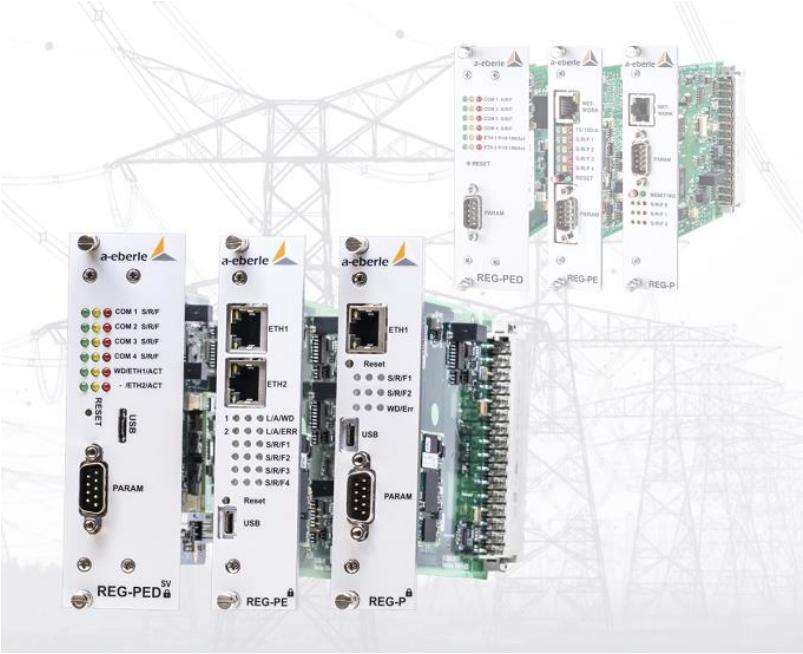
Telecontrol

User Instruction Manual



Author	Department	Changes	Version	Date
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Initial release	0.1	15.02.2009
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Revision of all chapters	0.2	05.03.2009
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Revision of pictures	0.3	19.03.2009
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Revision of pictures, FW	0.4	25.03.2009
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Addition of MODBUS	0.5	10.04.2009
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	MODBUS modifications	0.6	18.05.2009
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Various modifications	0.7	29.06.2009
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Various modifications	0.8	12.08.2009
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Various modifications	0.9	16.09.2009
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Release version	1.0	29.01.2010
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Addition of IEC103/REG-PE(D)	1.1	10.05.2010
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Various modifications	1.2	20.08.2010
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	DNP3/REG-PE(D) over Ethernet	1.3	19.10.2010
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	IEC104 with 5 partner stations	1.4	14.02.2011
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	IEC103 full revision	1.5	05.05.2012
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	IEC61850 full revision	1.6	26.05.2012
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	IEC61850 IED name configuration	1.7	11.06.2012
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Update to Version 9.9, versioning now same as WinConfig.	9.9	13.09.2012
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Extension to new doc guidelines.	9.9.1	13.10.2012
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	New SCL_Config	9.9.2	13.12.2012
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Extension of Modbus and RPL.	9.9.4	01.03.2013
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Extension of IEC 104.	9.9.5	08.03.2013

Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Extension to PRP V0	10.5.2	28.11.2013
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Extension to PRP V1	10.5.3	12.12.2013
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Extension to Cyber Security Version	11.0.0	23.12.2013
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Extension with IEC 60870-5-101	11.0.1	23.05.2014
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Cyber Security adjustable, IEC 61850 Ed. 2	11.0.2	23.07.2013
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Extension of IEC 61850 client functionality, Grouping in IEC 60870-5-104	11.0.3	10.09.2014
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Various modifications	11.0.6	08.08.2015
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	IEC 61860 client extended documentation	11.0.7	05.09.2015
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	SPA-BUS extension	11.1.0	15.10.2015
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	RSTP	11.2.0	7.1.2015
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	“DaKo”, Routing functionality from IEC 60870-5-103 to 60870-5-101	11.2.1	16.3.2015
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	REG-P serial transfer hints, extension of IEC104 (GI)	11.2.1	30.3.2015
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Synchronous time stamps for REG-D log entries and IEC 61850 events, SPA-Bus ring topology	11.2.2	24.11.2016
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	IEC104 modifications, TK28	13.0.1	11.08.2018
Wolfgang Borchers	wolfgang.borchers@a-eberle.de	Review of all chapters according to 200911_User Instruction Manual Serial Protocols EN.docx	13.0.2	23.08.2019
Vladimir Povolny	On behalf of wolfgang.borchers@a-eberle.de	Added information about DNP3 firmware version shown on regulator screen	13.4.0	30.9.2019
Vladimir Povolny	On behalf of wolfgang.borchers@a-eberle.de	Modification of MEA number for IEC103, TI3 and TI9	13.4.4	10.2.2020
Vladimir Povolny	On behalf of wolfgang.borchers@a-eberle.de	Mod. of RS485 settings for boards TK28x, TK102 Mod. of IEC103 data points Add. Converter errors for TK28-4		

Content

1. User Guidance

The *User instruction manual* is focused to the configuration of telecontrol boards REG-P / REG-PE / REG-PED / PQI-DA using DNP3, IEC101, IEC103, IEC104, Modbus, 61850, C37.118 communication protocols and Ethernet/COM in connection with XXXSysTM devices (e.g. REGSys™ or EORSys devices) of a.eberle company. For security and other information see the *Administrator manual*.

To understand the ideas and techniques described, you should already be familiar with general concepts concerning the above stated protocols and serial communication settings.

Two methods of configuration may be used: either “online” with connection to the REG-PE, REG-PED and TK28-8, or “offline” using a PC-tool called WinConfig Tools.

The web server is a permanent part of the firmware of the REG-PE / REG-PED devices and requires no special installation.

Web server is also part of the WinConfig offline version.

1.1 Target group

The User Manual is intended for skilled technician’s as well trained and certified operators.

The contents of this User Manual must be accessible to people tasked with the installation and operation of the system.

1.2 Warnings

Structure of the warnings

Warnings are structured as follows:

⚠ SIGNAL WORD	**Nature and source of the danger.** Consequences of non-compliance. Actions to avoid the danger.

Types of warnings

Warnings are distinguished by the type of danger they are warning against:

⚠ DANGER!	Warns of imminent danger that can result in death or serious injuries if not avoided.

⚠ WARNING!	Warns of a potentially dangerous situation that can result in death or serious injuries when not avoided.

⚠ **CAUTION!**	Warns of a potentially dangerous situation that can result in fairly serious or minor injuries when not avoided.

NOTICE:	Warns of a potentially dangerous situation that if not avoided could result in material or environmental damage.

1.3 Tips

Tips on the appropriate device use and recommendations.

1.4 Other Symbols

Instructions

Structure of instructions:

➲ Instructions for an action.

↳ Indication of an outcome, if necessary.

Lists

Structure of unstructured lists:

0 List level 1

– List level 2

Structure of numbered lists:

1) List level 1

2) List level 1

1. List level 2
2. List level 2

1.5 Applicable documentation

For the safe and correct use of the product, observe the additional documentation that is delivered with the system as well as the relevant standards and laws.

1.6 Keeping

Keep the user manual, including the supplied documentation, readily accessible near the system.

1.7 Updated documentation

The most recent versions of the documents can be obtained at https://www.a-eberle.de/de/downloads.

2. Scope of Delivery

- WinConfig Software, available on FTP: ftp://a-eberle-user:eberle@ftp.a-eberle.de/public/SCADA/WinConfig_11/ or at the Download Centre of our Homepage: http://www.a-eberle.de
- User Manual
- RS232 cable
- RPL Loader Software, available on FTP: ftp://a-eberle-user:eberle@ftp.a-eberle.de/public/SCADA/REG-PE(X)-Loader/

3. Safety instructions

- Observe the operating instructions
- Always keep the operating instructions with the unit.
- Make sure that the device is never operated in a damaged or compromised condition.
- Make sure that only specialized personnel operate the unit.
- The device must be connected according to the manufacturer's installation instructions.
- Make sure that the device is never operated beyond its stated ratings
- Do not operate the unit in any hazardous environment where explosive gases, dust or fumes occur.
- Ensure that protective covers are always in place and are functional
- Ensure that the five safety regulations according to DIN VDE 0105 are always observed.
- Clean the appliance only with commercially available detergents.

4. Supported Software

Table 1: Topical software state at the 2017-11-27

Name	Definitions	
Date	27.11.2017	
REG-PE version TK860	Supported XML settings from WinConfig	
Settings can be found in directory /mnt/jffs2/param	XML settings file	settings.xml
	other files and directories are only temporary generated from settings.xml after each restart	
Images:	Firmware ramdisk: uRamdisk (BusyBox, common libraries and utilities)	
	Kernel: kernel.tgz (Linux kernel for TK860)	
	TK860_DNP3.tgz TK860_IEC104.tgz TK860_IEC103.tgz TK860_IEC101.tgz TK860_MODBUS.tgz TK860_CSO.tgz TK860_C37118.tgz TK860_IEC61850.tgz TK860_DDAKO.tgz TK860_SPABUS.tgz (protocol specific applications and web pages)	

Name	Definitions	
Date	27.11.2017	
REG-PED version TK885	Supported XML settings from WinConfig	
Settings set in directory /mnt/jffs2/param	XML settings file	settings.xml
	others files and directories are only temporary generated after each start from set-tings.xml	
Images:	Firmware ramdisk: uRamdisk (BusyBox, common libraries and utilities)	
	Kernel: kernel_16MB.tgz kernel_16MB_SCC4.tgz kernel_32MB.tgz kernel_32MB_SCC4.tgz (Linux kernel for TK885D board with 16 and 32 MB flash)	
	TK885_DNP3.tgz TK885_IEC104.tgz TK885_IEC103.tgz TK885_IEC101.tgz TK885_MODBUS.tgz TK885_CSO.tgz TK885_C37118.tgz TK885_IEC61850.tgz TK885_SPABUS.tgz (protocol specific applications and web pages)	

REG-PED version TK102	Supported XML settings from WinConfig	
Settings set in directory /data/param	XML settings file	settings.xml
	others files and directories are only temporary generated after each start from set-tings.xml	
Images:	System firmware image: System.fit (kernel, BusyBox, common libraries and utilities)	
	TK102_CSO.tgz TK102_DNP3.tgz TK102_IEC101.tgz TK102_IEC103.tgz TK102_IEC104.tgz TK102_IEC61850.tgz TK102_MODBUS.tgz (protocol specific applications and web pages)	

REG-PE version TK28-4	Supported XML settings from WinConfig	
Settings set in directory /data/param	XML settings file	settings.xml
	others files and directories are only temporary generated after each start from set-tings.xml	
Images:	System firmware image: System.fit (kernel, BusyBox, common libraries and utilities)	
	TK28-4_CSO.tgz TK28-4_DNP3.tgz TK28-4_IEC101.tgz TK28-4_IEC103.tgz TK28-4_IEC104.tgz TK28-4_IEC61850.tgz TK28-4_MODBUS.tgz	

REG-PE version TK28-6	Supported XML settings from WinConfig	
Settings can be found in directory /mnt/jffs2/param	XML settings file	settings.xml
	other files and directories are only temporary generated from settings.xml after each restart	
Images:	Firmware ramdisk: uRamdisk (BusyBox, common libraries and utilities)	
	Kernel: kernel.tgz (Linux kernel for TK28-6)	
	TK28-6_CSO.tgz TK28-6_DNP3.tgz TK28-6_IEC101.tgz TK28-6_IEC103.tgz TK28-6_IEC104.tgz TK28-6_IEC61850.tgz TK28-6_MODBUS.tgz (protocol specific applications and web pages)	

REG-P version TK28-8	Supported XML settings from WinConfig	
Settings set in directory /data/param	XML settings file	settings.xml
	others files and directories are only temporary generated after each start from settings.xml	
Images:	System firmware image: System.fit (kernel, BusyBox, common libraries and utilities)	
	TK28-8_CSO.tgz	

Table 2: Firmware REG-P

Firmware REG-P			
REG-P Version TK509	IEC101 balanced	25-01-2011	asciireg101B509V4215.hex Version 42.15
	IEC101 unbalanced	25-01-2011	asciireg101U509V4215.hex Version 42.15
	IEC103	04-03-2010	asciireg103_509V4211.hex Version 42.11
	DNP3	16-11-2009	DNP3.hex
REG-P version TK517	IEC101 balanced	25-01-2011	asciireg101BEXTV4215.hex Version 42.15
	IEC101 balanced	25-01-2011	asciireg101BINTV4215.hex Version 42.15
	IEC101 unbalanced	25-01-2011	asciireg101UEXTV4215.hex Version 42.15
	IEC101 unbalanced	25-01-2011	asciireg101UINTV4215.hex Version 42.15
	IEC103	03-03-2010	asciireg103_EXTV4211.hex Version 42.11
	IEC103	10-03-2010	asciireg103_INTV4211.hex Version 42.11
	DNP3	02-10-2012	DNP3EXT.hex
	DNP3	02-10-2012	DNP3INT.hex
REG-P version TK400	IEC101 balanced	25-01-2011	ASCIIReg101B400V5213.hex Version 52.13
	IEC101 unbalanced	25-01-2011	ASCIIReg101U400V5213.hex Version 52.13
	IEC103	12-01-2012	ASCIIReg103_400V5216.hex Version 52.16
	DNP3	23-07-2012	DNP3.hex
	CSO	16-11-2009	CSOv6007.hex Version 60.07
PQI-DA (TK400)	CSO	16-11-2009	CSOv6007.hex Version 60.07

5. Glossary

Combo-Box	A text box combined with a List Box within a software program
FTP	File Transfer Protocol
Group-box	A named rounded box typically enclosing a group of one or more buttons
GUI	Graphical User Interface
HTTPS	Hypertext Transfer Protocol Secure
IOA	Information Object Address
SCADA	Supervisory Control And Data Acquisition
VM	Virtual Machine
TSDU	Telegram Service Data Unit
XML	Extensible Markup Language

6. WinConfig REG-P / REG-PE / REG-PED /REG-PEDSV

6.1 WinConfig Software introduction

WinConfig is software for managing of firmware and communication protocol settings of telecontrol boards and modules: REG-P / REG-PE / REG-PED / REG-PEDSV placed into a.eberle device racks. WinConfig is a web-based program for creation and management of files containing protocol settings, for two way transfers of settings and firmware from a user PC to REG-P / REG-PE / REG-PED / REG-PEDSV boards and modules, and for identification of REG-P / REG-PE / REG-PED / REG-PEDSV devices connected to the network.

Telecontrol board firmware has to be equipped with COM-Server to identify itself within the network. COM-Server is part of all IEC101, IEC103, and IEC104 protocols installed as firmware and accessible by the WinConfig environment. COM-Server cannot work in TK519 and TK509 REG-P types, because Ethernet connections are not available with these board types.

WinConfig program equipment consists of web server Mohican equipped with active pages for GUI and libraries developed in C# .NET software development environment for communication with telecontrol boards, file services and additional auxiliary functions.

WinConfig prepares settings for REG-P / REG-PE / REG-PED / REG-PEDSV with IEC101, IEC103, IEC104, DNP3 , Modbus, C37118 and IEC61850 protocols and COM-Server on a local host (local web server) and stores them in a standard file format - .XML file. The settings file can then be transferred via HTTPS to board flash memory in the case of board types containing Linux. WinConfig creates binary data files in Intel HEX format and transfers them into the board memory in the case of non-Linux boards. Serial transfer via a.eberle device or Ethernet transfer can be used according to the REG-P type.

A part of configuration software is also transferred to the telecontrol board and this *online* part provides a system functions focused to the management of telecontrol board system software, user management etc. with high level of security. The functionality of this part of WinConfig is described in the Administrator manual.

WinConfig splits into two main parts: the local web server and the local Web site with application libraries. Settings may be prepared, stored and retrieved for various configurations without a direct link to the device.

Settings are saved in .xml file types. WinConfig launches a local web server and a default web browser on your PC.

Should one of the expressions used in this document be unclear to you, you may refer to the glossary chapter for an explanation of it. Otherwise please feel free to contact us with your technical questions at this email address: info@a-eberle.de.

6.2 REG-PEX Loader software

The REG-PEX loader (RPL) is software tool for transfer of Linux Kernel and RAM disk into the REG-PE(D) and PQI-DA telecontrol boards equipped only with U-Boot software. Such boards cannot cooperate directly with WinConfig. The RPL also allows change of board IP settings and selection of kernel with/without the bonding feature.

NOTICE:	The RPL is low-level software tool and should be used by advanced users only.

The RPL software is contained in the WinConfig installation package and can be launched from *Transfer from PC* page by the *Run RPL* button. The WinConfig also offers launch of RPL in the case when no REG-PE(D) telecontrol board is detected.

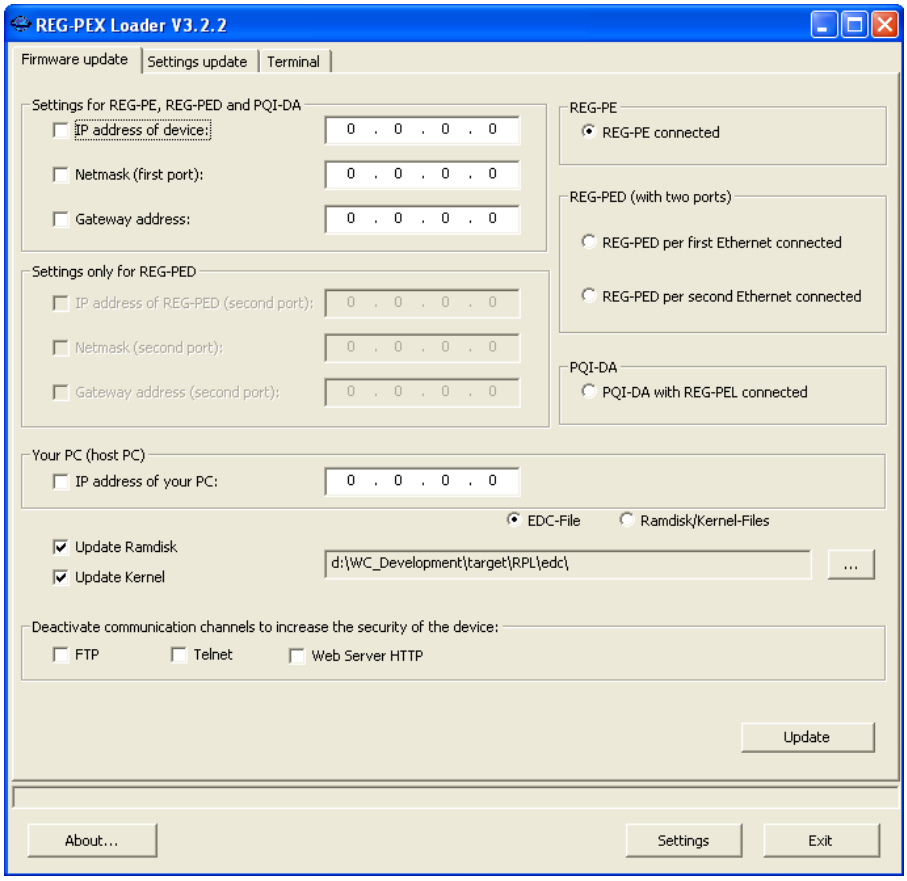


Figure 1: The RPL window

To transfer Linux Kernel and RAM disk into the REG-PE(x) follow these steps:

- Connect the PARAM connector of REG-PE(x) board and your computer with the RS232 cable supplied with the A-Eberle device or with any serial null modem cable.
- Connect your computer and the REG-PE(x) board by Ethernet cable. Some Ethernet adapters do not switch to the correct mode automatically, so please use preferably a crosslink patch cable.
- Fill the IP address lines in RPL window.
- Use the (...) button to browse the edc file placed in the WinConfig installation folders. There are two edc files distributed in the WinConfig setup, the difference is in the versions of Kernel - with/without support of bonding. Select whatever of the two files as bonding and related features can be set later using the *Change of IP settings for REG-PE(D) telecontrol boards* WinConfig function.
- Press the *Update* button. The update process can be seen in the RPL tab *Terminal*.

6.3 Communication with REG-PE(D) telecontrol board in WinConfig 13

A higher level of security for data transfer and communication with REG-PE(D) telecontrol board is used in WinConfig v.13. The online WinConfig (www pages placed in the board memory) can be disabled in the *Transfer settings from PC* page in offline WinConfig or in the *REG-PE(D) board IP settings* page in online WinConfig or in user menu.

The new firmware supports several functions as described below.

The following secured communication technologies are used in WinConfig 13:

- SFTP (SSH file transfer protocol) replaced the online WinConfig. The v.11 firmware supports several functions focused to file transfer. The file transfer via SFTP protocol is encrypted and protected by user login and password; *remoteuser* login can be used with *remoteuser* password (factory default).
- SSH is used instead of former telnet for remote access to console. This access is typically used for basic board configuration. A SSH client (e.g. PUTTY) is necessary for this type of connection.
- HTTPS (HTTP over SSL) together with SSL certificates is used for communication between off-line WinConfig and telecontrol board.

NOTICE:	**Note on HTTPS accounts functionality when upgrading/downgrading from/to WinConfig 10:** When user upgrades from WinConfig 10 to 13 using offline WinConfig, one of the HTTPS accounts (username and password) from version 10 (passwords coded by XOR, not by SHA2 hash) is used. The accounts defined in the version 10 coded by XOR remain in the upgraded version 13. The individual account is changed to the new SHA2 coding version in the moment when user changes this account in the WinConfig 13. The file with SHA2 coded accounts remains in the telecontrol board when downgrading from version 13 to version 10. Offline WinConfig 10 using XOR password coding will not work in such case. To solve such situation, the user can change the accounts using FTP or serial PARAM port or to delete the account file /mnt/jffs2/config/webs_users.conf. When the file is deleted, the default account will be used.

6.3.1 SFTP access

A SFTP (SSH file transfer protocol) client program has to be used for connection with telecontrol board and for transfer of files between board and PC computer, e.g. WinSCP for MS Windows, GFTP for MS Windows and Linux or, possibly, SFTP (PSFTP) for the command line mode.

The following files can be found in the board memory and transferred to PC:

- current XML settings
- ICD file for 61850 protocol
- files with information about hardware, SW version, system kernel log etc.

The XML settings and ICD file are placed in the */xload/actual* folder and files with information about HW etc. are placed in the folder */xload/info.*

The XML settings and ICD file can be replaced and thus new configuration can be installed using SFTP. It is also possible to transfer SSL certificates with key that are used for HTTPS communication with WinConfig or to change debugging (logging) parameters as defined in the *Supervisory* page of WinConfig. The debugging (logging) parameters can be changed without need of board restart. However, the most of parameter changes require restart of board that can be also done via SFTP.

Use always the */xload/new* folder when transferring files from PC to board. The */xload/new* folder is scanned by firmware approximately every 20 seconds and firmware starts required action in the case when relevant files are found in the folder.

6.3.2 Actions supported by firmware and their usage:

Restart of board

- Prepare empty file named *reboot* and copy it in the */xload/new* folder.
- Wait approx. 20s for the automatic restart of board.

Installation of new XML settings and ICD file

- Prepare new settings file named *settings.xml* and copy it in the */xload/new* folder.
- Prepare new ICD file (if ICD change is required) and copy it to the folder.
- Prepare empty file named move and copy it.
- Wait approx. 20s for the automatic move and installation of the files.
- Prepare empty file named *reload* and copy it.
- Wait approx. 20s for the automatic reload of files transferred in the previous sequence. Reload can be used if there was change in the supervisory parameters only. Otherwise use *restart*, see item.

6.3.3 SSH access

SSH is used for remote access to console. The file transfer is encrypted and protected by user login and password; *remoteuser* login can be used with *remoteuser* password.

The access is driven by sequence of user menu that allow user to show and/or change the board settings of to show logs of kernel, system and applications.

6.3.3.1 Menu and meaning of individual items:

The configuration of menu depends on the logged user and his rights.

Main menu

1) Network menu

- *Go to menu for network setting and diagnostic*

2) Services menu

- *Go to menu administration of network services (SSH/SFTP, HTTPS)*

3) Log menu

- *Go to menu showing logs*

4) Change terminal password

- *Change of SSH and SFTP passwords. Change is applied to the currently logged user. Program asks for entering of old password and two times new password.*

NOTICE:	*Attention, a change is applied immediately.*

5) HTTPS users management

➲ *Go to administration of HTTPS users (off-line WinConfig)*

6) Logout

➲ *Terminal logout*

7) Reboot

➲ *Restart telecontrol board*

8) Recovery menu

➲ *Go to recovery mode. This menu item is shown only in the case of access via local serial port. Another condition is that the board has to be prepared for the recovery mode (the R key is pressed in the moment or recovery notification during the card restart).*

9) Start root shell

➲ *The root shell is determined only for administrators and is not available for remoteuser and localuser.*

Network menu

1) Ping ICMP

➲ *The ICMP ping is determined for the diagnostic of network connection. The system asks for counterparty IP. The ICMP echo-request packet is used. The user network interface is determined by routing table.*

2) Ping ARP

➲ *The ARP ping is determined for the diagnostic of network connection within one subnet. The system asks for counterparty IP and, if there is more network interfaces (TK885), it asks also for the interface to be used. This ping usually passes through firewall. The ARP protocol is not routed to other networks.*

3) Show routing table

➲ *Shows current routing table.*

4) Show interfaces

➲ *Shows current list of network interfaces with parameters (IP address, mask, MAC address and statistics of sent and received data).*

5) Show saved network parameters (IP addresses, bonding)

➲ *Shows network parameters (IP address, mask, gateway, state of bonding) saved in the flash memory. These parameters will be used after board restart.*

6) Set network parameters (IP addresses, bonding)

➲ *Setting of network parameters (IP address, mask, gateway, state of bonding) solved as a series of questions and answers. Possible options of bonding parameters:*

1. Disabled
2. PRP V1
3. Broadcast mode
4. Bridge with RSTP

7) Back

➲ *Go to main menu*

Services menu

1) Services state

➲ *Shows the state of SSH/SFTP and HTTPS services (enabled or disabled).*

2) Enable SSH/SFTP

➲ *Enables SSH/SFTP service. The change takes effect after board restart.*

3) Disable SSH/SFTP

➲ *Disables SSH/SFTP service. The change takes effect after board restart.*

4) Enable WinConfig (https, network detect)

➲ *Enables services necessary for the communication with off-line WinConfig. The change takes effect after board restart.*

5) Disable WinConfig (https, network detect)

➲ *Disables services necessary for the communication with off-line WinConfig. The change takes effect after board restart.*

6) Enable WinConfig WWW pages

➲ *Enables WinConfig WWW pages.*

7) Disable WinConfig WWW pages

➲ *Disables WinConfig WWW pages.*

8) Back

➲ *Go to main menu.*

NOTICE:	**Attention:** When both SSH/SFTP and HTTPS accesses are disabled, it is not possible to connect the board remotely. The local access via PARAM port only is possible in such case.

Log menu

1) Application and system log

➲ *Shows log with messages from system and from user applications.*

2) Kernel log

➲ *Shows log with messages from system kernel.*

3) Back

➲ *Go to main menu.*

HTTPS user's management menu

1) List users

➲ *Shows list of user accounts for HTTPS service (users of off-line WinConfig).*

2) Change user password

➲ *Changes user password. The service asks for old password and two times for the new password. The change takes effect after board restart.*

3) Add new user

➲ *Adds a new user account. The service asks for new account name and two times password. The change takes effect after board restart.*

4) Delete user

➲ *Deletes existing user account. The service asks for existing user account name. The change takes effect after board restart.*

5) Back

➲ *Go to main menu.*

Recovery menu

1) Reboot and format applications part of firmware

➲ *Sets the formatting flag and performs board reset. Attention, this service formats the jffs2 area without possibility of recovery. This service is determined for emergency situations only, when the board stuck and there is no other possibility of fix. The off-line WinConfig can be consequently used for transfer of new firmware.*

2) Back

➲ *Go to main menu.*

6.4 Communication with telecontrol boards type TK28x and TK102

Communication with these board types utilizes special security measures using Radius and Active Directory. For more information see Administrator manual.

6.5 Time synchronization

Time synchronization methods available for telecontrol boards and communication protocols consist of the following possibilities and options:

- synchronization by communication protocol
- synchronization using NTP server
- synchronization using Precision Time Protocol (PTP)

6.5.1 Synchronization by communication protocol

If the communication protocol used in telecontrol board allows time synchronization messages then such option is available in protocol parameters.

Protocols with time synchronization availability: DNP3, IEC101, IEC103

6.5.2 Synchronization using NTP (Network Time Protocol) server

Synchronization using NTP server is available in the case Ethernet protocols:

IEC104, MODBUS, IEC61850, C37.118. The IEC61850 and C37.118 has also DCF77 synchronization available in certain cases.

6.5.3 Synchronization using PTP

The time synchronization using PTP is implemented for the board's type TK28x and TK102.The default configuration file is prepared to set up the profile according to the standard IEEE P37.238, PTP Power Profile. The characteristic properties of this profile are set this way:

- Slave only, one-step
- Delay Mechanism: Peer-to-Peer
- Transport Mechanism: Layer 2
- PTP Domain: 0
- Sync Interval: 1s (= 2^0 s)
- Min pdelay request interval: 1s (= 2^0 s)
- Announce Interval: 1s (= 2^0 s)
- Announce receipt timeout: 3s

- Priority 1: 255 (Slave clock)
- Priority 2: 255 (Slave clock)

The PTP parameters are available in the Time synchronization settings for the above mentioned boards and network protocols.

For more information about PTP see the IEEE 1588 standard.

6.5.3.1 Reported status of PTP

The current PTP status can be shown in the *Time synchronization* tree branch.

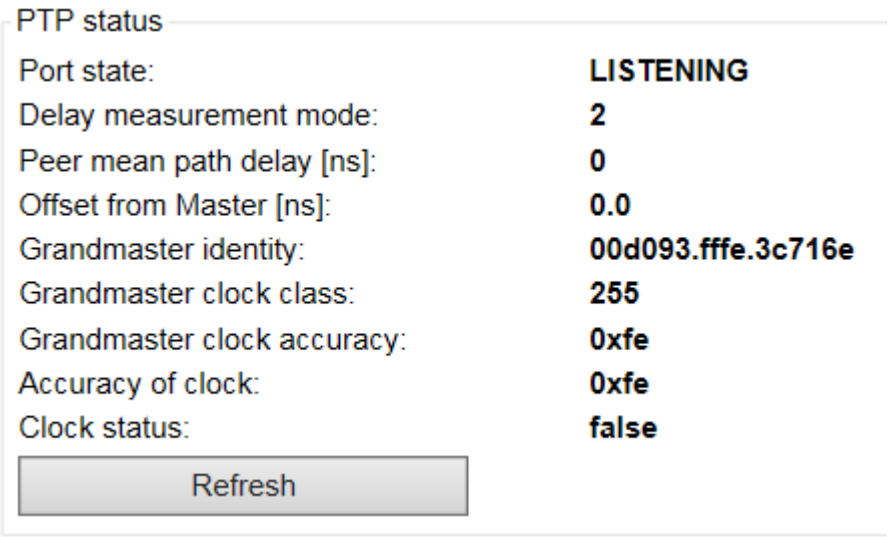


Figure 2: PTP status

Table 3: Port states

State	Description
slave	Configures the 1588v2 interface to be in the slave state. That is, the 1588v2 device keeps track of external time information. There can be only one slave port in a 1588v2 device.
passive	Configures the 1588v2 interface to be in the passive state. That is, the 1588v2 device neither keeps track of external time information, nor advertises time information. The port shall not place any messages on its communication path except for Pdelay_Req, Pdelay_Resp, Pdelay_Resp_Follow_Up, or signaling messages, or management messages that are a required response to another management message. If more than one master ports have been detected in the domain, the best one will be selected to be master. The corresponding local port will be slave, and other local ports will be passive to backup for slave ports.
master	Configures the 1588v2 interface to be in the master state. That is, the 1588v2 device advertises time information to other devices.

State	Description
premaster	Configures the 1588v2 interface to be in the premaster state. The port shall not place any messages on its communication path except for Pdelay_Req, Pdelay_Resp, Pdelay_Resp_Follow_Up, or signaling messages, or management messages that are a required response to another management message.
listening	Configures the 1588v2 interface to be in the listening state. That is, the 1588v2 device neither keeps track of external time information, nor advertises time information. (If a device originally functioning as a master clock is configured to be an OC working in slave-only mode, or if the device becomes faulty, the status of the 1588v2 interface on the device changes from master to listening.)
faulty	Indicates that the 1588v2 interface is Down. The port shall not place any messages on its communication path except for response messages to some management messages.
disabled	Configures the 1588v2 interface to be in the disabled state. The port shall not place any messages on its communication path. A port in this state shall discard all received 1588v2 messages except for management messages.
initializing	Configures the 1588v2 interface to be in the initializing state. While a port is in the initializing state, the port initializes its data sets, hardware, and communication facilities. No port of the clock shall place any 1588v2 messages on its communication path.

The desired PTP port state when the PTP is switched ON and correctly synchronized is ***slave***. Other states that can appear indicate other than synchronized state.

7. Serial ports assignment

The Serial ports assignment is tool for management of serial ports for telecontrol board type TK860 and newer. The serial ports available in telecontrol board are well-arranged in table together with the information about their usage in protocols and COM-Server channels. The page contains also internal checks to avoid conflicts in usage of COM ports. At the same time, the table also allows to switch ON/OFF individual protocols or COM-Server channels.

The assignment of serial ports differs for telecontrol boards type TK28x and TK102 due to addition of WebREG functionality.

The TK28-4 telecontrol board has a special serial port *FO* for serial protocol and fiber optic serial interface.

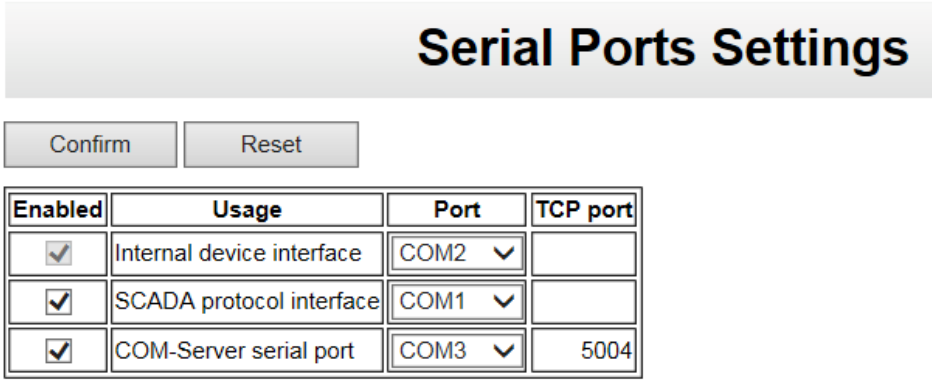


Figure 3: Serial Ports Settings REG-PE(D) (DNP3)

Table 4: IEC101 Serial Ports Settings

Setting	Format	Range	Default	Description
Enabled	checkbox	ON/OFF		Checkbox enables/disables corresponding protocol (COM-Server channel)
Usage	text	-		Definition of corresponding protocol /COM-Server channel (read only)
Port	-	Selection of values in combo box		Selection of corresponding COM port
TCP port	-	-		TCP port used by CS channels (read only)

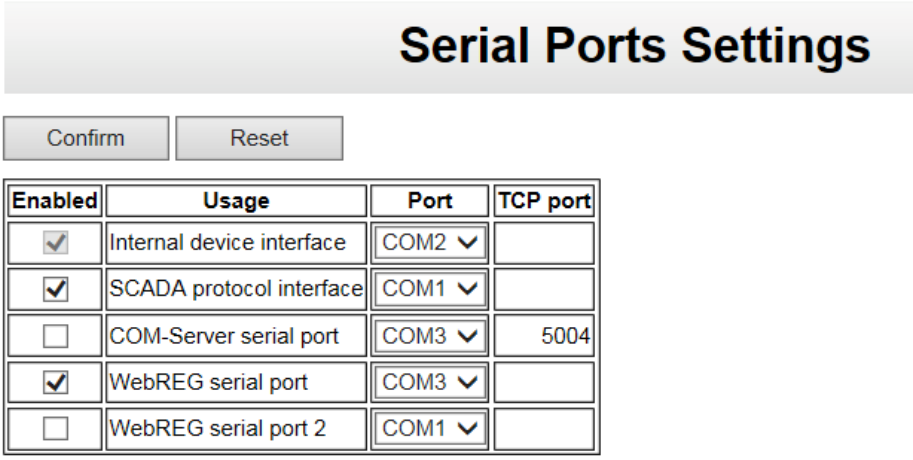


Figure 4: Serial Ports Settings TK28-6 (IEC101)

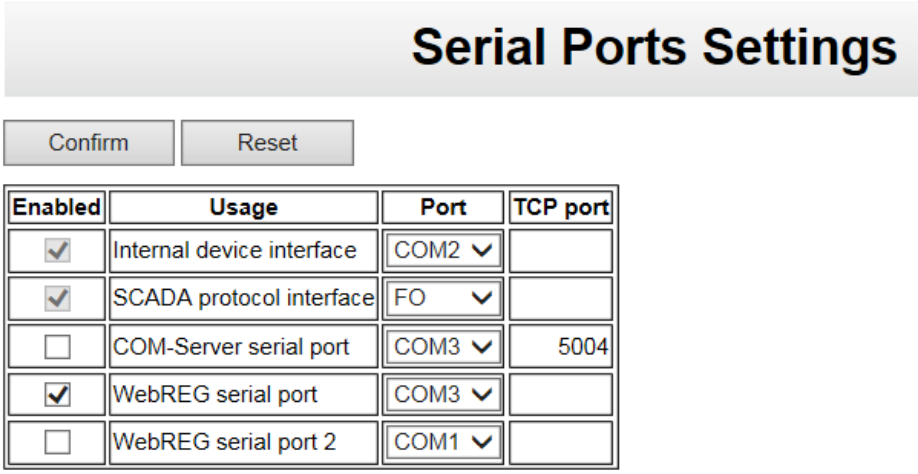


Figure 5: Serial Ports Settings TK28-4 (IEC101)

8. Supported protocols and telecontrol board types

Table 5: Supported protocols and telecontrol board types

Telecontrol board types	Available protocols	Protocols Accessible via
REG-PE(D) (TK860, TK885)	IEC104; DNP3; Modbus; IEC103; IEC61850; ComServer only (CSO); C37.118, SPA-BUS	
PQI-DA(TK885-1)	CSO, IEC61850, IEC104, IEC104	
REG-P (TK509, TK517)	IEC101 balanced; unbalanced; IEC103, DNP3	Serial (Write only)
REG-P (TK400)	IEC101 balanced, unbalanced; IEC103; DNP3; CSO	Serial *(Write only) and Com Server (Read and Write)
REG-P (TK28-4)	CSO DNP3 IEC101 IEC103 IEC104 IEC61850 MODBUS	Serial *(Write only) and COM-Server (Read and Write)
REG-PE (TK28-6)	CSO DNP3 IEC101 IEC103 IEC104 IEC61850 MODBUS	
REG-PE (TK28-8)	CSO	
REG-PEDSV (TK102)	CSO DNP3 IEC101 IEC103 IEC104 IEC61850 MODBUS	
PQI-DA (TK400)	CSO	Serial *(Write only) and COM-Server (Read and Write)

Further protocols can be implemented on demand, please contact: info@a-eberle.de.

9. Introductory window

The following introductory window should appear on your screen after WinConfig is started. The following user actions are available from this screen:

- Select WinConfig language from the combo box in the upper right corner of the window.
- Run the standard setting and data transfer wizard from the *Step-by-Step* button.
- Run complete WinConfig from the *Advanced* button.
- Quit WinConfig using the *Quit* button.

Figure 6: Introductory window

NOTICE:	**Important note:** If user tries to run WinConfig from read-only medium (CD, DVD), a warning message appears instead of the introductory window.

10. Work with protocol settings

WinConfig can be used for creation and modification of communication protocol settings. If the settings file was created by a previous version of generator (e.g. GenReg, INI file) then WinConfig can be used also for conversion of INI file to the XML file of settings used by WinConfig.

The communication protocol settings file can be transferred into the memory of the telecontrol board. WinConfig always appends corresponding firmware code to the settings thus the matching pair of settings and code is always transferred as a pair.

The user can also read the settings from the telecontrol boards and show the settings in the WinConfig window using the transfer to PC function. This function is not available for TK509 telecontrol boards.

10.1 Settings tree

WinConfig can have more than one settings open; all settings are shown in tree structure in the left frame of WinConfig window.

The selected settings have an orange background.

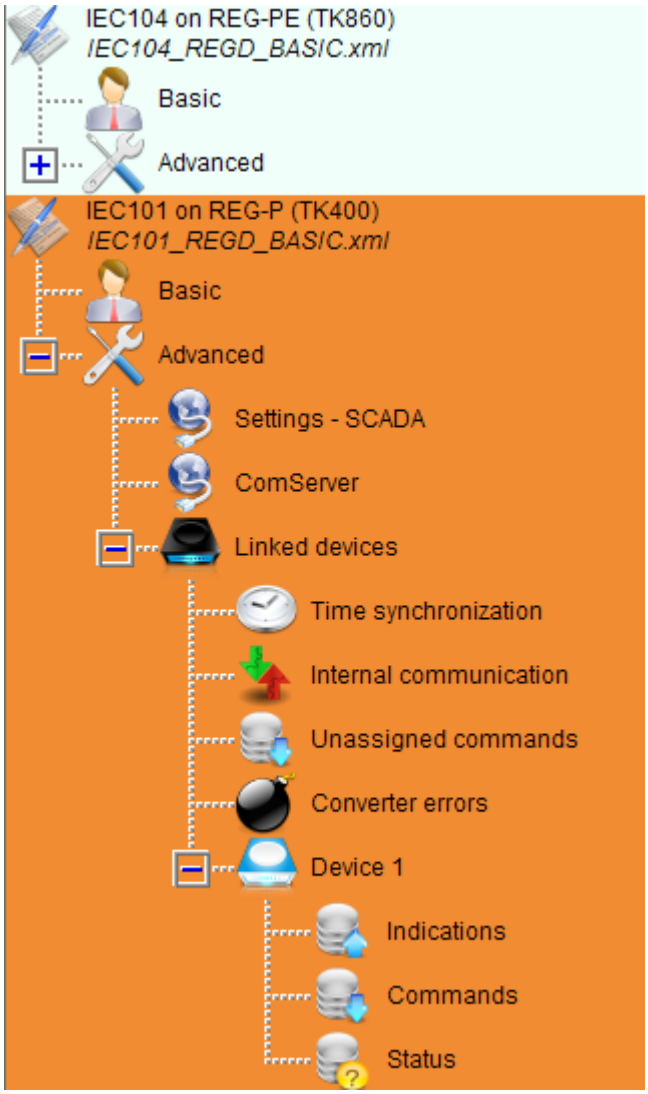


Figure 7: Settings tree

Each setting can be drilled down to sets of editable pages. Clicking the text in the tree structure selects the corresponding page in the right frame of WinConfig window.

10.2 Main menu buttons

- *New* – create new settings based on a default template. User has to enter desired telecontrol board type, protocol, SCADA and device template. WinConfig creates new settings according to the selected options. If the selected SCADA and device template are not defined in WinConfig, a default template will be used instead. (Default settings are based on successful experience in the field and should only be changed if there is a good reason to do so).
- *Open* – open existing XML settings file or open then convert an existing INI settings file to the newer XML settings format. User has to enter/browse the required settings file and enter the target type of the telecontrol board in case of conversion from the older INI format.
- *Remove* – remove selected settings from the tree in the WinConfig window. Selected settings are marked with an orange background. To select settings click the root node of the settings in the tree (e.g. DNP3 on REG-P (TK400))
- *Save* – save the selected settings to the XML file on local disk.
- *Compare* – comparison of settings in XML files with results stored in Microsoft Excel XLS file.
- *Export* – export of selected settings to a Microsoft Excel XLS file.
- *Transfer to PC* – transfer settings from a connected telecontrol board to WinConfig as described above.
- *Transfer from PC* – transfer selected settings from WinConfig to the connected telecontrol board as described above.

Figure 8: Main menu buttons

10.2.1 New settings

To create new settings from an existing template, please click *new* button. Select board type, protocol, SCADA template and devices template from combo boxes shown below then click the *Add* button. These newly created settings will appear in the settings tree.

The setting templates are divided into two editions in the case of IEC 61850 protocol. The edition of template can be chosen in the *Template edition* listbox. This listbox is disabled in the case of other protocols.

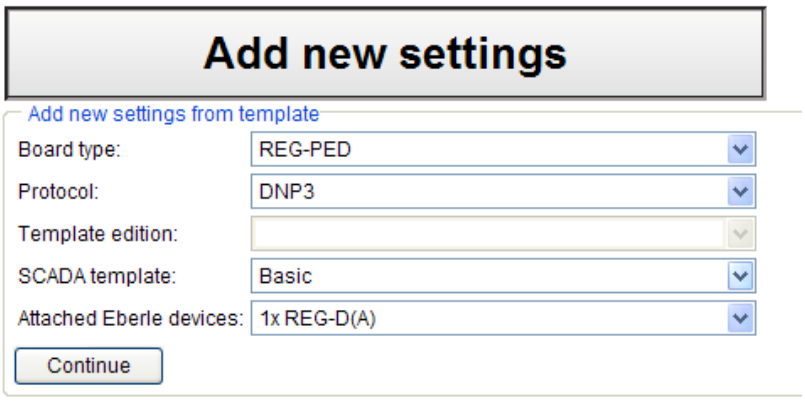


Figure 9: Add new settings

Predefined templates

Valid workable combinations of board type / protocol / SCADA_template / Devices template are pre-defined in WinConfig. However, the default template files, which can be created, exist only for valid combinations already used and known.

If a template for a given combination is not available, a warning message will appear onto the screen:

Template file isn't implemented for chosen combination protocol/SCADA/Eberle devices! Default template will be used!

If the Continue button is pressed apart from invalid combinations, a default template will be used to create the new set of settings. Default templates typically contain basic configurations without pre-defined data points or commands.

10.2.2 Open, conversion from INI, import from Excel

Open Settings from file (XML settings)

In Order to open an existing XML settings file, convert an existing INI file or import a WinConfig-exported Excel file, please click the Open button. To open existing settings please browse the settings file by using the Browse button and then click the Open button in the Open settings from file Group-box

Convert settings from GenReg "*.ini" file

To convert settings from GenReg INI format, browse the file by using the Browse button, select required telecontrol board type from combo box and click the Convert button in the Convert settings from GenReg “*.ini” file frame. WinConfig will automatically detect the protocol described in the INI file and converts the settings to a suitable format for the required board type.

Import settings from WinConfig-exported Excel file

To import settings from WinConfig-exported Excel file, browse the file by using the Browse button and click Import button in the Import settings, from WinConfig-exported Excel file frame.

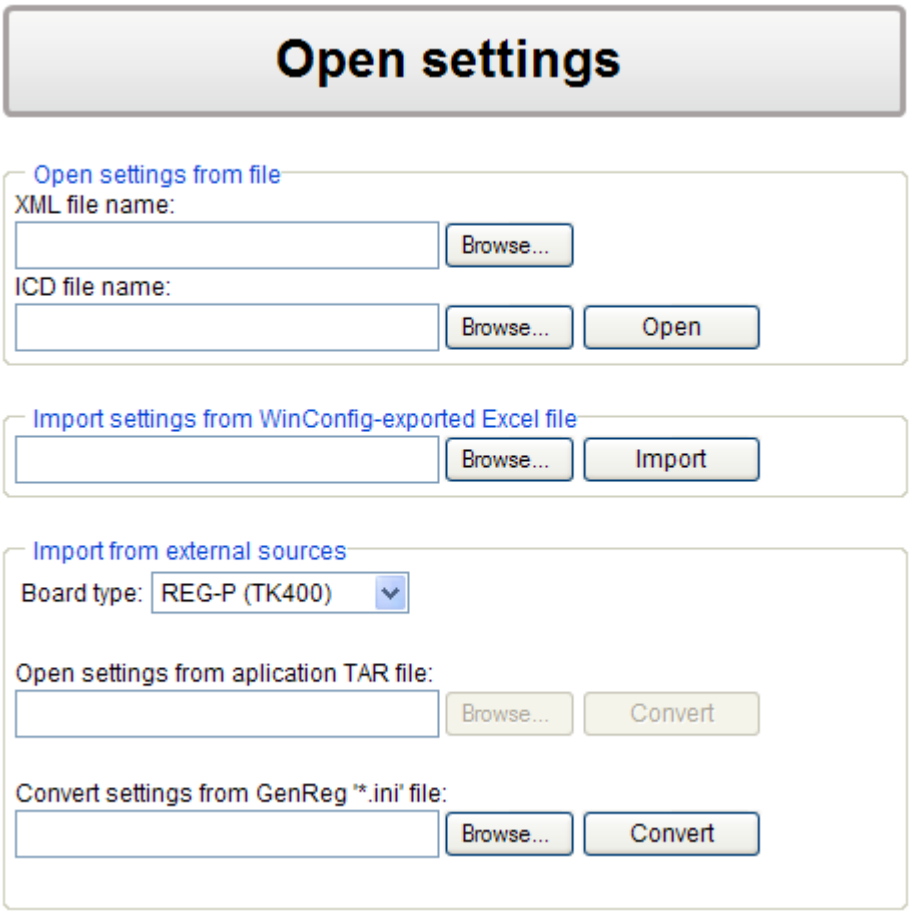


Figure 10: Open settings

10.2.3 Remove, Save

Click the Remove button to remove the selected settings from the settings tree.

Click the Save button to save selected settings to a WinConfig XML settings file. Select folder and type the settings file name in the dialog box.

10.3 Compare settings function

Two compare modes can be found on the WinConfig Compare settings page. Select the desired mode in the Compare mode frame.

Compare selected settings with settings file

To compare a pair of settings browse two xml setting files to compare, and then click the Compare button.

Compare two settings files

To compare a currently selected settings with an xml setting file browse this file and click the *Compare* button.

Results of the comparisons are available in a Microsoft Excel xls file that is created from this comparison. Individual sets of settings are arranged in individual sheets in Excel workbook. Differences can be seen coloured in the Excel sheets. Black fonts are used for matching pairs of settings, magenta fonts for different pairs and red fonts for missing settings.

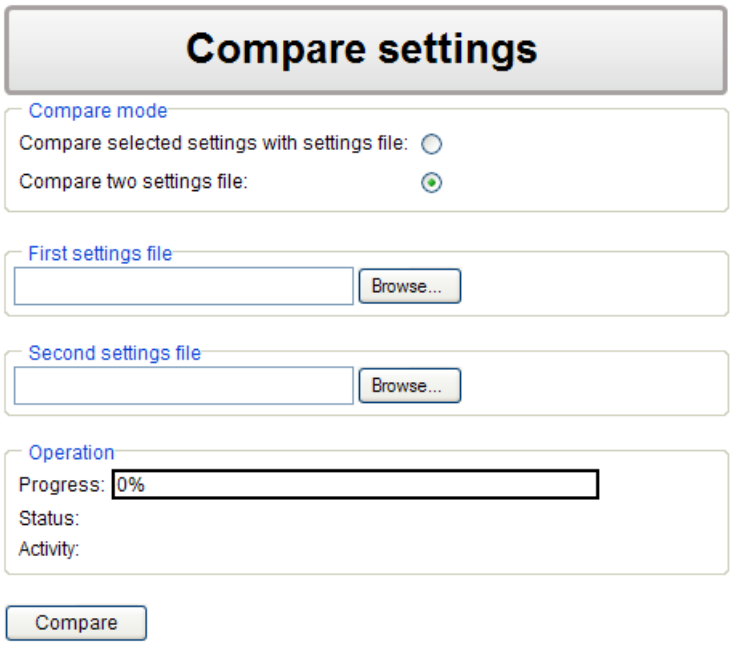


Figure 11: Compare settings

The third compare mode implemented in WinConfig is comparison of the selected settings with settings contained in the connected telecontrol board. This function is available in the Transfer settings to PC page as Compare to selected settings button. It is necessary to detect the board first in the case of remote mode. The rules of comparison are same as described above. This functionality cannot be used with TK509 telecontrol boards where Transfer settings to PC functionality are not available.

10.4 Rules for export/import using Microsoft Excel

10.4.1 Export to Excel

Ways of export:

- Commands only of selected device from *Commands* page
- Indications only of selected device from *Indications* page
- Entire selected settings using *Export* icon in the main menu.

Data is exported into the new file winconfig-exportxx.xls placed in the system temp folder.

Individual parts of exported data are placed in individual sheets of Excel workbook, i.e. commands of each device and indications of each device are placed in corresponding sheets, e.g. sheet of indications of device A: is named *x. device A indications* and commands sheet is named *x. device A commands* (where x is the device order number). The character ":" in device name is skipped as Excel doesn't allow usage of this character in the sheet name.

Data is arranged in lines. First line represents heading with settings names according to the corresponding XML template.

The exported sheets also contain plain text describing setting names. This information can be found in the second row of the table-based sheets and in second columns of the other sheets.

10.4.2 Import from Excel

Ways of import:

- Commands from selected sheet to *Commands* page of selected device.
- Indications from selected sheet to *Indications* page of selected device.

Import is performed from the Excel file with valid .xls extension. The file has to contain corresponding sheet with appropriate name and heading line with names of settings according to the corresponding XML template (see Export). Import function uses topical settings as target and replaces existing data in the target settings.

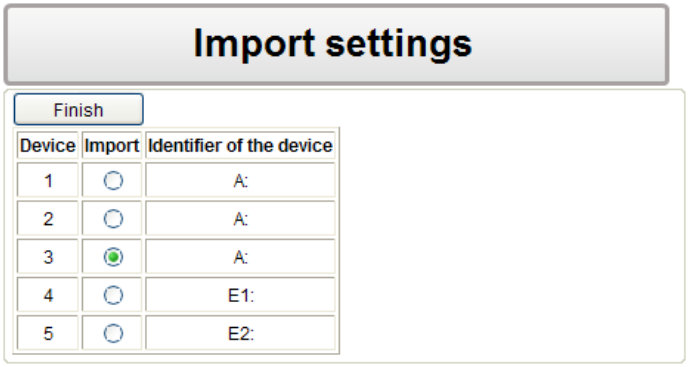


Figure 12: Import settings

10.5 Migration of settings

WinConfig can migrate settings between different versions of telecontrol boards. The migration can be done in several ways:

- Convert GenReg INI file with REG-P board type selected in the *Open settings* page (other than the telecontrol board for which INI file was originally created, e.g. INI file created for TK517 and IEC101 protocol can be open as IEC101 for TK400 telecontrol board).
- Using *Migrate* button on *Basic settings* page. In this way the migration between TK400 and TK517 boards in both directions can be performed.
- Using *Migrate* button on *Basic settings* page to migrate DNP3, IEC101 and IEC103 protocol settings between TK400 and TK28-4 boards.
- Using *Migrate* button on *Basic settings* page to migrate DNP3, IEC104, IEC61850 and MODBUS protocol settings between TK860 and TK28-6 boards.
- Using *Migrate* button on *Basic settings* page to migrate DNP3, IEC104, IEC61850 and MODBUS protocol settings between TK885 and TK102 boards.

First step of migration and INI file conversion implemented in WinConfig is to check for completion and correctness of settings data. This has to be done due to some hardware differences that exist between some REG-P boards.

The *Missing/incorrect values* page provides user interaction possibility during the check process and default values are suggested for changing and confirmation.

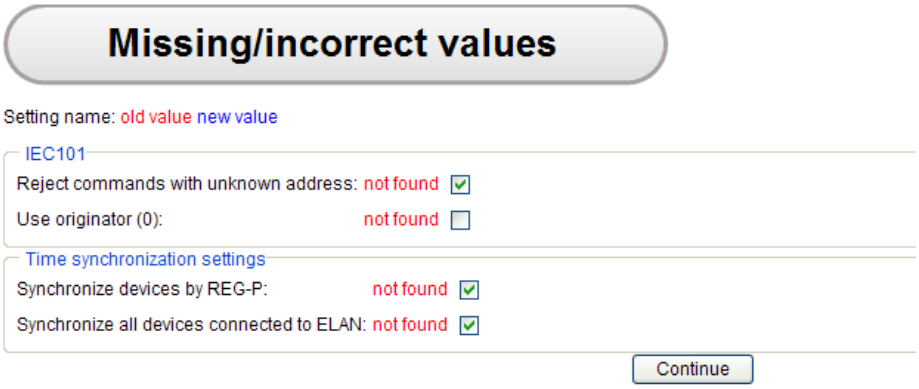


Figure 13: Missing/incorrect values

10.6 Checking of entered values

WinConfig pages containing tables (values are organized in tabular format, e.g. indications, commands) also contain online internal checking of individual cells. The check runs when the user leaves cell. Entered values are checked on valid limits. If limits are broken, the last or default value is automatically entered and cell is marked by red colour. Correctly changed values are not marked. User cannot leave the page without confirmation or resetting of the changed values.

There is also additional integrity test of values present within the confirmation procedure. This test checks three basic rules:

- Test of non-zero values of object addresses,
- Existence of non-empty command strings in command tables,
- Test of uniqueness of object address, which is performed entirely for all addressable objects in the settings, i.e. comparison of each address with other addresses. Uniqueness of devices text IDs is not tested. There are some exceptions from the rule e.g. in IEC103/TK8xx where TK3 type data points are tested on uniqueness together with measurement value type.

11. IEC101 settings

11.1 Basic

Basic settings tree branch form contains common settings of IEC protocol – selection of available Baud rates, Link and ASDU addresses shown as one number or pair of Bytes. Basic settings also contain user definable descriptions - and names for the entire set of settings.

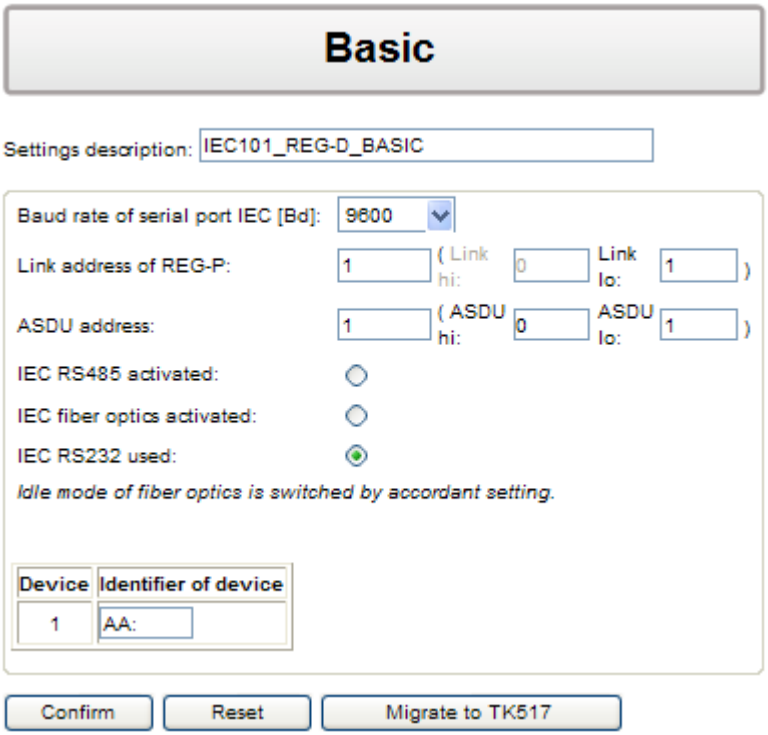


Figure 14: IEC101 basic settings

Table 6: IEC101 basic settings

Setting	Format	Range	Default	Description
Settings description	text	50 characters	Filename of open settings	Short user description of settings file or name of settings file.
Baud rate of serial port IEC	Bd	Selection of values in combo box	9600	Baud rate of IEC101 serial port
Link address of REG-P	-	0 to 255 or 0 to 65535	1	Link address displayed as word or set of two bytes. The range is determined by the Link address size option in advanced settings.
ASDU address	-	0 to 255 or 0 to 65535	1	ASDU address displayed as word or set of two bytes. The range is determined by the ASDU address size option found in advanced settings.
IEC RS485 activated	-	option box	NOT selected	Activation of RS485 interface option. This option is greyed out

Setting	Format	Range	Default	Description
				and not functional in the case for REG-P telecontrol boards with jumpers.
IEC fiber optics activated	-	option box	NOT selected	Activation of fiber optics interface option. This option is greyed out and not functional in the case for REG-P telecontrol boards with jumpers.
IEC RS232 used	-	option box	selected	Activation of RS232 interface option. This option is greyed out and not functional in the case for REG-P telecontrol boards with jumpers.
Identifier of device	text	3 characters	defaults defined in the Devices tree branch	Device identifier string for device protocol

11.2 Advanced

11.2.1 IEC101 Settings - SCADA for REG-P telecontrol boards

The Settings - SCADA tree branch contains several board specific settings available for TK400 and TK517 telecontrol board types without jumpers and also contains a full range of IEC101 specific settings.

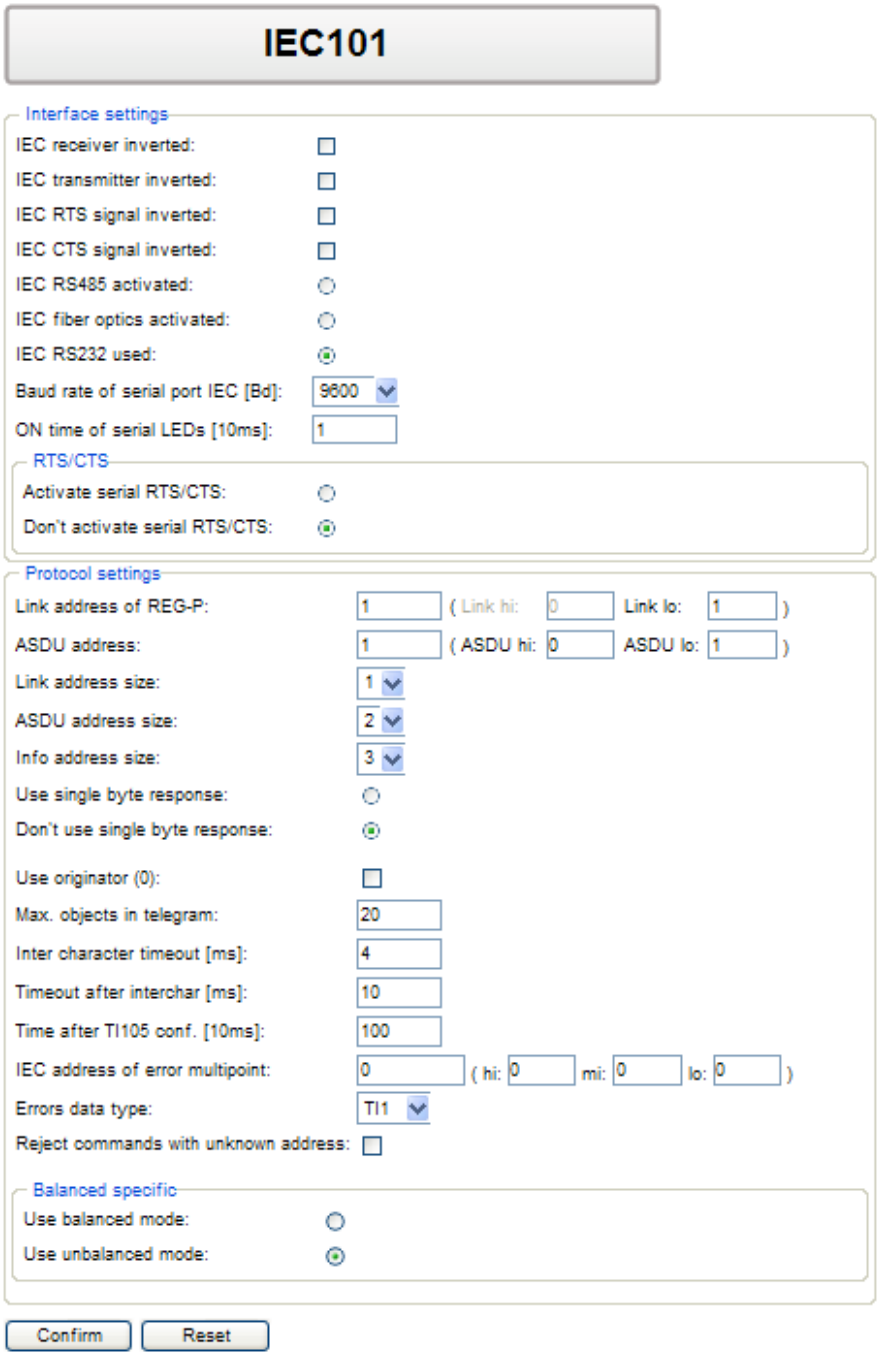


Figure 15: Settings – SCADA, IEC101 REG-P

Table 7: Settings – SCADA, IEC101 REG-P

Setting	Format	Range	Default	Description
IEC receiver inverted	-	option box	NOT selected	Inversion of RxD signal
IEC transmitter inverted	-	option box	NOT selected	Inversion of TxD signal
IEC RTS signal inverted	-	option box	NOT selected	Inversion of RTS signal
IEC CTS signal inverted	-	option box	NOT selected	Inversion of CTS signal
IEC RS485 terminator activated	-	option box	NOT selected	Activation of RS485 bus terminator.
IEC RS485 activated	-	option box	NOT selected	Activation of RS485 interface option. This option is not functional in the case for REG-P telecontrol boards with jumpers.
IEC fiber optics activated	-	option box	NOT selected	Activation of fiber optics interface option. This option is not functional in the case for REG-P telecontrol boards with jumpers.
IEC RS232 used	-	option box	selected	Activation of RS232 interface option. This option is not functional in the case for REG-P telecontrol boards with jumpers.
Baud rate of IEC serial	Bd	Selection of values in combo box	9600	Baud rate of IEC101 serial port;
ON time of serial LEDs	10 ms	1 to 100	1	ON time of serial LEDs indicating activity on the IEC serial interface
Link address of REG-P	-	0 to 255 or 0 to 65535	1	Link address displayed as word or set of two bytes. The range is determined by the Link address size option.
ASDU address	-	0 to 255 or 0 to 65535	1	ASDU address displayed as word or set of two bytes. The range is determined by the ASDU address size option.
Link address size	-	Selection of values in combo box	1	Size of link address in Bytes
ASDU address size	-	Selection of values in combo box	2	Size of ASDU address in Bytes
Info address size	-	Selection of values in combo box	3	Size of information address (IOA) in Bytes
Use/Don't use single byte response	-	option box	Use	Usage of short single-byte responses.

Setting	Format	Range	Default	Description
Use single byte response for ACK/Use single byte response for NAK	-	option box	ACK	Single-byte response used for ACK/NAK
Single byte response	HEX	0 to FF	E5	Value of single byte response
Use originator (0)	-	option box	NOT selected	Usage of originator (value 0)
Max objects in telegram	-	1 to 50	20	Max. No. of data objects in telegram
Inter character timeout	ms	2 to 100	4	Timeout between two characters in telegram
Timeout after interchar	ms	0 to 255	10	Timeout after Interchar timeout expiration
Time after TK105 conf.	10 ms	0 to 65535	100	Timeout after TK105 confirmation
IEC address of error multipoint	-	0 to 16777215 or 3x 0 to 255	0	IEC address (IOA) of multipoint for errors, 0 - undefined
Errors data type	-	Selection of values in combo box	TI1	Data type for errors in IEC101 communication

Balanced mode settings:

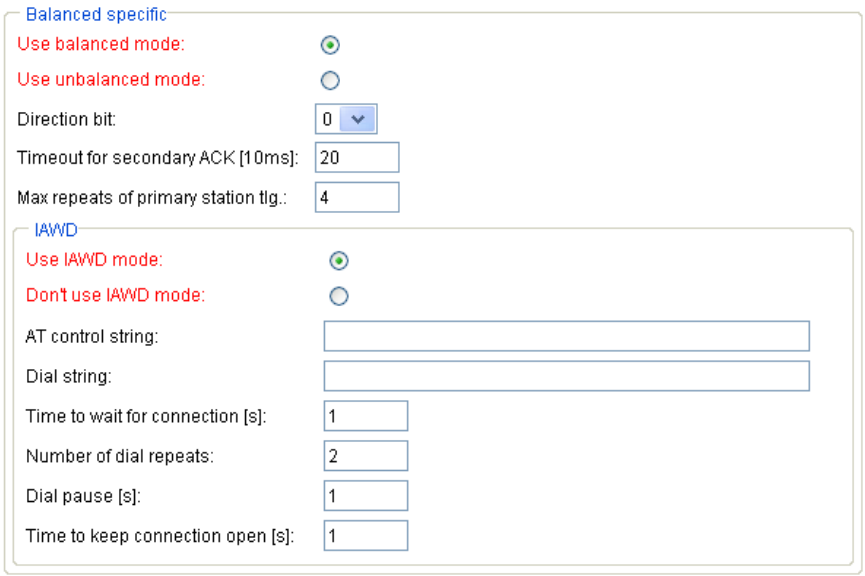


Figure 16: Balanced mode settings

Table 8: IEC101 balanced mode settings

Setting	Format	Range	Default	Description
Use balanced mode / Use un-balanced mode	-	option box	unbalanced	Selection of IEC101 mode
Direction bit	-	selection of values in combo box	0	Direction bit
Timeout for sec-ondary ACK	10 ms	1 to 255	20	Timeout for secondary ACK
Max repeats of primary station telegram.	-	1 to 255	4	Max. No. of repeats of primary station telegram
Use IAWD mode / Don't use IAWD mode	-	option box	Don't use	IAWD mode selection
AT control string	text	80 charac-ters	empty	AT control string
Dial string	text	20 charac-ters	empty	Dial string
Time to wait for connection	s	1 to 60	1	Time to wait for connection
Number of dial repeats	-	1 to 255	2	Number of dial repeats
Dial pause	s	1 to 60	1	Dial pause
Time to keep connection open	s	1 to 60	1	Time to keep connection open

11.2.2 IEC101 Settings - SCADA for REG-PE(D) telecontrol boards

IEC101 *Settings – SCADA* for REG-PE(D) boards contain IEC101 specific parameters for corresponding firmware in REG-PE(D) (TK860, TK885, TK28-4, TK28-6, TK102) telecontrol boards.

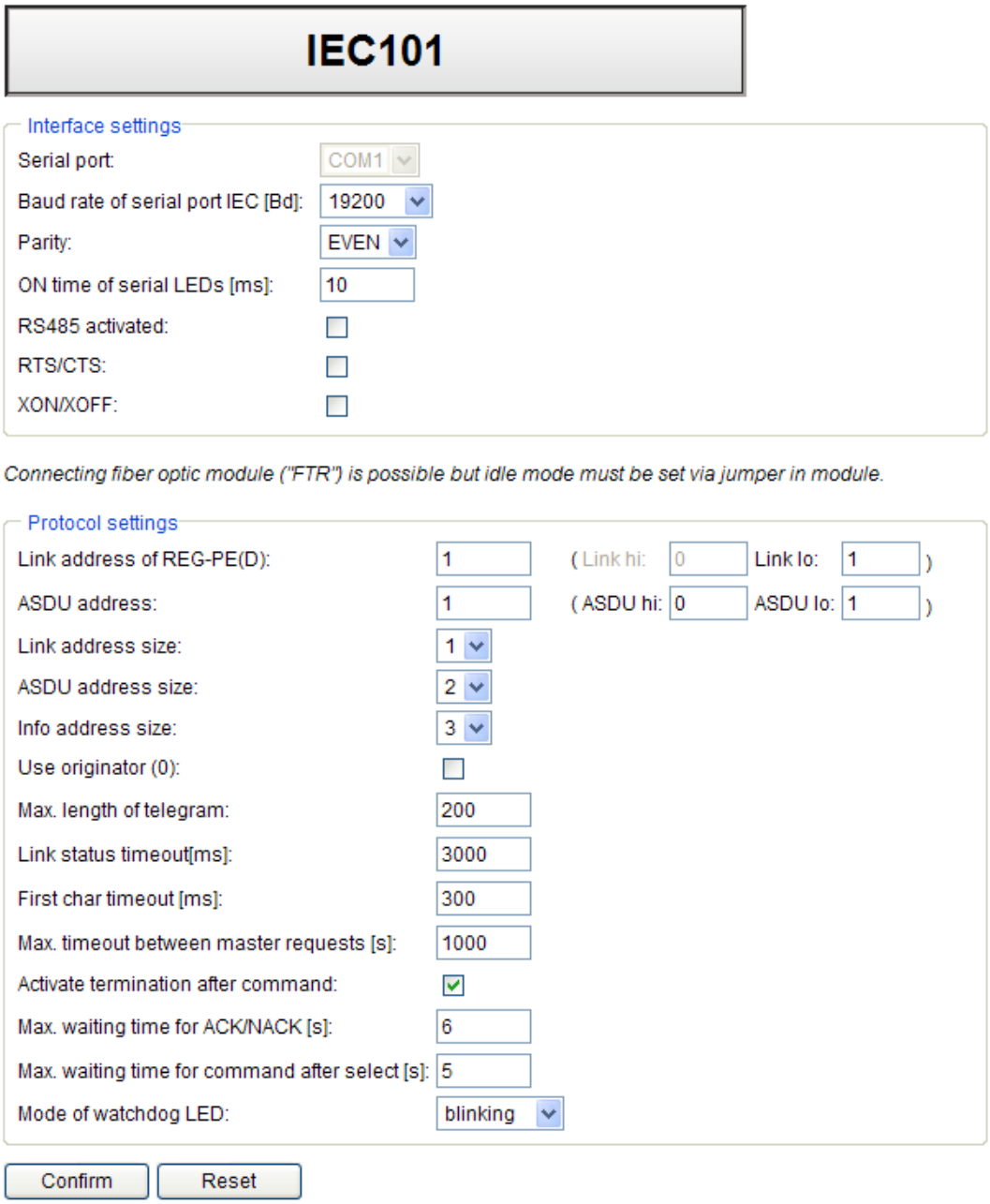


Figure 17: Settings – SCADA, IEC101 REG-PE(D)

Table 9: IEC101 REG-PE(D) Settings – SCADA, interface settings

Setting	Format	Range	Default	Description
Serial port	-	-	COM1	Selection of serial port. This option is disabled, selection is done in the *Serial port assignment* branch
Baud rate of serial port IEC	Bd	Selection of values in combo box	19200	Baud rate of serial port
Parity	-	Selection of values in combo box	EVEN	Serial port parity
ON time of serial LEDs	ms	1 to 100	10	ON time of serial LEDs
RS485 activated	-	checkbox	unchecked	Activation of RS485
RTS/CTS	-	checkbox	unchecked	Activation of RTS/CTS handshaking
XON/XOFF	-	checkbox	unchecked	Activation of XON/XOFF handshaking

Table 10: IEC101 REG-PE(D) Settings – SCADA, protocol settings

Setting	Format	Range	Default	Description
Link address of REG-PE(D)	-	1 to 254 1 to 65534	1	Link address of REG-PE(D), range is dependent on Link address size
ASDU address	-	1 to 254 1 to 65534	1	ASDU address of REG-PE(D), range is dependent on ASDU address size
Link address size	Byte	Selection of values in combo box	1	Link address size
ASDU address size	Byte	Selection of values in combo box	2	ASDU address size
Info address size	Byte	Selection of values in combo box	3	Info address size:
Use originator (0)	-	checkbox	unchecked	Usage of originator
Max. length of telegram	Byte	1 to 255	200	Maximum length of telegram
Link status timeout	ms	2 to 1000		Link status timeout
First char timeout	ms	0 to 65535	300	First char timeout
Max. timeout between master requests	s	0 to 255		Max. timeout between master requests
Activate termination after	-	checkbox	unchecked	Activate termination after command

Setting	Format	Range	Default	Description
command				
Max. waiting time for ACK/NACK	s	0 to 255	6	Maximum waiting time for ACK/NACK
Max. waiting time for command after select	s	0 to 255	5	Maximum waiting time for command after select
Mode of watchdog LED	-	Selection of values in combo box	blinking	Mode of watchdog LED

11.2.3 IEC101 Settings - SCADA for boards type TK28-4

IEC101 settings – SCADA for the above stated boards contain more options for serial port settings in RS485 mode. The newer versions of the boards allow usage of open-drain or push-pull modes of the RS485 interface. However, the concrete board version information is available after the board detection. A user can also the see corresponding hint when the board is detected. The value of open-drain and push-pull radio button has no influence in the case of older board versions.

The open-drain and push-pull radio buttons are also present in another serial protocols as this option is not protocol-related.

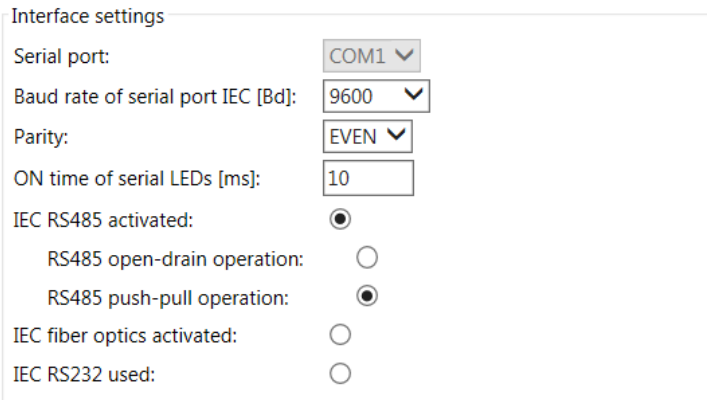


Figure 18: Example of RS485 radio buttons

11.2.4 ComServer settings

ComServer settings form part of the IEC settings in WinConfig for TK400 and TK8xx. ComServer is included in the protocol conversion firmware in the case of serial protocols with the exception of DNP for the purpose of remote management of telecontrol board configuration.

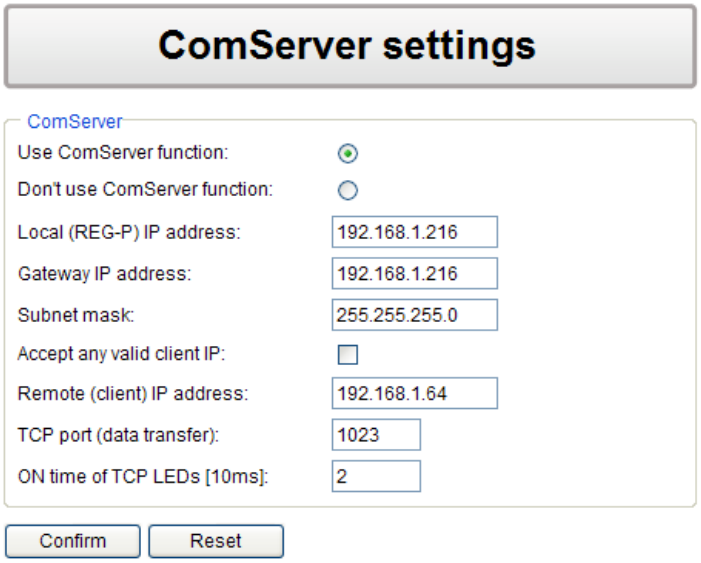


Figure 19: TK400 ComServer settings

Table 11: TK400 COM-Server settings

Setting	Format	Range	Default	Description
Use ComServer function / Don't use ComServer function	-	option box	Don't use	Selection of COM-Server function
Local IP address	-	4x 0 to 255	0.0.0.0	COM-Server IP address
Accept any valid client IP	-	option box	selected	Selection whether COM-Server should accept any valid IP for connection
Remote IP address	-	4x 0 to 255	0.0.0.0	Accepted IP address for connection
Gateway IP address	-	4x 0 to 255	0.0.0.0	IP address of default gateway.
Subnet mask	-	4x 0 to 255	0.0.0.0	Subnet mask
TCP port	-	0 to 65535	1023	COM-Server TCP port. Changing of these settings is not recommended.
ON time of TCP LEDs	ms	1 to 60	2	ON time of TCP LEDs

COM-Server for REG-P (TK400) telecontrol board is necessary for all remote operations in WinConfig, i.e. all remote data transfers, detections on LAN, remote comparison of settings with connected board etc. If COM-Server is switched off, only local (manual) operations of WinConfig can be used.

11.2.5 ComServer settings, IEC101 for REG-PE(D)

For parameters of ComServer function in IEC101 for REG-PE(D) see the *IEC103 for REG-PE(D)* chapter in this manual.

11.2.6 Supervisory settings, IEC101 for REG-PE(D)

For parameters of Supervisory settings in IEC101 for REG-PE(D) see the *IEC103 for REG-PE(D)* chapter in this manual.

11.3 Linked devices

The *Linked Devices* tree branch shows survey of all 8 devices that can be used in settings created by WinConfig. Only the devices checked as *Enabled* are described in the following tree branches. To add new device to the topical settings check the corresponding *Enabled* option box. Identifier of the enabled device can be consequently changed in the corresponding *Device x* tree branch.

Devices

Device	Enabled	Identifier of the device	Poll type
1	☑	A:	RPS
2	☐	B:	RPS
3	☐	C:	RPS
4	☐	D:	RPS
5	☐	E:	RPS
6	☐	F:	RPS
7	☐	G:	RPS
8	☐	H:	RPS

Confirm Reset

Figure 20: Linked Devices

11.3.1 Time synchronization

Settings tree branch for time synchronization settings.

Time synchronization

Synchronize direct connected device: ☑

Synchronize all devices connected to ELAN: ☑

Confirm Reset

Figure 21: Time synchronization settings

For parameters of Time synchronization in IEC101 for REG-PE(D) see the *IEC103 for REG-PE(D)* chapter in this manual.

11.3.2 Internal communication

The *Internal Communication settings* tree branch describes settings of communication settings for communication between telecontrol board and a.eberle device.

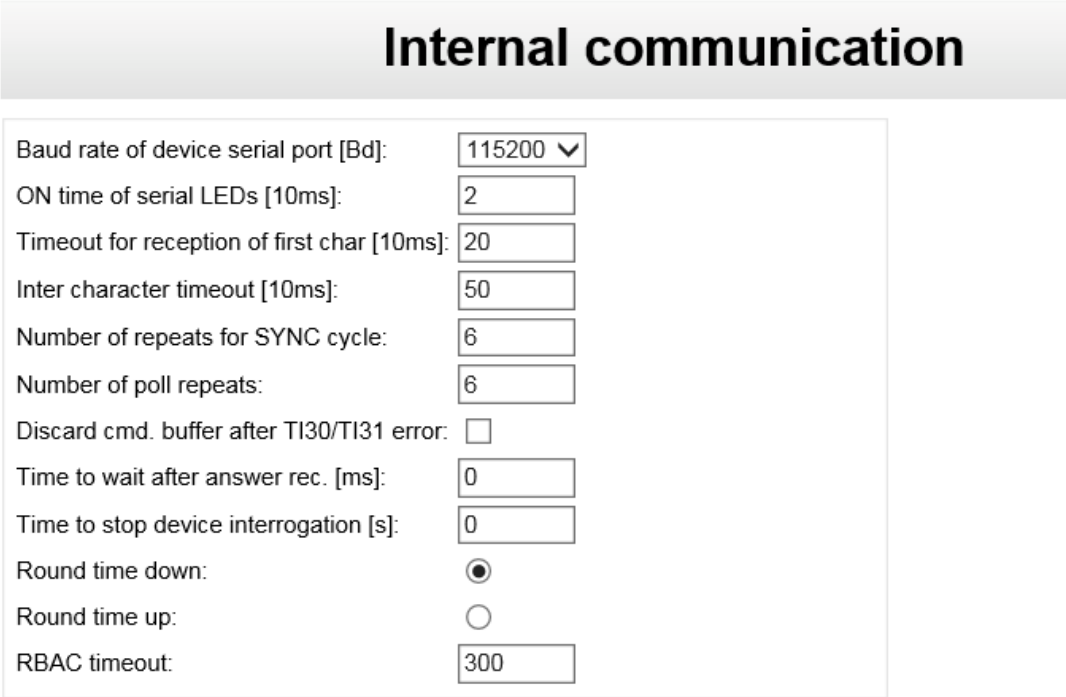


Figure 22: Internal communication, IEC101 for REG-P

Table 12: Internal communication

Setting	Format	Range	Default	Description
Baud rate of device serial	Bd	selection of values in combo box	115200	Baud rate of serial communication with device
ON time of serial LEDs	10 ms	1 to 100	1	ON time of serial LEDs
Timeout for reception of first char	10 ms	1 to 255	50	Timeout for reception of first character
Inter character timeout	10 ms	1 to 255	20	Timeout between two characters in telegram
Number of repeats for SYNC cycle	-	1 to 255	5	Number of repeats for SYNC cycle
Number of command repeats	-	1 to 255	2	Number of command (poll) repeats
TX blocking	ms	0 to 255	30	Time to wait when answer was received
Timeout for analog cyclic sending	100 ms	0 to 650	0	Timeout for analog (measurements) cyclic sending (0 = disable)
Time to stop REG-D/A. interrogation	s	0 to 650	0	Time to stop regulator interrogation after IEC

Setting	Format	Range	Default	Description
				communication break
Round time down / Round time up	-	Option box	Round down	Rounding time selection
RBAC	s	30 to 600	300	Definition of RBAC timeout for RegSys firmware supporting user roles and rights and tele-control bards TK8xx and TK102

For parameters of Internal communication in IEC101 for REG-PE(D) see the *IEC103 for REG-PE(D)* chapter in this manual.

11.3.3 Converter Errors

The *Converter Errors* table describes settings of error indications generated by telecontrol board. Meaning of individual error bits is described in the table. Multipoint bit comprises all defined bits in the table. The data type of errors in the IEC protocol is defined in IEC101 settings, see chapter 11.2.1.

The *Converter Errors* and *error multipoint* are defined for boards type TK400 and its replacement type TK28-4.

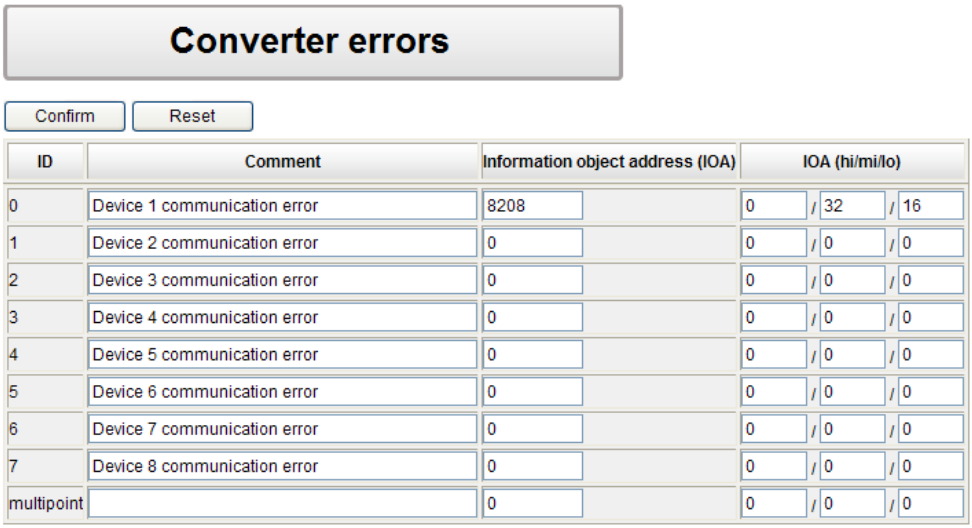


Figure 23: Converter errors

11.4 Device x

11.4.1 Device request settings

Device request settings tree branch describes communication settings of individual devices connected to telecontrol board.

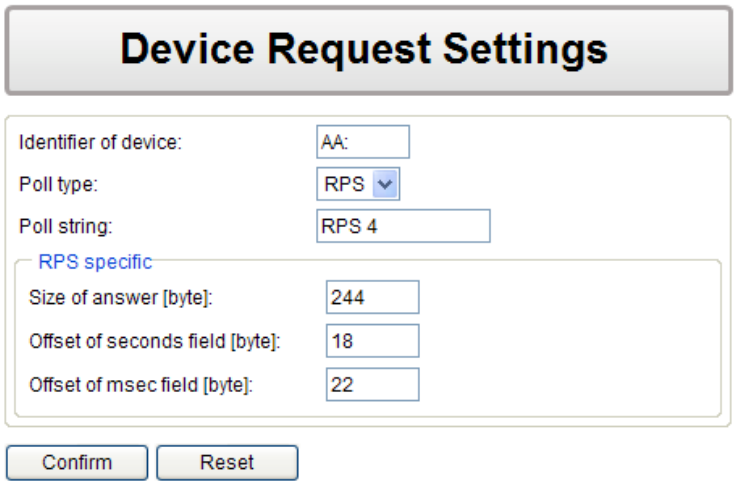


Figure 24: Device request settings

Table 13: IEC101 device settings

Setting	Format	Range	Default	Description
Identifier of device	text	AA: or A(1 to 9): to Z(1 to 4):	AA:	Identifier of device as appears in the device communication
Poll type	-	selection of values in combo box	RPS	Device poll type
Poll string	text	23 chars	RPS 4	Device poll string
RPS specific: Size of answer	byte	1 to 255	244	Size of answer
RPS specific: Offset of seconds field	byte	0 to 255	18	Offset of seconds field
RPS specific: Offset of msec field	byte	0 to 255	22	Offset of msec field

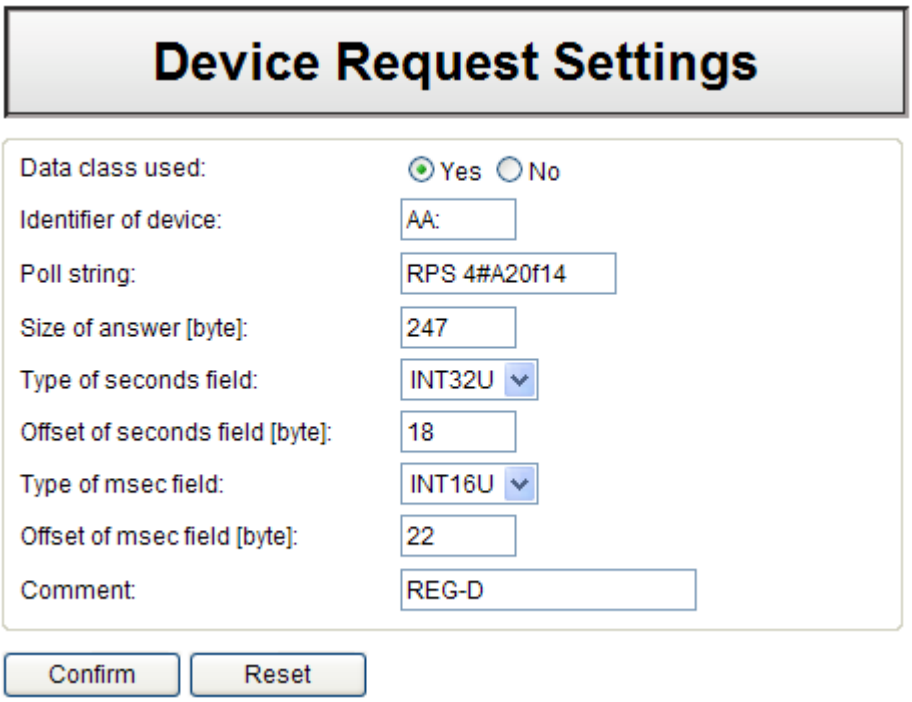


Figure 25: IEC101 device request settings for REG-PE(D)

Table 14: IEC101 device settings for REG-PE(D)

Setting	Format	Range	Default	Description
Data class used	-	Option boxes	Yes	Usage of Data class
Identifier of device	-	3 characters	AA:	Identifier of device
Poll string	-	24 characters	RPS 4#A20f14	Poll string
Size of answer	byte	1 to 294	247	Size of answer:
Type of seconds field	-	Selection of values in combo box	INT32U	Type of seconds field
Offset of seconds field	byte	0 to 255	18	Offset of seconds field
Type of msec field	-	Selection of values in combo box	INT16U	Type of seconds field
Offset of msec field	byte	0 to 255	22	Offset of msec field
Comment	-	23 characters	REG-D	Comment

11.4.2 Indications

Indications tree branch describes indications of individual device. Rules for work with those settings are the same as for work with commands.

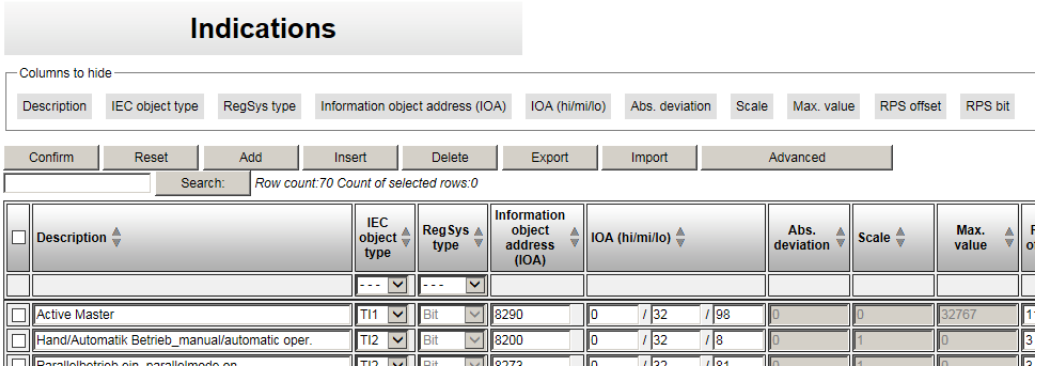


Figure 26: Indications

The RegSys type is disabled by default. To edit RegSys type use the *Advanced* button to enable corresponding column. The same rule is valid for all protocols using RegSys type as parameter of indications.

Table 15: IEC101 indications

Setting	Format	Range	Default	Description
IEC object type	-	selection of values in combo box	TI1	Indication type in IEC communication
REG data type	-	selection of values in combo box	Bit	Indication type in device communication
Information object address (IOA) (IOA (hi/mi/lo))	-	0 to 16777215 or 3x 0 to 255	0	IEC address (IOA) of indication
Abs. deviation	float		0	Absolute deviation value
Scale	float		0	Scale value
Max. value	-	0 to 65535	32767	Max. value
RPS offset	-	0 to 255	0	RPS offset
RPS bit	-	selection of values in combo box	0	RPS bit
P1 data type (P1 method)	-	selection of values in combo box	IEEE type	P1 data type
P1 index (P1 method)	-	3 to 255	3	P1 index
Table (P1 method)	-	selection of values in combo box	0	Table No. if 32 bit data type is used
Bit (P1 method)	-	selection of values in combo box	0	Bit No. if 32 bit data type is used
Description	text	50 chars	empty	Description

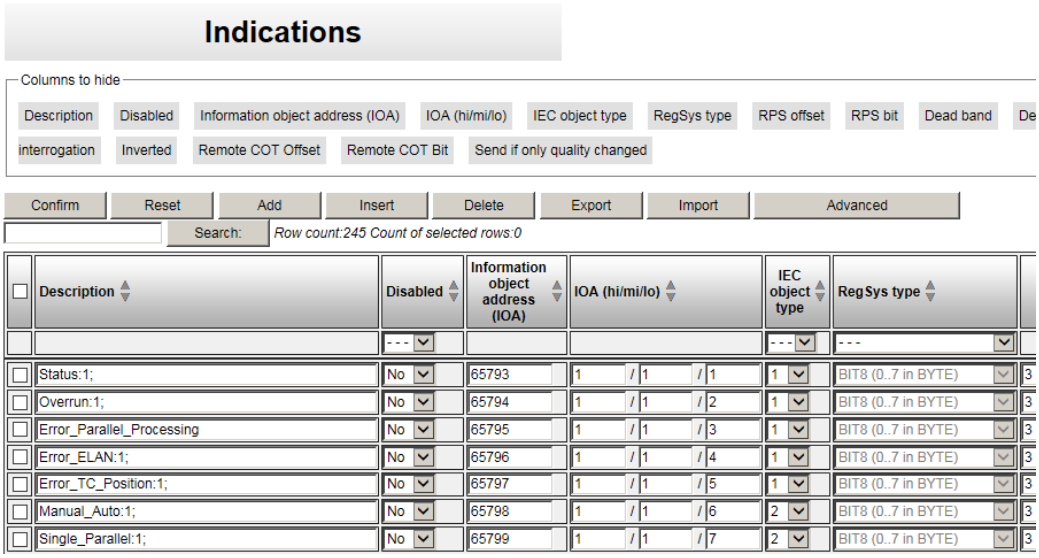


Figure 27: IEC101 Indications for REG-PE(D)

Table 16: IEC101 indications

Setting	Format	Range	Default	Description
Description	text	50 chars	empty	Description
Disabled	-	selection of values in combo box	No	Option to disable the data point
Information object address (IOA) (IOA (hi/mi/lo))	-	0 to 16777215 or 3x 0 to 255	0	IEC address (IOA) of indication
IEC object type	-	selection of values in combo box	TI1	Indication type in IEC communication
RegSys type	-	selection of values in combo box	Bit8	Indication type in device communication
RPS offset	-	0 to 65535	0	RPS offset
RPS bit	-	0 to 31	0	RPS bit
Dead band	-	float	0	Dead band
Dead band absolute number	-	selection of values in combo box	No	Selection of Dead band format: absolute number or value in per cent
Max. range	-	float	0	Maximum range
Resolution	-	float	0	Resolution
Initial value transmision	-	selection of values in combo box	No	Initial value transmision
Use in GI	-	selection of values in combo box	Yes	Use in GI
Group interrogation	-	0 to 16	0	Group number for group interrogation
Inverted	-	selection of values in combo box	No	Inverted
Offset connected with remote COT	-	0 to 512	0	Offset connected with remote COT
Remote COT bits of remote offset	-	0 to 7	0	Remote COT bits of remote offset
Send group change	-	selection of values in combo box	No	Send group change

11.4.3 Commands

Table of settings of individual commands represents command settings. This table is common for all a.eberle devices connected to the telecontrol board.

The upper line contains execution buttons for work with the individual command lines and for export/import of the entire table of commands.

Selected line in the table is marked by yellow background. All changes have to be confirmed by *Confirm* button.

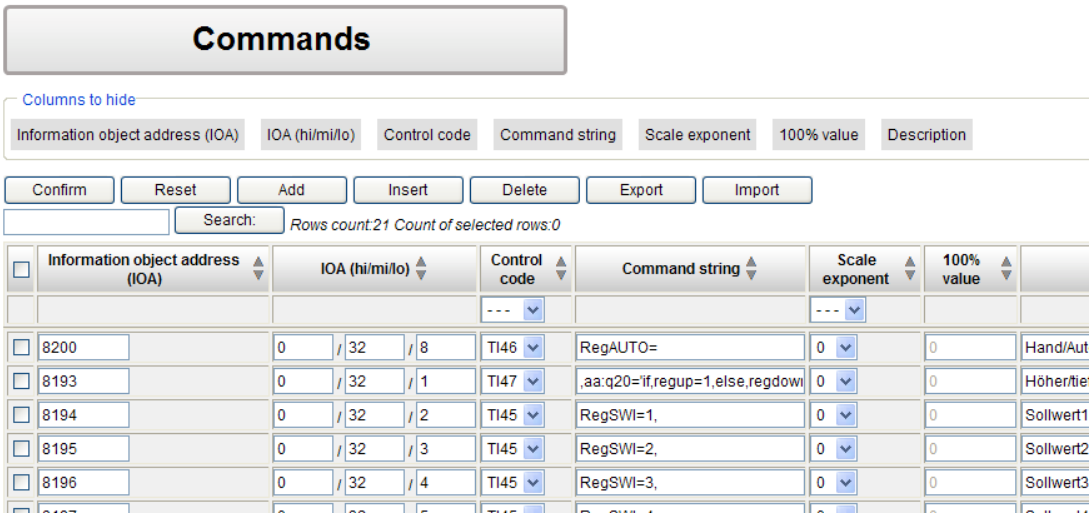


Figure 28: IEC101 Commands

Table 17: IEC101 Commands

Setting	Format	Range	Default	Description
IOA (IOA (hi/mi/lo))	-	0 to 16777215 or 3x 0 to 255	0	Information object address, identification of information in IEC telegram
Control code	-	selection of values in combo box	TI45	Information object type (control code)
Command string	text	50 chars	empty	Command string
Scale exponent	-	selection of values in combo box	0	Scale exponent
100% value	decimal	0 to 65535	0	100% value available for TI48 only
Description	text	48 chars	empty	User description

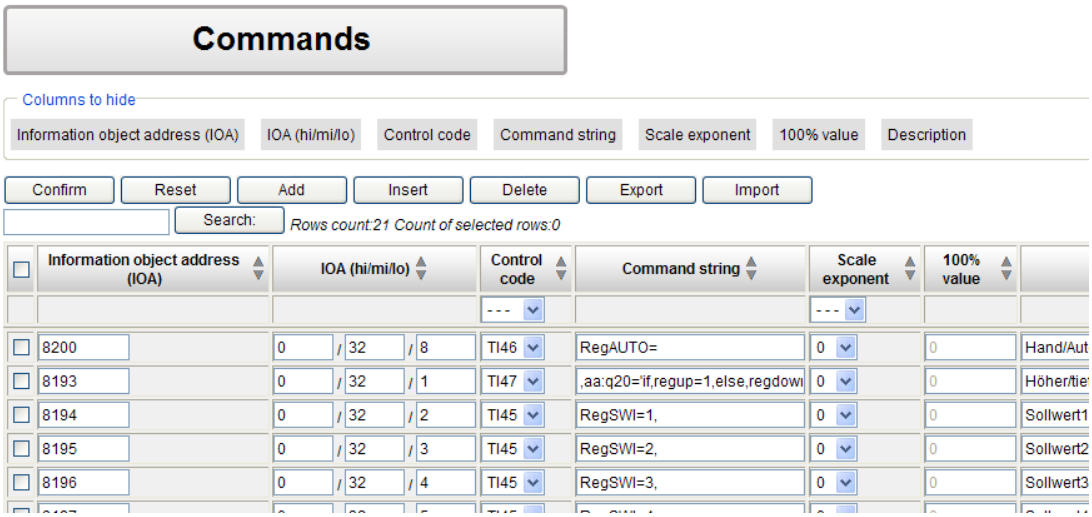


Figure 29: IEC101 Commands

Table 18: IEC101 Commands

Setting	Format	Range	Default	Description
IOA (IOA (hi/mi/lo))	-	0 to 16777215 or 3x 0 to 255	0	Information object address, identification of information in IEC telegram
Control code	-	selection of values in combo box	TI45	Information object type (control code)
Command string	text	50 chars	empty	Command string
Scale exponent	-	selection of values in combo box	0	Scale exponent
100% value	decimal	0 to 65535	0	100% value available for TI48 only
Description	text	48 chars	empty	User description

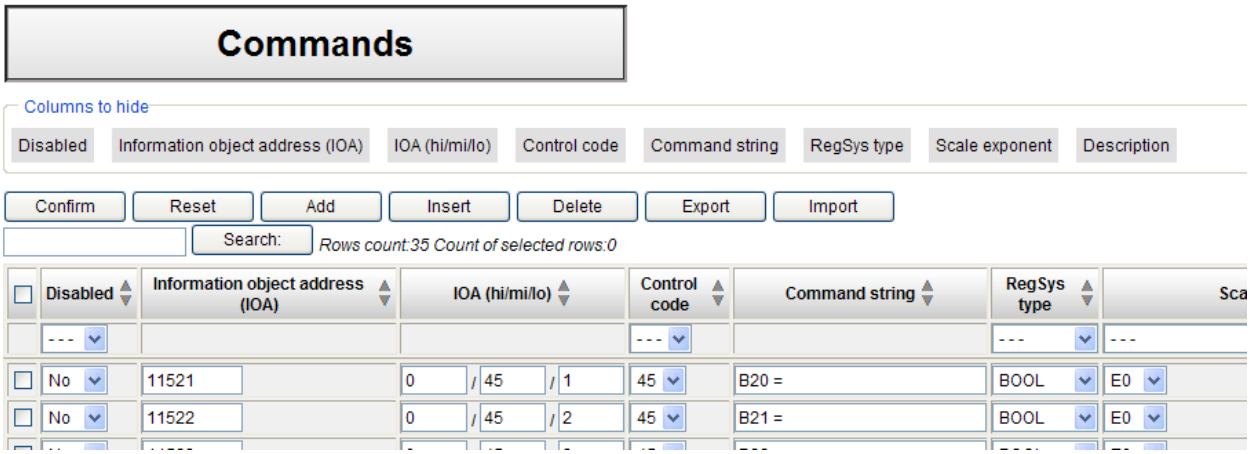


Figure 30: IEC101 Commands REG-PE(D)

Table 19: IEC101 Commands REG-PE(D)

Setting	Format	Range	Default	Description
Disabled	-	selection of values in combo box	No	Option to disable the command
IOA (IOA (hi/mi/lo))	-	0 to 16777215 or 3x 0 to 255	0	Information object address, identification of information in IEC telegram
Control code	-	selection of values in combo box	TI45	Information object type (control code)
Command string	text	50 chars	empty	Command string
RegSys type	-	selection of values in combo box	BOOL	RegSys type of command
Scale exponent	-	selection of values in combo box	0	Scale exponent
100% value	decimal	0 to 65535	0	100% value available for TI48 only
Description	text	48 chars	empty	User description

11.4.4 Editing the IOA in columns

In Order to change the IOA high, middle or low byte in the entire column in the indications or commands table click the right mouse button in the IOA hi/mi/lo table textbox. The following option table will appear on the screen:

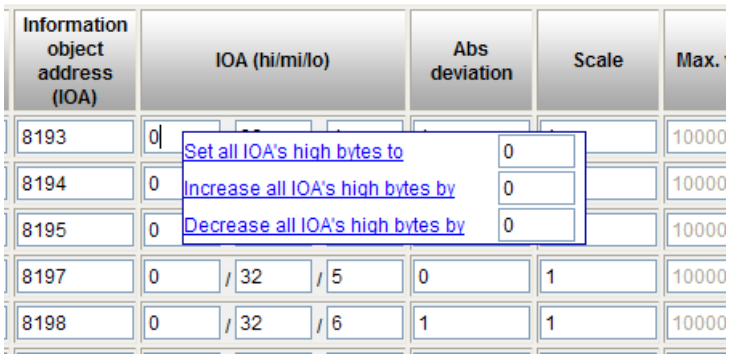


Figure 31: Editing the IOA bytes in entire columns

To set the corresponding bytes to the desired value use the first option.

To increase corresponding bytes by the desired value use the second option.

To decrease corresponding bytes by the desired value use the third option.

If the increased or decreased value of any of the table rows exceeds the valid range, the function will be aborted and a warning message will appear on the screen.

11.4.5 Status

Status bits describe bit indication generated by a.eberle device. Bits are arranged in the 32-bit table with predefined meaning of individual lines. Entire table is user-editable. Status bits are available for P1 poll type only.

Status

Confirm Reset

ID	Comment	IOA	IOA (hi/mi/lo)
0	Selbsttest-Fehler	0	0 / 0 / 0
1	ROM-Fehler	0	0 / 0 / 0
2	RAM-Fehler	0	0 / 0 / 0
3	EEPROM-A-Fehler	0	0 / 0 / 0
4	EEPROM-B-Fehler	0	0 / 0 / 0
5	Anwender-Fehler-A	0	0 / 0 / 0
6		0	0 / 0 / 0
7	Interner Batterie-Fehler	0	0 / 0 / 0
8		0	0 / 0 / 0
9		0	0 / 0 / 0
10	Uv Ausfall	0	0 / 0 / 0
11		0	0 / 0 / 0
12		0	0 / 0 / 0
13	COM1 Kommunikations-Fehler	0	0 / 0 / 0
14	COM2 Kommunikations-Fehler	0	0 / 0 / 0
15	COM3 Kommunikations-Fehler	0	0 / 0 / 0
16	LAN Kommunikations-Fehler	0	0 / 0 / 0
17		0	0 / 0 / 0
18		0	0 / 0 / 0
19		0	0 / 0 / 0
20	LAN/L Fehler	0	0 / 0 / 0
21	LAN/R Fehler	0	0 / 0 / 0
22	LON Fehler	0	0 / 0 / 0
23		0	0 / 0 / 0
24		0	0 / 0 / 0
25		0	0 / 0 / 0
26		0	0 / 0 / 0
27		0	0 / 0 / 0
28	Batterie fast verbraucht	0	0 / 0 / 0
29		0	0 / 0 / 0
30		0	0 / 0 / 0
31		0	0 / 0 / 0
multipoint		0	0 / 0 / 0

Figure 32: Status bits

Table 20: Meaning of Status bits

ID	German text	English translation
0	Selbsttest-Fehler	Autotest error
1	ROM-Fehler	ROM error
2	RAM-Fehler	RAM error
3	EEPROM-A-Fehler	EEPROM-A error
4	EEPROM-B-Fehler	EEPROM-AB error
5	Anwender-Fehler-A	User error A
7	InternerBatterie-Fehler	Internal battery error
10	UV Ausfall	UV outage
13	COM1 Kommunikations-Fehler	COM1 communication error
14	COM2 Kommunikations-Fehler	COM2 communication error
15	COM3 Kommunikations-Fehler	COM3 communication error
16	LAN Kommunikations-Fehler	LAN communication error
20	LAN/L Fehler	LAN/L error
21	LAN/R Fehler	LAN/R error
22	LON Fehler	LON error
28	Batterie fast verbraucht	Low battery

12. Settings – SCADA for IEC103 (REG-P)

IEC103 settings for REG-P telecontrol boards (TK509, TK517, and TK400) are different from settings for REG-PE(D) telecontrol boards (TK860, TK885). This chapter describes IEC103 settings for REG-P in the WinConfig pages, where these settings are different from IEC101.

See chapter 13 for description of IEC103 for REG-PE(D) telecontrol boards.

12.1 Advanced

12.1.1 Settings – SCADA

Settings – SCADA tree branch contains IEC103 specific settings.

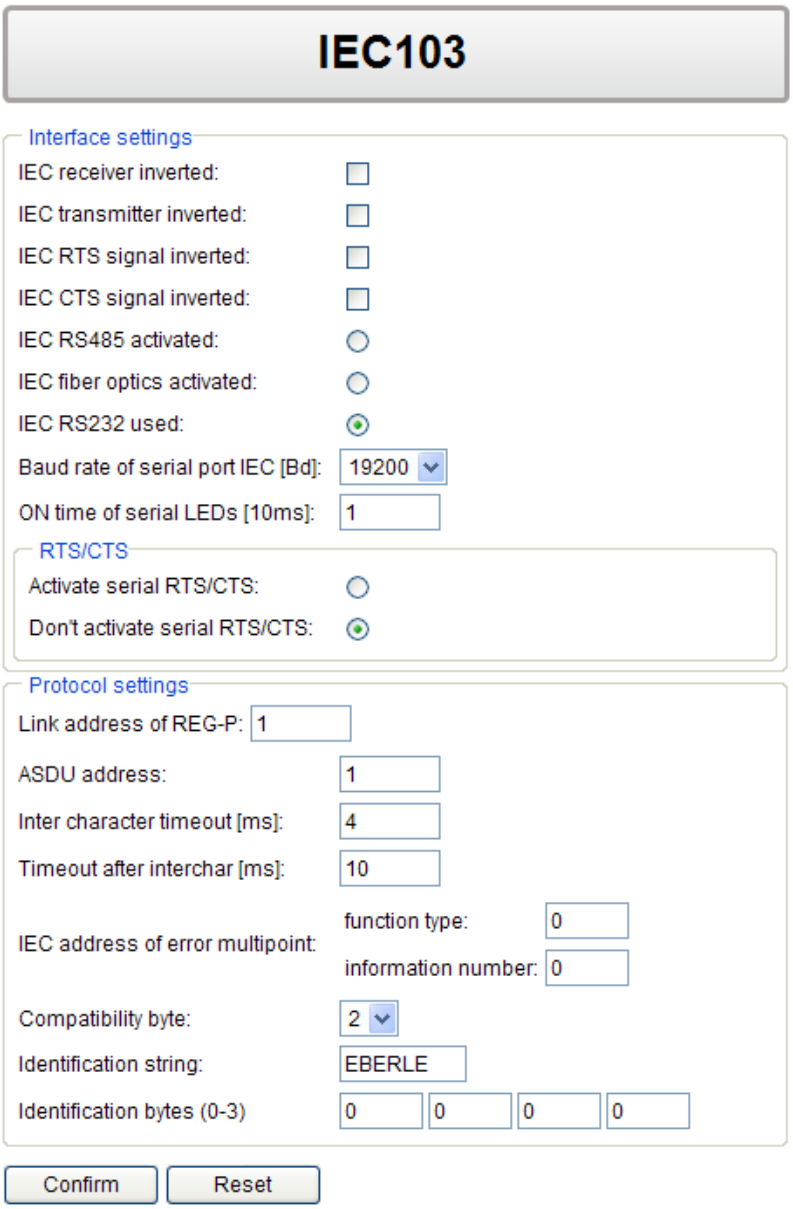


Figure 33: IEC103 specific settings

Table 21: IEC103 settings

Setting	Format	Range	Default	Description
Baud rate of IEC serial	Bd	selection of values in combo box	19200	Baud rate of IEC103 serial port;
ON time of serial LEDs	10 ms	1 to 255	1	ON time of serial LEDs indicating activity on the IEC serial interface
Link address of REG-P	-	1 to 254	1	Link address of REG-P
ASDU address	-	1 to 254	1	ASDU address
Inter character timeout	ms	2 to 100	4	Timeout between two characters in telegram
Timeout after interchar	ms	0 to 255	10	Timeout after interchar timeout expiration
IEC address of error multipoint (function type, information number)	-	0 to 65535 (0 to 255)	0	IEC address (IOA) of multipoint for errors, 0 - undefined
Compatibility byte	-	selection of values in combo box	2	Compatibility byte
Identification string	text	8 chars	empty	Identification string
Identification bytes	-	0 to 255	0	Identification bytes
Activate serial RTS/CTS / Don't activate serial RTS/CTS	-	option box	NOT activated	Activation of RTS/CTS handshaking in the IEC communication (e.g. for driving the modem carrier)
RTS leading time	ms	1 to 255	1	Overlapping of RTS signal before the telegram
RTS trailing time	ms	1 to 255	1	Overlapping of RTS signal after the telegram

12.2 Devices

12.2.1 Converter Errors

Only one device error is available as IEC103 conversion firmware can manage only one a.eberle device at a time.

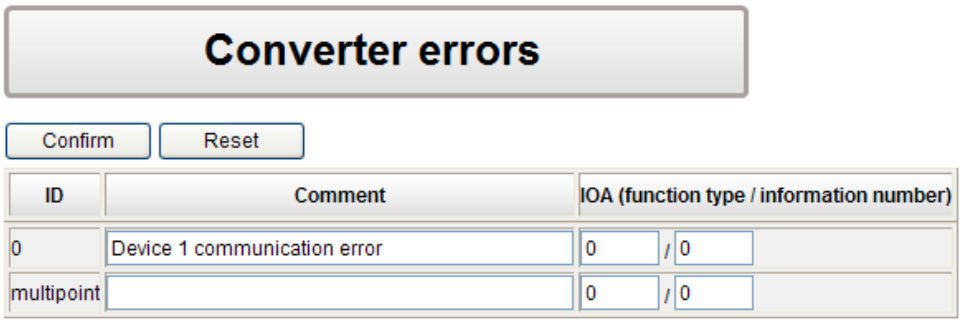


Figure 34: IEC103 converter errors

12.3 Device x

12.3.1 Device request settings

This tree branch contains IEC103 specific device settings.

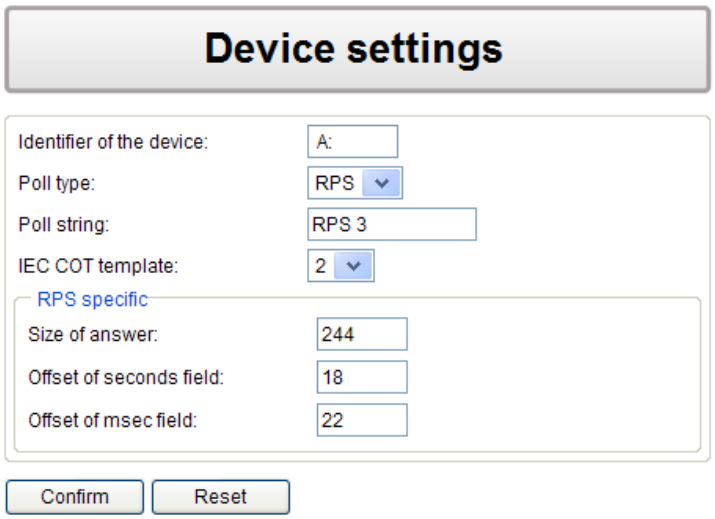


Figure 35: IEC103 device request settings

Table 22: IEC103 device settings

Setting	Format	Range	Default	Description
Identifier of device	text	AA: or A(1 to 9): to Z(1 to 4):	AA:	Identifier of device as appears in the device communication
Poll type	-	selection of values in combo box	RPS	Device poll type
Poll string	text	23 chars	RPS 3	Device poll string
RPS specific: Size of answer	byte	1 to 255	244	Size of answer
RPS specific: Offset of seconds field	byte	0 to 255	18	Offset of seconds field
RPS specific: Offset of msec field	byte	0 to 255	22	Offset of msec field

13. IEC103 settings (REG-PE(D))

Here you are able to set the settings related to IEC60870-5-103.

IEC60870-5-103 protocol is a multipoint protocol. This means that one Master can communicate with multiple Slaves on the same communication line. Due to this a given slave must have a unique ID to which it responds - a device Link address. A slave's device address shall be unique on a given communication network - duplicate addresses lead to bus collision. Device addresses must lie in the range 1 to 254. For broadcast “Send/no reply”-service must be used by master and the Link address field is defined as 255.

One “Frame” contains not more than one Application Service Data Unit (ASDU).

13.1 Common

13.1.1 IEC 60870-5-103-Conformity

The size, contents and values of information fields of ASDU (Application Service Data Unit) are set and used according to IEC 60870-5-4/-103.

13.1.2 Supported Type Identifications

The following types are supported:

0 Information in monitor direction

Type	PQISYS, REGSYS Devices	EORSYS Devices
<1>:= time-tagged message	✓	✓
<4>:= time-tagged measurements with relative time	✓	✓
<5>:= identification	✓	✓
<6>:= time synchronization	✓	✓
<8>:= general interrogation termination	✓	✓
<9>:= measurements II	✓	✓
<23>:= list of recorded disturbances	×	✓
<26>:= ready for transmission of disturbance data	×	✓
<27>:= ready for transmission of a channel	×	✓
<28>:= ready for transmission of tags	×	✓
<29>:= transmission of tags	×	✓
<30>:= transmission of disturbance values	×	✓
<31>:= end of transmission	×	✓

0 Information in control direction

Type	PQISYS, REGSYS Devices	EORSYS Devices
<7>:= general interrogation	✓	✓
<6>:= time synchronization	✓	✓
<20>:= general command	✓	✓
<24>:= order for disturbance data transmission	✓	✓
<25>:= acknowledgement for disturbance data transmission	×	✓

13.1.3 Supported Cause of Transmission

0 Information in monitor direction

- <1>:= spontaneous
- <2>:= cyclic
- <3>:= reset frame count bit (FCB)
- <4>:= reset communication unit (CU)
- <5>:= start / restart
- <6>:= power on
- <7>:= test mode
- <8>:= time synchronization
- <9>:= general interrogation
- <10>:= termination of general interrogation
- <11>:= local operation
- <12>:= remote operation
- <20>:= positive acknowledgement of command
- <21>:= negative acknowledgement of command
- <31>:= transmission of disturbance data

0 Information in control direction

- <8>:= time synchronization
- <9>:= initiation of general interrogation
- <20>:= general command
- <31>:= transmission of disturbance data

13.1.4 Topical channel (ACC)

The value from 1 up to 255 are supported

13.1.5 Fault Number (FAN)

FAN values are ranged from 0 up to 9999. If FAN amounts to 9999, the application sets next FAN to zero.

13.1.6 Interval between information elements (INT)

It defines the interval for acquisition of the single information elements is the same for all disturbance data. It is listed in microseconds.

Its values can be set in general IEC settings as “Interval for acquisition in TI26 [microsecond]:”

13.1.7 Compatibility level (COL)

The compatibility level of protection equipment based on the “Compatibility byte” setting. See figure below. It defined according to on this companion standard and preset to 1.

13.1.8 Number of channels (NOC)

The value is set to 8 and is constant for EOR-D

13.1.9 Number of information elements of a channel (NOE)

All channels contain the same number of information elements. This number is transmitted in ASDU 26 ‘ready for transmission of disturbance data’ and set to 2048 for EOR-D by default. This setting can be changed in IEC-settings pane.

13.1.10 Number of tags (NOT)

The transmission of tag not supported. NOT is preset to 0 as constant.

13.1.11 Number of relevant disturbance values per ASDU (NDV)

NDV equals 25 for all disturbance channels.

13.1.12 Return information identifier (RII)

RII is not processed in REG-PE(D) and returned to control center according to IEC-60870-5-103 7.2.6

13.1.13 Scan number (SCN)

It is used as return identifier in general interrogation responses.

13.1.14 Supplementary information (SIN)

It can be used as follows:

0 By general interrogation as a number of GI request

- By positive or negative acknowledgement of command as RII

13.1.15 Status of fault (SOF)

SOF indicates whether the EOR-D has tripped during the fault (bit one), whether the disturbance data are currently being transmitted (bit two).

Bit 3 (Test) equals 0 and defines “disturbance data recorded during normal operation”.

13.1.16 Tag position (TAP)

It set to 0 as constant.

13.1.17 Type of order (TOO)

REG-PE(D) supports the following types:

- <1> := selection of fault
- <2> := request for disturbance data
- <3> := abortion of disturbance data
- <8> := request for channel
- <9> := abortion of channel
- <16> := request for tags
- <17> := abortion of tags
- <24> := request for list of recorded disturbances
- <32> := end of disturbance data transmission without abortion
- <33> := end of disturbance data transmission with abortion by control system
- <34> := end of disturbance data transmission with abortion by the protection equipment
- <35> := end of channel transmission without abortion
- <36> := end of channel transmission with abortion by control system
- <37> := end of channel transmission with abortion by the protection equipment
- <38> := end of tag transmission without abortion
- <39> := end of tag transmission with abortion by control system
- <40> := end of tag transmission with abortion by the protection equipment
- <64> := disturbance data transmitted successfully (positive)
- <65> := disturbance data transmitted not successfully (negative)

- <66> := channel transmitted successfully (positive)
- <67> := channel transmitted not successfully (negative)
- <68> := tags transmitted successfully (positive)
- <69> := tags transmitted not successfully (negative)

13.1.18 Type of disturbance values (TOV)

It is not used and set to 1. The value is irrelevant.

13.1.19 Binary time

CP32Time2a and CP56Time2a are supported according to IEC 60870-5-4

13.2 Basic settings

The Basic page contains basic settings for IEC103 protocol:

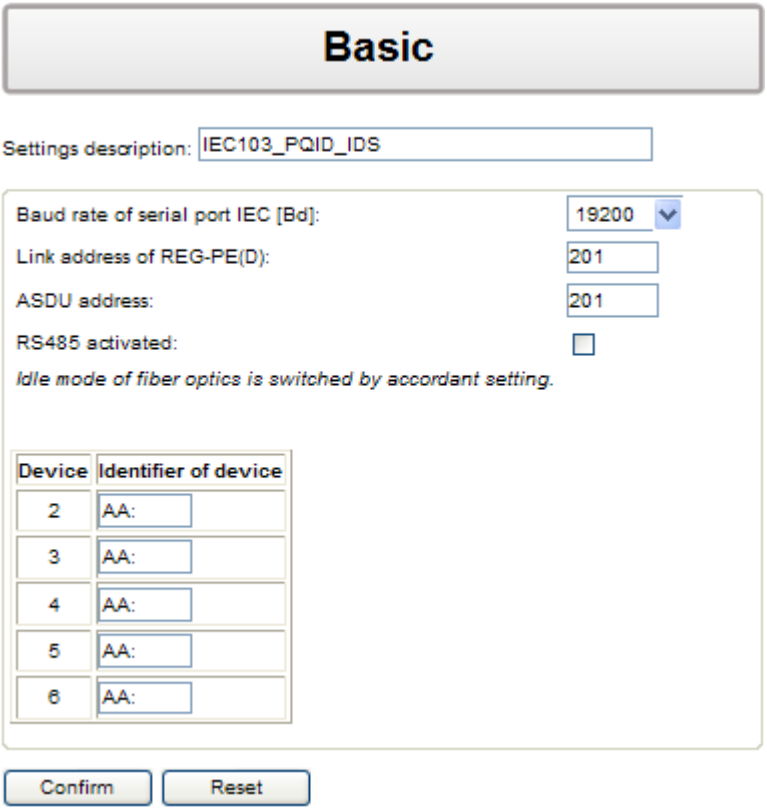


Figure 36: IEC103 basic settings REG-PE(D)

Table 23: IEC103 basic settings REG-PE(D)

Setting	Format	Range	Default	Description
Settings description	text	50 characters		Short user description of settings file. WinConfig uses text stored in the template file if settings are created from template.
Baud rate of IEC serial	Bd	Selection of values in combo box	38400	Baud rate of IEC103 serial port;
Link address of REG-P	-	1 to 254		Link address in the given range.
ASDU address	-	1 to 254		ASDU address in the given range.
RS485 activated	-	option box	NOT selected	Activation of RS485 interface.
Identifier of device	text	AA: or A(1 to 9): to Z(1 to 4):	strings defined in the Devices tree branch	Device identifier string as appears in the device protocol

Default values always depend on values entered in the corresponding template.

13.3 Advanced settings

13.3.1 IEC103 Settings – SCADA for PQI-D device

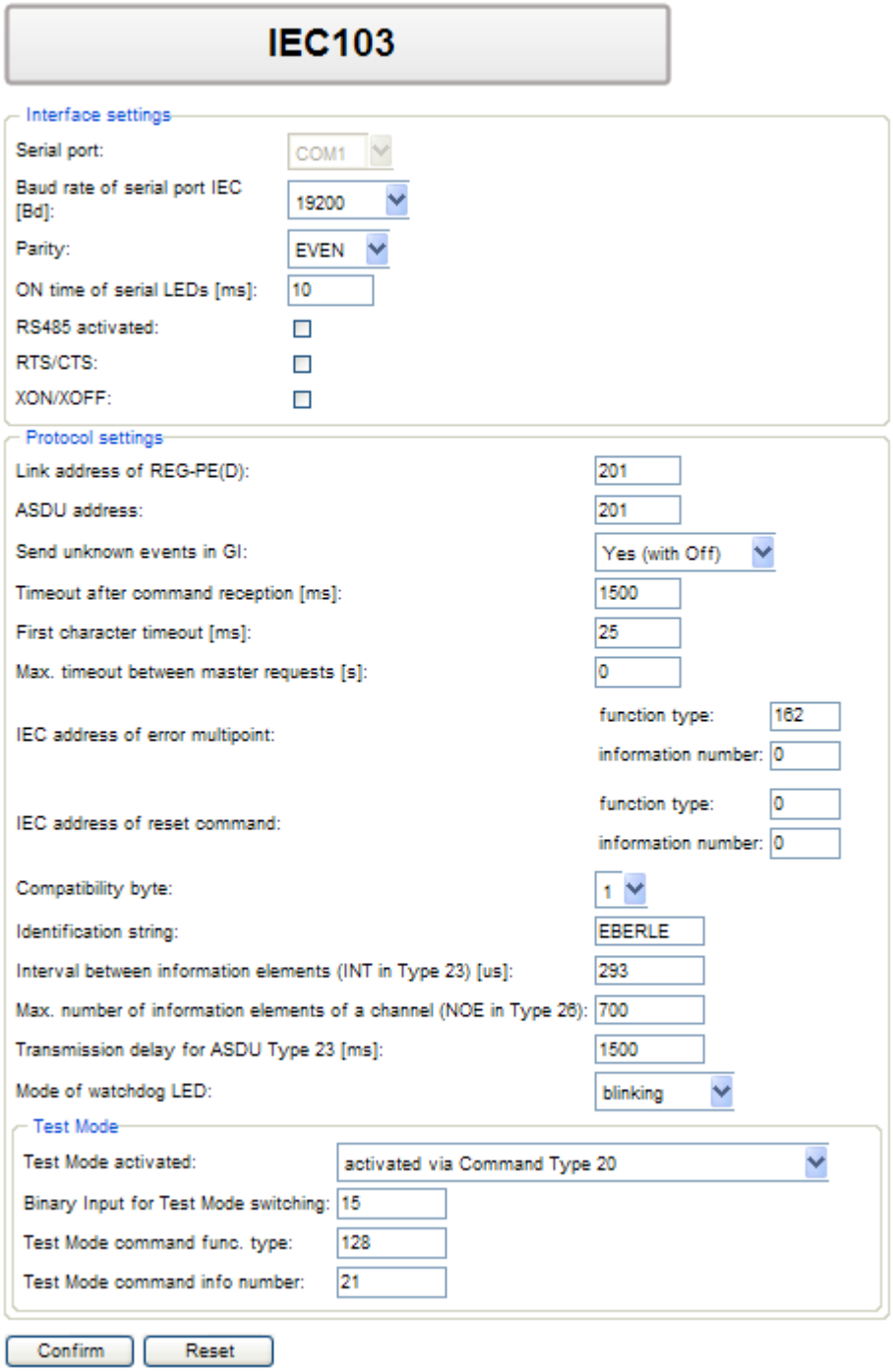


Figure 37: IEC103 settings SCADA for PQI-D

Table 24: IEC103 settings SCADA PQI-D

Setting	Format	Range	Default	Description
Serial port		Selection of values in combo box	COM1	Selection of COM ports for IEC103 communication
Baud rate of serial port IEC	Bd	Selection of values in combo box	38400	Baud rate of IEC103 serial port;
Parity	-	Selection of values in combo box	EVEN	Selection of parity of IEC103 communication. Conforming to the IEC 60870-5-103 standard, the program sets the default byte parity to even, sets the number of data bits to 8 and the number of stop bits to 1.
ON time of serial LEDs	ms	1 to 100	10	ON time of serial LEDs
Link address of REG-PE(D)	-	1 to 254	201	Enter the address field for link layer (IEC 60870-5-2 Frame 1.2.). Address must be unique within a shared line, or it may be unique within a group of links sharing a common channel. Value is configurable in the range 0…254. The default value is 1. Value 255 is reserved for broadcast messages with “Send/no reply” coding.
ASDU address	-	1 to 254	201	Enter a Common Address Application Service Data Unit (ASDU). The Common Address shall usually be identical to the address used in the link address. Range of setting is from 0 up to 254. The default value is 1. For broadcast “Send/no reply”- services of the master are mandatory. In this case the ASDU address field is defined as 255. Therefore value 255 is not allowed as specific device address.
Timeout after command reception	[ms]	0 to 65535	1500	The setting determines a maximal waiting time for acknowledgement of the command in control direction. If a command message is received before the previous command has been acknowledged, it will be rejected with negative acknowledgement of command. Commands that cannot be processed for various reasons will be rejected with negative acknowledgement. Value is configurable in the range 0…65535. The default value is 1500. (setting is not used)
First character timeout	ms	0 to 65535	25	Time of first character
Max. timeout	s	0 to 255	0	Maximum timeout between master en-

Setting	Format	Range	Default	Description
between master requests				quires
IEC address of error multipoint (function type, information number)	-	0 to 255	162	If a protection device sends the error message and this is not a result of transmission with a control station, REG-PE(D) uses address "error multipoint". “Function type of error multipoint” is the function type of multipoint error address. Value is configurable in the range 0…255. The default value is 162. “Information number of error multipoint” is the information of the multi-point error address. Value is configurable in the range 0-255. The default value is 0.
IEC address of reset command (function type, information number)	-	0 to 255	0	
Identification string	-	8 characters	“EBERLE”	Name of producer of the device at the time of initialization. The maximal length of the string's name is 8 symbols, which may be chosen freely. The default value is “EBERLE"
RS485 activated	-	option box	NOT selected	Activation of RS485 interface.
RTS/CTS activated	-	option box	NOT selected	Activation of Hardware Flow Control.
XONN/XOFF activated	-	option box	NOT selected	Activation of Software Flow Control.
Test Mode activated	-	Selection of values in combo box	activated via Command type 20	Selection of way of activation the test mode. Possible options: deactivated, activated via binary input, activated via Command type 20
Binary Input for Test Mode switching	-	0 to 65535	15	Number of binary input for test mode activation
Test Mode command func. type	-	0 to 255	128	Function type of command for test mode activation
Test Mode command info number	-	0 to 255	21	Information number of command for test mode activation
Interval between information elements (INT in Type 23) [µs]:				The interval for acquisition of the single information elements is the same for all disturbance data. It is listed in microseconds. Value is configurable in the range 0…65535. The default value is 293. For more information see chapter 7.2.6.7 in IEC 60870-5-103
Max. Number of information elements of a channel (NOE in				The number of information elements in each channel. All channels contain the same number of information elements. This number is transmitted in ASDU Type

Setting	Format	Range	Default	Description
Type 26):				id. 26 'ready for transmission of disturbance data', being valid for all channels.
Inter transmission delay for transmission ASDU Type 23 [ms]:				Value is configurable in the range 0…65535. The default value is 700.

Default values always depend on values entered in the corresponding template.

13.3.2 IEC103 Settings – SCADA for EOR-D device

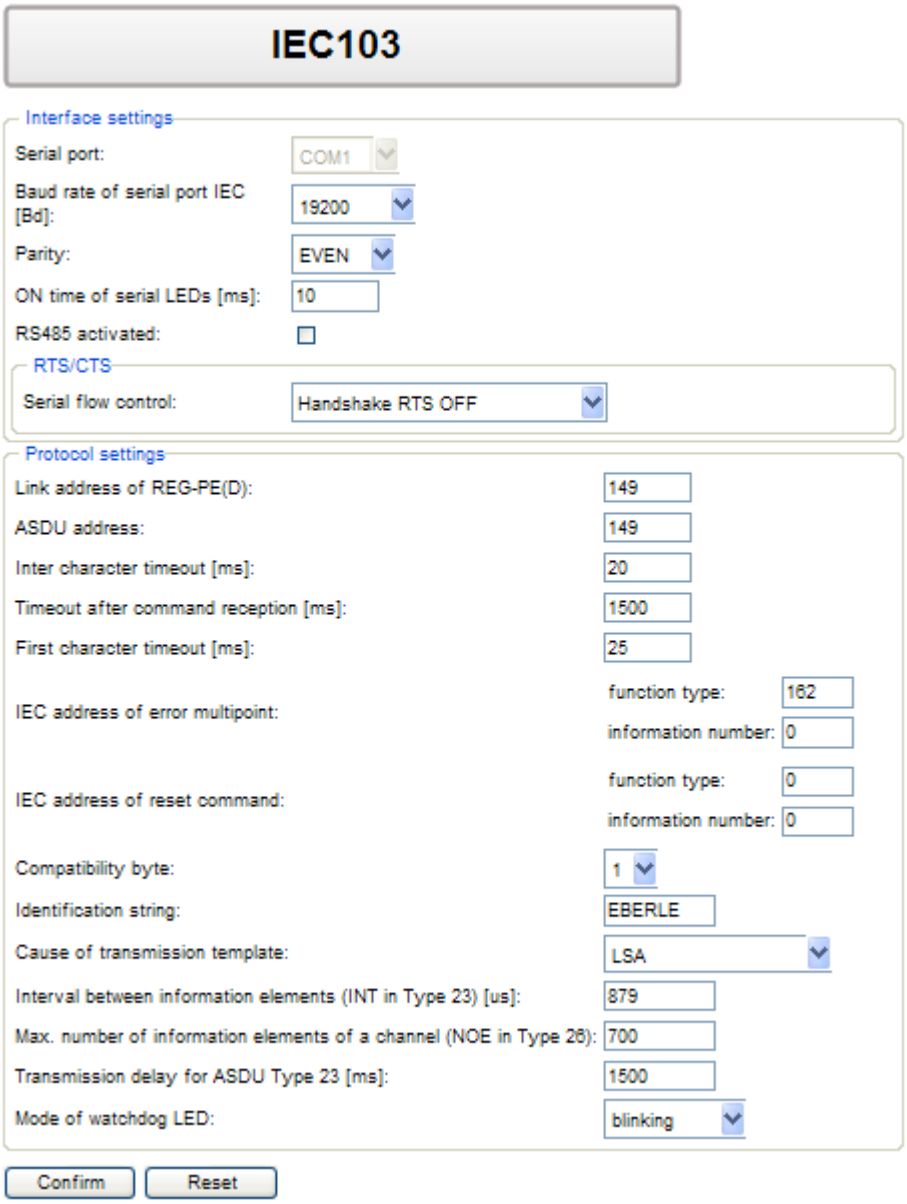


Figure 38: IEC103 settings SCADA for EOR-D

Table 25: IEC103 settings SCADA for EOR-D

Setting	Format	Range	Default	Description
Serial port		Selection of values in combo box	COM1	Selection of COM ports for IEC103 communication
Baud rate of serial port IEC	Bd	Selection of values in combo box	38400	Baud rate of IEC103 serial port;
Parity	-	Selection of values in combo box	EVEN	Selection of parity of IEC103 communication.
ON time of serial LEDs	ms	1 to 100	10	ON time of serial LEDs
Link address of REG-PE(D)	-	1 to 254	201	Link address in the given range.
ASDU address	-	1 to 254	201	ASDU address in the given range.
Inter character timeout	ms	2 to 1000	20	Timeout between two characters
Timeout after command reception	ms	0 to 65535	1500	Timeout after command reception
First character timeout	ms	0 to 65535	25	Time of first character
Max. timeout between master requests	s	0 to 255	0	Maximum timeout between master enquires
IEC address of error multipoint (function type, information number)	-	0 to 255	162	IEC address (IOA) of multipoint for errors, 0 - undefined
IEC address of reset command (function type, information number)	-	0 to 255	0	IEC address (IOA) of multipoint for errors, 0 - undefined
Compatibility byte	-	Selection of values in combo box	1	Value of compatibility byte
Identification string	-	8 characters	“EBERLE”	Identification string
RS485 activated	-	option box	NOT selected	Activation of RS485 interface option.
Cause of transmission template	-	Selection of values in combo box	LSA	Cause of transmission template
Interval between information elements (INT in Type 23)	µs	0 to 65535	293	Interval between information elements (INT in Type 23)
Max. number of information elements of a channel (NOE in Type 26)	-	1 to 2048	700	Max. number of information elements of a channel (NOE in Type 26)
Transmission delay for ASDU Type 23	ms	0 to 65535	1500	Transmission delay for ASDU Type 23

Setting	Format	Range	Default	Description
Serial flow control	-	Selection of values in combo box	Handshake RTS OFF	Serial flow control

13.3.3 Ethernet-COM-Server

Working additionally as COM-Server the latest REG-PE(D)-type enables users to setup the telecontrol card for remote parameterization or retrieving data of REG-D®(DA)/PQI-D®/EOR-D -devices by WinReg software or for other programs which request data per Ethernet.

The most useful feature of COM-Server is the supporting a shared serial channel mode for IEC control center as well as for WinPQ software at the same time. The TCP/IP access from WinPQ via COM-Server allows a receiving online data.

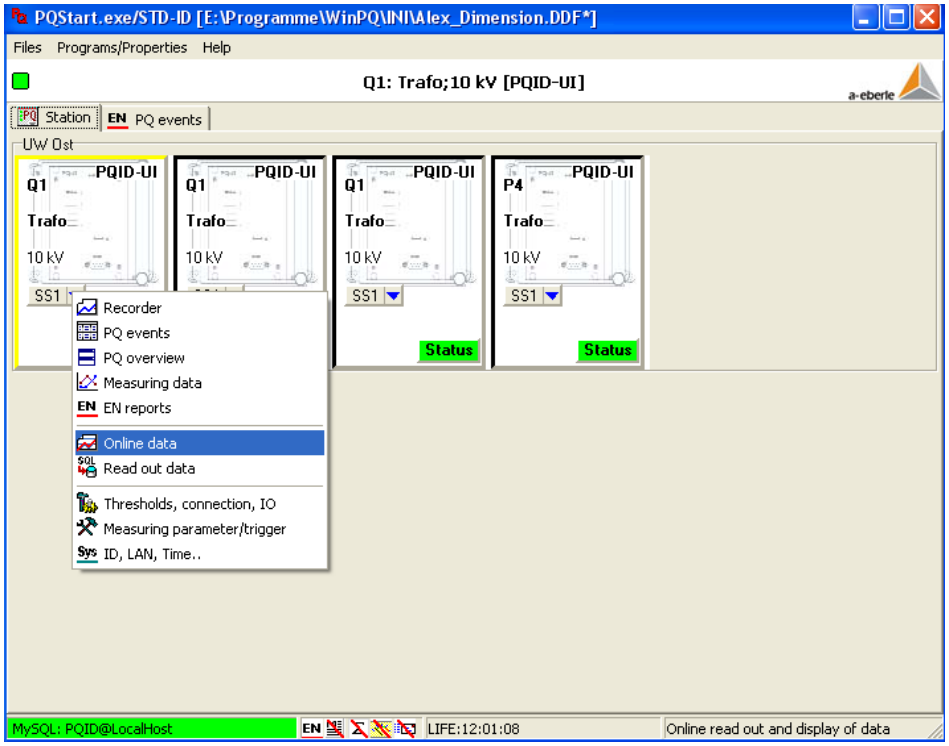


Figure 39: Receiving Online-Data from PQI-D per shared channel COM-Server

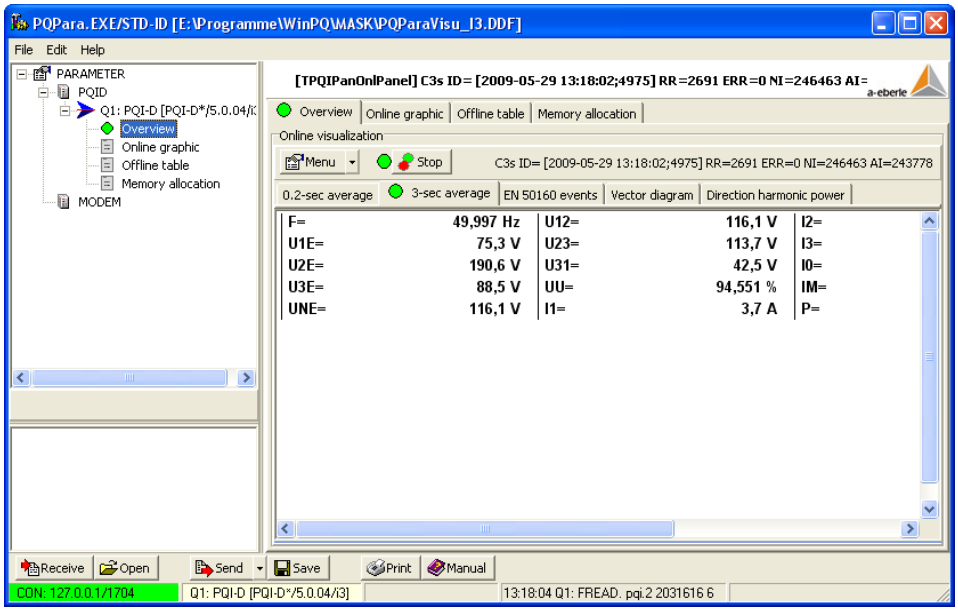


Figure 40: Online data Overview via REG-PE(D) COM-Server ComServer

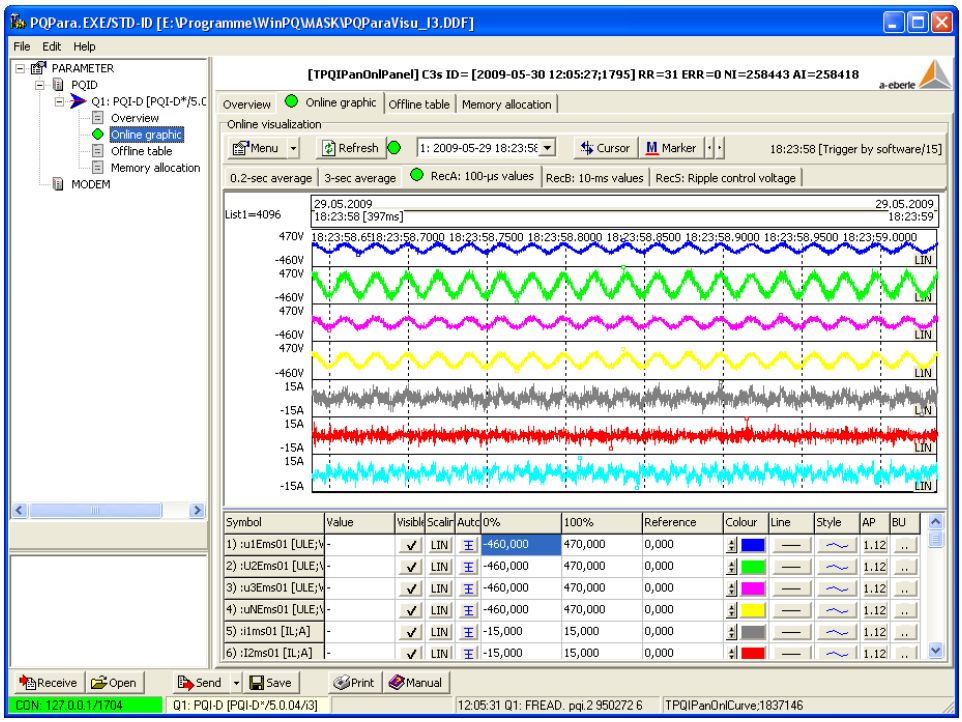


Figure 41: Online graphic disturbance data from PQI-D

With this new type of telecontrol card you are able to have the following operation modes now:

- IEC only
- IEC and COM-Server at the same time where IEC is regarded of higher priority
- COM-Server only

These operation modes are online changeable without need of changing settings, i.e. if you have mostly IEC communication operation mode only you will be able to use from time to time additionally the COM-Server functionality e.g. for retrieving saved recorder data via WinReg (not supported yet for EORSys and PQI-D). Another application case is an outage of IEC line: in this case you will be able to connect to COM-Server via WinReg and retrieve important data from regulator during the IEC outage.

The COM-Server also may be used for maintenance purposes with any standard terminal program.

A disturbance data receiving from PQI-D can last sufficiently long (up to 1-2 min).The IEC control center does not receive the information at same time, because PQI-D gives out the data in output stream. A size of output stream in COM-Server optimized and set to 2 Kbytes. For example, the transmission 110 Kbytes disturbance data per COM-Server needs about 35 sec.

13.3.4 ComServer settings PQI-D

ComServer settings for PQI-D and also for REG-PE(D) type telecontrol boards shows common parameters in the basic view. To show and edit also parameters intended for advanced user click the *Extend* button. Warning message is displayed before WinConfig shows advanced parameters as change of these parameters can affect the ComServer functionality.

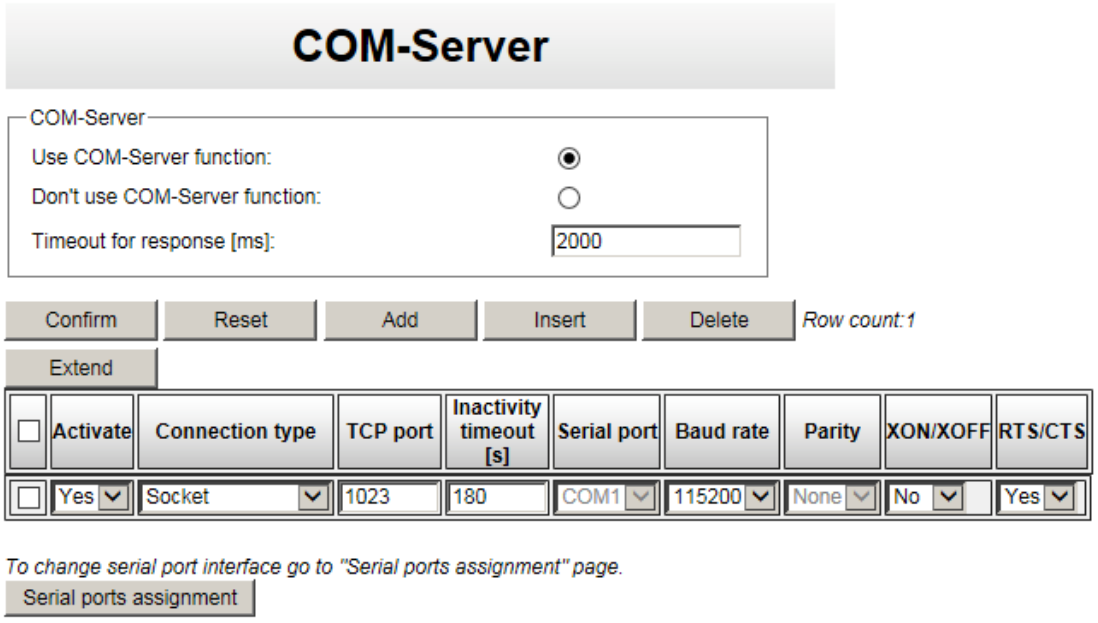


Figure 42: IEC103 advanced settings PQI-D – ComServer

Table 26: IEC103 ComServer settings PQI-D

Setting	Format	Range	Default	Description
Use/Don't use Com-Server function	-	Option box	Don't use	Option to select whether Com-Server will be used

Setting	Format	Range	Default	Description
Timeout for response	ms	1 to 65535	2000	Timeout for response

Table 27: IEC103 ComServer settings PQI-D, Channels

Setting	Format	Range	Default	Description
Activate	-	Yes/No	No	Option to disable the channel
Connection type	-	Selection of values in combo box	RAW	State of channel. (SOCKET, Serial Direct, Telnet, Shared with IEC, OFF)
IP address	-	4x 0 to 255		IP address
TCP port	-	0 to 65535	3003	TCP port
Inactivity timeout	S		180	Timeout after which the serial device is closed if data transfer does not occur. By default is 0. It means that serial device is closed only by closing TCP-Port.
Serial port	-	Selection of values in combo box	COM2	Selection of serial port
Baud rate	Bd	Selection of values in combo box	115200	Baud rate
Parity	-	Selection of values in combo box	Even	Parity
Stop bits	-	Selection of values in combo box	1	Stop bits
Data bits	-	Selection of values in combo box	8	Data bits
XON/XOFF	-	Selection of values in combo box	No	Option to select XON/XOFF handshaking
RTS/CTS	-	Selection of values in combo box	No	Option to select RTS/CTS hand-shaking
RTS/CTS inverted	-	Selection of values in combo box	No	Option to select inversion of RTS, CTS signals
Rxd/TxD inverted	-	Selection of values in combo box	No	Option to select inversion of RxD, TxD signals
Interface type	-	Selection of values in combo box	RS232	Option to select type of inter-face

Setting	Format	Range	Default	Description
Max. message length	-	0 to 65535	0	Max. message length
Tx blocking time	ms	0 to 65535	0	Tx blocking time

13.3.5 ComServer settings EOR-D

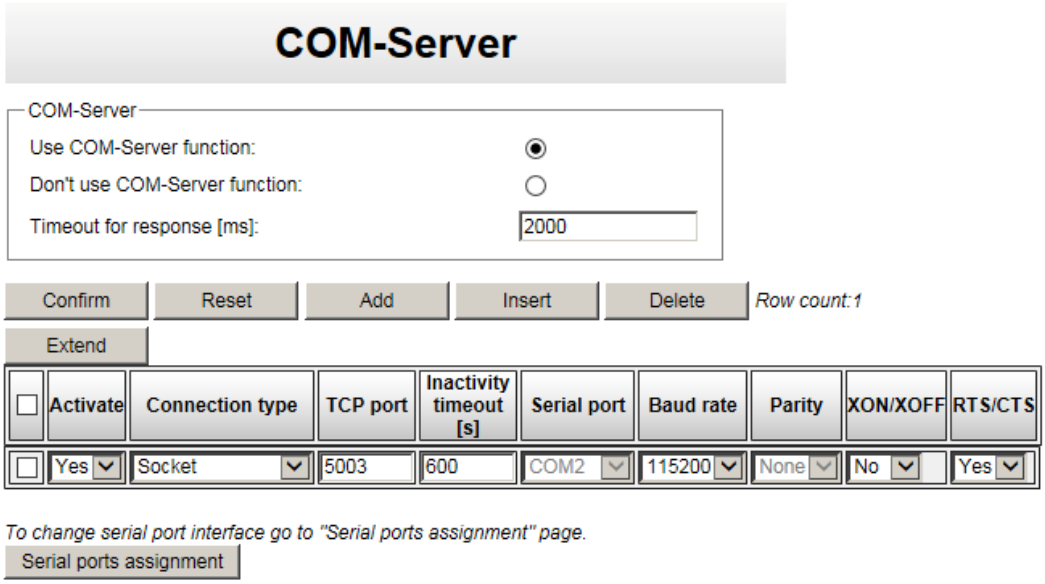


Figure 43: ComServer settings, EOR-D

Table 28: IEC103 ComServer settings EOR-D

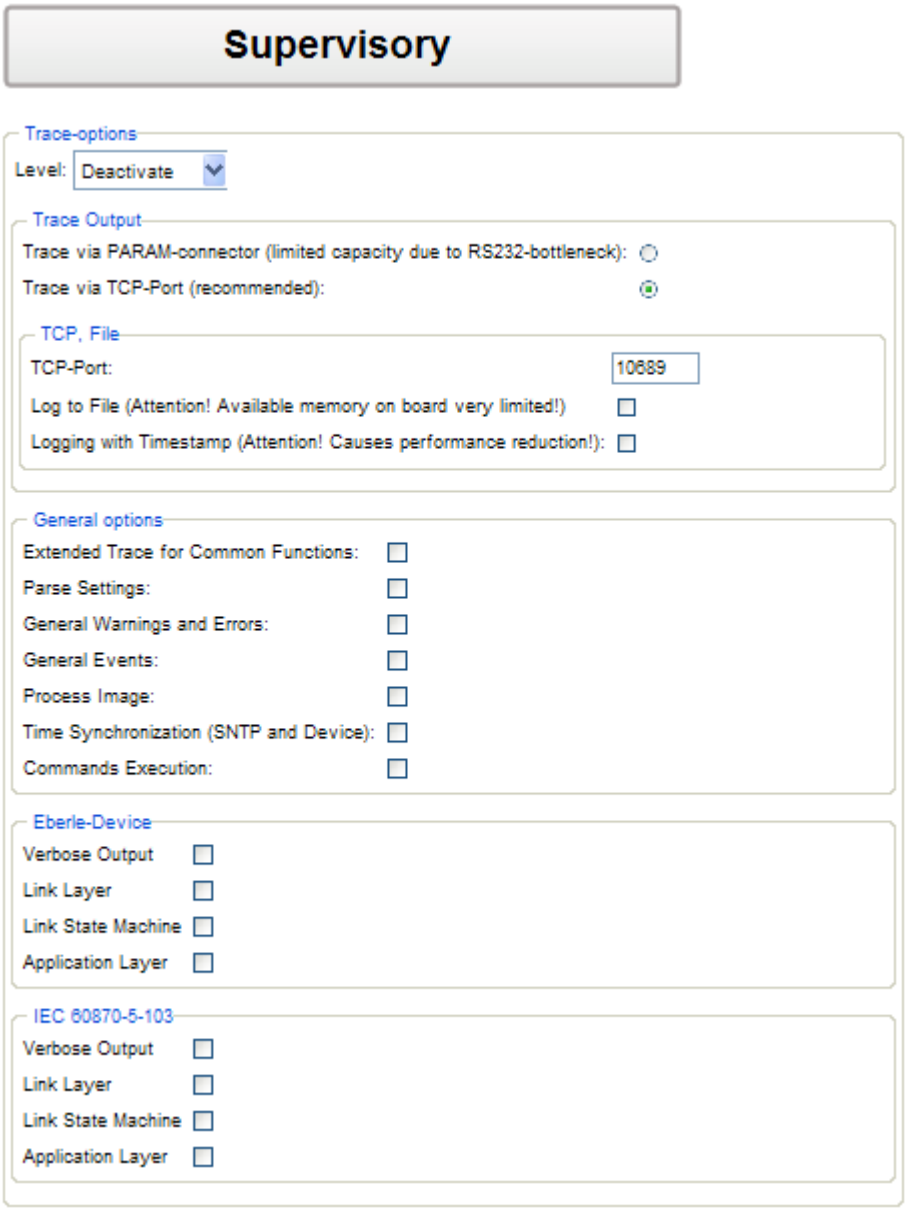
Setting	Format	Range	Default	Description
Use/Don't use ComServer function	-	Option box	Don't use	Option to select whether Com-Server will be used
Timeout for response	ms	1 to 65535	2000	Timeout for response
Activate	-	Yes/No	No	Option to disable the channel
Connection type	-	Selection of values in combo box	RAW	State of channel. (SOCKET, Serial Direct, Telnet, Shared with IEC, OFF)
IP address	-	4x 0 to 255		IP address
TCP port	-	0 to 65535	3003	TCP port
Inactivity timeout	S		180	Timeout after which the serial device is closed if data transfer does not occur. By default is 0. It means that serial device is closed only by closing TCP-Port.

Setting	Format	Range	Default	Description
Serial port	-	Selection of values in combo box	COM2	Selection of serial port
Baud rate	Bd	Selection of values in combo box	115200	Baud rate
Parity	-	Selection of values in combo box	Even	Parity
Stop bits	-	Selection of values in combo box	1	Stop bits
Data bits	-	Selection of values in combo box	8	Data bits
XON/XOFF	-	Selection of values in combo box	No	Option to select XON/XOFF handshaking
RTS/CTS	-	Selection of values in combo box	No	Option to select RTS/CTS hand-shaking
RTS/CTS inverted	-	Selection of values in combo box	No	Option to select inversion of RTS, CTS signals
Rxd/TxD inverted	-	Selection of values in combo box	No	Option to select inversion of RxD, TxD signals
Interface type	-	Selection of values in combo box	RS232	Option to select type of inter-face
Max. message length	-	0 to 65535	0	Max. message length
Tx blocking time	ms	0 to 65535	0	Tx blocking time

13.3.6 Supervisory settings

IEC103 firmware for TK8xx telecontrol boards can be parameterized to send diagnostic supervisory messages. These messages are sent to the parameterization port of telecontrol board.

Logging level and type of messages can be set in the *Supervisory settings* window contained in the IEC103 settings. Logging level can be set to ERROR, WARNING, INFORMATION or DEBUG mode in the combo box and individual types or messages can be selected by checkboxes.



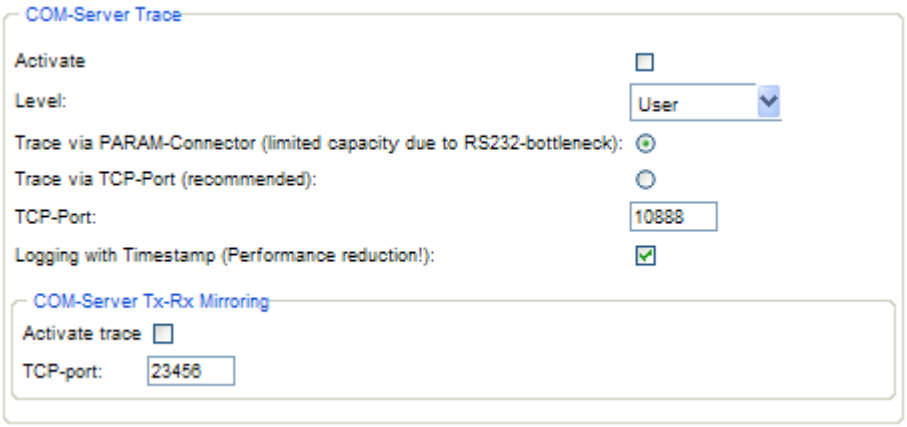


Figure 44: Supervisory settings, REG-PE(D)

13.3.6.1 Supervisory settings for boards type REG-P, -PE und PEDSV (TK28-4, TK28-6, TK102)

The supervisory settings for boards TK2-4, TK28-2 and TK102 differs from other REG-PE(D) boards by usage of *Syslog server*. The *Syslog server* is always used for ComServer logging and can be also used as general trace logging option.

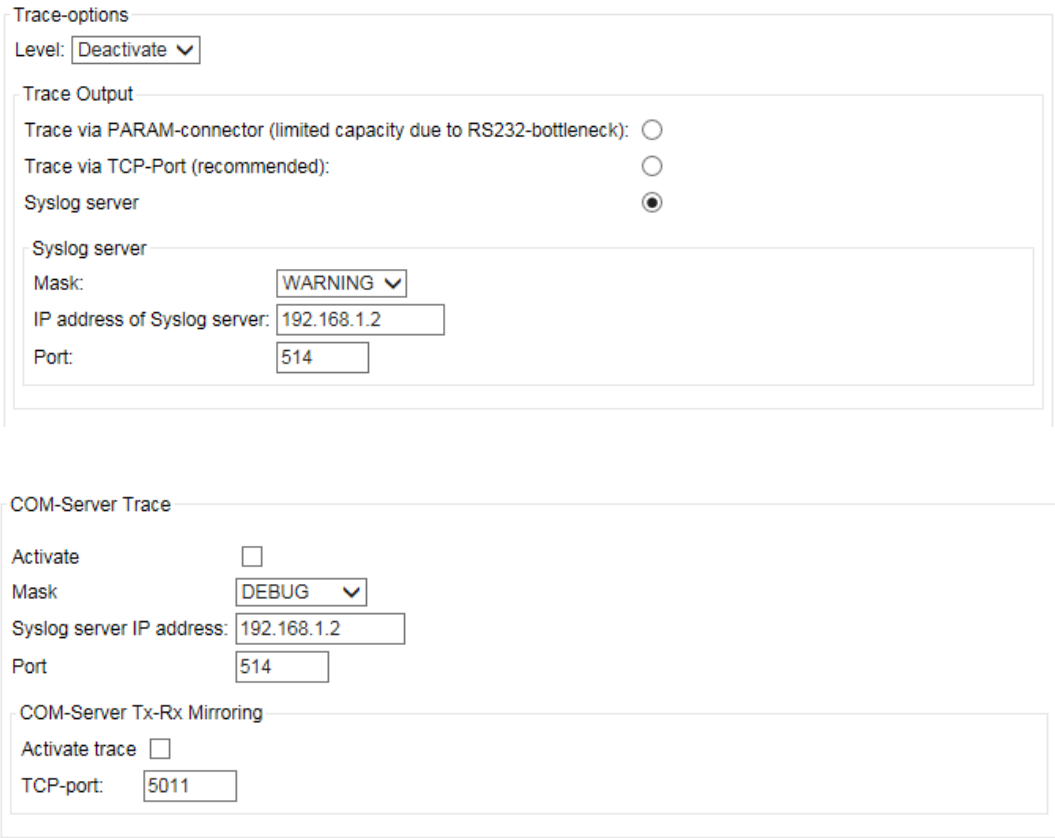


Figure 45: Supervisory settings, boards TK28-4, TK28-6, TK102

Table 29: IEC103 Supervisory settings

Setting	Format	Range	Default	Description
Level	-	Selection of values in combo box	Deactivate	Level of Log messages
Trace output:	-	radio button	PARAM-connector	Option of tracing output: PARAM-connector, TCP-port or Syslog server. Additional parameters are necessary in some cases.
General options: Extended Trace	-	checkbox	unchecked	Extended Trace for Common Functions
General options: Parse Settings	-	checkbox	unchecked	Parse Settings
General options: General Warnings	-	checkbox	unchecked	General Warnings and Errors
General options: General Events	-	checkbox	unchecked	General Events
General options: Time Synchronization	-	checkbox	unchecked	Time Synchronization (SNTP and Device)
General options: Process Image	-	checkbox	unchecked	Process Image
General options: Commands Execution	-	checkbox	unchecked	Commands Execution
Eberle-Device: Verbose output	-	checkbox	unchecked	Verbose output
Eberle-Device: Link Layer	-	checkbox	unchecked	Link layer log
Eberle-Device: Link State machine	-	checkbox	unchecked	Link State machine log
Eberle-Device: Application Layer	-	checkbox	unchecked	Application layer log
IEC103: Verbose output	-	checkbox	unchecked	Verbose output
IEC103: Link Layer	-	checkbox	unchecked	Link layer log
IEC103: Link State machine	-	checkbox	unchecked	Link State machine log
IEC103: Application Layer	-	checkbox	unchecked	Application layer log
COM-Server Trace: Activate trace		checkbox	checked	Protocol debug option activation
Mask	-	Selection of values in list box	DEBUG	Option to select lever of supervisory messages

Setting	Format	Range	Default	Description
Syslog server IP address	IPV4	textbox	192.168.1.2	Syslog IP address
Port	-	1 to 65535	514	Syslog port
Com-Server Tx-Rx mirroring: Activate trace	-	checkbox	unchecked	Activation
Com-Server Tx-Rx mirroring: TCP-port	-	1 to 65535	5011	TCP port

13.4 Devices

13.4.1 Time synchronization PQI-D

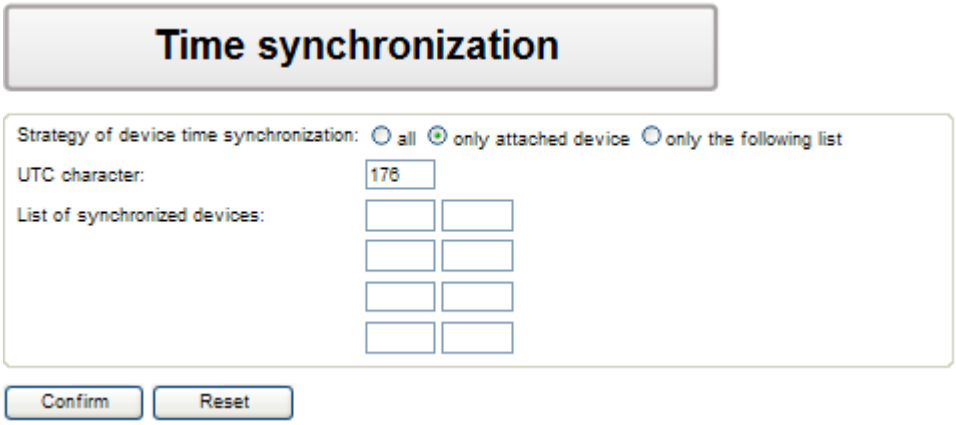


Figure 46: IEC103 Devices, Time synchronization settings, PQI-D

Table 30: IEC103 Devices, Time synchronization settings, PQI-D

Setting	Format	Range	Default	Description
Strategy of device time synchronization	-	Selection of checkboxes	all	Strategy of device time synchronization
UTC character	-	0 to 255	176	UTC character
List of synchronized devices	-	3 characters of device ID	-	List of synchronized devices if *only the following list* option is used

13.4.2 Time synchronization EOR-D

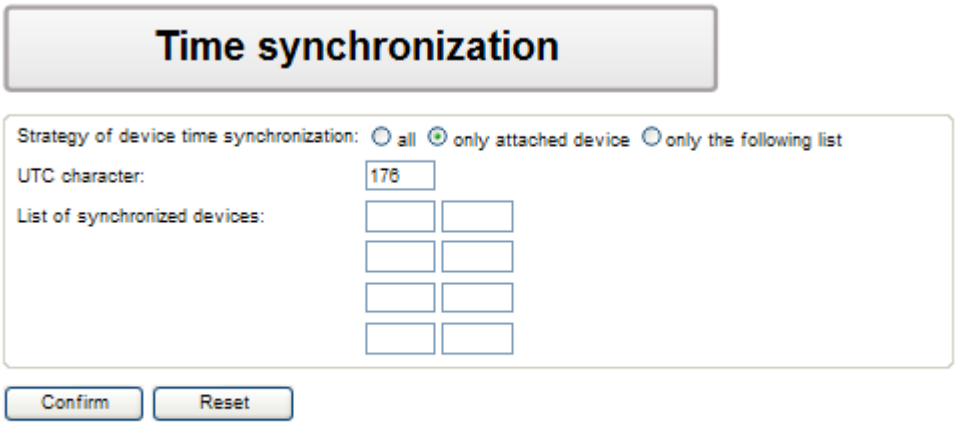


Figure 47: IEC103 Devices, Time synchronization settings, EOR-D

Table 31: IEC103 Devices, Time synchronization settings, EOR-D

Setting	Format	Range	Default	Description
Strategy of device time synchronization	-	Selection of checkboxes	all	Strategy of device time synchronization
UTC character	-	0 to 255	176	UTC character
List of synchronized devices	-	3 characters of device ID	-	List of synchronized devices if *only the following list* option is used

13.4.3 Internal communication PQI-D

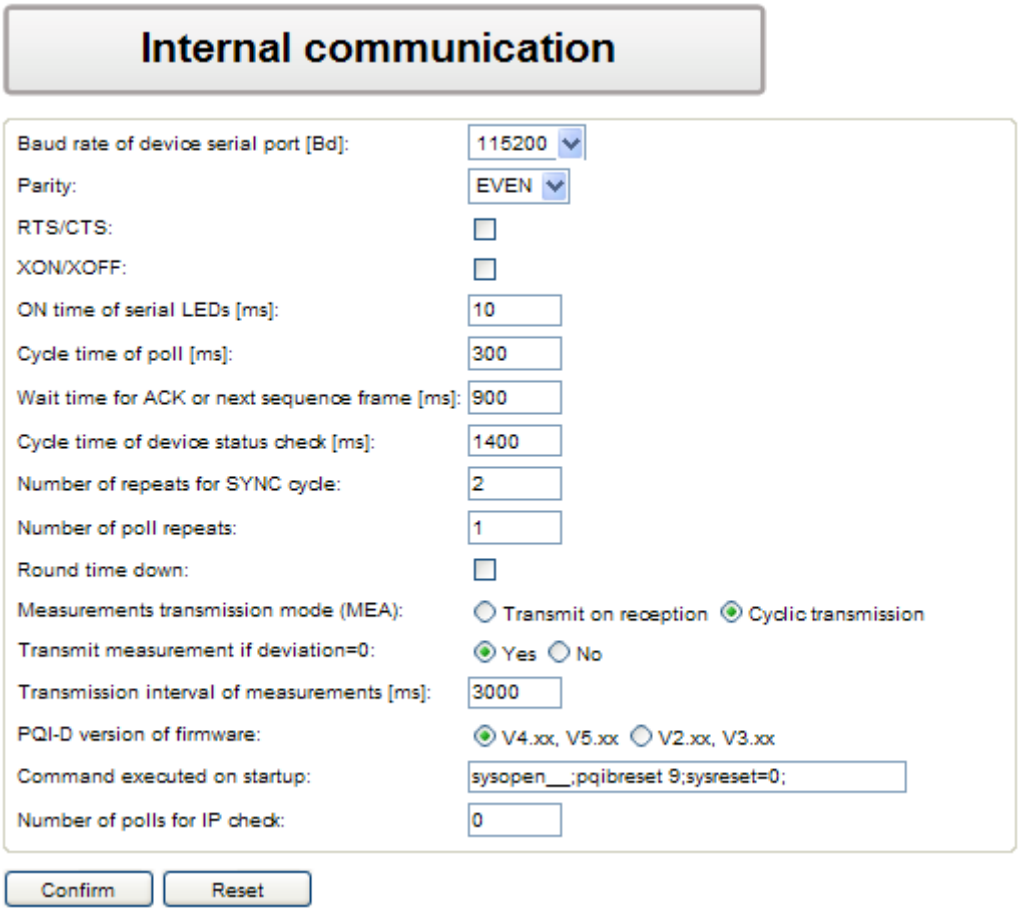
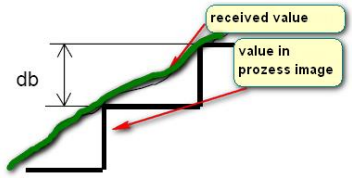


Figure 48: IEC103 Internal communication, PQI-D

Table 32: IEC103 Internal communication, PQI-D

Setting	Format	Range	Default	Description
Baud rate of device serial port	Bd	Selection of values in combo box	115200	Baud rate of device serial port
Parity	-	Selection of values in combo box	EVEN	Parity
ON time of serial LEDs	ms	1 to 65535	10	ON time of serial LEDs
Cycle time of poll	ms	0 to 65535	300	The parameter determines the cycle time of the substation call. If you set the parameter to zero, the call is executed as soon as possible. Value is configurable in the range 0…65535. The default value is 300.

Setting	Format	Range	Default	Description
Wait time for ACK or next sequence frame	ms	0 to 65535	800	This parameter specifies how long the program waits for sequenced next frame (data > 2000 Bytes) or the acknowledgement for command. The wait time is dependent on the baud rate and the maximum message length. Value is configurable in the range 0…65535. The default value is 800.
Cycle time of device status check	ms	0 to 65535	1400	Cycle time of device status check, if connection with device fault
Number of repeats for SYNC cycle		1 to 255	2	Max count of synchronization requests, if serial communication with regulator fails. Value is configurable in the range 0…255. The default value is 3.
Number of poll repeats	-	0 to 255	1	Max. number of the device's polling. The setting is not used to the commands. Value is configurable in the range 0…255. The default value is 1.
Round time down	-	Check box	NOT checked	If value equals 0, time stamps are rounded down in scale of one second to prevent time inconsistencies with substation. If value equals one time stamps are rounded up in scale of one second. The default value is 0.
Measurements transmission mode (MEA)	-	Option boxes	Transmit on reception	Defines a transmitting behaviour of the measurands. If “on receiving” checked, all data transmitted forthright after their changing. In this case a cause of transmission will be “spontaneous”. If “one time per interval” checked, all measured values transmitted once per interval “Measurements receiving interval”. In this case a cause of transmission will be “cyclic” 
Transmission interval of measurements	ms	0 to 65535	1000	Defines a time interval of the cyclic transmitting the measured values. Value is configurable in the range 0…65535. The default value is 1000 ms.
PQI-D version of firmware	-	Option boxes	V2.xx, V3.xx	Defines used version of PQI-D firmware. It is very important setting. Incompatibility of the application setting with topical used PQI-D firmware version gives wrong data and events!

Setting	Format	Range	Default	Description
Command executed on startup of REG-PE(D)	-	64 characters	sys-open__;pqibreset9;sysreset=0;	Command that will be executed once after first connection with device.
Number of polls for IP check		0 to 255	0	Frequency of interrogation of IP addresses of all devices. Value is configurable in the range 0…255. The default value is 0. (setting is not used) Setting is applicable only for REG-D device.

13.4.4 Internal communication, EOR-D

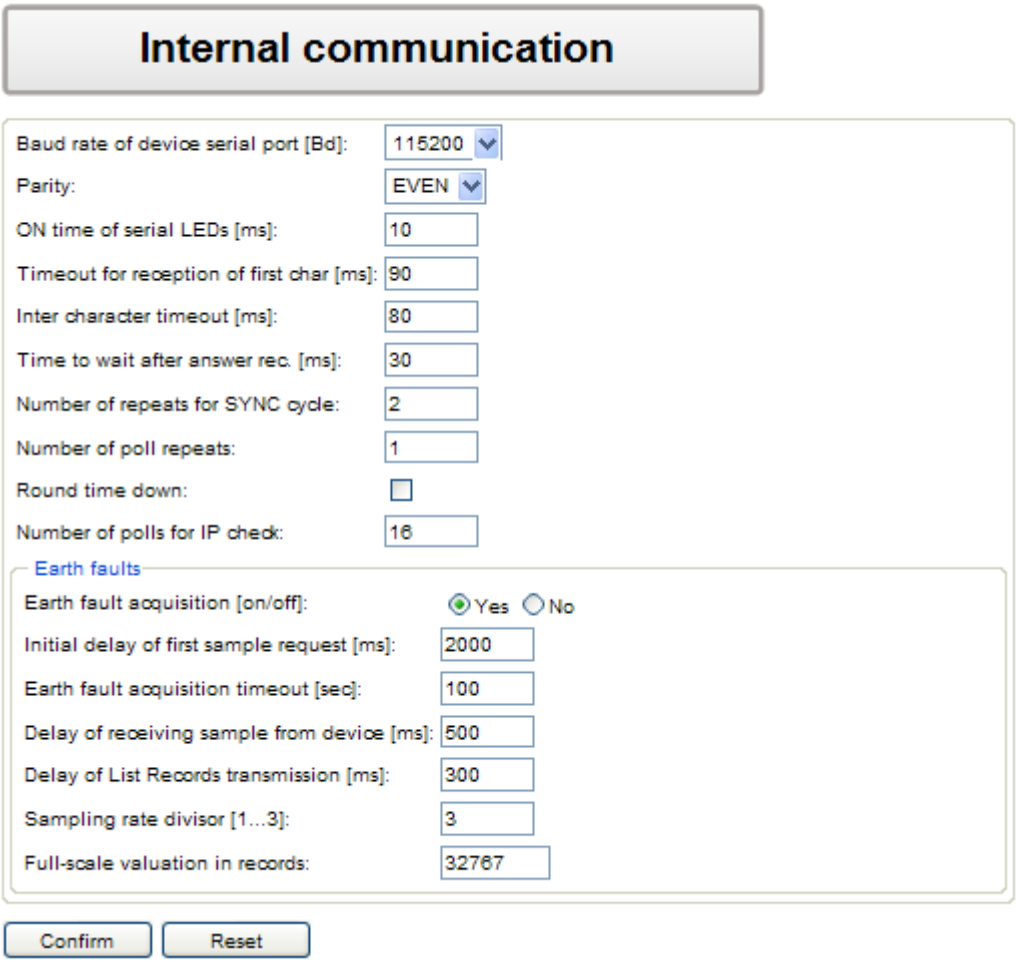


Figure 49: IEC103 Devices, EOR-D, Internal communication

Table 33: IEC103 Devices, EOR-D, Communication settings

Setting	Format	Range	Default	Description
Baud rate of device serial port	Bd	Selection of values in combo box	115200	Baud rate of device serial port
Parity	-	Selection of values in combo box	EVEN	Parity
ON time of serial LEDs	ms	1 to 65535	10	ON time of serial LEDs
Inter character timeout	ms	1 to 65535	80	Inter character timeout
Time to wait after answer rec.	ms	1 to 65535	30	Time to wait after answer reception
Number of repeats for SYNC cycle		1 to 255	2	Number of repeats for SYNC cycle
Number of poll repeats	-	0 to 255	1	Number of poll repeats
Round time down	-	Check box	NOT checked	Round time down
Number of polls for IP check		0 to 255	16	Frequency of interrogation of IP addresses of all devices. Value is configurable in the range 0…255. The default value is 0. (setting is not used)
Earth fault acquisition [on/off]	ms	Option boxes	Yes	Earth fault acquisition activate. If “On” set, all data with earth-faults will be transmitted from current device to control center. Otherwise this feature not supported and off. **Note:** The feature supported now only for EORSys® devices.
Initial delay of first sample request	ms	0 to 65535	2000	Max. wait for repetition of the initial state of device to start state machine. Value is configurable in the range 0…65535. The default value is 800 ms.
Earth fault acquisition timeout	s	0 to 65535	100	Max. wait for repetition of new Earth-Faults samples request from device to start “get mode”. Value is configurable in the range 0…65535. The default value is 100 sec.
Delay of List Records transmission	ms	0 to 65535	300	Min. timeout in device response in Earth-Faults transmit to control center with type identification 30 according to standard IEC 60870-5-103. Value is configurable in the range 0…65535. The default value is 300 ms.

Setting	Format	Range	Default	Description
Sampling rate divisor [1...3]	-	1 to 5	3	Defines a sampling frequency factor (instance for value 2: 2 Samples of three each are deleted). Value is configurable in the range 0…65535. The default value is 3.
Full-scale valua-tion in records	-	1 to 1000000	32767	Defines the maximum amplitude a disturbance data can present. If the amplitude exceeds the limit, REG-PE(D) halves the maximum amplitude to ensure the values up to “Full-scale valuation”. Value is configurable in the range 1…32767. The default value is 32767.

13.5 Device x

13.5.1 Device settings

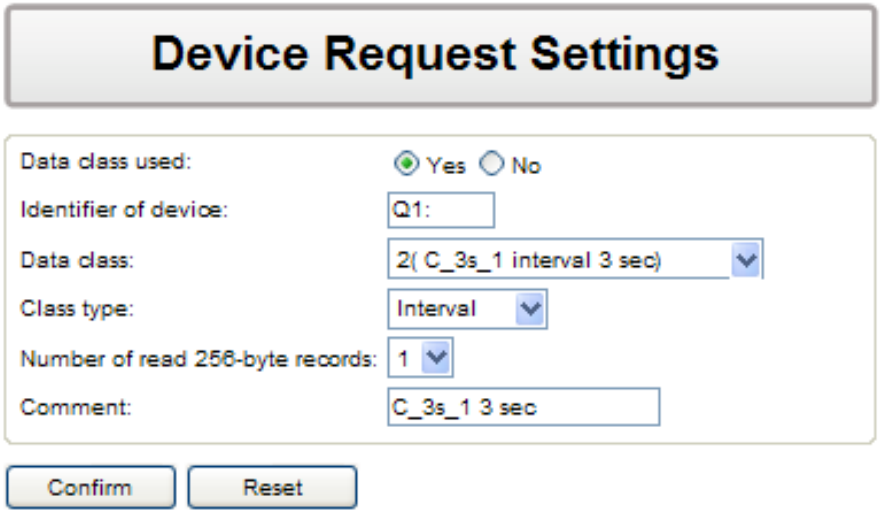


Figure 50: IEC103 Device x, PQI-D

Table 34: IEC103 Device *x*, Device settings PQI-D

Setting	Format	Range	Default	Description
Data class used	-	Option boxes	Yes	Usage of Data class
Identifier of device	-	3 characters	Q1:	Identifier of device
Data class	-	Selection of values in combo box	1(C_s2_1 interval 200 ms)	Data class
Class Type	-	Selection of values in combo box	Interval	The poll type of logical device. It is the characteristic of the delivered setting's set. Do not change the setting without confirmation of Eberle staff.
Number of read 256-byte records	-	Selection of values in combo box	1	Defines a number of the entries replayed in one request.
Comment	-	23 characters	C_c2_1 200 ms	Comment

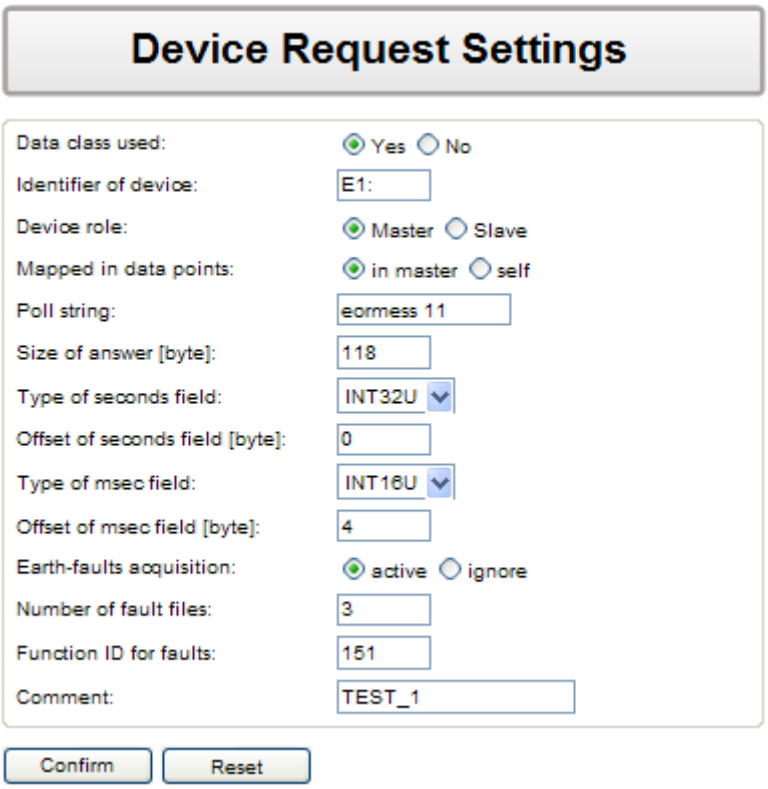


Figure 51: IEC103 Device x, Device settings EOR-D

Table 35: IEC103 Device *x*, Device settings EOR-D

Setting	Format	Range	Default	Description
Data class used	-	Option boxes	Yes	Usage of Data class
Identifier of device	-	3 characters	E1:	Identifier of device
Device role	-	Option boxes	In master	Device role
Poll string	-	24 characters	eormess 11	Poll string
Size of answer	byte	1 to 255	118	Size of answer
Type of seconds field	-	Selection of values in combo box	INT32U	Type of seconds field
Offset of seconds field	byte	0 to 255	0	Offset of seconds field
Type of msec field	-	Selection of values in combo box	INT16U	Type of seconds field
Offset of msec field	byte	0 to 255	4	Offset of msec field
Earth-faults acquisition	-	Option boxes	active	If “active” selected, all data with earth-faults will be transmitted from current device to control center. Otherwise this feature is not supported. **Note:** Feature is supported only for EORSys® devices.
Number of fault files		0 to 255	1	Maximal number of Samples files in the EORSys® device. Value is configurable in the range 0…8. The default value is 3.
Function ID for faults		0 to 255	151	IEC functional identify for current device. Instance in a 19”-rack had mounted three EOR-D devices. For first EOR-D Functional Id. 151 is set, for second – 152 and for third – 153. It is needed for an identification disturbance data on the control center’s side.
Comment	-	23 characters	EOR-D	Comment

13.5.2 Data points – indications, PQI-D

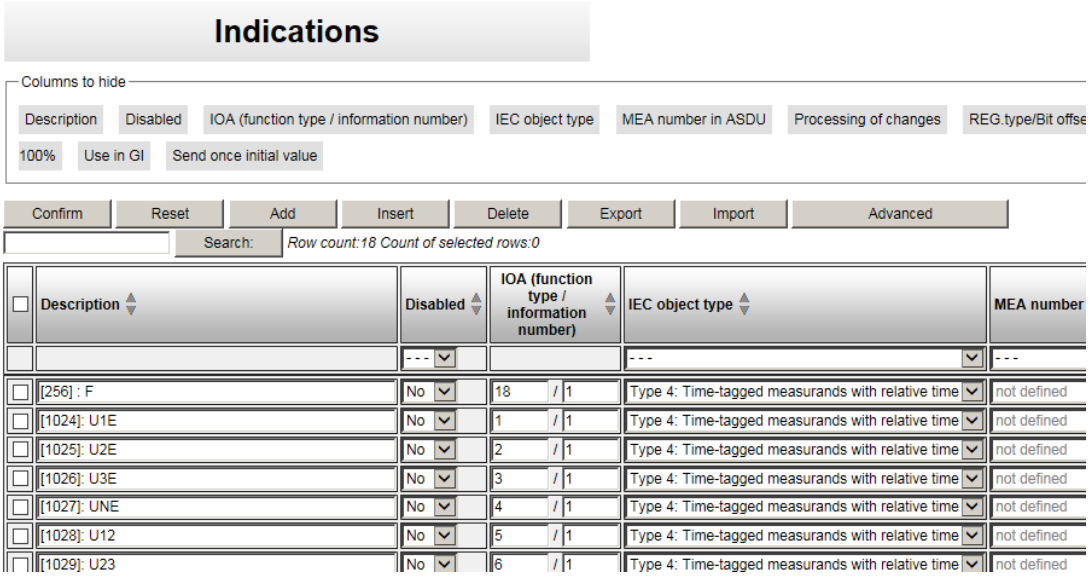


Figure 52: IEC103 Device x, Indications, PQI-D

Table 36: IEC103 Device *x*, Indications, PQI-D

Setting	Format	Range	Default	Description
Disabled	-	Option boxes	No	Enabling/disabling of individual data point
IOA (function type / information number)	-	2x 0 to 255	0	The corresponding IEC data type must be entered. The Type Identification is used for the compatible range.
IEC object type	-	Selection of values in combo box	Type 1: Time-tagged mes-sage	IEC 60870-5-103 type of data
MEA number in ASDU		Selection of values in combo box	not defined	Information order number of Common Address Application Service Data Unit (ASDU). It is applied only to type 3 and 9.
Processing of changes	-	Selection of values in combo box	value	Processing of changes. Should be set to value for EOR-D device type.
REG. type/Bit offset	-	Selection of values in combo box	BIT0	Selection of regulator data type
RPS offset	-	0 to 255	0	Definition of RPS offset
Channel number	-	0 to 255	0	Channel number
Data structure type	-	Selection of values in combo box	Measured [FLT]/Event	Data structure type

Setting	Format	Range	Default	Description
Threshold CALC method	-	Selection of values in combo box	percentage	Threshold calculation method
Threshold integrate up to ms	-	0..10000	0	Threshold integrate up to ms
Threshold value	-	float	0.1	Threshold value
Scale factor for analog measured value	-	float	1	Scale factor for analog measured value
Rated value	-	float	3413	Rated value
Maximal value	-	float	4095	Maximal value
Use in GI	-	Selection of values in combo box	No	Option whether the data point will be used in GI
Send once initial value	-	Selection of values in combo box	Yes	Initial value transmission
Inverted	-	Selection of values in combo box	no	Inversion of binary data point
Description	string	50 characters	empty string	User description of data point

13.5.3 Indications, EOR-D

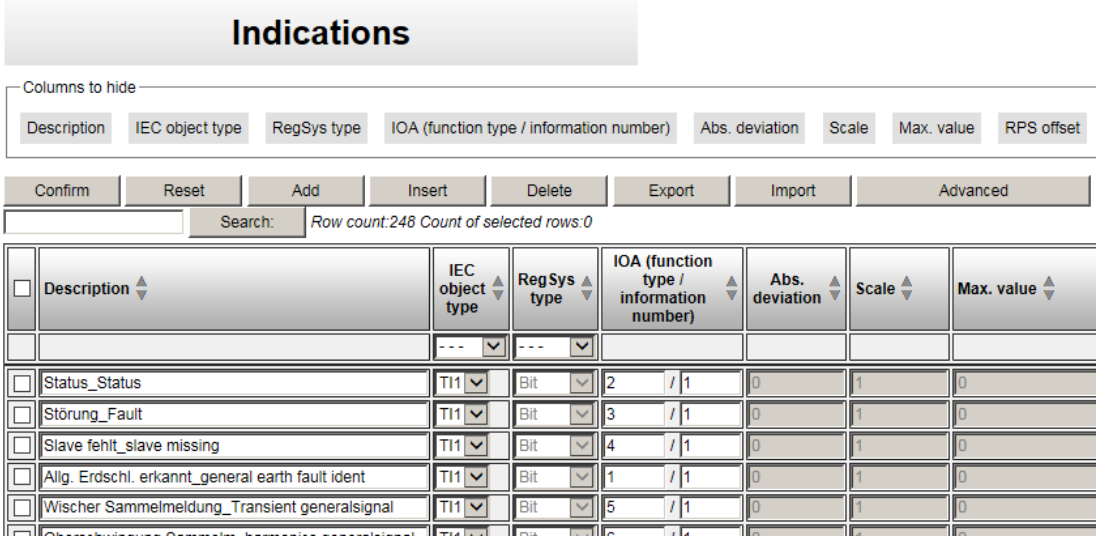


Figure 53: IEC103 Device x, Indications, EOR-D

Table 37: IEC103 Device *x*, Data points – indications, EOR-D

Setting	Format	Range	Default	Description
Disabled	-	Option boxes	No	Enabling/disabling of individual data point
IOA (function type / information number)	-	2x 0 to 255	0	IEC address (IOA) of indication
IEC object type	-	Selection of values in combo box	Type 1: Time-tagged message	IEC data type of data point
Processing of changes	-	Selection of values in combo box	value	Processing of changes. Should be set to value for EOR-D device type.
REG. type/Bit offset	-	Selection of values in combo box	BIT0	Selection of regulator data type
RPS offset	-	0 to 255	0	Definition of RPS offset
Threshold CALC method	-	Selection of values in combo box	percentage	Threshold calculation method
Threshold integrate up to ms	-		0	Threshold integrate up to ms
Threshold value	-	float	0.1	Threshold value

Setting	Format	Range	Default	Description
Use in GI		Selection of values in combo box	No	Option whether the data point will be used in GI
Remote COT offset	-	0 to 65535	1	REG-D/EOR-D specific setting. Definition of data offset in the case of remote cause of the transition (COT). If 0, the data point will not be mapped to remote operation.
Remote COT bit	-	0 to 255	0	Remote COT bits of remote offset
Feeder	string	50 characters	empty	Feeder
Inverted	-	Selection of values in combo box	no	Inversion of binary data point
Description	string	50 characters	empty string	User description of data point

13.5.4 Data types TI3 and TI9

Data types TI3 and TI9 use multiple data points differed by Information order number (MEA). The MEA number consists of numbers 1 to 15 and its definition is required, otherwise WinConfig refuses to confirm such data point. The pair IOA and MEA has to be unique for IEC type TI3 and TI9.

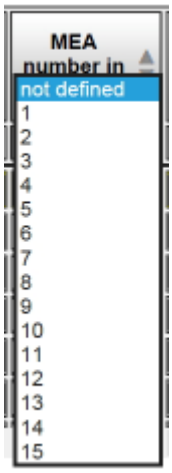


Figure 54: Selection of MEA numbers in listbox

13.5.5 Commands

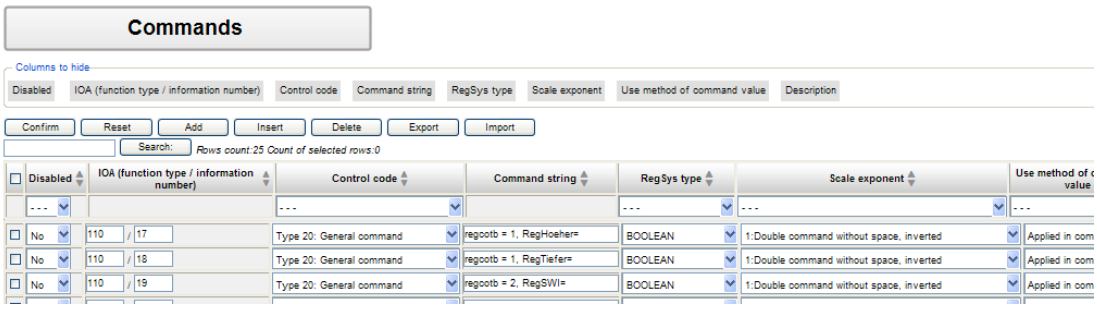


Figure 55: IEC103 Device x, Commands

Table 38: IEC103 Device *x*, Data points – commands

Setting	Format	Range	Default	Description
Disabled	-	Option boxes	Yes	Enabling/disabling of individual data point
IOA (function type / information number)	-	2x 0 to 255	0	The corresponding IEC data type must be entered. The Type Identification is used for the compatible range.
Control code	-	Selection of values in combo box	Type 20: General command	IEC 60870-5-103 type of data
Command string	string	50 characters	empty string	Command string to be sent to device
REG data type	-	Selection of values in combo box	INT8	Device data type of command
Scale exponent	-	Selection of values in combo box	0	Normally, scale is used as exponent with single commands. Only if Maximal Value is 0 scale has Double Point type: With <0> := not used, <1> := OFF, <2> := ON, <3> := not used. In either case scale is an enumeration.
Use method of command value	-	Selection of values in combo box	Applied in command	Application method of command value. If “ignored” is selected, command value will be ignored.
Description	-	50 characters	empty string	User description of command

13.5.6 Fault records

The terms earth-faults and channels are used to describe particular of a single channel in an IEC 60870-5-103 sense.

Using WinEDC software is able to get sample files saved in inner EOR-D memory. Data can be saved in COMTRADE or CSV (comma separated) files.

Earth fault channels page contains parameterization of transmission disturbances.

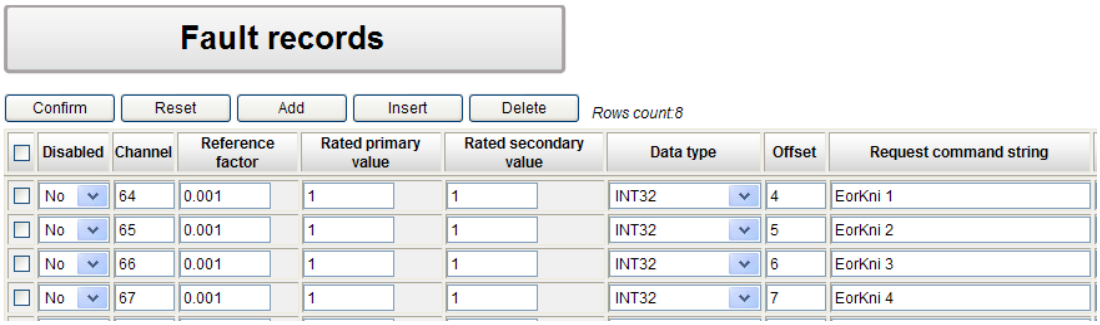


Figure 56: IEC103 Device x, Fault records, EOR-D

Table 39: IEC103 Device *x*, Fault records, EOR-D

Setting	Format	Range	Default	Description
Disabled	-	Option boxes	Yes	Enabling/disabling of individual data point
Channel	-	0 to 255	64	According to IEC 60870-5-103, the number of channels indicates the number of analogue channels in transmission data (NOC Number).
Reference factor	-	float	1	Reference factor (RFA) defined in 7.2.6.17 IEC 60870-5-103© RFA is pre-set to 0.001. REG-PE(D) calculates the additional factors for each channel to limit values in range up to 31767 (two bytes). Then this additional factor is multiplied with pre-set RFA. The result is transmitted as IEC "Reference factor".
Rated primary value	-	float	1	Rated primary value (RPV) defined in 7.2.6.18 IEC 60870-5-103© The value is calculated for each set channel using EOR-D factor commands "EorKni X" or "EorKnu Y" accordingly with type of channel (voltage or current)
Rated secondary value	-	float	1	Rated secondary value (RSV) defined in 7.2.6.19 IEC 60870-5-103© Value set to 1 for EORSys™.
Data type	-	Selection of values in combo box	INT8	Device data type
Offset	-	0 to 7	12	Channel data offset in Records

Setting	Format	Range	Default	Description
Request command string	-	63 charac-ters	empty string	Factor request command string
Descrip-tion	-	63 charac-ters	empty string	User description

The conformity of IEC-channels and earth-fault channels of EOR-D shown in the figure below.

EOR-D earth-fault record is able to read and to save in COMTRADE or comma-separated (CSV) file format.

The data mapping of channels particular are explained on an example.

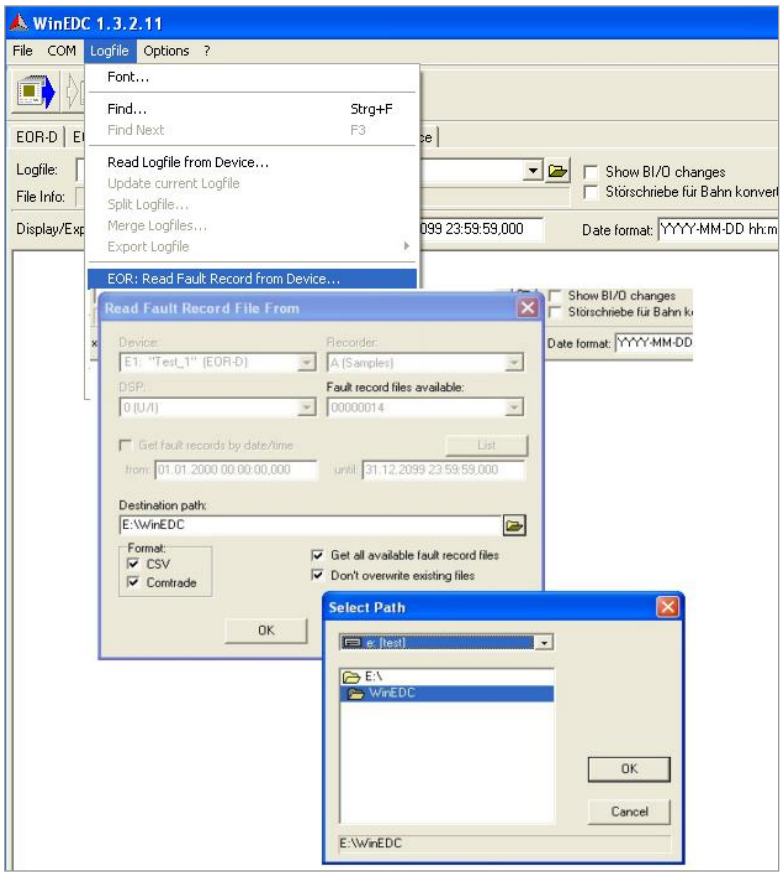


Figure 57: Read Faults Record from EOR-D

With the help of WinEDC program (see Figure above) records data from EOR-D device “E1” saved to CSV-file. The IEC-channel data are located in the column “i1”.

13.5.7 EOR-D® defined settings

The meaning of offset is explained in table below.

“i1”- earth-faults values are located in the faults record with begin offset 4.

Table 40: Channel offset term

7	EOR-D	Test_3	E3:					
1320	11540	1	0					
1	0	0	0					
963	0	0	0					
383,73	0	0	0					

Data from WinEDC CSV-file:

Index	u1	u2	u3	u4	i1	i2	i3	i4
0	-2233	-2488	-4	-43	489	-1	0	0
1	645	-2488	-29	-92	450	-1	0	-1
2	-2233	-2488	-4	-43	359	-1	-1	-1
3	-5111	-2488	21	-43	359	-1	-1	-1
4	-5111	-2488	-29	-92	359	-1	-1	-1
5	-5111	-2488	-29	-43	359	-1	0	-1
6	645	-2488	194	406	489	-1	0	-1

Description:

Offset	0	1	2	3	4	5	6	7

13.5.8 Single disturbance value (SDV)

SDV := F16[1..16] <-1..+1-2^{-15}> is defined and calculated according to IEC requirements.

The raw-values are transmitted as integer in range from – 32768 up to 32767 and then normalized to -1.0 … +1.0.

14. DNP3 settings (REG-P)

Chapter DNP settings describes only settings which are not described above.

14.1 Basic

Basic settings branch tree contains basic settings for DNP protocol conversion.

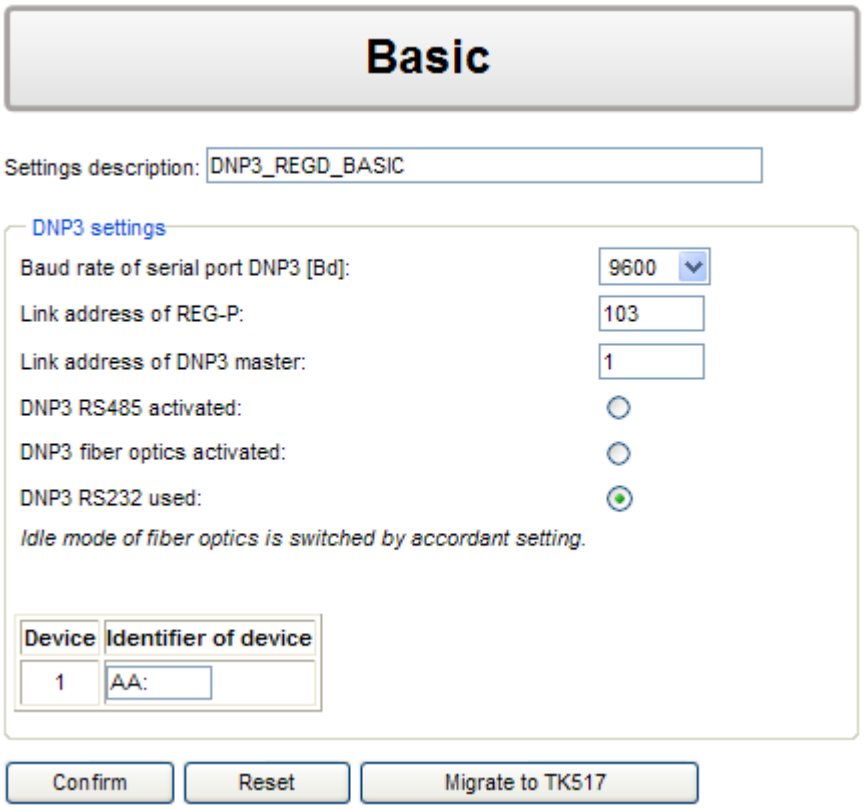


Figure 58: DNP3 basic settings REG-P

Table 41: DNP3 basic settings REG-P

Setting	Format	Range	Default	Description
Settings description	text	50 characters	Filename of open settings	Short user description of settings file or name of settings file.
Baud rate of serial port DNP3	Bd	selection of values in combo box	9600	Baud rate of serial port DNP
Link address of REG-P	-	0 to 65535	103	Link address of REG-P
Link address of DNP3 master	-	0 to 65535	1	Link address of DNP master
DNP3 RS485 activated	-	option box	not selected	DNP3 RS485 activated
DNP3 fiber optics activated	-	option box	not selected	DNP3 fiber optics activated
DNP3 RS232 used	-	option box	selected	DNP3 RS232 used
Identifier of device	text	AA: or A(1 to 9): to Z(1 to 4):	AA:	Identifier of device

14.2 Advanced

14.2.1 Settings - SCADA

Advanced tree branch for Settings - SCADA contains complete DNP3 specific communication settings.

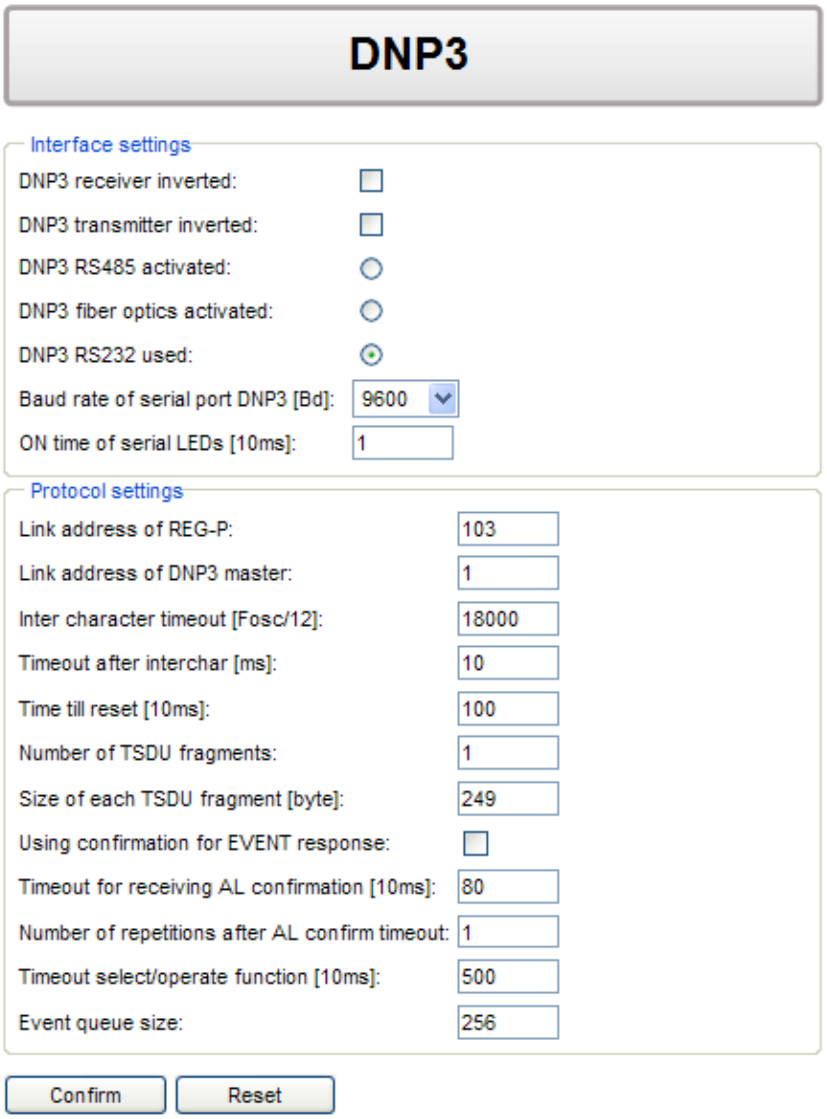


Figure 59: Advanced Settings - SCADA for REG-P (TK509, TK400)

Table 42: DNP3 Settings - SCADA REG-P (TK509, TK400)

Setting	Format	Range	Default	Description
DNP3 receiver inverted	-	checkbox	unchecked	DNP3 receiver inverted without jumpers
DNP3 transmitter inverted	-	checkbox	unchecked	DNP3 transmitter inverted
DNP3 RS485 terminator activated	-	checkbox	unchecked	DNP3 RS485 terminator activated
DNP3 RS485 activated	-	radio button	unchecked	DNP3 RS485 activated
DNP3 fiber optics activated	-	radio button	unchecked	DNP3 fiber optics activated
DNP3 RS232 used	-	radio button	checked	DNP3 RS232 used
Baud rate of serial port DNP3	Bd	selection of values in combo box	9600	Baud rate of serial port DNP
ON time of serial LEDs	10 ms	1 to 255	4	ON time of serial LEDs
Link address of REG-P	-	0 to 65535	103	Link address of REG-P
Link address of DNP3 master	-	0 to 65535	1	Link address of DNP master
Inter character timeout	Fosc/12	1000 to 65535	18000	Timeout between two characters in telegram
Timeout after interchar	ms	0 to 255	0	Timeout after inter character timeout expiration
Time till reset	10 ms	1 to 65535	100	Time until reset after cold restart
Number of TSDU fragments	-	1 to 128	1	Number of TSDU fragments
Size of each TSDU fragment	-	249 - 2048	249	Size of each TSDU fragment
Using confirmation for EVENT response	-	checkbox	unchecked	Using confirmation for EVENT response
Timeout for receiving AL confirmation	10 ms	1 to 65535	80	Timeout for receiving AL confirmation
Number of repetitions after AL confirm timeout		0 to 255	1	Number repetitions after AL confirm timeout
Timeout select/operate function	10 ms	1 to 65535	500	Timeout select/operate function
Event queue size	-	10 to 1024	256	Event queue size

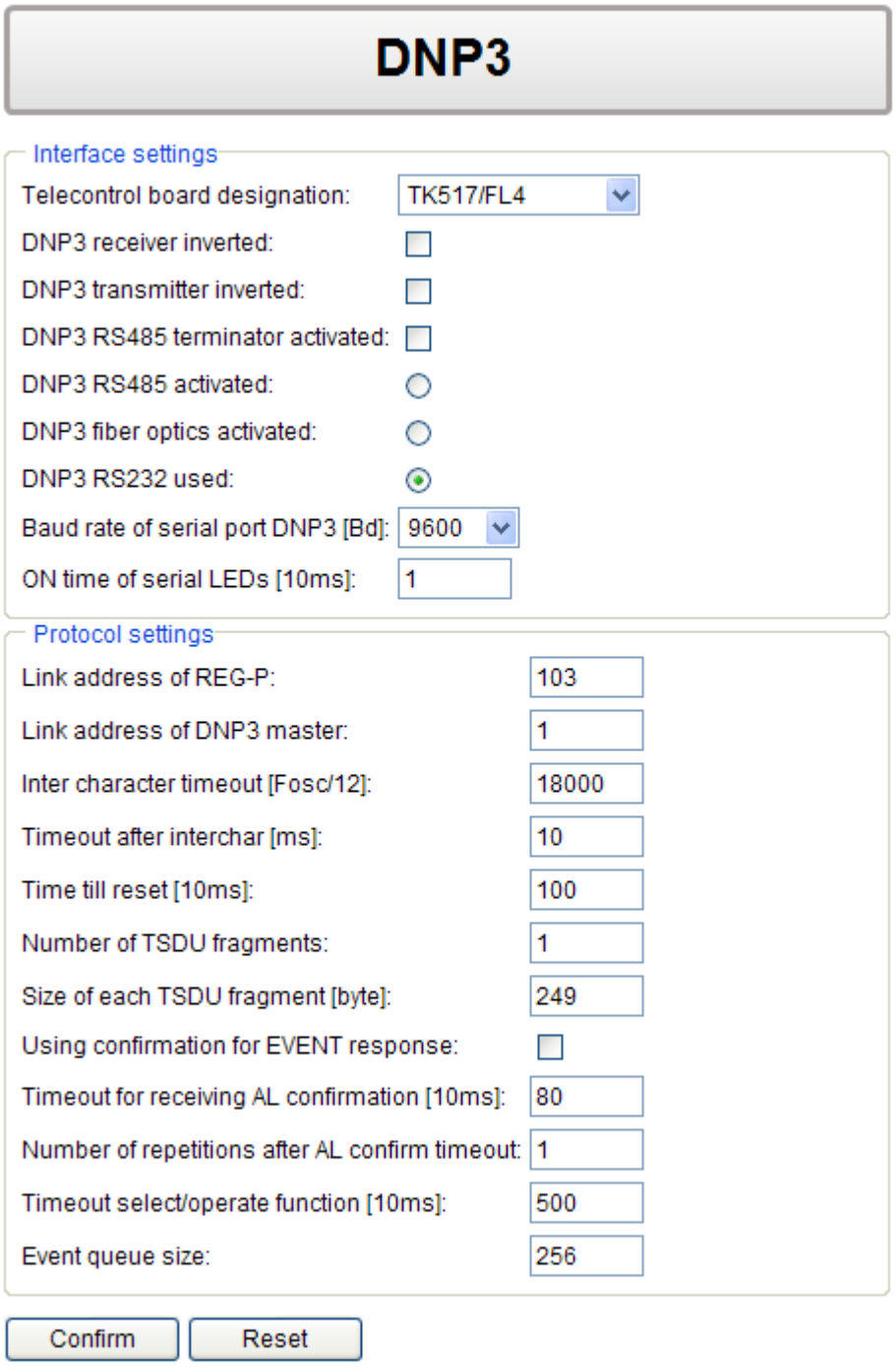


Figure 60: Advanced Settings - SCADA for REG-P (TK517)

Table 43: DNP3 Settings - SCADA REG-P (TK517)

Setting	Format	Range	Default	Description
Telecontrol board designation		selection of values in combo box	TK517/FL4	Selection from 4 available board types to get correct version of firmware.
DNP3 receiver inverted	-	checkbox	unchecked	DNP3 receiver inverted, option for board without jumpers
DNP3 transmitter inverted	-	checkbox	unchecked	DNP3 transmitter inverted, option for board without jumpers
DNP3 RS485 terminator activated	-	checkbox	unchecked	DNP3 RS485 terminator activated, option for board without jumpers
DNP3 RS485 activated	-	radio button	unchecked	DNP3 RS485 activated, option for board without jumpers
DNP3 fiber optics activated	-	radio button	unchecked	DNP3 fiber optics activated, option for board without jumpers
DNP3 RS232 used	-	radio button	checked	DNP3 RS232 used, option for board without jumpers
Baud rate of serial port DNP3	Bd	selection of values in combo box	9600	Baud rate of serial port DNP
ON time of serial LEDs	10 ms	1 to 255	4	ON time of serial LEDs
Link address of REG-P	-	0 to 65535	103	Link address of REG-P
Link address of DNP3 master	-	0 to 65535	1	Link address of DNP master
Inter character timeout	Fosc/12	1000 to 65535	18000	Timeout between two characters in telegram
Timeout after interchar	ms	0 to 255	0	Timeout after inter character timeout expiration
Time till reset	10 ms	1 to 65535	100	Time until reset after cold restart
Number of TSDU fragments	-	1 to 128	1	Number of TSDU fragments
Size of each TSDU fragment	-	249 - 2048	249	Size of each TSDU fragment
Using confirmation for EVENT response	-	option box	Not selected	Using confirmation for EVENT response
Timeout for receiving AL confirmation	10 ms	1 to 65535	80	Timeout for receiving AL confirmation
Number of repetitions after AL confirm timeout		0 to 255	1	Number repetitions after AL confirm timeout

Setting	Format	Range	Default	Description
Timeout select/operate function	10 ms	1 to 65535	500	Timeout select/operate function
Event queue size	-	10 to 1024	256	Event queue size

14.3 Device x

14.3.1 Device request settings

Device request settings tree branch contains device specific settings.

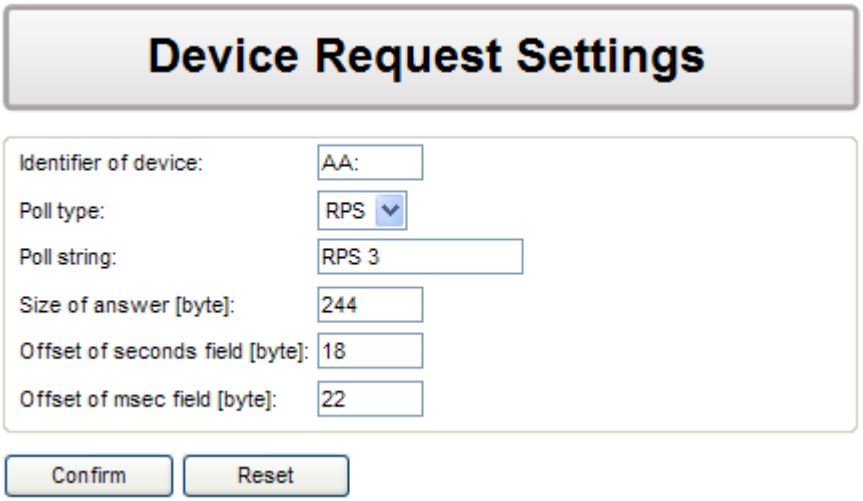


Figure 61: DNP3 device request settings REG-P

Table 44: DNP3 device settings REG-P

Setting	Format	Range	Default	Description
Identifier of device	text	AA: or A(1 to 9): to Z(1 to 4):	AA:	Identifier of device as appears in the device communication
Poll type	-	selection of values in combo box	RPS	Device poll type
Poll string	text	23 chars	RPS 3	Device poll string
RPS specific: Size of answer	byte	1 to 255	244	Size of answer
RPS specific: Offset of seconds field	byte	0 to 255	18	Offset of seconds field
RPS specific: Offset of msec field	byte	0 to 255	22	Offset of msec field

14.3.2 Commands

Commands tree branch contains DNP specific settings for DNP protocol.

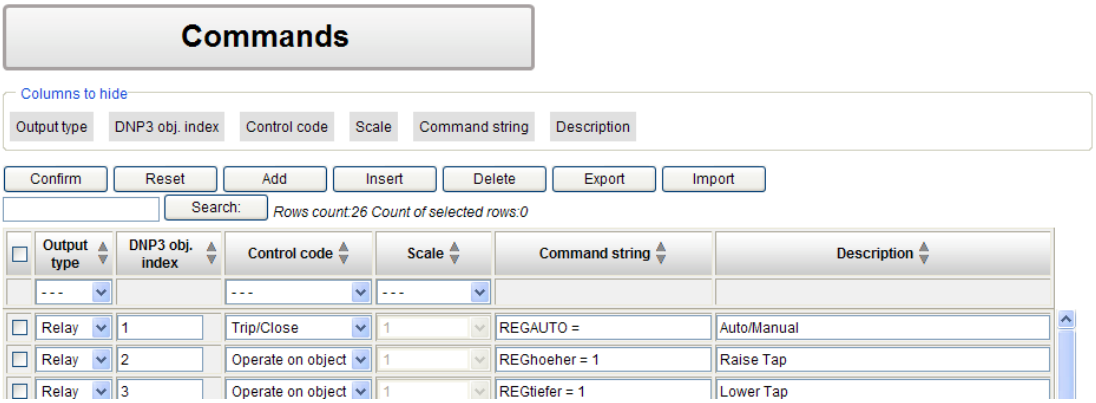


Figure 62: DNP3 commands REG-P

Table 45: DNP3 commands REG-P

Setting	Format	Range	Default	Description
Output type	-	selection of values in combo box	Relay	Output type
Obj. index	-	0 to 128	0	
Control code	-	selection of values in combo box	Operate on object	Control code
Scale	-	selection of values in combo box	1	Scale, valid for analog data type
Command string	text	50 characters	empty	Command string
Description	text	50 characters	empty	User description

The function for storage of descriptions of commands and data points in the telecontrol board memory is not implemented for DNP3 protocol.

Settings transferred back to PC from REG-P telecontrol board will have empty descriptions of commands and data points.

14.3.3 Indications

Indications tree branch contains DNP specific settings for DNP protocol.

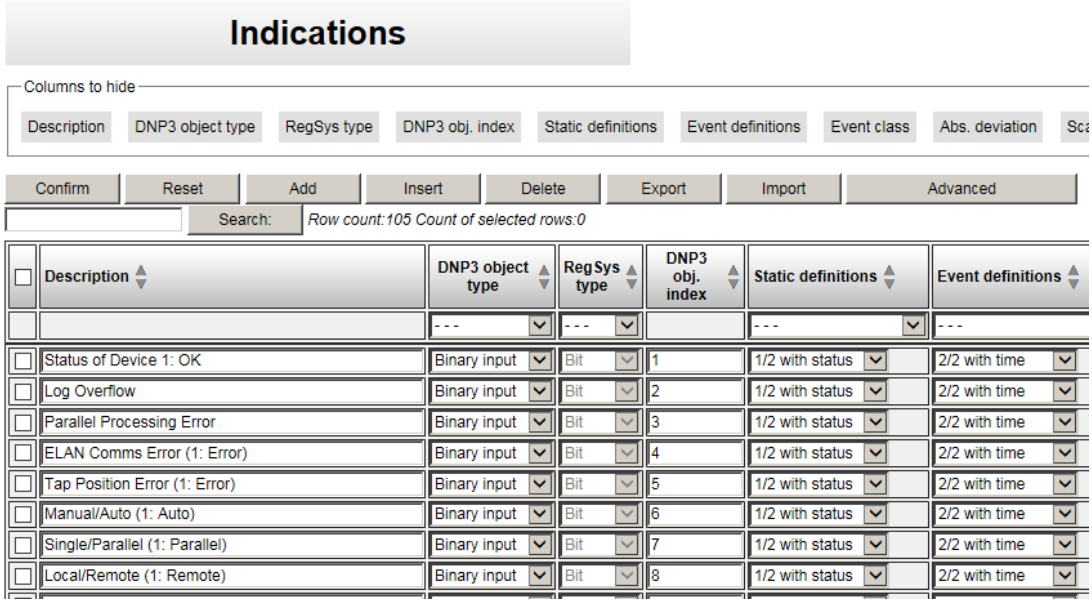


Figure 63: DNP3 indications REG-P

Table 46: DNP3 indications REG-P

Setting	Format	Range	Default	Description
DNP3 object type	-	selection of values in combo box	Binary input	DNP object type
REG data type	-	selection of values in combo box	Bit	REG data type
DNP3 obj. index	-	0 to 65535	0	DNP object index
Static definitions	-	selection of values in combo box	no class 0 point	Static definitions
Event definitions	-	selection of values in combo box	no event	Event definitions
Event class	-	selection of values in combo box	1	Event class
Abs. deviation	-	0 to 65535	0	Absolute deviation
Scale	float		1	Scale
RPS offset		0 to 255	0	RPS offset
RPS bit	-	selection of values in combo box	0	RPS bit
Description	text	50 characters	empty	User description

15. DNP3 settings (REG-PE(D), REG-PEDSV, TK28-4, TK28-6, TK102)

15.1 Basic

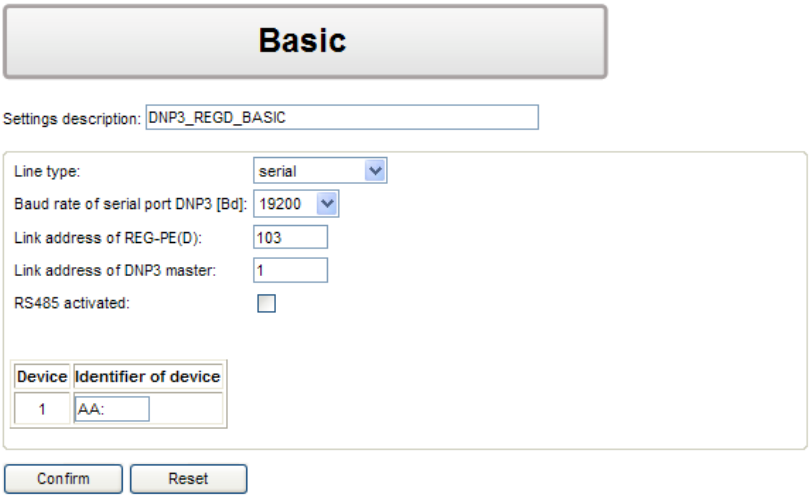


Figure 64: DNP3 basic settings REG-PE(D)), REG-PEDSV, TK28-6

Table 47: DNP3 basic settings REG-PE(D)), REG-PEDSV, TK28-6

Setting	Format	Range	Default	Description
Settings description	text	50 characters	Identification if the template source	Short user description of settings file.
Line type	-	selection of values in combo box	serial	Type of communication line – serial, Ethernet TCP, Ethernet UDP
Authorized central stations IP addresses	-	4x 0 to 255	192.168.1.68 192.168.1.64 192.168.1.43	IP addresses of central stations authorized to connect to telecontrol board
Baud rate of serial port DNP3	Bd	selection of values in combo box	19200	Baud rate of serial port DNP
Link address of REG-P	-	0 to 65535	103	Link address of REG-P
Link address of DNP3 master	-	0 to 65535	1	Link address of DNP master
RS485 activated	-	option box	not selected	RS485 activated
Identifier of device	text	AA: or A(1 to 9): to Z(1 to 4):	AA:	Identifier of device

15.2 Advanced

15.2.1 Settings SCADA

The advanced tree branch SCADA setting contains complete DNP3 specific communication settings.

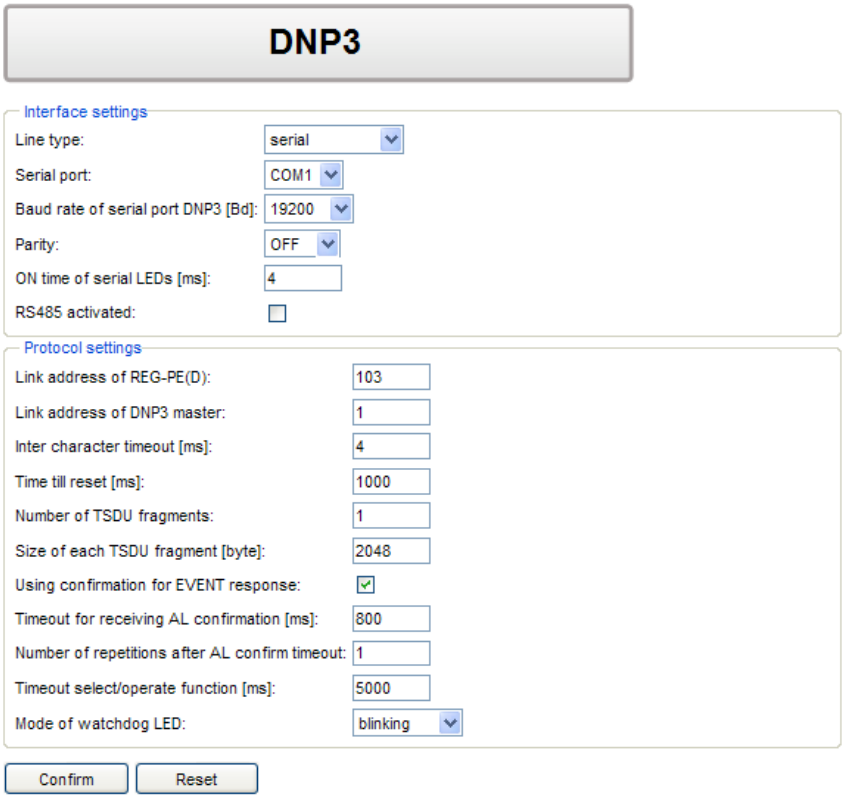


Figure 65: Advanced settings SCADA REG-PE(D)

Table 48: DNP3 advanced settings REG-PE(D)), REG-PEDSV, TK28-6

Setting	Format	Range	Default	Description
Line type	-	selection of values in combo box	serial	Type of communication line – serial, Ethernet TCP, Ethernet UDP
Authorized central stations IP addresses	-	4x 0 to 255	192.168.1.68 192.168.1.64 192.168.1.43	IP addresses of central stations authorized to connect to telecontrol board
Port	-	1 to 65535	20000	TCP or UDP Port
Serial port	-	selection of values in combo box	COM1	Selection of DNP3 COM port
Baud rate of serial port DNP3	Bd	selection of values in combo box	19200	Baud rate of serial port DNP
Parity	-	selection of values in combo box	Off	Parity of serial port DNP
ON time of serial LEDs	ms	0 to 255	4	ON time of serial LEDs
Link address of REG-PE(D)	-	0 to 65535	103	Link address of REG-P
Link address of DNP3 master	-	0 to 65535	1	Link address of DNP master
Inter character timeout	ms	2 to 1000	4	Timeout between two characters in telegram
Time till reset	ms	1 to 65535	1000	Time until reset after cold restart
RS485 activated	-	option box	Not selected	RS485 activated
Number of TSDU fragments	-	1 to 128	1	Number of TSDU fragments
Size of each TSDU fragment	-	64 - 2048	2048	Size of each TSDU fragment
Using confirmation for EVENT response	-	option box	selected	Using confirmation for EVENT response
Timeout for receiving AL confirmation	ms	1 to 65535	800	Timeout for receiving AL confirmation
Number of repetitions after AL confirm timeout	-	0 to 255	1	Number repetitions after AL confirm timeout
Timeout select/operate function	ms	1 to 65535	5000	Timeout select/operate function

15.2.2 COM-Server

The COM server tree branch contains parameters for COM-Server functionality of DNP3 firmware. For detailed description of COM Server parameters see the COM-Server chapter in IEC104 protocol.

15.2.3 Supervisory settings

For detailed description of Supervisory parameters see the Supervisory settings chapter in IEC103 protocol.

Note that usage of Syslog server is available only for COM-Server logging in DNP3 firmware.

15.2.4 Linked devices – time synchronization

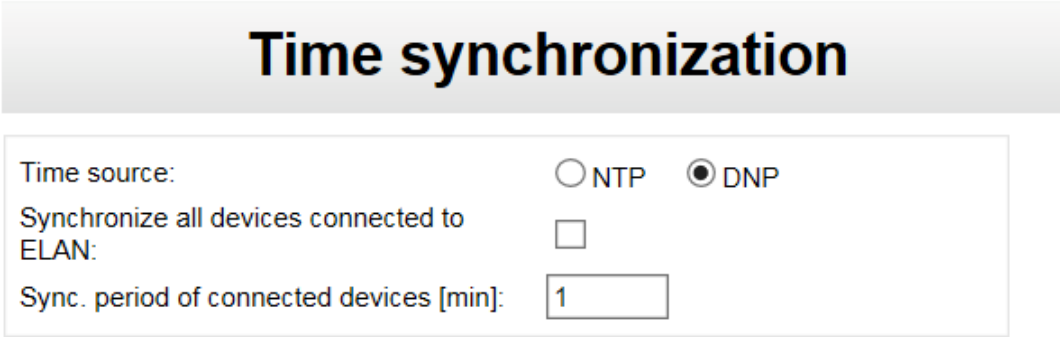


Figure 66: Time synchronization

Table 49: Time synchronization

Setting	Format	Range	Default	Description
Time source	option	NTP/DNP	DNP	Time source
Synchronize all devices connected to ELAN	-	checkbox	unchecked	Synchronize all devices connected to ELAN
Sync. period of connected devices	min	1 to 999	1	Synchronization period of connected devices

15.2.5 Time synchronization for boards type TK28-4, TK28-6 and TK102

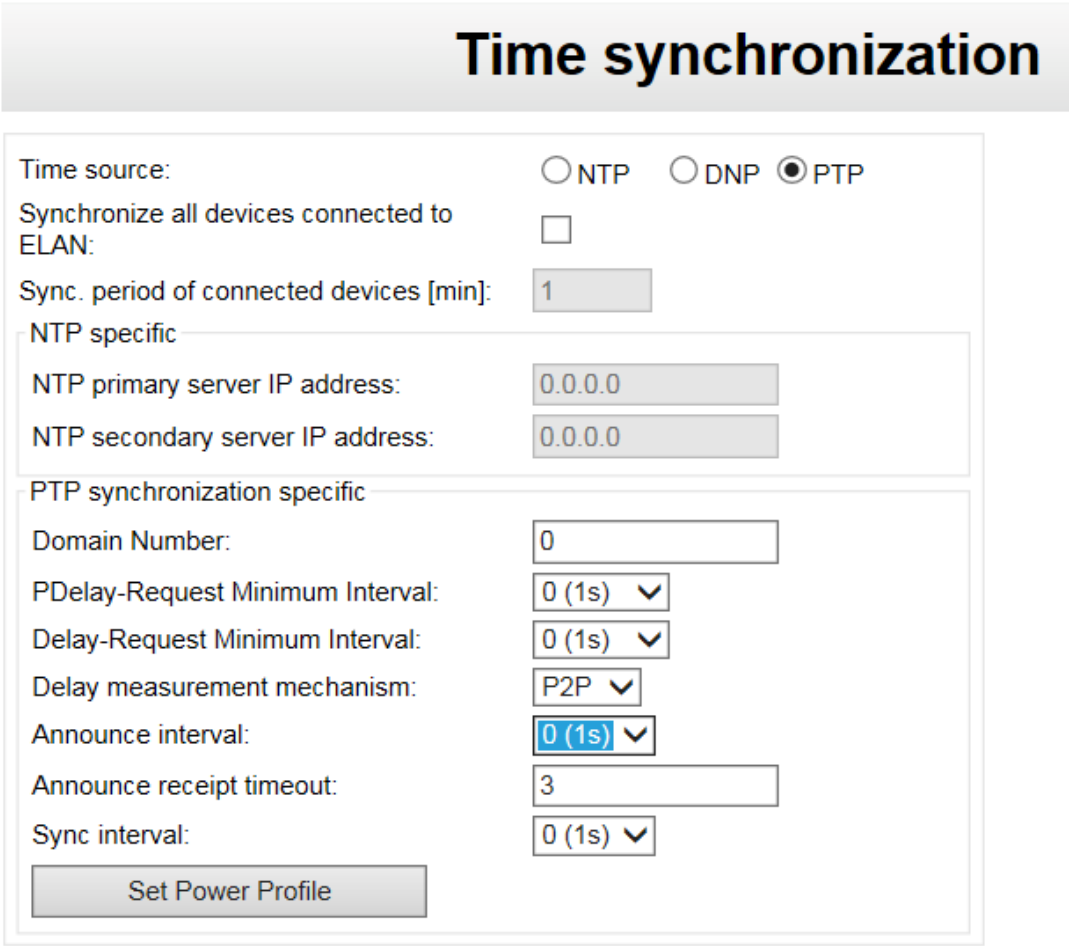


Figure 67: Time synchronization for boards type TK28-4, TK28-6 and TK102

Table 50: Time synchronization for boards type TK28-4, TK28-6 and TK102

Setting	Format	Range	Default	Description
Time source	option	NTP/DNP/PTP	DNP	Time source
Synchronize all devices connected to ELAN	-	checkbox	unchecked	Synchronize all devices connected to ELAN
Sync. period of connected devices	min	1 to 999	1	Synchronization period of connected devices
NTP primary server IP address	IPV4	4x 0 to 255	0.0.0.0	NTP primary server IP address
NTP secondary server IP address	IPV4	4x 0 to 255	0.0.0.0	NTP secondary server IP address
PTP specific: VLAN ID			0	VLAN ID
PTP specific: Domain Number		0 to 255	0	Domain Number
PTP specific: PDelay-Request Minimum Interval		Selection of values from listbox	0	PDelay-Request Minimum Interval, 0 to 5
PTP specific: Delay-Request Minimum Interval		Selection of values from listbox	0	Delay-Request Minimum Interval, 0 to 5
PTP specific: Delay measurementt mechanism		Selection of values from listbox	Auto	Delay measurement mechanism
PTP specific: Announce interval		Selection of values from listbox	1	Announce interval, 0 to 3. All PTP nodes in network should have the same value
PTP specific: Announce receipt timeout		2 to 10	3	Announce receipt timeout, all PTP nodes in network should have the same value
PTP specific: Sync. interval		Selection of values from listbox	none	Synchronization interval, 0 to 2

15.3 Device X

15.3.1 Device request settings

Device request settings tree branch contains device specific settings.

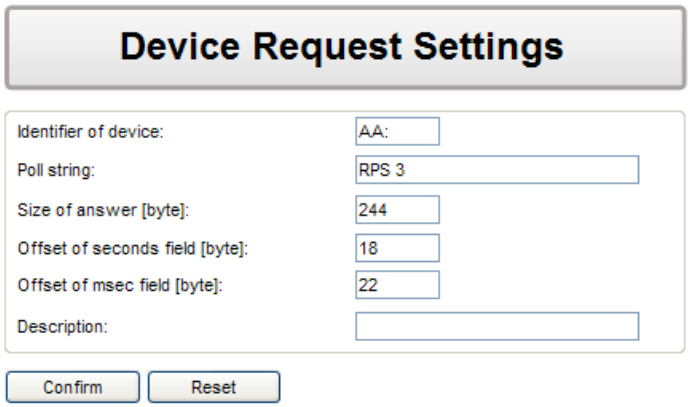
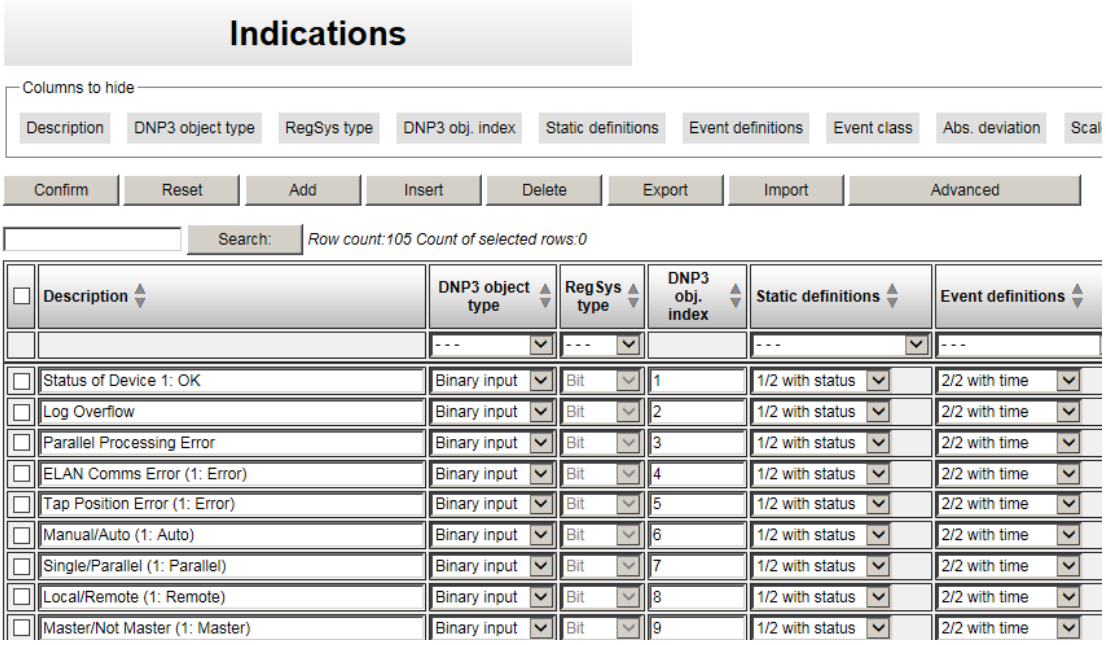


Figure 68: DNP3 device request settings REG-PE(D)

Table 51: DNP3 device settings REG-PE(D)

Setting	Format	Range	Default	Description
Identifier of device	text	AA: or A(1 to 9): to Z(1 to 4):	AA:	Identifier of device as appears in the device communication
Poll string	text	23 chars	fread RPS 3	Device poll string
Size of answer	byte	1 to 255	244	Size of answer
Offset of seconds field	byte	0 to 255	18	Offset of seconds field
Offset of msec field	byte	0 to 255	22	Offset of msec field
Description	string	30 characters	Empty string	User description

15.3.2 Indications



Description	DNP3 object type	RegSys type	DNP3 obj. index	Static definitions	Event definitions
	- - -	- - -		- - -	- - -
Status of Device 1: OK	Binary input	Bit	1	1/2 with status	2/2 with time
Log Overflow	Binary input	Bit	2	1/2 with status	2/2 with time
Parallel Processing Error	Binary input	Bit	3	1/2 with status	2/2 with time
ELAN Comms Error (1: Error)	Binary input	Bit	4	1/2 with status	2/2 with time
Tap Position Error (1: Error)	Binary input	Bit	5	1/2 with status	2/2 with time
Manual/Auto (1: Auto)	Binary input	Bit	6	1/2 with status	2/2 with time
Single/Parallel (1: Parallel)	Binary input	Bit	7	1/2 with status	2/2 with time
Local/Remote (1: Remote)	Binary input	Bit	8	1/2 with status	2/2 with time
Master/Not Master (1: Master)	Binary input	Bit	9	1/2 with status	2/2 with time

Figure 69: DNP3 indications REG-PE(D)

Table 52: DNP3 indications REG-PE(D)

Setting	Format	Range	Default	Description
DNP3 object type	-	selection of values in combo box	Binary input	DNP3 object type
REG data type	-	selection of values in combo box	Bit	REG data type
DNP3 obj. index	-	0 to 65535	0	DNP object index
Static definitions	-	selection of values in combo box	no class 0 point	Static definitions
Event definitions	-	selection of values in combo box	no events	Event definitions
Event class	-	selection of values in combo box	1	Event class
Abs. deviation	float		0	Absolute deviation
Scale	float		1	Scale
RPS offset		0 to 255	0	RPS offset
RPS bit	-	selection of values in combo box	0	RPS bit
Description	text	50 characters	empty	User description
Simulation		selection of values in combo box	No	Option whether the data point value can be simulated
Simulation value		according to the data type	0	Simulated data point value

Simulation of the data point value is new feature in WinConfig version starting from 11.0.6. User can allow simulation and prepare simulation values of individual data points. The simulation can be consequently launched by *Run simulation* button in the online WinConfig in REG-PE(D) telecontrol board.

15.3.3 Commands

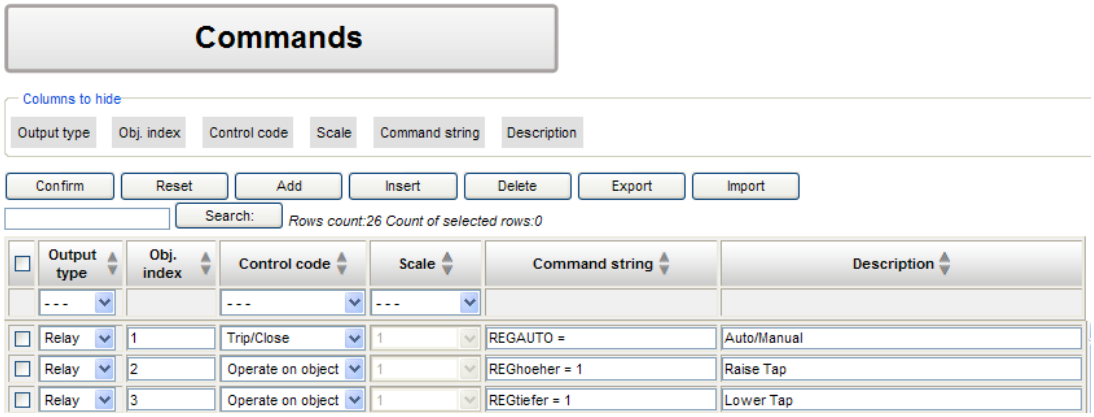


Figure 70: DNP3 commands REG-PE(D)

Table 53: DNP3 commands REG-PE(D)

Setting	Format	Range	Default	Description
Output type	-	selection of values in combo box	Relay	Output type
Obj. index	-	0 to 255	1	Object index
Control code	-	selection of values in combo box	Operate on object	Control code
Scale	-	selection of values in combo box	1	Scale, valid for analog data type
Command string	text	50 characters	empty	Command string
Description	text	50 characters	empty	User description

15.3.4 Information about installed DNP3 version

The DNP3 firmware contains a special function to facilitate the access to the information about installed DNP3 firmware version. This information can be seen on the Regsys screen for a short period of time during the telecontrol board start.

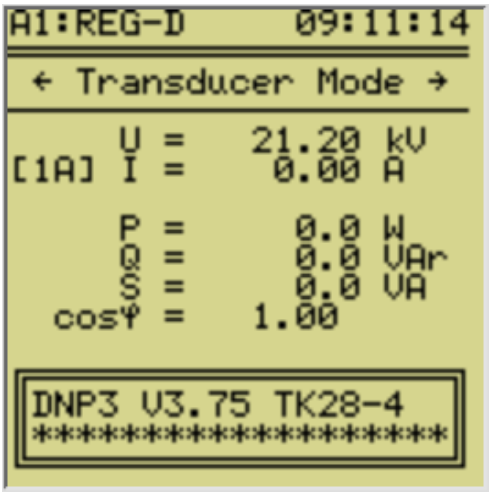


Figure 71: Information about the DNP3 firmware version

15.4 MODBUS Collector for DNP3/TKxx

DNP3 comes additionally with Modbus-Collector-Functionality, which provides a MODBUS-RTU Master to retrieve information from Modbus-slaves to be processed in a-eberle-device.

The MODBUS Master can receive pre-defined analogue values from up to 32 MODBUS-RTU server and to be processed in a-eberle devices. Usage of MODBUS-RTU using is optional.

Basic settings tree branch form contains common settings of MODBUS-RTU.

Extended settings shall be done by a-eberle staff.

MODBUS collector settings

RTU communication settings

Activate:	☑
Serial port:	COM4
Baud rate of serial port MODBUS [Bd]:	19200
Parity:	EVEN
Stop bits:	1
Data bits:	8
RS485 activated:	☑

Advanced timing settings

Response timeout [ms]:	1000
Byte timeout [ms]:	0
No reply:	0

Slave stations

Activate	Slave ID	Register address	Number of registers
Yes	1	7000	6
Yes	2	7000	6
Yes	3	7000	6
No	4	7000	6
No	5	7000	6
No	6	7000	6
No	7	7000	6
No	8	7000	6

Figure 72: MODBUS collector basic settings

Table 54: MODBUS collector settings

Setting	Format	Range	Default	Description
Activate	Checkout	Yes/no	no	Activate MODBUS-RTU extension.
Serial Port	-	Selection of values in combo box	COM1	Selection of available COM ports for MODBUS-RTU communication – read only
Baud Rate	-	Selection of values in combo box	19200	Data transfer rate. 19200 b/s is default.
Parity	-	Selection of values in combo box	EVEN	Even parity is required
Stop bits	-	Selection of values in combo box	1	Stop bits
Data bits	-	Selection of values in combo box	8	Data bits
RS485 activated		checkbox	checked	Activation of RS485
Response timeout	ms	0..65535	1000	The master is configured by the user to wait for a predetermined timeout interval (Response time-out) before aborting the transaction
Byte timeout	-	0..65535	0	The maximum timeout interval in ms. between two consecutive bytes of the same message
No reply	-	0..65535	0	Idle timeout after “no replay” from slave up to a next query.

Table 55: MODBUS collector slaves settings

Setting	Format	Range	Default	Description
Activate	Checkout	Yes/no	no	Activate MODBUS-RTU slave use.
Slave ID	-	1..254	1	Modbus slave address. The address must be unique on a MODBUS serial bus
Register address	-	2 Bytes 0x0000 to 0xFFFF	7000	The starting register address
Number of registers	-	1 to 500	6	The number of registers

15.4.1 Modbus collector – supervisory settings

Modbus collector – supervisory settings tree branch contains usual settings for supervising the Modbus communication. Settings are similar to the available in other protocols available in WinConfig.

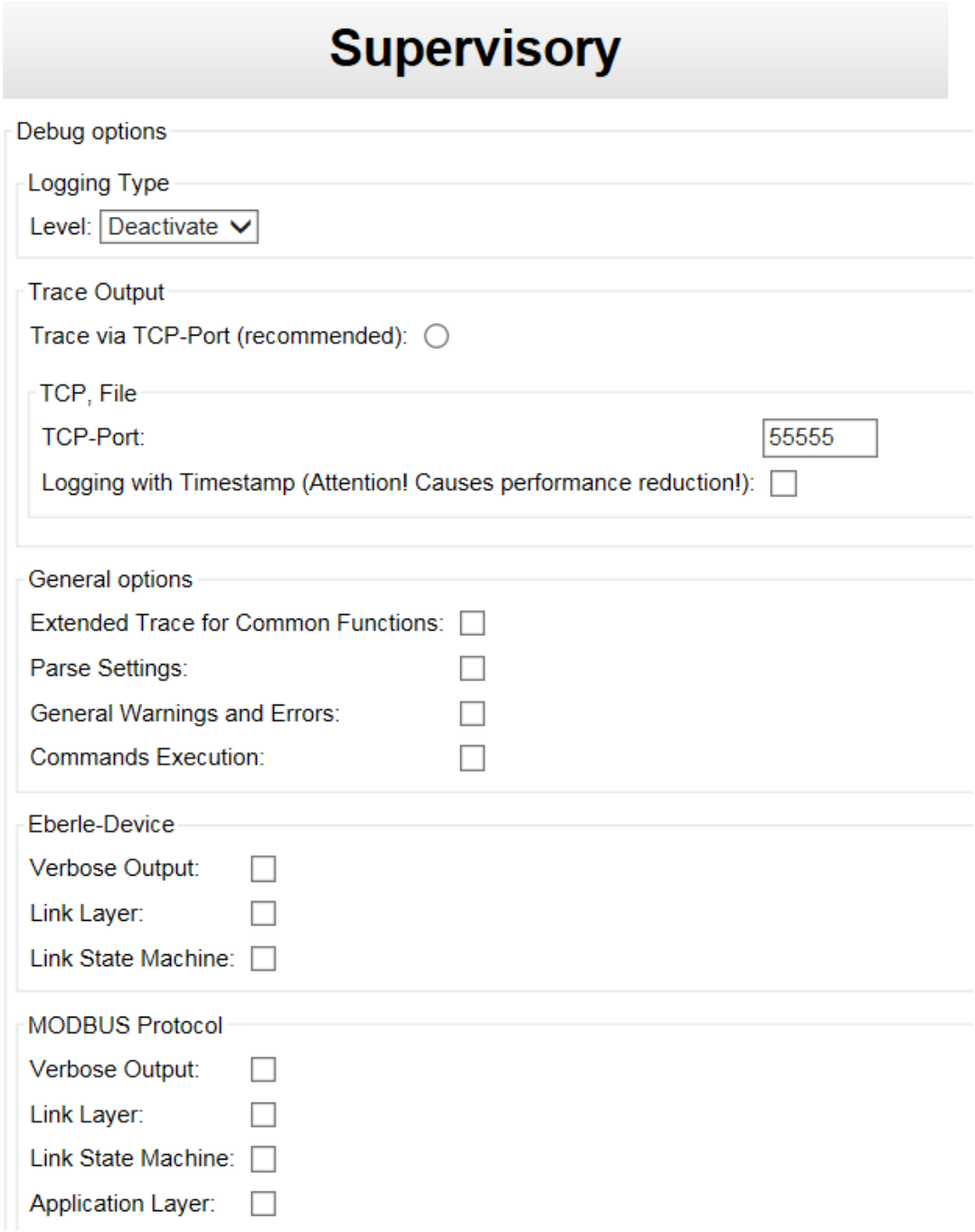


Figure 73: MODBUS collector supervisory settings

15.4.2 Modbus collector – internal communication

Modbus collector – internal settings tree branch contains options for internal communication between the device and telecontrol board.

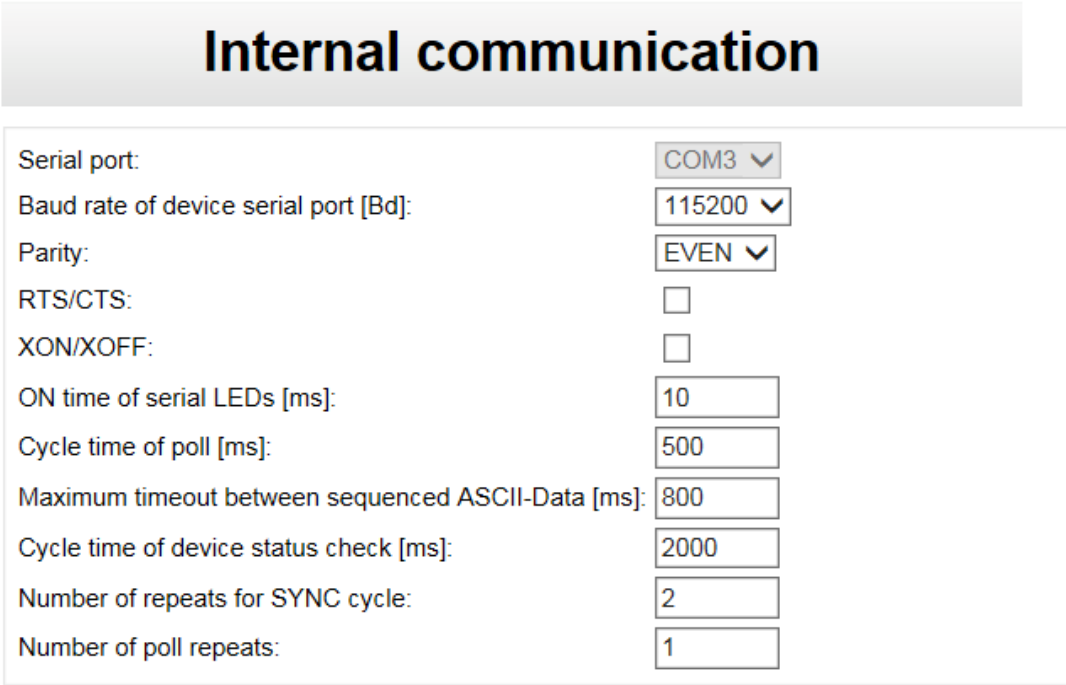


Figure 74: MODBUS collector – internal communication

Table 56: MODBUS collector – internal communication

Setting	Format	Range	Default	Description
Serial Port	-	Selection of values in combo box	COM3	Selection of available COM ports for MODBUS-RTU communication – read only
Baud Rate of device serial port	-	Selection of values in combo box	115200	Data transfer rate.
Parity	-	Selection of values in combo box	EVEN	Even parity is required
RTS/CTS	-	Checkbox	unchecked	RTS/CTS handshaking
XON/XOFF	-	Checkbox	unchecked	XON/XOFF handshaking
ON time of serial LEDs	ms	1..65535	10	ON time of serial LEDs
Cycle time of poll	ms	0..65535	500	Cycle time of poll
Maximum timeout between sequenced ASCII-Data	ms	0..65535	800	Maximum timeout between sequenced ASCII-Data
Cycle time of device status check	ms	0..65535	2000	Cycle time of device status check
Number of repeats for SYNC cycle	-	1..255	2	Number of repeats for SYNC cycle
Number of poll repeats	-	0..255	1	Number of poll repeats

16. Modbus settings

You are able to select of either two connection type “serial” or “TCP”.

16.1 Basic settings MODBUS RTU

Basic settings tree branch form contains common settings of MODBUS protocol – selection of available Baud rates, Slave address and identifier if device (devices). Basic settings also contain use definable description - name of the entire settings.

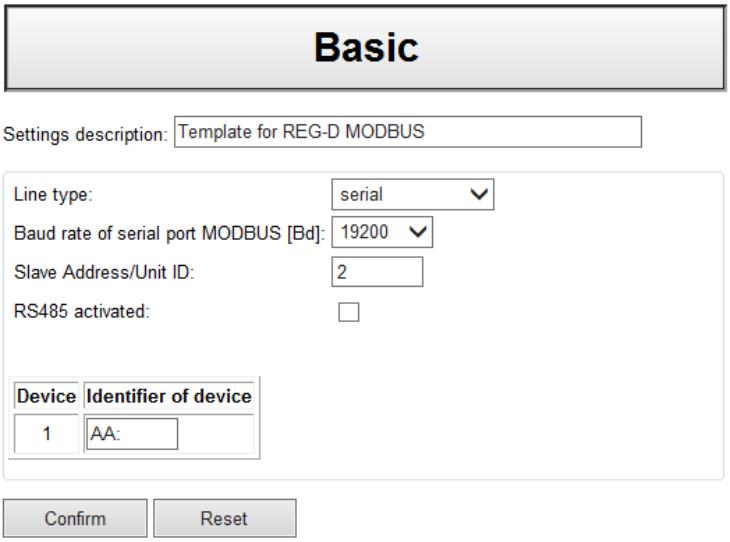


Figure 75: MODBUS RTU basic settings

Table 57: MODBUS basic settings

Setting	Format	Range	Default	Description
Settings description	Text	50 characters	Filename of open settings	Short user description of settings file or name of settings file.
Slave address	-	1-247	2	Address of slave
RS485 activated	Bd	Checkbox	unchecked	If unchecked then RS232 or fiber optic mode is selected.
Identifier of device	text	AA: or A(1 to 9): to Z(1 to 4):	defaults defined in the Devices tree branch	Device identifier string as appears in the device protocol

16.2 Basic settings MODBUS TCP

Basic settings tree branch form contains common settings of MODBUS TCP protocol – selection of Unit ID and identifier if device (devices). Basic settings also contain user definable description - name of the entire settings.

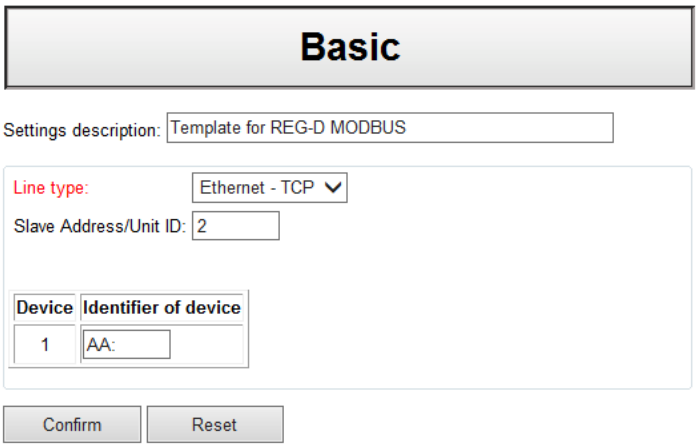


Figure 76: Modbus TCP basic settings

Table 58: MODBUS TCP basic settings

Setting	Format	Range	Default	Description
Settings description	Text	50 characters	Filename of open settings	Short user description of settings file or name of settings file.
Unit Id	-	1-247	2	Slave Address (same as the Unit ID used in MODBUS TCP/IP).
Identifier of device	text	AA: or A(1 to 9): to Z(1 to 4):	defaults defined in the Devices tree branch	Device identifier string as appears in the device protocol

The port number is default 502.

16.3 Advanced - Settings - SCADA

Advanced settings tree branch contains the complete range of MODBUS settings:

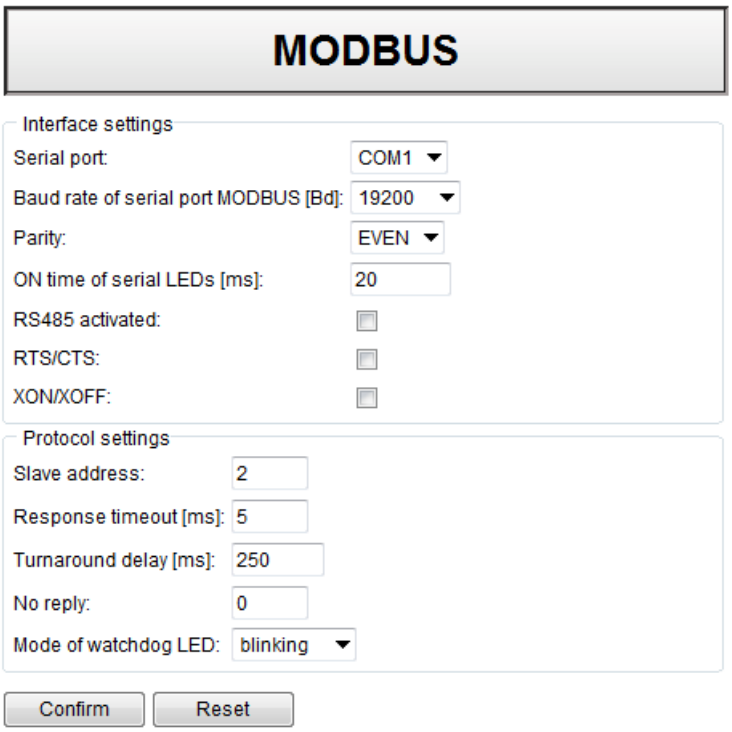


Figure 77: MODBUS SCADA settings

Table 59: MODBUS advanced settings

Setting	Format	Range	Default	Description
Serial port	-	Selection of values in combo box	COM1	Selection of available COM ports for Modbus communication
Baud rate of serial [Bd]	Bd	Selection of values in combo box	19200	Baud rate of Modbus serial port
Parity	-	Selection of values in combo box	Even	Parity of Modbus serial port
ON time of serial LEDs	ms	0 to 65535	20	ON time of serial LEDs indicating activity on the Modbus serial interface
Slave address	-	1-247	2	Address of slave
RS 485 activated	-	checkbox	Not checked	Activation of RS485 interface
RTS/CTS	**-**	**checkbox**	**Not checked**	**RTS/CTS handshaking**
XON/XOFF	-	checkbox	Not checked	XON/XOFF handshaking
Response timeout	**ms**	**2 to 100**	**5**	**SCADA response timeout**
Turnaround delay	ms	0 to 65535	250	Turnaround delay
No reply	-	0 to 255	0	No reply
Mode of watchdog LED	-	Selection of values in combo box	blinking	Mode of watchdog LED (blinking/switched off)

16.4 Devices

Devices tree branch is the same as for IEC101 protocol. See chapter 11.2

16.4.1 Time synchronization

Time synchronization tree branch is the same as for IEC101 protocol. See chapter 11.2.2.

16.4.2 Internal communication settings

Device communication settings contain the following options:

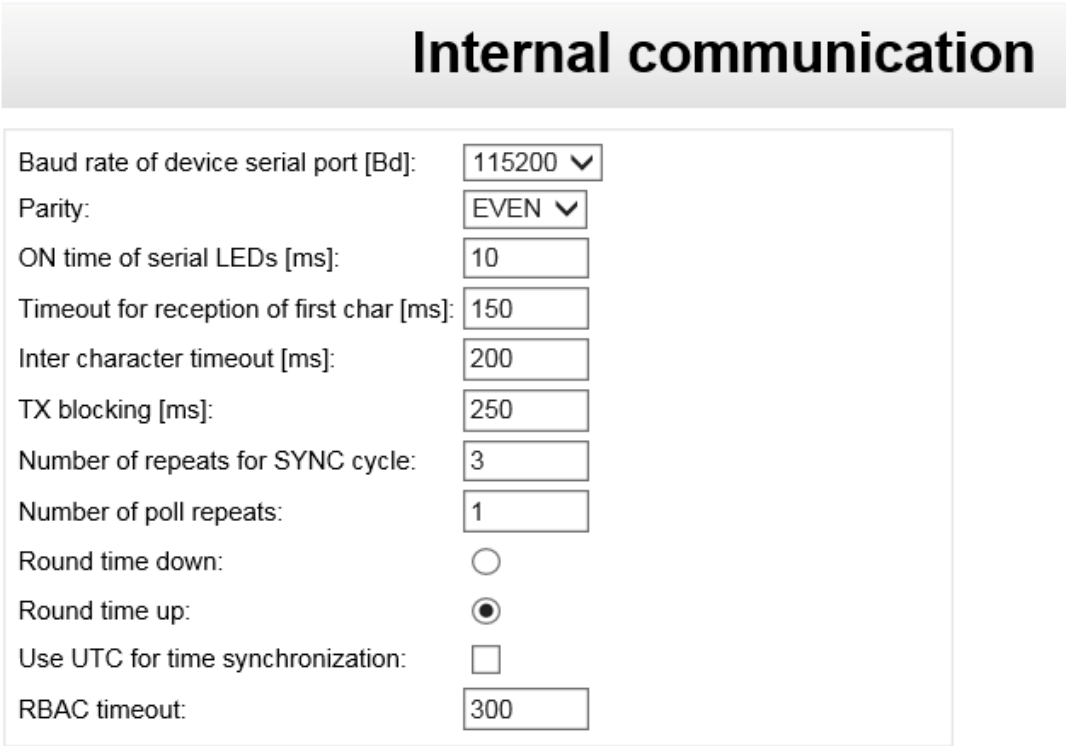


Figure 78: Device internal communication settings

Table 60: Device communication settings for MODBUS

Setting	Format	Range	Default	Description
Baud rate of device serial	Bd	Selection of values in combo box	115200	Baud rate of device serial port
Parity	-	Selection of values in combo box	Even	Parity of device serial port
ON time of serial LEDs	ms	0 to 65535	10	ON time of serial LEDs for indication of device communication
Timeout for reception of first char	ms	0 to 65535	90	Timeout for reception of first character
Inter character timeout	ms	0 to 65535	80	Timeout between two characters in telegram
TX blocking	ms	0 to 65535	30	Timeout to wait when answer was received
Number of repeats for SYNC cycle	-	0 to 255	3	Number of repeats for SYNC cycle
Number of command repeats	-	0 to 255	1	Number of command (poll) repeats
Round time down /	-	option box	round down	Rounding time selection

Setting	Format	Range	Default	Description
Round time up				
Use UTC for time synchronization	-	check box	unchecked	Selection of usage UTC for time synchronization
RBAC timeout	s	30 to 600	300	RBAC timeout for RegSys devices firmware supporting user roles and rights and telecontrol boards TK8xx and TK102

16.5 Device x

16.5.1 Device settings

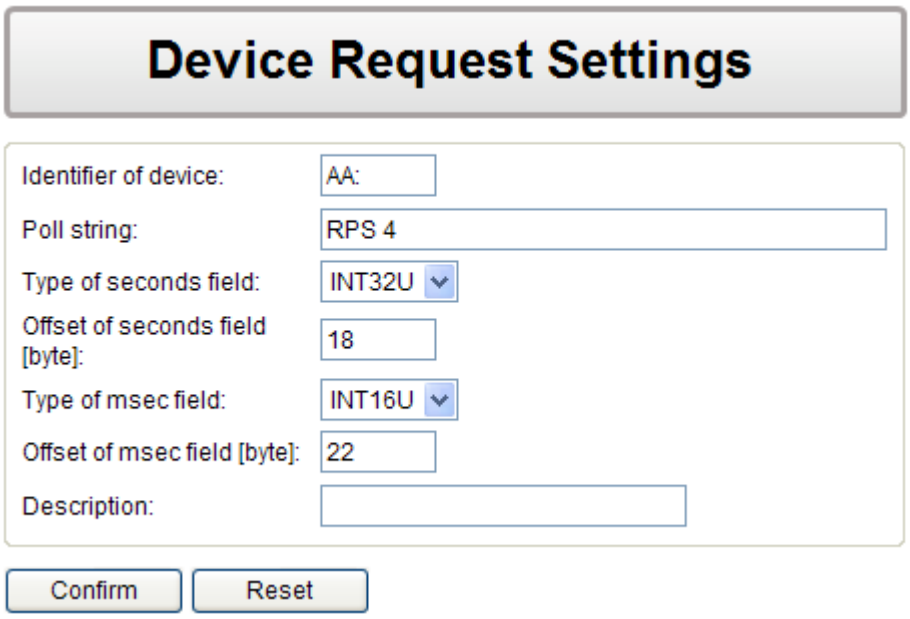


Figure 79: MODBUS device request settings

Table 61: MODBUS device settings

Setting	Format	Range	Default	Description
Identifier of device	text	3 chars	AA:	Identifier of device as appears in the device communication
Poll string	text	63 chars	RPS 4	Device poll string
Type of seconds field	-	Selection of values in combo box	INT32U	Type of “seconds” field
Offset of seconds field	byte	0 - 65535	18	Offset of seconds field
Type of msec field	-	Selection of values in combo box	INT32U	Type of “milliseconds” field
Offset of msec field	byte	0 - 65535	22	Offset of “milliseconds” field

Setting	Format	Range	Default	Description
Description	text	30 chars	empty	User description

16.5.2 Indications

Indications tree branch describes indications of individual device.

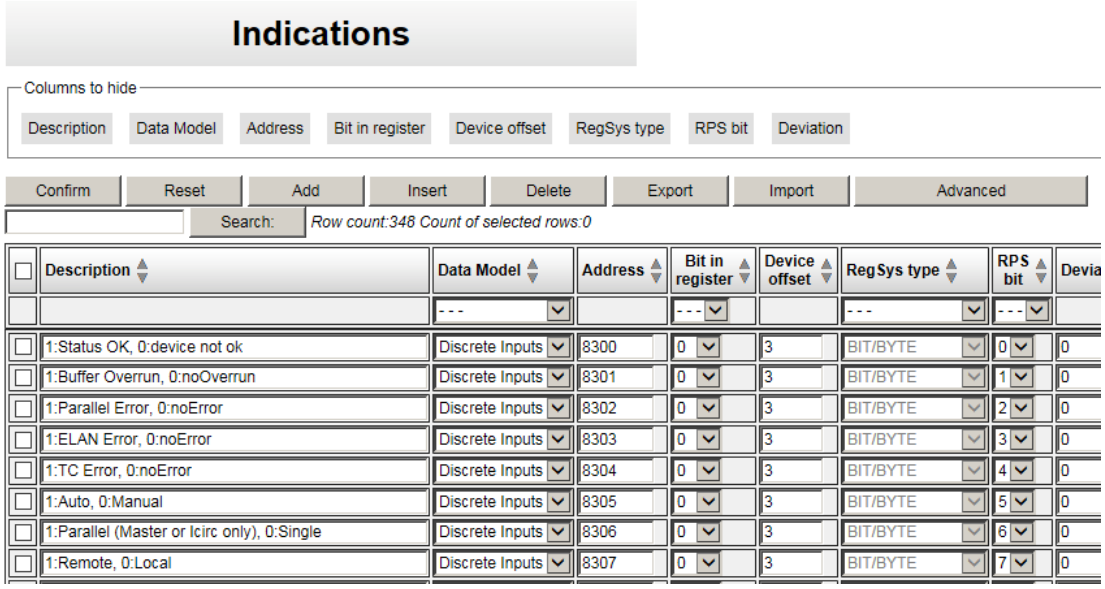


Figure 80: MODBUS indications

Table 62: MODBUS indications

Setting	Format	Range	Default	Description
Function	-	0 to 999	0	Function number
Address	-	0 to 65535	0	Address
Class	-	0 to 65535	0	Class
Device offset		0 to 999	0	Indication device offset
Dev type	-	0 to 999	0	Indication device type
Deviation	float		0	Absolute deviation value
Scale	float		0	Scale value
Max. value	float	0 to 65535	0	Max. value
Description	text	50 chars	empty	User description

16.5.3 Commands

Table of settings of individual commands represents command settings. This table is common for all a.eberle devices connected to the telecontrol board.

The upper line contains execution buttons for work with the individual command lines and for export/import of the entire table of commands.

Selected line in the table is marked by yellow background. All changes have to be confirmed by using the *Confirm* button.

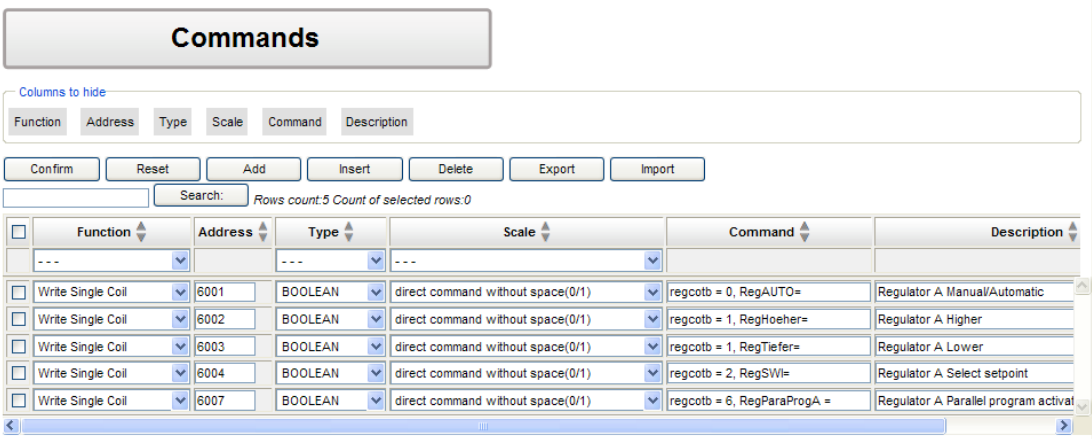


Figure 81: MODBUS commands

Table 63: MODBUS Commands

Setting	Format	Range	Default	Description
Function	-	1 to 128	1	Function number
Address	-	1 to 128	0	Information address
Type	-	1 to 128	0	Data type
Scale	-	1 to 128	0	Scale
Max value	-	1 to 128	0	Maximum value
Command	text	50 chars	empty	Command string
Description	text	50 chars	empty	User description

17. SPA-Bus settings

17.1 General Description

The SPA-bus is originally designed as a fieldbus in a distributed protection, control and event reporting system.

The SPA bus uses an asynchronous serial communications protocol (1 start bit, 7 data bits + even parity, 1 stop bit) with data transfer rate of 9600 b/s. Messages on the bus consist of ASCII characters. The bus can support one master and several slaves. The basic construction of the protocol assumes that the slave (REG-D) has no self-initiated need to talk to the master but the master is aware of the data contained in the slaves and, consequently, can request required data. In addition, the master can send data (REG-D commands) to the slave. Requesting by the master can be performed either by sequenced polling (e.g. for event information) or only on demand.

The master requests slave information using request messages and sends information to the slave and writes messages. Furthermore, the master can send all slaves in common a broadcast message containing time or other data.

The inactive state of bus transmit and receive lines is a logical "1".

NOTICE:	If you want to use ring topology please load according SPABUS template.

17.2 Conformance Statement with SPA-Bus Communication Protocol V2.5

1) Serial communications protocol (1 start bit, 7 data bits + even parity, 1 stop bit) with data transfer rate of 4800, 9600 b/s.
2) RS232, RS485 interfaces are supported.
3) Supported message types:
    1. Master to slave message types:
        - R (Read) Data read from slave.
        - W (Write) Direct data write to slave.
    2. Slave to master message types:
        - D (Data) Data message.
        - N (Nack) Negative acknowledgment.
        - A (Acknowledge) Message acknowledgment.
4) Supported Data categories:

- Input data I
- Output data O
- Setting values S
- Variables (internal) V
- Slave status C
- Slave identification F
- Time T
- Date and time D
- Last events L
- Last events from backup buffer B

17.3 Basic settings SPA-Bus

Basic settings tree branch form contains common settings of SPA-Bus protocol – selection of available Baud rates and Slave number. Basic settings also contain use definable description - name of the entire settings.

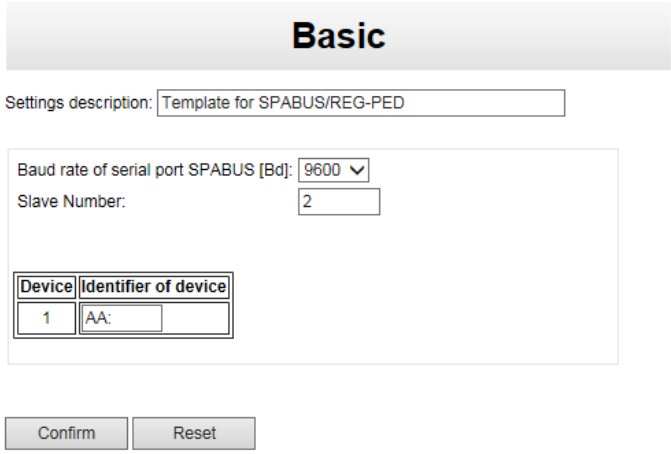


Figure 82: SPA-Bus basic settings

Table 64: SPA-BUS basic settings

Setting	Format	Range	Default	Description
Settings description	Text	50 characters	Filename of open settings	Short user description of settings file or name of settings file.
Baud Rate	-	Selection of values in combo box	9600	Data transfer rate. 9600 b/s is default. (In some cases a rate of 300, 1200, 2400 or 4800 bit/s can also be used.

Setting	Format	Range	Default	Description
Slave Number	-	1..999	2	The slave number is given in decimal format as 1...999.

17.4 Advanced - Settings - SCADA

Advanced settings tree branch contains the complete range of SPA-BUS settings:

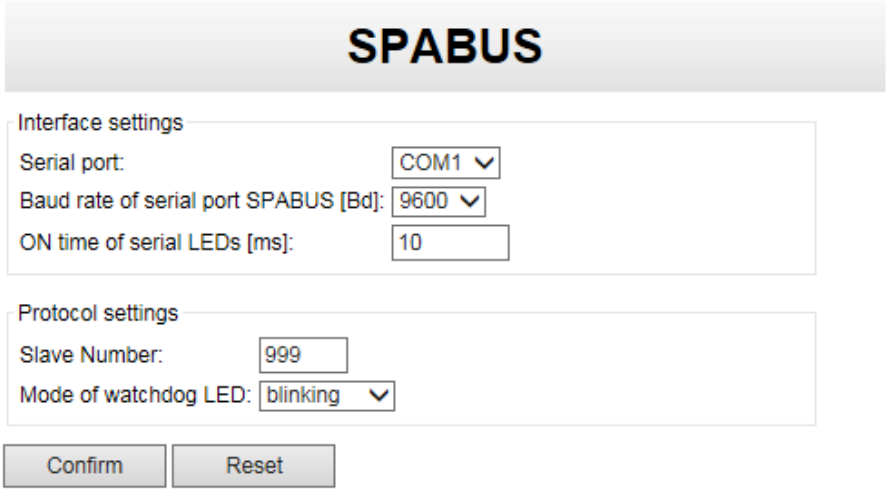


Figure 83: SPA-Bus SCADA settings

Table 65: SPA-Bus advanced settings

Setting	Format	Range	Default	Description
Serial port	-	Selection of values in combo box	COM1	Selection of available COM ports for SPA-Bus communication
Baud rate of serial [Bd]	Bd	Selection of values in combo box	19200	Baud rate of SPA-Bus serial port
ON time of serial LEDs	ms	0 to 65535	20	ON time of serial LEDs indicating activity on the SPA-Bus serial interface
Slave Number	-	1-999	2	SPA-Bus slave Number
Mode of watchdog LED	-	Selection of values in combo box	blinking	Mode of watchdog LED (blinking/switched off)
RS485 activate	-	0/1 in XML file with the settings	0	Activate RS485 SPA-bus connect
Maximum events in one frame SPA-bus	-	0..15 in XML file with the settings	10	Maximum events in one frame SPA-bus

An example of the SPA-bus configuration in connect with SPA-bus Master.

```
<protocol type="SPABUS">
```

```
        <params port="1" baud="9600" slave_number="202"
            led_time="10" rs485="0" maxEventsInFrame="10" />
</protocol>
```

17.5 Linked Devices

Linked Devices tree branch is the same as for IEC101 protocol. See chapter 11.3

17.6 Advanced Settings for Device monitored Data in XML-File

For more information and to answer your questions please contact the support.

17.7 Advanced Settings for monitored Events in XML-File

For more information and to answer your questions please contact the support.

17.8 Advanced Settings for supported Commands in XML-File

For more information and to answer your questions please contact the support.

17.9 Important Information for SPAbus Interface with REG-DPA.

Since REG-PE boards require special wiring please make sure to order this feature in advance!

18. DaKo – routing from IEC 60870-5-103 to 60870-5-101

DaKo is special firmware for routing the IEC103 channels to IEC101. The DaKo firmware runs in REG-PE telecontrol board. WinConfig treats DaKo as a special type of communication protocol.

18.1 IEC101 basic, IEC103 basic

These parameters are described in *IEC101 advanced* and *IEC103 advanced* chapters.

18.2 Linked devices

DaKo devices is table describing mapping of IEC103 substations to IEC101 channels.

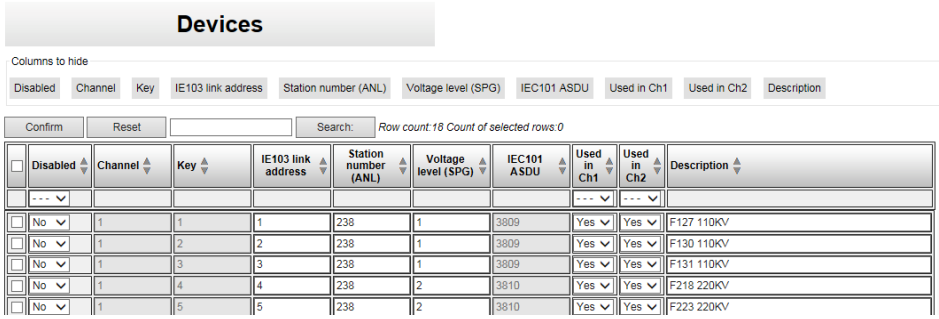


Figure 84: DaKo devices

Table 66: DaKo devices

Setting	Format	Range	Default	Description
Disabled	-	Check box	-	Enabling/disabling the corresponding DaKo devices
Channel	-	0/1	-	DaKo channel, not editable
Key	-	1 to 18	-	DaKo devices key, not editable
IEC103 link address	-	0 to 254	-	IEC103 link address
Station number (ANL)	-	0 to 4095	-	Station number (ANL)
Voltage level (SPG)	-	0 to 15	-	Voltage level (SPG)
IEC 101 ASDU	-	0 to 65534	-	IEC 101 ASDU, not editable
Used in Ch1	-	Option box	Yes	Used in Ch1
Used in Ch2	-	Option box	Yes	Used in Ch2
Description	text	50 characters	-	User description

The ASDU address is constructed automatically by WinConfig according to the following table:

ASDU address	Station number (ANL)	Voltage level (SPG)	LSB Byte
	Station number (ANL)		MSB Byte

18.1 IEC101 advanced

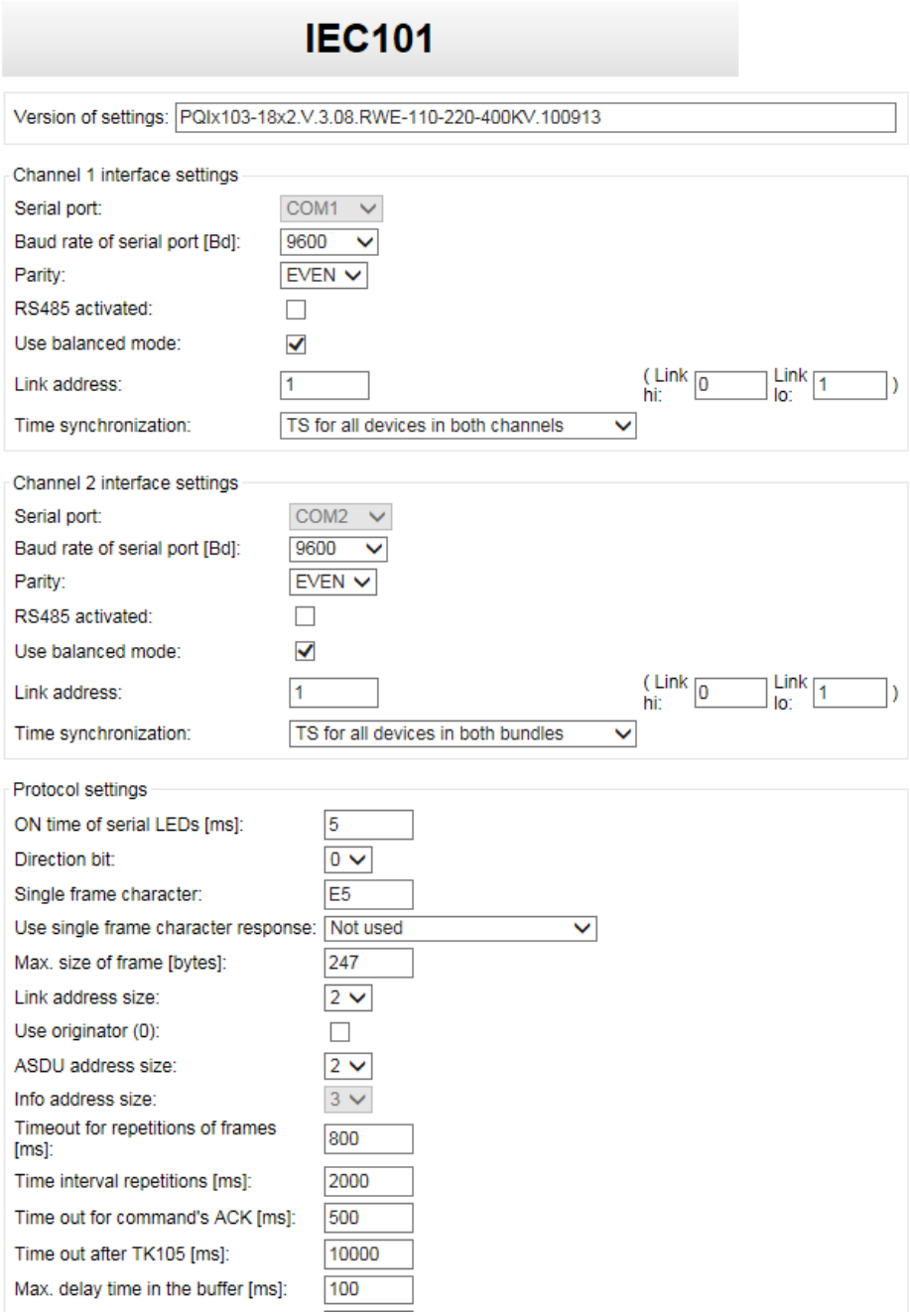


Figure 85: IEC101 advanced settings

Table 67: IEC101 advanced settings

Setting	Format	Range	Default	Description
Version of settings	text		-	Version of settings, not editable
Ch.1 interface – Serial port	-		-	Serial port, not editable. For changing see *Serial ports settings*
Ch.1 interface –	Bd	Selection of	9600	Baud rate of serial port

Setting	Format	Range	Default	Description
Baud rate of serial port		values in combo box		
Ch.1 interface – Parity		Selection of values in combo box	even	Parity
Ch.1 interface – RS485 activated	-	Check box	Unchecked	RS485 activated
Ch.1 interface – Use balanced mode	-	Check box	Checked	Usage of balanced mode
Ch.1 interface – Link address	-	1 to 254 (1 to 65534)		Link address, valid range according to the *Link address size*
Ch.1 interface – Time synchronization	-	Selection of values in combo box	TS for all devices in both channels	Time synchronization – option of time synchronization method for devices in communication channels
Ch.2 interface settings	-			*Same as Channel 1 interface settings*
ON time of serial LEDs	ms	1 to 65535	5	ON time of serial LEDs
Direction bit		Selection of values in combo box	0	Direction bit
Single frame character	HEX	1 to FF	E5	Single byte response value
Use single frame character response	-	Selection of values in combo box	Not used	Usage of single frame character response
Max. size of frame	-	1 to 255	247	Maximum size of frame
Link address size	-	Selection of values in combo box	2	Link address size
Use originator (0)	-	Check box	Unchecked	Use originator (value 0)
ASDU address size	-	Selection of values in combo box	2	ASDU address size
Info address size	-	Selection of values in combo box	3	Info address size, not editable
Timeout for repetitions of frames	ms	0 to 65535	800	Timeout for repetitions of frames in balanced mode
Time interval repetitions	ms	0 to 65535	2000	Time interval of permitted repetitions in balanced mode
Time out for command's ACK	ms	0 to 65535	500	Maximum wait time for command acknowledgement
Time out after TK105	ms	0 to 65535	10000	Delay time after *reset* command

Setting	Format	Range	Default	Description
Max. delay time in the buffer	ms	0 to 65535	100	Waiting time for messages to create a new telegram
Timeout for execute of test link	ms	0 to 65535	5000	Timeout for test of line in balanced mode
Max. objects in frame	-	1 to 255	30	Maximum number of data objects in one telegram
Activation termination is used (actterm)	-	Check box	Checked	Usage of activation termination in the command
Command ACK type	-	Selection of values in combo box	TK1 single point value	Definition of IEC data type (TI) or command acknowledgement
Polling cycle time of measurands	ms	0 to 65535	1000	Polling cycle for measurements
Time tags IV before the first TS	-	Check box	Unchecked	Time is invalid until the first time synchronization

18.2 IEC103 advanced

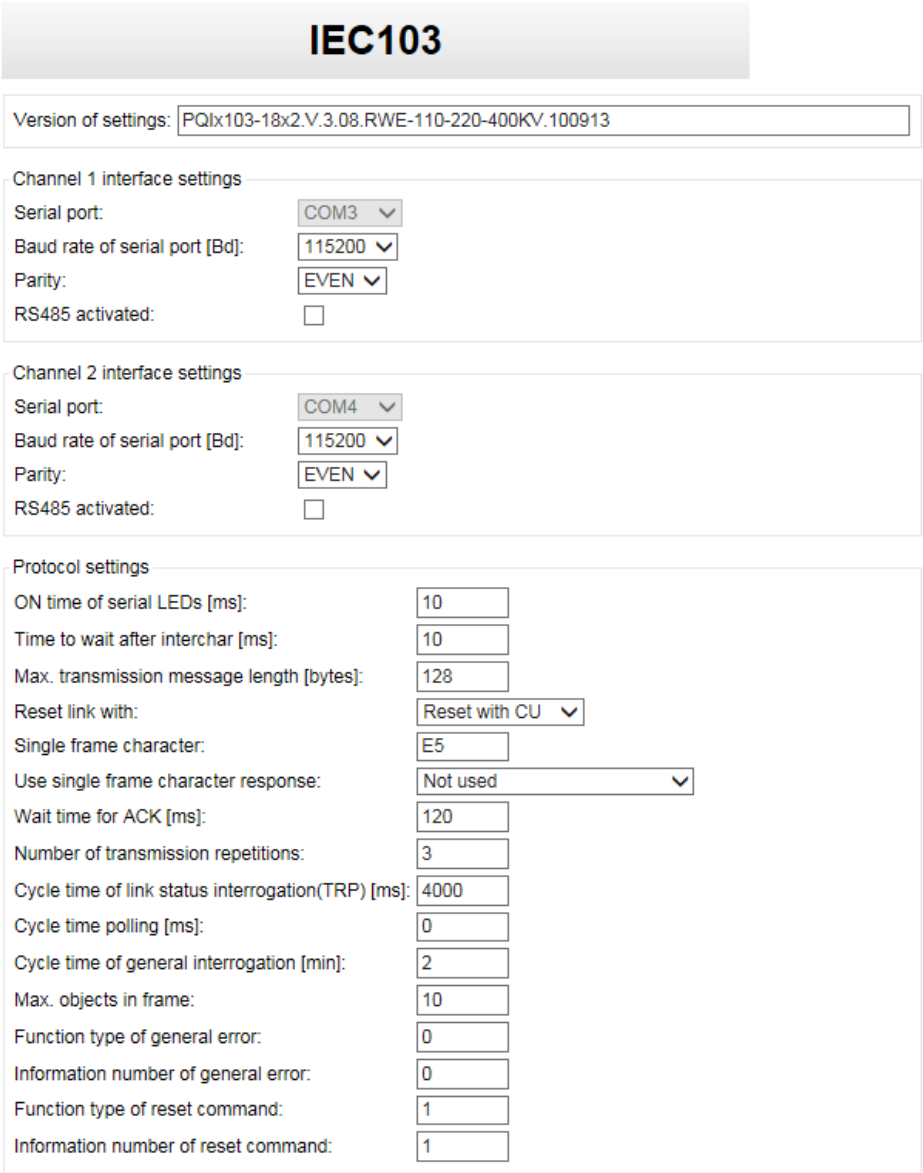


Figure 86: IEC103 advanced settings

Table 68: IEC103 advanced settings

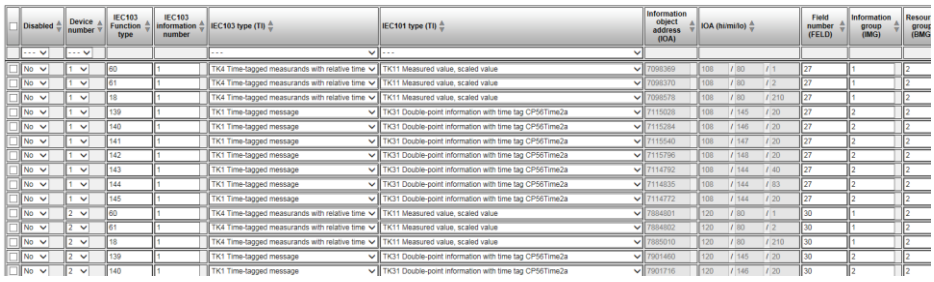
Setting	Format	Range	Default	Description
Version of settings	text	-	-	Version of settings, not editable
Ch.1 interface – Serial port	-	-	-	Serial port, not editable. For changing see *Serial ports settings*
Ch.1 interface – Baud rate of serial port	Bd	Selection of values in combo box	9600	Baud rate of serial port
Ch.1 interface – Parity	-	Selection of values in combo box	even	Parity
Ch.1 interface – RS485 activated	-	Check box	Unchecked	RS485 activated
Ch.1 interface – Use balanced mode	-	Check box	Checked	Usage of balanced mode
Ch.1 interface – Link address	-	1 to 254 (1 to 65534)	-	Link address, valid range according to the *Link address size*
Ch.1 interface – Time synchronization	-	Selection of values in combo box	TS for all devices in both channels	Time synchronization – option of time synchronization method for devices in communication channels
Ch.2 interface settings				*Same as Channel 1 interface settings*
ON time of serial LEDs	ms	1 to 65535	10	ON time of serial LEDs
Time to wait after interchar	ms	1 to 65535	10	Time interval between two telegrams
Max. transmission message length		1 to 261	128	Maximum length of telegram
Reset link with	-	Selection of values in combo box	Reset with CU	Reset link with code
Single frame character	HEX	1 to FF	E5	Single byte response value
Use single frame character response	-	Selection of values in combo box	Not used	Usage of single frame character response
Wait time for ACK	ms	0 to 65535	120	Maximum waiting time for acknowledgement
Number of transmission repetitions	-	1 to 30	3	Maximum number of telegram repetitions
Cycle time of link status interrogation (TRP)	ms	0 to 65535	4000	Cycle time of request link (TRP)
Cycle time polling	ms	0 to 65535	0	Polling cycle time

Setting	Format	Range	Default	Description
Max. objects in frame	-	1 to 255	10	Maximum number of data objects in one telegram
Function type of general error	-	0 to 255	0	Function type of general error
Information number of general error	-	0 to 255	0	Information number of general error
Function type of reset command	-	0 to 255	1	Function type of reset command
Information number of reset command	-	0 to 255	1	Information number of reset command

18.3 Supervisory

Supervisory settings are similar to other protocols, see *Supervisory settings* in IEC103, chapter 13.3.6.1.

18.4 Indications



Disabled	Device number	IEC103 Function type	IEC103 information number	IEC103 type (TI)	IEC101 type (TI)	Information object address (IOA)	IOA (hi/mi/lo)	Field number (FELD)	Information group (IMG)	Resour group (GMG
---	---			---	---					
No	1	60	1	TK4 Time-tagged measurands with relative time	TK11 Measured value, scaled value	7098369	108 / 80 / 1	27	1	2
No	1	61	1	TK4 Time-tagged measurands with relative time	TK11 Measured value, scaled value	7098370	108 / 80 / 2	27	1	2
No	1	18	1	TK4 Time-tagged measurands with relative time	TK11 Measured value, scaled value	7098578	108 / 80 / 210	27	1	2
No	1	139	1	TK1 Time-tagged message	TK31 Double-point information with time tag CP56Time2a	7115028	108 / 145 / 20	27	2	2
No	1	140	1	TK1 Time-tagged message	TK31 Double-point information with time tag CP56Time2a	7115284	108 / 146 / 20	27	2	2
No	1	141	1	TK1 Time-tagged message	TK31 Double-point information with time tag CP56Time2a	7115540	108 / 147 / 20	27	2	2
No	1	142	1	TK1 Time-tagged message	TK31 Double-point information with time tag CP56Time2a	7115796	108 / 148 / 20	27	2	2
No	1	143	1	TK1 Time-tagged message	TK31 Double-point information with time tag CP56Time2a	7114792	108 / 144 / 40	27	2	2
No	1	144	1	TK1 Time-tagged message	TK31 Double-point information with time tag CP56Time2a	7114535	108 / 144 / 83	27	2	2
No	1	145	1	TK1 Time-tagged message	TK31 Double-point information with time tag CP56Time2a	7114772	108 / 144 / 20	27	2	2
No	2	60	1	TK4 Time-tagged measurands with relative time	TK11 Measured value, scaled value	7884801	120 / 80 / 1	30	1	2
No	2	61	1	TK4 Time-tagged measurands with relative time	TK11 Measured value, scaled value	7884802	120 / 80 / 2	30	1	2
No	2	18	1	TK4 Time-tagged measurands with relative time	TK11 Measured value, scaled value	7885010	120 / 80 / 210	30	1	2
No	2	139	1	TK1 Time-tagged message	TK31 Double-point information with time tag CP56Time2a	7901460	120 / 145 / 20	30	2	2
No	2	140	1	TK1 Time-tagged message	TK31 Double-point information with time tag CP56Time2a	7901716	120 / 146 / 20	30	2	2

Figure 87: Indications

Table 69: Indications

Setting	Format	Range	Default	Description
Disabled	-	Option box	No	Enabling/disabling the data point
Device number	-	Selection of values in combo box	-	Device number
IEC103 Function type	-	0 to 255	-	IEC103 Function type
IEC103 information number	-	0 to 255	-	IEC103 information number
IEC103 type (TI)	-	Selection of values in combo box	-	IEC103 type (TI)
IEC101 type (TI)	-	Selection of values in combo box	-	IEC101 type (TI)
Information object address (IOA)	-	0 to 16777215	-	Information object address (IOA), not editable, see table below
Field number (FELD)	-	0 to 63	-	Field number (FELD)
Information group (IMG)	-	0 to 15	-	Information group (IMG)
Resource group (BMG)	-	0 to 7	-	Resource group (BMG)
Basis element group (BEG)	-	0 to 7	-	Basis element group (BEG)
Basis element (BEL)	-	0 to 255	-	Basis element (BEL)
GI group	-	Selection of values in combo box	-	GI group
Counter interr. qualifier	-	Selection of values in combo box	-	Counter interrogation qualifier
Description	text	50 characters	-	User description

The IOA is constructed automatically by WinConfig according to the following table:

IOA	Basis element (BEL)				LSB Byte
	Info-	BMG	BEG		
	Field number			Group	MSB Byte

19. WinConfig in Step-by-Step mode

To run WinConfig in *Step-by-Step* mode click the *Step-by-Step* button in the splash screen when WinConfig starts.

WinConfig *Step-by-Step* mode is especially useful case when default configuration settings can be used with minimum modifications and the simplest failsafe way of data transfer. *Step-by-Step* mode enables user to create and use typical configuration of settings without having exact knowledge of SCADA protocol data point settings, protocol standards, firmware-specific settings and other complex settings.

User typically selects board type, SCADA and device template and enters a few application-specific settings to create settings and to load the created settings into the board in the corresponding step. *Step-by-Step* mode also gives the possibility to open settings pre-defined in advanced mode (XML file) or settings created in GenReg (INI file).

Quick help is displayed in all steps in the right part of window to explain the corresponding settings and actions.

- The *Confirm* button switches to the next step (all entered values remembered).
- The *Back* button switches to the previous step (all entered values on the current form will be forgotten).
- The *Cancel* button switches to the first step (all previously entered values on the current form/s will be forgotten).
- The *Finish* button completes the protocol settings transactions and switches the user to the first step for another round of protocol settings should the user choose to enter another set of settings (only on the last page).

19.1 Templates in Step-by-Step mode

Step-by-Step mode of WinConfig works with pre-defined templates of settings as described in chapter 10.2.1. Thus usage of templates is limited to configurations containing known and already used combination of *board_type/protocol/SCADA_template/Devices_template.* WinConfig will be equipped with other templates in new versions as soon as new templates will be available.

Individual steps are numbered according to the sequence valid for the individual board and protocol.

19.2 Step 1 - hardware

User selects pre-defined type of telecontrol board in the first step. Selection is done in the corresponding combo box.

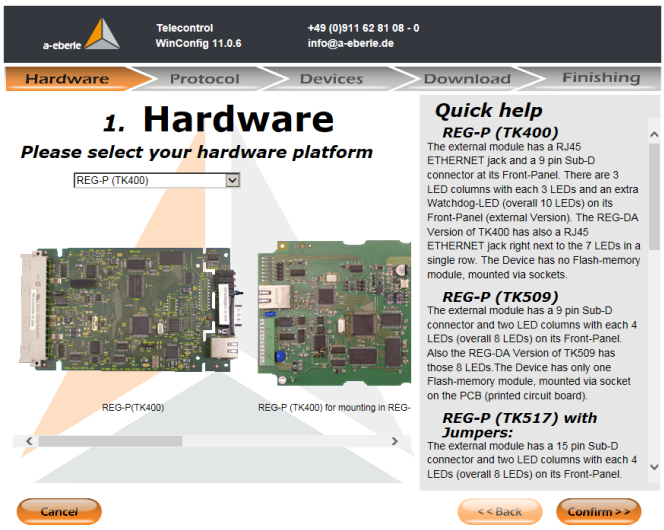


Figure 88: Selection of hardware

19.3 Protocol and templates

The selection of protocol is performed in next step. Available options are stated in the following table.

Table 70: Protocols and templates

Board	Protocol	SCADA	Devices	Template availability	Note
TK509, TK517, TK400,	DNP3	Basic	REG-D	Yes	Basic template type of SCADA is defined as typical configuration not related to particular SCADA producer
		Basic	REG-DP	No	
	IEC101	Basic	REG-D	Yes	
		ABB	REG-D	Yes	
		Areva	REG-D	No	
		IDS	REG-D	Yes	
		SAT	REG-D	Yes	
		Siemens	REG-D	No	
		Sprecher	REG-D	No	
	IEC101	Basic	REG-DP	Yes	
		ABB	REG-DP	No	
		Areva	REG-DP	No	
		IDS	REG-DP	Yes	
		SAT	REG-DP	No	
		Siemens	REG-DP	No	
		Sprecher	REG-DP	No	
	IEC101	Basic	EOR-D	Yes	
		ABB	EOR-D	No	
		Areva	EOR-D	No	
		IDS	EOR-D	No	
		SAT	EOR-D	No	
		Siemens	EOR-D	No	
		Sprecher	EOR-D	No	
	IEC101	Basic	2x REG-D	Yes	
		ABB	2x REG-D	No	
		Areva	2x REG-D	No	
		IDS	2x REG-D	No	
		SAT	2x REG-D	No	
		Siemens	2x REG-D	No	
		Sprecher	2x REG-D	No	
	IEC101	Basic	3x REG-D	Yes	
		ABB	3x REG-D	No	

Board	Protocol	SCADA	Devices	Template availability	Note
		Areva	3x REG-D	No	
		IDS	3x REG-D	No	
		SAT	3x REG-D	No	
		Siemens	3x REG-D	No	
		Sprecher	3x REG-D	No	
	IEC101	Basic	4x REG-D	Yes	
		ABB	4x REG-D	No	
		Areva	4x REG-D	No	
		IDS	4x REG-D	No	
		SAT	4x REG-D	No	
		Siemens	4x REG-D	No	
		Sprecher	4x REG-D	No	
	IEC101	Basic	2x REG-DP	Yes	
		ABB	2x REG-DP	No	
		Areva	2x REG-DP	No	
		IDS	2x REG-DP	No	
		SAT	2x REG-DP	No	
		Siemens	2x REG-DP	No	
		Sprecher	2x REG-DP	No	
	IEC101	Basic	4x REG-DP	Yes	
		ABB	4x REG-DP	No	
		Areva	4x REG-DP	No	
		IDS	4x REG-DP	No	
		SAT	4x REG-DP	No	
		Siemens	4x REG-DP	No	
		Sprecher	4x REG-DP	No	
	IEC101	Basic	REG-D + REG-DP	Yes	
		ABB	REG-D + REG-DP	No	
		Areva	REG-D + REG-DP	No	
		IDS	REG-D + REG-DP	No	
		SAT	REG-D + REG-DP	No	
		Siemens	REG-D + REG-DP	No	
		Sprecher	REG-D + REG-DP	No	
	IEC101	Basic	2x REG-D + 1x REG-DP	Yes	
		ABB	2x REG-D + 1x REG-DP	No	
		Areva	2x REG-D + 1x REG-DP	No	
		IDS	2x REG-D + 1x REG-DP	No	
		SAT	2x REG-D + 1x	No	

Board	Protocol	SCADA	Devices	Template availability	Note
			REG-DP		
		Siemens	2x REG-D + 1x REG-DP	No	
		Sprecher	2x REG-D + 1x REG-DP	No	
	IEC101	Basic	1x REG-D + 2x REG-DP	No	
		ABB	1x REG-D + 2x REG-DP	No	
		Areva	1x REG-D + 2x REG-DP	No	
		IDS	1x REG-D + 2x REG-DP	No	
		SAT	1x REG-D + 2x REG-DP	No	
		Siemens	1x REG-D + 2x REG-DP	No	
		Sprecher	1x REG-D + 2x REG-DP	No	
	IEC101	Basic	2x REG-D + 2x REG-DP	Yes	
		ABB	2x REG-D + 2x REG-DP	No	
		Areva	2x REG-D + 2x REG-DP	No	
		IDS	2x REG-D + 2x REG-DP	No	
		SAT	2x REG-D + 2x REG-DP	No	
		Siemens	2x REG-D + 2x REG-DP	No	
		Sprecher	2x REG-D + 2x REG-DP	No	
	IEC101	Basic	2x REG-DP + 1x EOR-D	Yes	
		ABB	2x REG-DP + 1x EOR-D	No	
		Areva	2x REG-DP + 1x EOR-D	No	
		IDS	2x REG-DP + 1x EOR-D	No	
		SAT	2x REG-DP + 1x EOR-D	No	
		Siemens	2x REG-DP + 1x EOR-D	No	
		Sprecher	2x REG-DP + 1x	No	

Board	Protocol	SCADA	Devices	Template availability	Note
			EOR-D		
	IEC103	Other	REG-D	Yes	
		ABB	REG-D	Yes	
		Areva	REG-D	Yes	
		DB	REG-D	No	
		IDS	REG-D	No	
		Mauell	REG-D	Yes	
		NRM	REG-D	No	
		SAT	REG-D	Yes	
		Siemens	REG-D	Yes	
		Sprecher	REG-D	Yes	
	IEC103	Basic	REG-DP	Yes	
		ABB	REG-DP	Yes	
		Areva	REG-DP	Yes	
		DB	REG-DP	No	
		IDS	REG-DP	No	
		Mauell	REG-DP	No	
		NRM	REG-DP	No	
		SAT	REG-DP	Yes	
		Siemens	REG-DP	Yes	
		Sprecher	REG-DP	Yes	
	IEC103	Basic	EOR-D	Yes	
		ABB	EOR-D	No	
		Areva	EOR-D	No	
		DB	EOR-D	No	
		IDS	EOR-D	No	
		Mauell	EOR-D	No	
		NRM	EOR-D	No	
		SAT	EOR-D	No	
		Siemens	EOR-D	No	
		Sprecher	EOR-D	No	
	IEC103	Basic	2x EOR-D	No	
		ABB	2x EOR-D	No	
		Areva	2x EOR-D	No	
		DB	2x EOR-D	No	
		IDS	2x EOR-D	No	
		Mauell	2x EOR-D	No	
		NRM	2x EOR-D	No	
		SAT	2x EOR-D	No	
		Siemens	2x EOR-D	No	
		Sprecher	2x EOR-D	No	

Board	Protocol	SCADA	Devices	Template availability	Note
	IEC103	Basic	3x EOR-D	No	
		ABB	3x EOR-D	No	
		Areva	3x EOR-D	No	
		DB	3x EOR-D	No	
		IDS	3x EOR-D	No	
		Mauell	3x EOR-D	No	
		NRM	3x EOR-D	No	
		SAT	3x EOR-D	No	
		Siemens	3x EOR-D	No	
		Sprecher	3x EOR-D	No	
	IEC103	Basic	PQI-D	No	
		ABB	PQI-D	No	
		Areva	PQI-D	No	
		DB	PQI-D	No	
		IDS	PQI-D	No	
		Mauell	PQI-D	No	
		NRM	PQI-D	No	
		SAT	PQI-D	No	
		Siemens	PQI-D	No	
		Sprecher	PQI-D	No	
	CSO	-	-	Yes	No SCADA or device specific data are applicable for CSO protocol. CSO is not available for TK509 and TK517 boards.
TK8xx	DNP3	Basic	REG-D	Yes	
		Basic	REG-DP	Yes	
		Basic	EOR-D	Yes	
		TRANS POWER	REG-D	Yes	
		UNISON	REG-D	Yes	
	IEC101	Basic	REG-D	Yes	
	IEC103	Basic	REG-D	Yes	
		ABB	REG-D	No	
		Areva	REG-D	No	
		DB	REG-D	No	
		IDS	REG-D	No	
		Mauell	REG-D	No	
		NRM	REG-D	No	
		SAT	REG-D	No	
		Siemens	REG-D	No	
		Sprecher	REG-D	No	

Board	Protocol	SCADA	Devices	Template availability	Note
	IEC103	Basic	REG-DP	No	
		ABB	REG-DP	No	
		Areva	REG-DP	No	
		DB	REG-DP	No	
		IDS	REG-DP	No	
		Mauell	REG-DP	No	
		NRM	REG-DP	No	
		SAT	REG-DP	No	
		Siemens	REG-DP	No	
		Sprecher	REG-DP	No	
	IEC103	Basic	EOR-D	No	
		ABB	EOR-D	No	
		Areva	EOR-D	No	
		DB	EOR-D	Yes	
		IDS	EOR-D	No	
		Mauell	EOR-D	No	
		NRM	EOR-D	No	
		SAT	EOR-D	No	
		Siemens	EOR-D	No	
		Sprecher	EOR-D	No	
	IEC103	Basic	2x EOR-D	No	
		ABB	2x EOR-D	No	
		Areva	2x EOR-D	No	
		DB	2x EOR-D	Yes	
		IDS	2x EOR-D	No	
		Mauell	2x EOR-D	No	
		NRM	2x EOR-D	No	
		SAT	2x EOR-D	No	
		Siemens	2x EOR-D	No	
		Sprecher	2x EOR-D	No	
	IEC103	Basic	3x EOR-D	No	
		ABB	3x EOR-D	No	
		Areva	3x EOR-D	No	
		DB	3x EOR-D	Yes	
		IDS	3x EOR-D	No	
		Mauell	3x EOR-D	No	
		NRM	3x EOR-D	No	
		SAT	3x EOR-D	No	
		Siemens	3x EOR-D	No	
		Sprecher	3x EOR-D	No	
	IEC103	Basic	PQI-D	No	

Board	Protocol	SCADA	Devices	Template availability	Note
		ABB	PQI-D	No	
		Areva	PQI-D	No	
		DB	PQI-D	No	
		IDS	PQI-D	Yes	
		Mauell	PQI-D	No	
		NRM	PQI-D	Yes	
		SAT	PQI-D	No	
		Siemens	PQI-D	No	
		Sprecher	PQI-D	No	
	IEC104	Basic	REG-D	Yes	
		Basic	REG-DP	Yes	
		Basic	REG-D + REG-DP	Yes	
		Basic	EOR-D	Yes	
		Basic	CPR-D	No	
		Basic	REG-DP + EOR-D	No	
		Basic	2x REG-DP	No	
		Basic	3x REG-D	No	
		Basic	8x REG-D	No	
	IEC61850		REG-D(A)	Yes	REG-D(A) Standard Configuration without GOOSE V4.3
			REG-D(A)	Yes	REG-D(A) Standard Configuration V4.3 With GOOSE
			REG-D(A)	Yes	REG-D(A) V4.3 With GOOSE, File transfer (COLDFIRE)
			REG-D(A) x2	Yes	REG-D(A)x2 without GOOSE V4.3
			REG-D(A)x3	Yes	REG-D(A)x3 without GOOSE V4.3
			REG-D(A) + REG-DP(A)	Yes	REG-D(A) + REG-DP(A) without goose V4.3 /1.6
			REG-D(A) + REG-DP(A)	Yes	REG-D(A) + REG-DP(A) with GOOSE V4.3/1.6
			REG-D(A)x3 + REG-DP(A)	Yes	REG-D(A)x3 + REG-DP(A) with GOOSE V4.3/.16
			REG-D(A)	Yes	REG-D(A) without GOOSE V4.0
			REG-D(A)	Yes	REG-D(A) without GOOSE V4.1
			REG-DP(A)	Yes	REG-DP(A) without GOOSE V1.6
			REG-DP(A)x2	Yes	REG-DP(A)x2 without

Board	Protocol	SCADA	Devices	Template availability	Note
					GOOSE V1.6
			EOR-D	Yes	EOR-D without GOOSE V4.5
			EOR-D	Yes	EOR-D with GOOSE V4.5
			PQI-D	Yes	PQI-D without GOOSE V2.0
			GDASYS	Yes	GDASYS without GOOSE V2.0
	C37.118	Basic	GDASys	Yes	
	MODBUS	Basic	REG-D	Yes	
	DaKo	2LS	18 PQI-D	Yes	
	DaKo	2LS	1 PQI-D	Yes	
TK28-6	IEC101	Basic	REG-D(A)	Yes	
		Basic	2x REG-D(A)	Yes	
		Basic	REG-DP(A)	Yes	
		Basic	2x REG-DP(A)	Yes	
		Basic	1x REG-D(A) + 1x REG-DP(A)	Yes	
TK28-4	IEC101	Basic	REG-D(A)	Yes	
		Basic	2x REG-D(A)	Yes	
		Basic	3x REG-D(A)	Yes	
		Basic	4x REG-D(A)	Yes	
		Basic	REG-DP(A)	Yes	
		Basic	2x REG-DP(A)	Yes	
		Basic	4x REG-DP(A)	Yes	
		Basic	1x REG-D(A) + 1x REG-DP(A)	Yes	
		Basic	1x REG-D(A) + 1x REG-DP(A)	Yes	
		Basic	2x REG-D(A) + 2x REG-DP(A)	Yes	
		Basic	EOR-D	Yes	
		Basic	2x REG-DP(A) + 1x EOR-D(A)	Yes	
TK102	IEC101	Basic	REG-D(A)	Yes	
		Basic	2x REG-D(A)	Yes	
		Basic	REG-DP(A)	Yes	
		Basic	2x REG-DP(A)	Yes	
		Basic	1x REG-D(A) + 1x REG-DP(A)	Yes	
TK28-6	IEC103	Basic	REG-D(A)	Yes	
		Basic	REG-DP(A)	Yes	
TK28-4	IEC103	Basic	REG-D(A)	Yes	

Board	Protocol	SCADA	Devices	Template availability	Note
		Basic	REG-DP(A)	Yes	
TK102	IEC103	Basic	REG-D(A)	Yes	
		Basic	REG-DP(A)	Yes	
TK28-6	IEC104	Basic	REG-D(A)	Yes	
		Basic	REG-DP(A)	Yes	
		Basic	EOR-D	Yes	
		Basic	1x REG-D(A) + 1x REG-DP(A)	Yes	
		Basic eormess 18	EOR-D	Yes	
		Basic eormess 19	EOR-D	Yes	
		COT	REG-D(A)	Yes	
TK28-4	IEC104	Basic	REG-D(A)	Yes	
		Basic	REG-DP(A)	Yes	
		Basic	EOR-D	Yes	
		Basic	1x REG-D(A) + 1x REG-DP(A)	Yes	
		Basic eormess 18	EOR-D	Yes	
		Basic eormess 19	EOR-D	Yes	
		COT	REG-D(A)	Yes	
TK102	IEC104	Basic	REG-D(A)	Yes	
		Basic	REG-DP(A)	Yes	
		Basic	EOR-D	Yes	
		Basic	1x REG-D(A) + 1x REG-DP(A)	Yes	
		Basic eormess 18	EOR-D	Yes	
		Basic eormess 19	EOR-D	Yes	
		COT	REG-D(A)	Yes	
TK28-6	IEC61850 Edition 1		REG-D(A)	Yes	REG-D(A) V4.3 with RBAC
			REG-D(A)	Yes	REG-D(A) V4.3 + REG-DP(A) with RBAC
			REG-D(A)	Yes	REG-D(A) Ed.1 St. Conf. without GOOSE V4.3

Board	Protocol	SCADA	Devices	Template availability	Note
			REG-D(A)	Yes	REG-D(A) Ed.1 St. Conf. with BRCB and without GOOSE V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 St. Conf. with GOOSE V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 St. Conf. with BRCB and with GOOSE V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 without GOOSE 64BI 14AI V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 COLDFIRE ED1. with GOOSE and File Transfer V4.3
			2x REG-D(A)	Yes	REG-D(A)x2 Ed.1 Conf. without GOOSE V4.3
			3x REG-D(A)	Yes	REG-D(A)x3 Ed.1 Conf. without GOOSE V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. Au-to/TapChg SBO V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. with analog inputs V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. Virt. CMD V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. Con-figuration with ebhanced security V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. Auto DPC (Bool-Cmd) V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. with all SBO commands V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. with-out GOOSE with 32 ASG V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. with-out GOOSE with 32 APC V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Client-Server Conf. with pro-tectting Device and GOOSE V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Client-Server Conf. with Com-mand Mirroring and GOOSE V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 LCCH Conf. without GOOSE V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. with

Board	Protocol	SCADA	Devices	Template availability	Note
					MODBUS-RTU master without GOOSE V4.3
			REG-D(A) PAN_D	Yes	REG-D(A)xPAN_D Ed.1 Conf. without GOOSE 1 V4.3
			REG-D(A) REG-DP(A)	Yes	REG-D(A)xREG-DP(A) Ed.1 St. Conf. without GOOSE V4.3/1.6
			REG-D(A) REG-DP(A)	Yes	REG-D(A)xREG-DP(A) Ed.1 St. Conf. with GOOSE V4.3/1.6
			3x REG-D(A) REG-DP(A)	Yes	REG-D(A)x3+REG-DP(A) Ed.1 Conf. with GOOSE V4.3/1.6
			REG-D(A) REG-DP(A)	Yes	REG-D(A)xREG-DP(A) Ed.1 Conf. SBO commands V4.3/1.6
			REG-D(A) REG-DP(A)	Yes	REG-D(A)xREG-DP(A) Ed.1 Conf. without Lo-cal/Remote V4.3/1.6
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. with-out GOOSE legacy V4.0
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. with-out GOOSE legacy V4.1
			REG-DP(A)	Yes	REG-DP(A) Ed.1 Conf. SBO commands V1.6
			REG-DP(A)	Yes	REG-DP(A) Ed.1 St. Conf. without GOOSE V1.6
			REG-DP(A)	Yes	REG-DP(A) Ed.1 Conf. with 32 incoming GOOSE V1.6
			REG-DP(A)x2 EOR-D	Yes	REG-DP(A)x2+EOR-D Ed.1 Conf. 1Mx4S without GOOSE V1.6/4.5
			REG-DP(A)	Yes	REG-DP(A) Ed.1 Conf. without Loc/Rem-Check and without GOOSE V1.6
			EOR-D	Yes	EOR-D Ed.1 St. Conf. with-out GOOSE V4.5
			EOR-D	Yes	EOR-D Ed.1 Conf. DB with GOOSE and File Transfer V4.5
			EOR-D	Yes	EOR-D Ed.1 Conf. DB without GOOSE V4.5
			PQI-D	Yes	PQI-D Ed.1 St. Conf. with-out GOOSE V2.0
			GDAsys	Yes	GDASYS Ed.1 St. Conf. without GOOSE V2.0

Board	Protocol	SCADA	Devices	Template availability	Note
	IEC61850 Edition 2		REG-D(A)	Yes	REG-D(A) V5.03 with RBAC
			REG-D(A) REG-DP(A)	Yes	REG-D(A) V4.3+REG-DP(A V1.6) with RBAC
			REG-D(A)	Yes	REG-D(A) Ed.2 V5.03
			REG-DP	Yes	REG-DP Ed.2 V4.0
			REG-DP	Yes	REG-DP Ed.2 V3 conf. V4.0
			REG-D(A) REG-DP(A)	Yes	REG-D(A) +REG-DP(A) Ed.2 V5.02/4.0
			EOR-D	Yes	EOR-D Ed.2 V5.02
			EOR-D	Yes	EOR-D Ed.2 DB V4.5 with File Transfer
			PQI-D	Yes	PQI-D Ed.2 V7.0
TK28-4	IEC61850 Edition 1		REG-D(A)	Yes	REG-D(A) V4.3 with RBAC
			REG-D(A)	Yes	REG-D(A) V4.3 + REG-DP(A) with RBAC
			REG-D(A)	Yes	REG-D(A) Ed.1 St. Conf. without GOOSE V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 St. Conf. with BRCB and without GOOSE V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 St. Conf. with GOOSE V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 St. Conf. with BRCB and with GOOSE V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 without GOOSE 64BI 14AI V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 COLDFIRE ED1. with GOOSE and File Transfer V4.3
			2x REG-D(A)	Yes	REG-D(A)x2 Ed.1 Conf. without GOOSE V4.3
			3x REG-D(A)	Yes	REG-D(A)x3 Ed.1 Conf. without GOOSE V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. Auto/TapChg SBO V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. with analog inputs V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. Virt. CMD V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. Configuration with ebhanced security V4.3

Board	Protocol	SCADA	Devices	Template availability	Note
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. Auto DPC (Bool-Cmd) V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. with all SBO commands V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. without GOOSE with 32 ASG V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. without GOOSE with 32 APC V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Client-Server Conf. with protectting Device and GOOSE V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Client-Server Conf. with Command Mirroring and GOOSE V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 LCCH Conf. without GOOSE V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. with MODBUS-RTU master without GOOSE V4.3
			REG-D(A) PAN_D	Yes	REG-D(A)xPAN_D Ed.1 Conf. without GOOSE 1 V4.3
			REG-D(A) REG-DP(A)	Yes	REG-D(A)xREG-DP(A) Ed.1 St. Conf. without GOOSE V4.3/1.6
			REG-D(A) REG-DP(A)	Yes	REG-D(A)xREG-DP(A) Ed.1 St. Conf. with GOOSE V4.3/1.6
			3x REG-D(A) REG-DP(A)	Yes	REG-D(A)x3+REG-DP(A) Ed.1 Conf. with GOOSE V4.3/1.6
			REG-D(A) REG-DP(A)	Yes	REG-D(A)xREG-DP(A) Ed.1 Conf. SBO commands V4.3/1.6
			REG-D(A) REG-DP(A)	Yes	REG-D(A)xREG-DP(A) Ed.1 Conf. without Local/Remote V4.3/1.6
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. without GOOSE legacy V4.0
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. without GOOSE legacy V4.1
			REG-DP(A)	Yes	REG-DP(A) Ed.1 Conf. SBO commands V1.6

Board	Protocol	SCADA	Devices	Template availability	Note
			REG-DP(A)	Yes	REG-DP(A) Ed.1 St. Conf. without GOOSE V1.6
			REG-DP(A)	Yes	REG-DP(A) Ed.1 Conf. with 32 incoming GOOSE V1.6
			REG-DP(A)x2 EOR-D	Yes	REG-DP(A)x2+EOR-D Ed.1 Conf. 1Mx4S without GOOSE V1.6/4.5
			REG-DP(A)	Yes	REG-DP(A) Ed.1 Conf. without Loc/Rem-Check and without GOOSE V1.6
			EOR-D	Yes	EOR-D Ed.1 St. Conf. without GOOSE V4.5
			EOR-D	Yes	EOR-D Ed.1 Conf. DB with GOOSE and File Transfer V4.5
			EOR-D	Yes	EOR-D Ed.1 Conf. DB without GOOSE V4.5
			PQI-D	Yes	PQI-D Ed.1 St. Conf. without GOOSE V2.0
			GDAsys	Yes	GDASYS Ed.1 St. Conf. without GOOSE V2.0
	IEC61850 Edition 2		REG-D(A)	Yes	REG-D(A) V5.03 with RBAC
			REG-D(A) REG-DP(A)	Yes	REG-D(A) V4.3+REG-DP(A V1.6) with RBAC
			REG-D(A)	Yes	REG-D(A) Ed.2 V5.03
			REG-DP	Yes	REG-DP Ed.2 V4.0
			REG-DP	Yes	REG-DP Ed.2 V3 conf. V4.0
			REG-D(A) REG-DP(A)	Yes	REG-D(A) +REG-DP(A) Ed.2 V5.02/4.0
			EOR-D	Yes	EOR-D Ed.2 V5.02
			EOR-D	Yes	EOR-D Ed.2 DB V4.5 with File Transfer
			PQI-D	Yes	PQI-D Ed.2 V7.0
TK102	IEC61850 Edition 1		REG-D(A)	Yes	REG-D(A) V4.3 with RBAC
			REG-D(A)	Yes	REG-D(A) V4.3 + REG-DP(A) with RBAC
			REG-D(A)	Yes	REG-D(A) Ed.1 St. Conf. without GOOSE V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 St. Conf. with BRCB and without GOOSE V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 St. Conf. with GOOSE V4.3

Board	Protocol	SCADA	Devices	Template availability	Note
			REG-D(A)	Yes	REG-D(A) Ed.1 St. Conf. with BRCB and with GOOSE V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 without GOOSE 64BI 14AI V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 COLDFIRE ED1. with GOOSE and File Transfer V4.3
			2x REG-D(A)	Yes	REG-D(A)x2 Ed.1 Conf. without GOOSE V4.3
			3x REG-D(A)	Yes	REG-D(A)x3 Ed.1 Conf. without GOOSE V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. Au-to/TapChg SBO V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. with analog inputs V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. Virt. CMD V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. Con-figuration with ebhanced security V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. Auto DPC (Bool-Cmd) V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. with all SBO commands V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. with-out GOOSE with 32 ASG V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. with-out GOOSE with 32 APC V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Client-Server Conf. with pro-tectting Device and GOOSE V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Client-Server Conf. with Com-mand Mirroring and GOOSE V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 LCCH Conf. without GOOSE V4.3
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. with MODBUS-RTU master without GOOSE V4.3
			REG-D(A) PAN_D	Yes	REG-D(A)xPAN_D Ed.1 Conf. without GOOSE 1 V4.3

Board	Protocol	SCADA	Devices	Template availability	Note
			REG-D(A) REG-DP(A)	Yes	REG-D(A)xREG-DP(A) Ed.1 St. Conf. without GOOSE V4.3/1.6
			REG-D(A) REG-DP(A)	Yes	REG-D(A)xREG-DP(A) Ed.1 St. Conf. with GOOSE V4.3/1.6
			3x REG-D(A) REG-DP(A)	Yes	REG-D(A)x3+REG-DP(A) Ed.1 Conf. with GOOSE V4.3/1.6
			REG-D(A) REG-DP(A)	Yes	REG-D(A)xREG-DP(A) Ed.1 Conf. SBO commands V4.3/1.6
			REG-D(A) REG-DP(A)	Yes	REG-D(A)xREG-DP(A) Ed.1 Conf. without Lo-cal/Remote V4.3/1.6
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. with-out GOOSE legacy V4.0
			REG-D(A)	Yes	REG-D(A) Ed.1 Conf. with-out GOOSE legacy V4.1
			REG-DP(A)	Yes	REG-DP(A) Ed.1 Conf. SBO commands V1.6
			REG-DP(A)	Yes	REG-DP(A) Ed.1 St. Conf. without GOOSE V1.6
			REG-DP(A)	Yes	REG-DP(A) Ed.1 Conf. with 32 incoming GOOSE V1.6
			REG-DP(A)x2 EOR-D	Yes	REG-DP(A)x2+EOR-D Ed.1 Conf. 1Mx4S without GOOSE V1.6/4.5
			REG-DP(A)	Yes	REG-DP(A) Ed.1 Conf. without Loc/Rem-Check and without GOOSE V1.6
			EOR-D	Yes	EOR-D Ed.1 St. Conf. with-out GOOSE V4.5
			EOR-D	Yes	EOR-D Ed.1 Conf. DB with GOOSE and File Transfer V4.5
			EOR-D	Yes	EOR-D Ed.1 Conf. DB without GOOSE V4.5
			PQI-D	Yes	PQI-D Ed.1 St. Conf. with-out GOOSE V2.0
			GDAsys	Yes	GDASYS Ed.1 St. Conf. without GOOSE V2.0
	IEC61850 Edition 2		REG-D(A)	Yes	REG-D(A) V5.03 with RBAC
			REG-D(A) REG-DP(A)	Yes	REG-D(A) V4.3+REG-DP(A V1.6) with RBAC

Board	Protocol	SCADA	Devices	Template availability	Note
			REG-D(A)	Yes	REG-D(A) Ed.2 V5.03
			REG-DP	Yes	REG-DP Ed.2 V4.0
			REG-DP	Yes	REG-DP Ed.2 V3 conf. V4.0
			REG-D(A) REG-DP(A)	Yes	REG-D(A) +REG-DP(A) Ed.2 V5.02/4.0
			EOR-D	Yes	EOR-D Ed.2 V5.02
			EOR-D	Yes	EOR-D Ed.2 DB V4.5 with File Transfer
			PQI-D	Yes	PQI-D Ed.2 V7.0
TK28-6	DNP3	Basic	REG-D(A)	Yes	
		Basic	REG-DP(A)	Yes	
		Basic	EOR-D	Yes	
TK28-4	DNP3	Basic	REG-D(A)	Yes	
		Basic	REG-DP(A)	Yes	
TK102	DNP3	Basic	REG-D(A)	Yes	
		Basic	REG-DP(A)	Yes	
		Basic	EOR-D	Yes	
TK28-6	MODBUS	Basic	REG-D(A)	Yes	
		Basic	REG-DP(A)	Yes	
		REG-PM compati-ble types	REG-D(A)	Yes	
		REG-PM compati-ble types	REG-DP(A)	Yes	
TK28-4	MODBUS	Basic	REG-D(A)	Yes	
		Basic	REG-DP(A)	Yes	
		REG-PM compati-ble types	REG-D(A)	Yes	
		REG-PM compati-ble types	REG-DP(A)	Yes	
TK102	MODBUS	Basic	REG-D(A)	Yes	
		Basic	REG-DP(A)	Yes	
		REG-PM compati-ble types	REG-D(A)	Yes	
		REG-PM compati-ble types	REG-DP(A)	Yes	
TK28-6	CSO			Yes	
TK28-4	CSO			Yes	
TK102	CSO			Yes	

NOTICE:	If the selected template is not available, the following text appears in the window: **Template file isn't implemented for chosen combination protocol/SCADA/Eberle devices !**

Other options available in the window:

Table 71: Settings of protocols and templates

Setting	Format	Range	Default	Description
Protocol	-	Selection of values in combo box	DNP3	Selection of transmission protocol
Template edition	-	Selection of values in combo box	Edition 1 for IEC61850 protocol or empty for other protocols	Selection of templates for chosen protocol
SCADA template	-	Selection of values in combo box	Protocol dependent	Selection of templates for chosen protocol
Attached eberle devices	-	Selection of values in combo box	Protocol dependent	Option to select attached Eberle devices, disabled for IEC61850
Transmission mode	-	Selection of values in combo box	balanced	IEC101 specific setting, selection of balanced or unbalanced mode.
Physical medium	-	Selection of values in combo box	RS232	Option to select type of serial interface, available for serial protocols.
Idle state	-	Selection of values in combo box	Non-inverted	Option to select inverted or non-inverted mode in the case when fiber optic serial interface is selected.
Open user-specific file	-	Option box	not selected	Option enables selection of existing XML or INI file with predefined settings
Local path to WinConfig *.xml file	-	Option box	not selected	Option enables selection of WinConfig *.xml file (*Browse* button).
Local path to GenReg *.ini file	-	Option box	not selected	Option enables selection of GenReg *.ini file (*Browse* button).

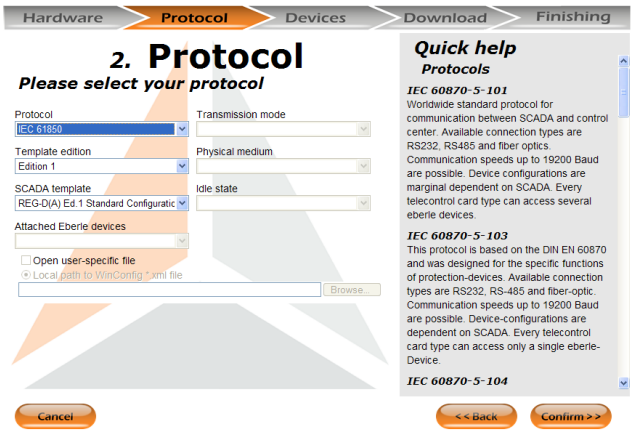


Figure 89: Selection of protocol and templates

19.4 Protocol-specific settings

User enters protocol-specific settings step 3. Available controls in step 3 are protocol-dependent so the appearance of this window changes according to the selections of previous steps.

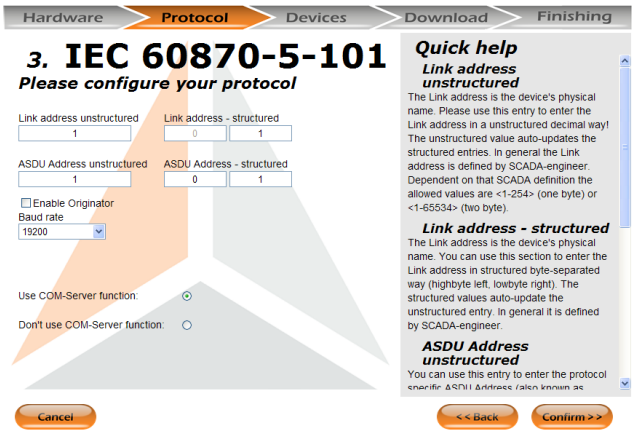


Figure 90: IEC101 settings

Table 72: IEC101 settings

Setting	Format	Range	Default	Description
Link address unstructured	-	1 to 65534	1	Link address as 16-bit number
Link address - structured	-	2x 0 to 255	0, 1	Link address as two 8-bit numbers
ASDU Address unstructured	-	1 to 65534	1	ASDU address as 16-bit number
ASDU Address - structured	-	2x 0 to 255	0, 1	ASDU address as two 8-bit numbers
Enable Originator	-	Option box	not selected	Option to enable originator in IEC101 protocol
Baud rate	-	Selection of values in combo box	19200	Speed of IEC101 serial port

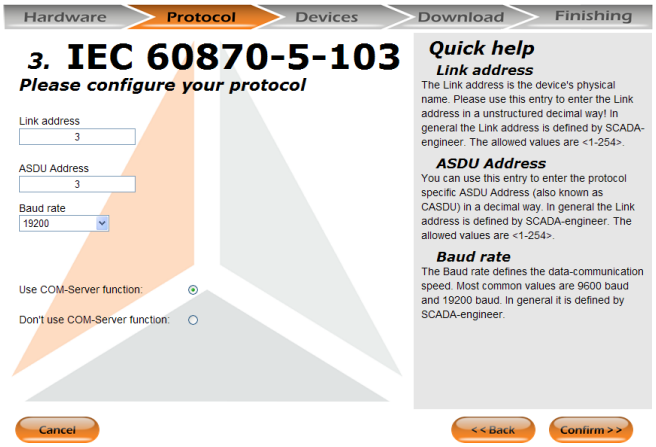


Figure 91: Protocol selection, REG-P, IEC103

Table 73: IEC103 settings, REG-P

Setting	Format	Range	Default	Description
Link address	-	1 to 254	1	Link address
ASDU Address	-	1 to 254	1	ASDU address
Baud rate	-	Selection of values in combo box	19200	Speed of IEC103 serial port

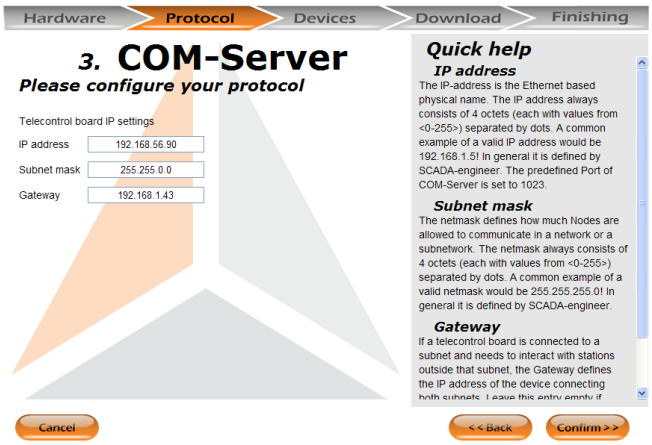


Figure 92: Protocol selection, REG-P, CSO

Table 74: CSO settings, REG-P

Setting	Format	Range	Default	Description
IP address	-	4x 1 to 254	1	IP address of telecontrol board
Netmask	-	4x 1 to 254	1	Network mask of telecontrol board
Gateway	-	Selection of values in combo box	19200	Default gateway of telecontrol board

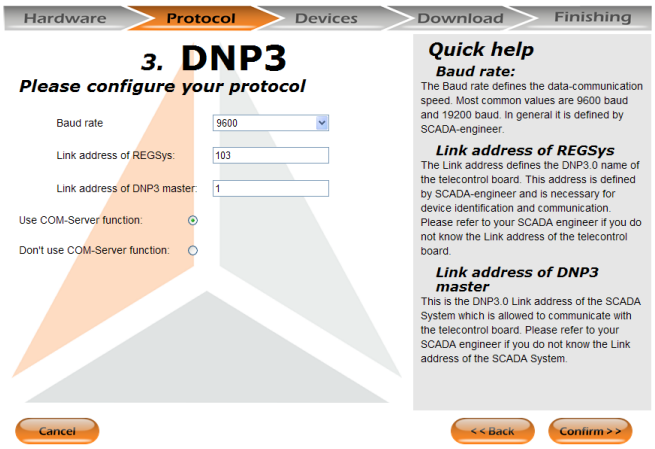


Figure 93: Protocol selection, DNP3

Table 75: DNP3 settings

Setting	Format	Range	Default	Description
Baud rate	-	Selection of values in combo box	19200	Baud rate of DNP3 serial port
Link address of REG-x	-	0 to 65535	103	Link address of REG-x
Link address of DNP3 master	-	0 to 65535	103	Link address of DNP3 master

19.5 Time synchronization

Time synchronization page appears in the case when the used telecontrol board or protocol enables time synchronization using NTP server. User selects time synchronization either by NTP server or by the used protocol.

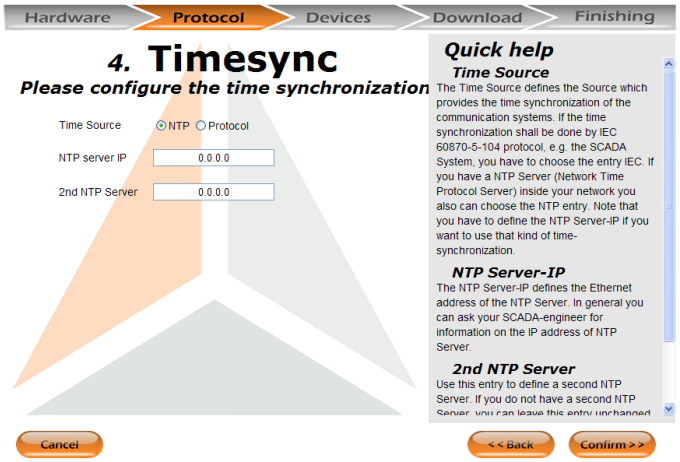


Figure 94: Time synchronization

Table 76: Time synchronization

Setting	Format	Range	Default	Description
Time Source	-	Option box	NTP	Selection of time source
NTP server IP	-	4x 1 to 254	0.0.0.0	IP address of NTP server
2nd NTP Server	-	4x 1 to 254	0.0.0.0	IP address of second alternative NTP server

19.6 Devices

Devices step displays devices contained in the settings. User can modify configuration by un-checking the individual device via the *Enabled* Check-box option. User can also change identifiers of individual devices by the *Identifier* textbox.

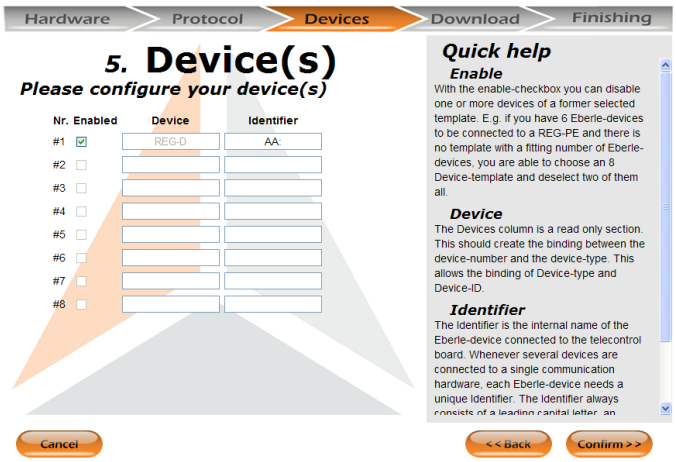


Figure 95: Devices

19.7 REGSys configuration

REGSys configuration step refers to the necessity of equal setting of communication configuration between telecontrol board and device. User has to modify the device communication settings to match the given settings of telecontrol board. The *HANDSHAKE* value reflects the version of telecontrol board.

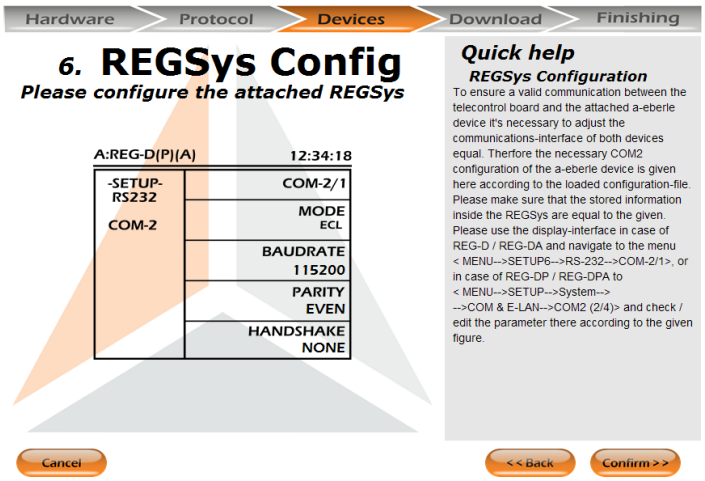


Figure 96: REGSys configuration

19.8 Download

Download step is intended for transfer of created settings and corresponding firmware to the telecontrol board. The appearance of the *Download* page differs according to the available data transfer possibilities of individual board and necessary settings.

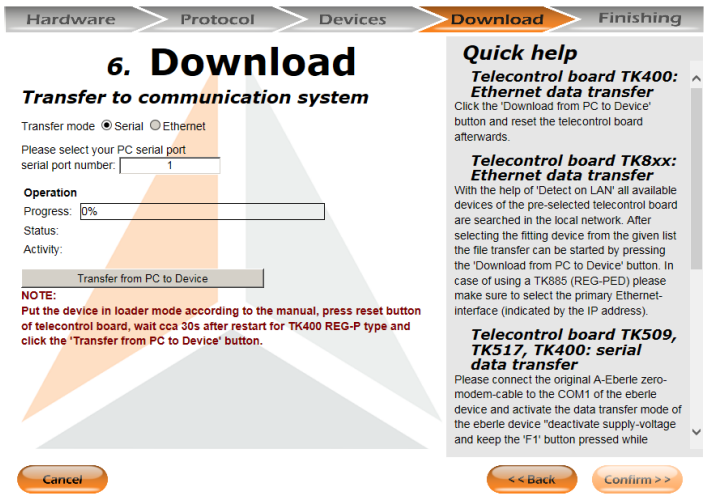


Figure 97: Download (REG-P)

Functionality and user actions of data transfer of settings and firmware to REG-P telecontrol board are similar to *Manual* data transfer which can be found in *Advanced* mode as described in chapter 11.2.1.

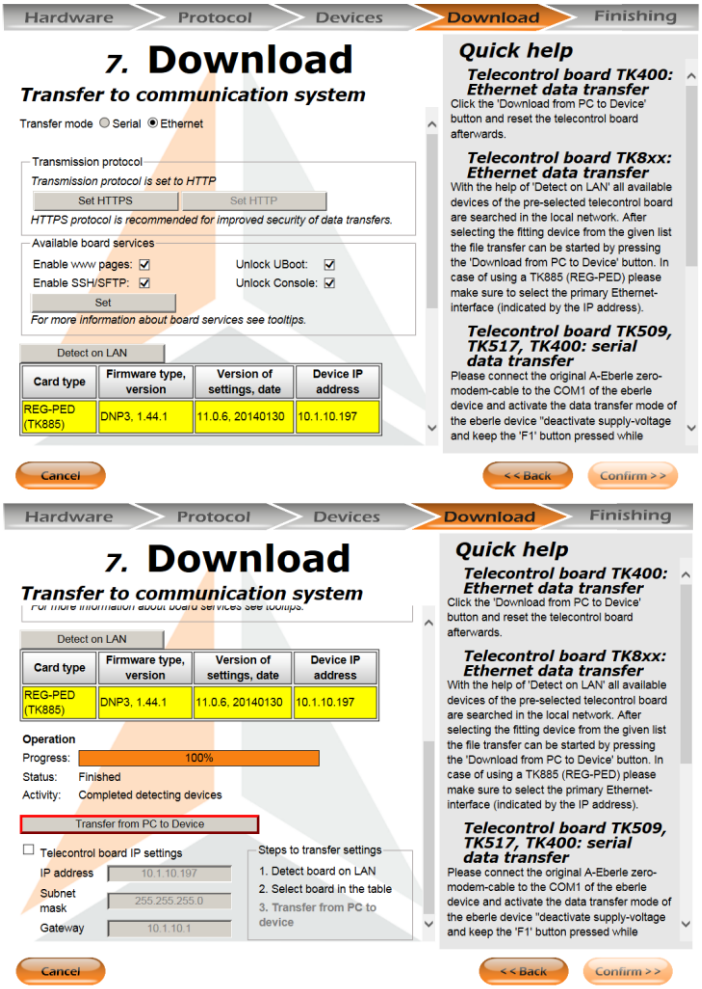


Figure 98: Download (REG-PE(D))

Functionality and user actions of data transfer of settings and firmware to REG-PE(D) telecontrol board are similar to *Remote* data transfer which can be found in *Advanced* mode as described in chapter 11.2.2. User detects the board in the network first to get the board settings and then selects the chosen board in the table. *Confirm* button is enabled after transfer.

19.9 Finishing

The last step allows the user to save their newly created settings into the WinConfig .XML file that can be processed by WinConfig in *Advanced* mode and/or for exporting the settings to the .XLS file.

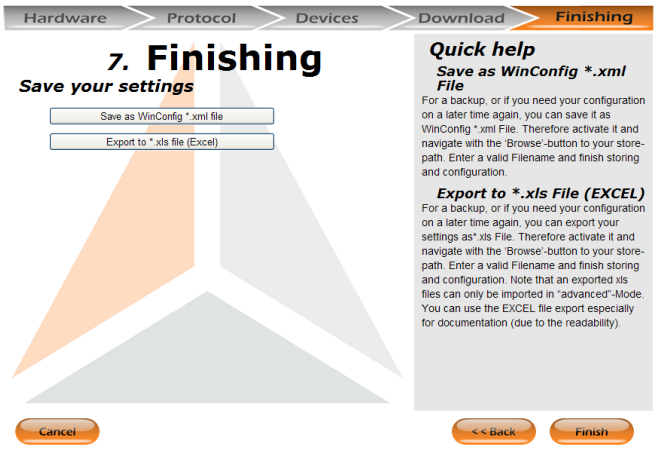


Figure 99: Finishing

20. Tips on Troubleshooting

The subject of this chapter is for providing tips on troubleshooting with the REG-PE / REG-PED device.

Firstly, here are the essential points necessary to ensure correct operation.

⚠ **DANGER!**	Only qualified personnel should work on this equipment, and only after becoming thoroughly familiar with all warnings and safety notices of this and the associated manuals, as well as with the applicable safety regulations.

20.1 Common troubleshooting tips

Table 77: Common troubleshooting tips

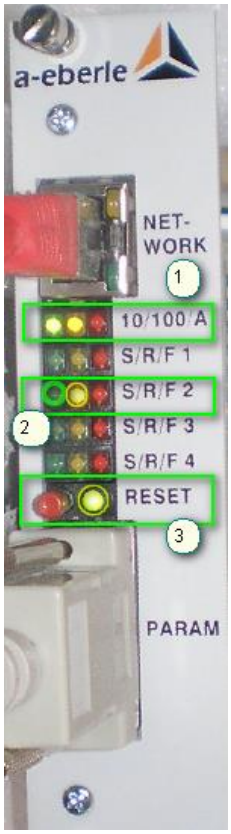
IP address	0 Has an IP address been set in the device? If this setting has not been made, it will not be possible to establish a link. To validate the IP address, it is possible to execute a ping from the network to the device's IP address using a Ping function on the Command line.
Subnet mask	0 Has the subnet mask been correctly set? The subnet mask results from the addressing scheme used in the network segment.
Remote access not possible	0 Has the gateway address been correctly set in the device? If it is not correct, it will not be possible to access a device via two or more networks.
No time synchroni-	0 Is there at least one timeserver in the network and what is its ad-

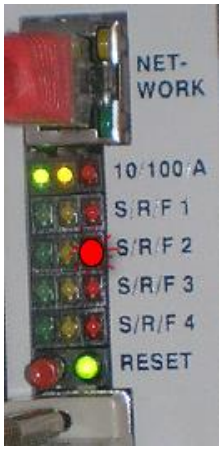
zation via NTP	dress? 0 Has the timeserver's address been correctly set in the NTP-setting of REG-PE / REG-PED device? 0 Is the device correctly parameterized for use of time synchronization via Ethernet? 0 If the timeserver is a PC, are the Windows time service deactivated and the correct NTP service started?
You can't save a data to jffs2.tar	0 Do you have permission to store the file or does the path of your file contain illegal characters?
You can't restore a data from jffs2.tar	0 Do you have permission to the working file and directory?

20.2 Diagnostic Functions in the Context of the REG-P / REG-PE / REG-PED Device

The subject of this section is troubleshooting problems with the settings of REG-PE / REG-PED device and XXXSys™-Device interconnection.

Table 78: Diagnostic functions in the context of the device

LED's status of REG-PE/ REG-PED device	Indication
	Normal operation: 1. Indication of Ethernet activity, depends on current activity on Ethernet line 2. Indication of communication on serial ports 1 to 4 (S – send data, R – receive data, F - error) 3. Watchdog indication

	Hardware or application fault. ➲ First of all check please network connection and power supply. ➲ Then follow the instructions described above.
	Communication REG-PE – REG-D™ faults. ➲ Check please device settings ➲ Check communication settings of REGSys™ (baud rate, parity etc.)

Note:
If the problems persist, please ask your system administrator first. For further assistance please contact a.eberle product support at
http://www.a-eberle.de

LED's status of REG-P version TK400 board	Indication
	Normal operation: 1. Reset button 2. Indication of watchdog or COM-Server running 3. Indication of transmit, receive and error in communication between REG-P and external device using the topical protocol 4. Indication of transmit, receive and error in internal communication between REG-P and a.eberle device All LEDs blinking – invalid combination of firmware and settings

	Ethernet booter operation: 1. Ethernet booter is waiting for connection (LEDs alternately blinking) 2. Ethernet booter finished data transfer and stores data in the internal memory “Running light” indicates data transfer
	Serial booter operation: 0 Serial booter is waiting for connection.
LED’s status of REG-P version TK517 board	**Indication**
	Normal operation: 1. Indication of transmit, receive and error in communication between REG-P and external device using the topical protocol 2. Indication of transmit, receive and error in internal communication between REG-P and a.eberle device 3. Indication of power supply voltage and running watchdog All LEDs blinking – invalid combination of firmware and settings.

	Parallel booter operation: 0 Parallel booter for data transfer via parallel Param port is running. This way of data transfer is not supported by WinConfig.
	Serial booter operation: 0 Serial booter is running. Alternate blinking of some LEDs indicates data transfer.

21. Related Documentation

Document	Author
"REG-PE Firmware Update IEC61850.v1.2.doc"	a-Eberle
"REG-PE Quick Guide for technicians IEC61850 1.2.doc"	a-Eberle
"REG-PE User Management IEC61850.v1.4.doc"	a-Eberle
Installation instructions COM-Server functionality of PQI-DA.doc	a-Eberle
PQI-DA_loader_mode.MOV	a-Eberle

22. Maintenance/Cleaning

This unit is maintenance-free for customers.

⚠ DANGER!	**Danger of electric shock!** Do not open the unit. Maintenance of the equipment can only be carried out by A-Eberle.

For service, contact A-Eberle.

Service address:

A. Eberle GmbH & Co. KG

Frankenstraße 160

D-90461 Nuremberg

23. Disassembly & disposal

The disposal of the LVRSys™ is carried out by A. Eberle GmbH & Co. KG.

➲ Send all components to:

A. Eberle GmbH & Co. KG

Frankenstraße 160

D-90461 Nuremberg

24. Product Warranty

A. Eberle GmbH & Co. KG. warrants that this product and accessories will be free from defects in materials and workmanship for a period of three years from the date of purchase.

Warranty does not apply to damage caused by:

- Accidents
- Misuse
- Abnormal operating conditions

To make a warranty claim, please contact your local A.Eberle distributor or alternatively contact A. Eberle GmbH & Co KG in Nuremberg, Germany

25. List of Figures

26. List of Tables

Notes

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Release Date: 2018-12-06