COT 3).</p> <p>Mode B: Local restoring, transmission on request. The counter values are cyclically relocated in the server. The relocated values are queried by a general counter query from the client ($RQT = 5$).</p> <p>Mode C: Relocate and transmit on request. The counter values are relocated in the server by a "Relocate Counter" command (with or without reset) of the client. The relocated values are queried by a general counter query from the client ($RQT = 5$).</p> <p>Mode D: Relocate on request, spontaneous transmission. The counter values are relocated in the server by a "Restore Counter" command (with or without reset) of the client. The relocated values are spontaneously transmitted by the server to the client (with the COT 3).</p>
Command Execution	<p>Set the mode of command execution:</p> <p>Direct Execution: The command is executed directly.</p> <p>Select+Execute: The command must first be selected before it can be executed.</p>
Select / Execute Timeout	This property is only visible if the command execution "Select+Execute" is selected. The monitoring time for the execution of commands after a selection can be configured here. Commands are only executed after a selection if the execution takes place within the time configured here. The rejected commands are acknowledged with a negative bit set in the transmission cause and are not executed.
Command Lock	<p>"1-out-N" interlock for commands.</p> <p>If the control field is activated, only one command execution can be active at a time.</p>

	<p>The processing of further objects 45 ... 47 and 58 ... 60 is rejected as long as a previous command has not yet been completed.</p> <p>The rejected commands are acknowledged with a negative bit set in the transmission cause and are not executed. The command interlock does not apply to continuous commands.</p>
Parameter K	The maximum number of telegrams that can be sent before waiting for an acknowledgement by the remote station.
Parameter W	The maximum number of telegrams that can be received before an acknowledgement is sent.
Parameter T1	Time within which unacknowledged telegrams must be acknowledged by the remote station.
Parameter T2	Setting of the time after which unacknowledged, received telegrams are acknowledged. The time T2 must be less than the parameter T1.
Parameter T3	Setting of the time for sending test telegrams. For connection monitoring, test telegrams are sent after T3 if no other data traffic is taking place.

2.1.3.5 Client Connection

Einstellungen

TCP-Port des Servers: 2404

Ethernet Adapter: Keine Bindung 192.168.100.204 Suchen

IP-Filter für Client: 0.0.0.0 0.0.0.0 0.0.0.0 0

Property	Description
TCP-Port of the Server	Setting of the TCP port for the IEC 60870-5-104 connection. The default port is 2404.
Ethernet-Adapter	<p>Binding of the Ethernet server to an Ethernet adapter of the PLC.</p> <p>No binding: The Ethernet server monitors all adapters for existing connections.</p> <p>Adapter binding: Binding of the Ethernet server to an adapter of the PLC. For this purpose, the IP address of the adapter must be entered.</p> <p>Alternatively, the adapter can be selected directly on the device using the ... button.</p>
IP-Filter for the Client	<p>Checking (filtering) of incoming connections.</p> <p>For each client connection, a maximum of three client IP addresses can be specified that are accepted for this connection.</p> <p>If a client with a different IP address tries to connect while filtering is active, this connection is not accepted and is closed by the server.</p> <p>The address "0.0.0.0" deactivates the filtering.</p> <p>For each connection, a BOOL variable can also be defined that indicates the connection status (TRUE = connection opened, FALSE = connection closed).</p>

2.1.3.6 Station Address (ASDU)

Settings

Comment:

ASDU address: 1 Originator address: 0

View options

Input format ASDU addr.: 1 x 16 Bit

Input format object addr.: 3 x 8 Bit 8-8-8

CODESYS Code address: Hexadezimal

Property	Description
Comment	Definition of a comment on the ASDU. The comment is displayed next to the ASDU address in the tree.
ASDU-Address	The address of the ASDU (ward address) can be assigned here.
Originator Address	Enter the originating address. The originating address is used for telegrams that the server sends spontaneously. The default value for the origin address is 0.
Input Format ASDU-Adr.	<p>Set the display format of the ASDU (station address).</p> <p>Format for the ASDU address:</p> <ul style="list-style-type: none"> • 1 x 16 bit • 2 x 8 bit

Input Format Objects	Set the display format of the object addresses. <ul style="list-style-type: none"> • 1 x 24 byte • 3 x 8 byte • Flexible Input x-x-x 																					
CODESYS Code Address	A CODESYS instance is automatically created for each ASDU and information object. The resulting instance name is composed as follows: fbInfoObj_M_DP_03_0001_16FE01 <table border="1"> <thead> <tr> <th>Name</th> <th>Range</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Prefix</td> <td>fbInfoObj_</td> <td>Window Prefix.</td> </tr> <tr> <td>Transmission Direction</td> <td>M/C</td> <td>Monitoring oder Kontrollrichtung.</td> </tr> <tr> <td>Type Group</td> <td>SP / DC etc.</td> <td>Group of the type identifier.</td> </tr> <tr> <td>Type Identifier</td> <td>1..64</td> <td>Numeric type identifier.</td> </tr> <tr> <td>ASDU</td> <td>16 bit</td> <td>16 bit ASDU address as decimal or hexadecimal display.</td> </tr> <tr> <td>Object Addr.</td> <td>24 byte</td> <td>24 bit object address as decimal or hexadecimal display.</td> </tr> </tbody> </table> <p>Examples: decimal display: fbInfoObj_M_DP_03_00001_022_254_001 hexadecimal display: fbInfoObj_M_DP_03_0001_16FE01</p>	Name	Range	Description	Prefix	fbInfoObj_	Window Prefix.	Transmission Direction	M/C	Monitoring oder Kontrollrichtung.	Type Group	SP / DC etc.	Group of the type identifier.	Type Identifier	1..64	Numeric type identifier.	ASDU	16 bit	16 bit ASDU address as decimal or hexadecimal display.	Object Addr.	24 byte	24 bit object address as decimal or hexadecimal display.
Name	Range	Description																				
Prefix	fbInfoObj_	Window Prefix.																				
Transmission Direction	M/C	Monitoring oder Kontrollrichtung.																				
Type Group	SP / DC etc.	Group of the type identifier.																				
Type Identifier	1..64	Numeric type identifier.																				
ASDU	16 bit	16 bit ASDU address as decimal or hexadecimal display.																				
Object Addr.	24 byte	24 bit object address as decimal or hexadecimal display.																				

2.1.4 Information Objects

The information objects are sorted by groups. All defined information objects of a group are tabulated at this level in the settings window. Some parameters of the objects can be set at group level.

A comment can be defined for each information object in the settings window.

This comment is displayed next to the respective object in the tree.

In each variable field in the settings window, variables can be selected via **F2** or entered and linked directly. Variables not selected via [F2] are explicitly created by the configurator in the generated global variable list *GVSysTC* (see [Variable Mapping](#)).

2.1.4.1 General Object Settings

Information objects can be configured individually via the settings window.

The following type identifier can be configured depending on the group:

Information Object	Transmission Direction	Type Identifier	Type Identifier CP56
Single-Point Information	Monitoring Direction	1 M_SP_NA_1	30 M_SP_TB_1
Double-Point Information	Monitoring Direction	3 M_DP_NA_1	31 M_DP_TB_1
Step-Point Information	Monitoring Direction	5 M_ST_NA_1	32 M_ST_TB_1
Bitstring 32 Bit	Monitoring Direction	7 M_BO_NA_1	33 M_BO_TB_1
Measured value, normalized	Monitoring Direction	9 M_ME_NA_1	34 M_ME_TD_1
Measured value, scaled	Monitoring Direction	11 M_ME_NB_1	35 M_ME_TE_1
Measured value, short floating point	Monitoring Direction	13 M_ME_NC_1	36 M_ME_TF_1
Integrated Totals	Monitoring Direction	15 M_IT_NA_1	37 M_IT_TB_1
Single Command	Control Direction	45 C_SC_NA_1	58 C_SC_TA_1
Double Command	Control Direction	46 C_DC_NA_1	59 C_DC_TA_1
Step Command	Control Direction	47 C_RC_NA_1	60 C_RC_TA_1
Set Point Command, normalized	Control Direction	48 C_SE_NA_1	61 C_SE_TA_1
Set Point Command, scaled	Control Direction	49 C_SE_NB_1	62 C_SE_TB_1
Set Point Command, short floating point	Control Direction	50 C_SE_NC_1	63 C_SE_TC_1
Set Point Bitstring 32 Bit	Control Direction	51 C_BO_NA_1	64 C_BO_TA_1

Other general object settings:

Property	M	C	Description
Comment	✓	✓	Definition of a comment on the information object. The comment is displayed next to the object in the tree.
Object Address	✓	✓	Definition of the 24-bit object address or as 3 x 8-bit decimal numbers.
Interrogation Identifier	✓	✗	<p>Information objects in the detector direction (without counter values) can be assigned to groups.</p> <ul style="list-style-type: none"> Exclude Global (QOI 20) Group 1 to 16 <p>If an information object is assigned to a group, it can be queried via a station query (QOI 20) and / or via a matching group query (QOI 21 ... 36). Excluded information objects are not sent during a general interrogation. No count value groups are supported for count values.</p>
Lock	✗	✓	<p>Definition of a variable for locking a command object.</p> <p>TRUE: The server answers the command with COT 7 and the P/N bit (negative confirmation) is set and does not execute the command.</p> <p>Application: e.g. for local access.</p>
New IEC Message	✗	✓	If a valid command was received, the value of this variable is incremented.

2.1.4.2 Quality Identifiers

There are several quality identifiers that differ depending on the object type.

Property	Description
BL	Definition of a variable for "Blocked" Indicates whether the information object is blocked for transmission and does not change its value. Data type: BOOL
SB	Definition of a variable for "Substituted" The current value of the information object is replaced by a value. Data type: BOOL
NT	Definition of a variable for "Not Topical" The value of the information object is not topical because it has not been updated within a specified period of time or is currently not available. Data type: BOOL
IV	Definition of a variable for "Invalid" The value is marked as invalid if it cannot be guaranteed that it has been entered correctly. The value is then considered unspecified and may not be used. Data type: BOOL
OV	Definition of a variable for "Overflow" If the value is outside a defined range, it is marked as OV. The OV quality identifier can be defined mainly for analogue measured values. Data type: BOOL

2.1.5 Information Objects in Monitoring Direction

2.1.5.1 Single-Point Information

Specific parameters of the single-point information:

Property	Description
SPI	Definition of a variable for the SPI (single-point information). Data type: BOOL

The general parameters of the object are listed in [General Object Settings](#).

The quality identifiers of the object are listed in [Quality Identifiers](#).

2.1.5.2 Double-Point Information

Specific parameters of the double-point information:

Property	Description
DPIO	Definition of a variable for the DPIO (double-point information), bit 1 specific status OFF. Data type: BOOL
DPI1	Definition of a variable for the DPI1 (double-point information), bit 2 specific status ON. Data type: BOOL
Lockout Suppression	Definition of a delay time for lockout suppression.

The general parameters of the object are listed in [General Object Settings](#).

The quality identifiers of the object are listed in [Quality Identifiers](#).

2.1.5.3 Step-Point Information

Specific parameters of the step-point information:

Property	Description
VTI	Definition of a variable for the VTI (value with transient state indication). Data type: BYTE

The general parameters of the object are listed in [General Object Settings](#).

The quality identifiers of the object are listed in [Quality Identifiers](#).

2.1.5.4 Bitstring 32 Bit

Specific parameters of the bitstring:

Property	Description
BSI	Definition of a variable for the BSI (binary state information). Data type: DWORD

The general parameters of the object are listed in [General Object Settings](#).

The quality identifiers of the object are listed in [Quality Identifiers](#).

2.1.5.5 Measured Value

Specific parameters of the measured value:

Property	Description
NVA	The parameter NVA can only be configured for type identifiers 09 and 34. Definition of a variable for the NVA (normalized value). Data type: INT
SVA	The parameter SVA can only be configured for type identifiers 11 and 35. Definition of a variable for the SVA (scaled value). Data type: INT
IEEE 754	The parameter IEEE 754 can only be configured for type identifiers 13 and 36. Definition of a variable for the SVA (short floating point number). Data type: REAL
RETAIN	When the parameter is activated, the measured value is applied in the RETAIN area of the PLC.
Reverse Mode	If the parameter is activated, measured values can also be received. An output variable can be created for this purpose.

The general parameters of the object are listed in [General Object Settings](#).

The quality identifiers of the object are listed in [Quality Identifiers](#).

2.1.5.6 Integrated Totals

Specific parameters of the integrated totals:

Property	Description
Counter Type	Set the counter value type: <ul style="list-style-type: none"> • Up Counter: A rising edge increments the count value. • Up/Down Counter: A rising edge increments or decrements the counter value. • External Counter: The count value is transferred directly from the application. Note: External counters cannot be reset by a reset telegram, as the summation or the counter value is generated by the user application.
BCR+	Definition of a variable for incrementing the count value on a rising edge. Data type: BOOL
BCR-	Definition of a variable for decrementing the count value on a rising edge. Data type: BOOL
Counter Value	Definition of a variable for the input of an external count value. Data type: DWORD
RETAIN	If this parameter is activated, the current counter value is stored in the RETAIN memory area of the PLC and reconstructed after a restart. Note: In the case of external counters, these may have to be saved in the RETAIN user application.

The general parameters of the object are listed in [General Object Settings](#).

The quality identifiers of the object are listed in [Quality Identifiers](#).

2.1.6 Informations-Objekte in Kontrollrichtung

2.1.6.1 Single Command

Specific parameters of the single command:

Property	Description
SCS	Definition of a variable for the output of the single command state (single command). Datentyp: BOOL
RETAIN	If this parameter is activated, the last state of the command outputs is stored in the RETAIN memory area of the PLC and reconstructed after a restart. However, this only applies to "continuous commands".
Feedback	Add / remove a feedback object to the command.

The general parameters of the object are listed in [General Object Settings](#).

The quality identifiers of the object are listed in [Quality Identifiers](#).

2.1.6.2 Double Command

Specific parameters of the double command:

Property	Description
DCS 0	Definition of a variable for the output of the double command state, bit 1 = OFF. Data type: BOOL
DCS 1	Definition of a variable for the output of the double command state, bit 2 = ON. Data type: BOOL
RETAIN	If this parameter is activated, the last state of the command outputs is stored in the RETAIN memory area of the PLC and reconstructed after a restart. However, this only applies to "continuous commands".
Feedback	Add / remove a feedback object to the command.

The general parameters of the object are listed in [General Object Settings](#).

The quality identifiers of the object are listed in [Quality Identifiers](#).

2.1.6.3 Step Command

Specific parameters of the step command:

Property	Description
RC--	Definition of a variable for the output of the regulating step command, bit 1 = next step LOWER. Data type: BOOL
RC++	Definition of a variable for the output of the regulating step command, bit 2 = next step UP. Data type: BOOL
RETAIN	If this parameter is activated, the last state of the command outputs is stored in the RETAIN memory area of the PLC and reconstructed after a restart. However, this only applies to "continuous commands".

The general parameters of the object are listed in [General Object Settings](#).

The quality identifiers of the object are listed in [Quality Identifiers](#).

2.1.6.4 Set Point Command

Specific parameters of the set point command:

Property	Description
NVA	The parameter NVA can only be configured for type identifiers 48 and 61. Definition of a variable for the NVA (normalized value). Data type: INT
SVA	The parameter SVA can only be configured for type identifiers 49 and 62. Definition of a variable for the SVA (scaled value). Data type: INT
IEEE 754	The parameter IEEE 754 can only be configured for type identifiers 50 and 63. Definition of a variable for the SVA (short floating point number). Data type: REAL
RETAIN	If this parameter is activated, the last state of the command outputs is stored in the RETAIN memory area of the PLC and reconstructed after a restart. However, this only applies to "continuous commands".

The general parameters of the object are listed in [General Object Settings](#).

The quality identifiers of the object are listed in [Quality Identifiers](#).

2.1.6.5 Set Point Bitstring 32 Bit

Specific parameters of the set point bitstring:

Property	Description
BSI	Definition of a variable for the output of the binary state information. Data type: DWORD
RETAIN	If this parameter is activated, the last state of the command outputs is stored in the RETAIN memory area of the PLC and reconstructed after a restart. However, this only applies to "continuous commands".

The general parameters of the object are listed in [General Object Settings](#).

The quality identifiers of the object are listed in [Quality Identifiers](#).

2.2 Automatically Generated Code

The **TELECONTROL_CONFIGURATOR** creates the following objects in the current application:

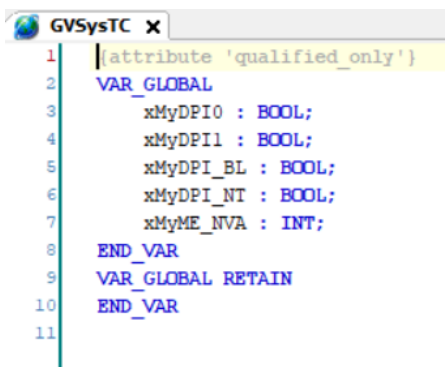
Object	Description
SysTelecontrol_Task10	Own task for the telecontrol stack. The cycle time and priority can be parameterised in the Advanced Settings .
GVSysTC	Global variable list for the variables from the Telecontrol Configurator.
prgTC_Main	Program module as the main entry point of the Telecontrol stack.
fbIEC60870_Server	A separate function block is generated for each defined IEC 60870-5-104 server. This module contains all function module instances of the current configuration. It is possible to access the Telecontrol objects from other CODESYS modules, e.g. <code>prgTC_Main.fb60870Server1.fbInfoObj_M_BO_07_00001_000_000_001.dwI_BO := xx</code>

2.3 Variable Mapping

In each variable field in the settings window, variables can be selected via **F2** or entered and linked directly. Unselected variables (via F2) are explicitly created in a global variable list *GVSysTC*.

If the cursor is in a variable field, the following options are available for selection/entry:

- Input of a new variable. If this variable does not exist in the internal repository, the variable is created in a global variable list *GVSysTC* after compiling [F11]. The newly created variables are checked according to IEC 61131-3 and, if necessary, the name is adapted.
- Selection of an already existing variable. Possible variables of the same data type are listed in the selection box and can be selected.
- **F2** opens the CODESYS input help. This window is used to easily select an existing variable from the current project.



```
GVSysTC x
1  |(attribute 'qualified_only')
2  VAR_GLOBAL
3      xMyDPI0 : BOOL;
4      xMyDPI1 : BOOL;
5      xMyDPI_BL : BOOL;
6      xMyDPI_NT : BOOL;
7      xMyME_NVA : INT;
8  END_VAR
9  VAR_GLOBAL RETAIN
10 END_VAR
11
```

GVSYSTC VARIABLE LIST

3. Shortcuts

Shortcut	Description
Alt +1..5	Collapse objects in the project tree.

4. Glossary

In this glossary, the underlying understanding of terms for the documentation is clearly stated.

Abbreviation	Meaning	Description
APDU	Application Protocol Data Unit	Data unit of the application protocol
ASDU	Application Service Data Unit	Summary of the application services of a data unit. More specifically, also refers to the common address for identifying all information objects of a particular substation.
COT	Cause of Transmission	The cause of the transmission.
FRZ	Freeze	Relocate.
IED	Intelligent Electronic Device	An IED is an intelligent field device.
IP	Internet Protocol	Connectionless network protocol at exchange layer level.
PLC	Programmable Logic Controller	A programmable logic controller is a device that is used to control or regulate a machine or system and is programmed on a digital basis.
QCC	qualifier field counter interrogation command	The qualifier field counter interrogation command.
RQT	request	Call, Request
RTU	remote telecontrol unit	The remote telecontrol unit of a substation.
S/E	select/execute	Select/Execute
TCP	Transmission Control Protocol	Connection-oriented network protocol at transport layer level.
UTC	Coordinated Universal Time	The Coordinated Universal Time.