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RTD-Unit TR1200IP - Application

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- IEC 61850 GOOSE – Message
- Connection to SIPROTEC 4
- ATTENTION: for part-no T224078 only

RTD-unit TR1200IP – application

Connection of TR1200IP with GOOSE – messages to SIPROTEC 4 devices

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1 Basics of IEC 61850 / GOOSE with TR1200IP

1.1 Summary

A new feature of the temperature measurement unit TR1200IP (RTD – unit) is the ability sending out IEC 61850 GOOSE – messages on its electrical 10 Mbit/s Ethernet interface (supported from 2015/04). All IEC 61850 GOOSE – servers which can receive float format measurements with quality may receive the temperature measurement values of the TR1200IP via a GOOSE – message. These values can be used for diverse applications inside the receiving IED e.g. the thermal supervision of motors or transformers. The 12 temperature measurements of the TR1200IP determined via PT100 sensors are cyclically transmitted with a GOOSE – message to the Ethernet network and can be subscribed from other protection and field devices e.g. SIPROTEC 4 or SIPROTEC 5 devices from Siemens. A temperature jump of a measurement results in a spontaneous GOOSE – message indicating that immediately. TR1200IP use the GOOSE – protocol defined in the IEC 61850 standard part 8-1. The engineering follows the IEC 61850 standard part 6 with a standard conformant ICD/CID – file describing TR1200IP IEC 61850 structure.

This application describes the IEC 61850 settings for TR1200IP with the values coming from the system configuration and the setting procedure of the SIPROTEC 4 device for receiving measurement values via GOOSE – messages. For this the new independent system configurator from Siemens is used which is part of the program DIGSI 4.9 of Siemens or delivered as a single program. The engineering workflow use Edition 2 of IEC 61850 but there are no main differences to Edition 1. Finally some test and diagnosis features will be shown.

Advantage of this solution is that several receiving IED can share temperature measurement values coming from one TR1200IP. Also redundant processing of received values in two receiving IED is possible. Using the worldwide accepted IEC 61850 standard allows to extend all protection and field devices with temperature measurement features and applications. One solution will be shown here.

1.2 TR1200IP IEC 61850 structure

The TR1200IP transmit 12 temperature measurement values (RTD – values), each RTD-value in floating point format and a quality value for each RTD-measuring. TR1200IP includes exclusively a server for GOOSE – messages and works as a GOOSE – transmitter. It is not possible to interrogate the device with an IEC 61850 client e.g. via reporting. Interrogating the device is possible with an Internet – browser under the IP-address of the device. How to set the device and it´s IP – address will be described in detail with the manual. Use this link:
https://www.ziehl.com/en/products/detail/TR1200IP-40

Figure 1 show the IEC 61850 structure of TR1200IP. This structure is defined with the ICD / CID – file. This file will be provided by the download link also as a template which must be modified during the system configuration (written in chapter 3). The IED - name will be given during the system configuration and set with a browser (In figure 1 named TR1200IP504 as an example). The default name in the ICD-file is *Template*. The Logical Device name is fixed and named with *MEAS*. Each temperature measurement point 1-12 is modeled by a Logical Node *STMP*, which is foreseen in the IEC 61850 standard part 7-4 for RTD – values. 12 values result in 12 Logical Nodes *STMP1 – STMP12*. The state of the failsafe relay in the TR1200IP is modeled by a LN GGIO and the state is given by a Single Point indication.

The dataset containing the measurement values and relay state is fixed and not dynamically e.g. with the number of connected measurement points. The dataset is part of Logical Node LLN0. Other properties defined inside the GOOSE control block are fixed, respectively must be given by the user after the system configuration and set in the device with the browser.

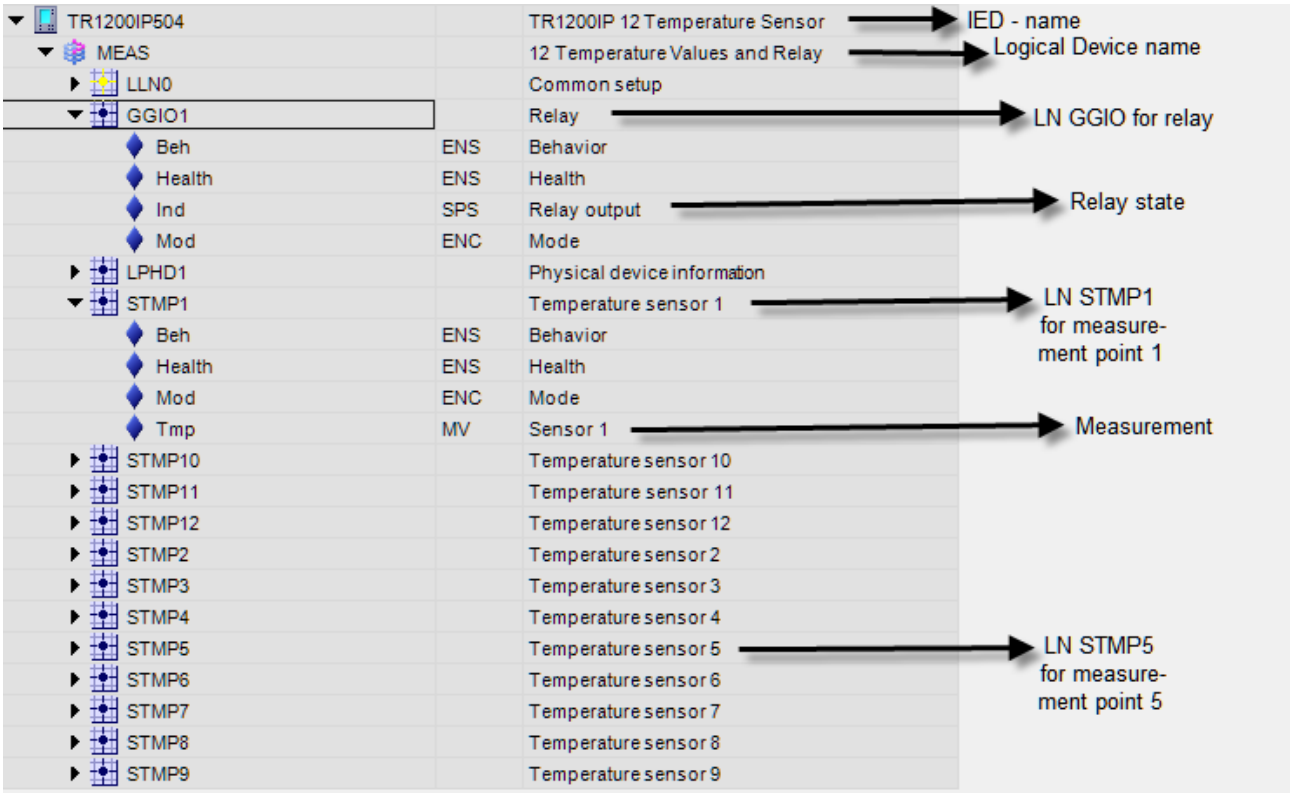

Fig.1: IEC 61850 structure of the TR1200IP

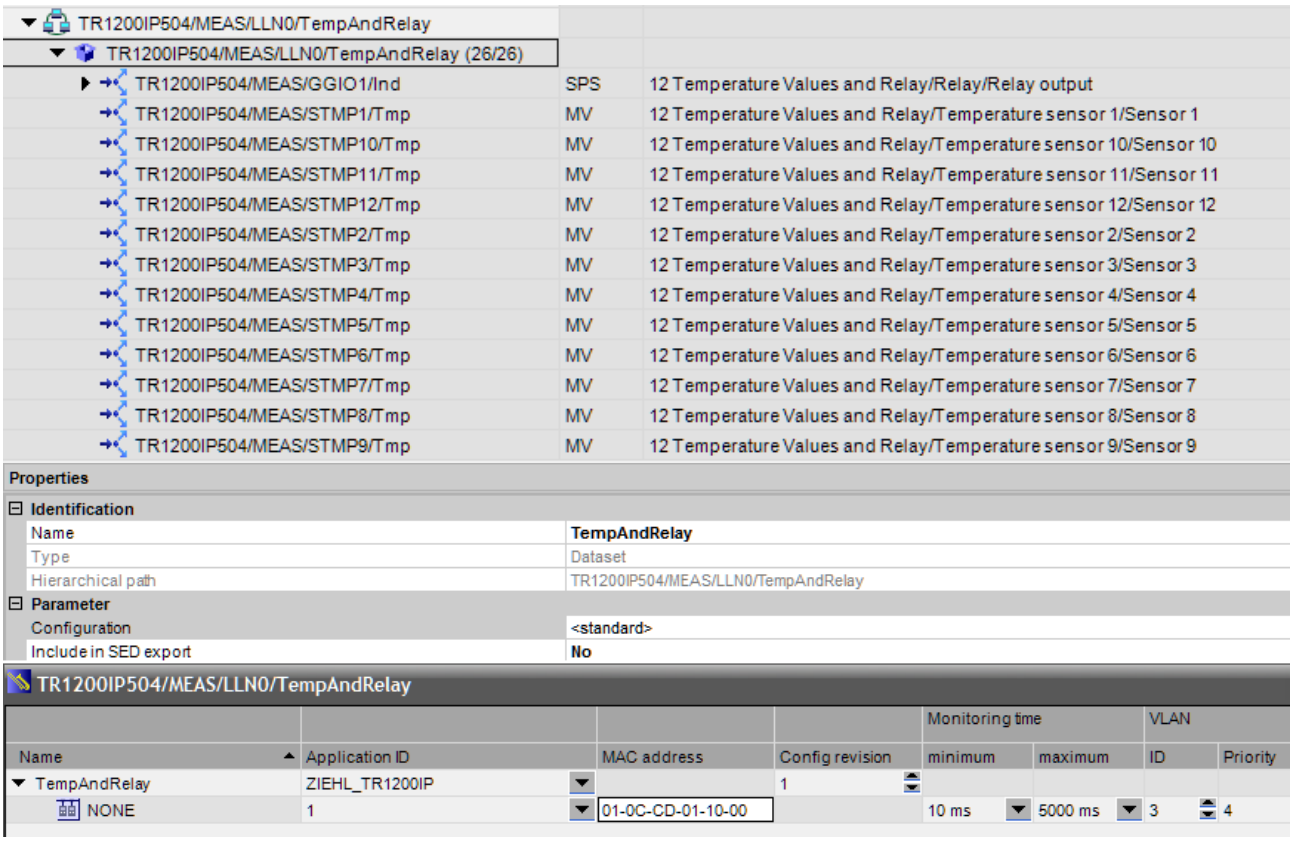

Fig. 2: Predefined dataset with relay state and 12 RTD measuring points and GOOSE control block properties

1.3 GOOSE settings for TR1200IP

1.3.1 GOOSE setting-page of TR1200IP with a browser

The settings for the GOOSE telegram are made via the Web-Server inside the TR1200IP under the option GOOSE. It is interrogated from a PC with the IP-address of the unit (e.g. http://192.168.1.75). An automatic update of the device with the values of the communication section of the SCD-file is not available. Settings are done under GOOSE – option manually. Some settings result from the system configuration. Other values e.g. the dataset name *TempAndRelay* and the GO-ID *ZIEHL_TR1200IP* are fixed. If system configuration tools allow changing this text it is forbidden to do this. Otherwise the GOOSE receiver will be updated with wrong values and not able to receive GOOSE telegrams from TR1200IP.

After settings are done don´t forget: *Save Config*.

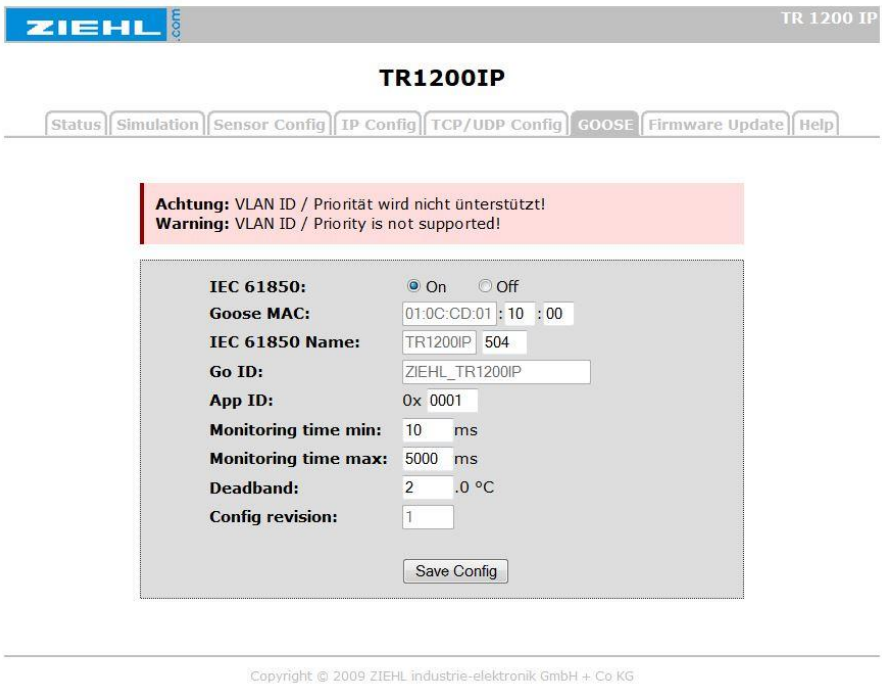

Fig. 3: Setting page for a GOOSE – message of the TR1200IP

1.3.2 IEC 61850 On / Off

This option switches sending a GOOSE – message ON or OFF. Typically it should be ON. This feature can be used also for testing. Switching the GOOSE – message OFF temporary can be used to test the receiver. If a GOOSE failure alarm is configured this GOOSE failure alarm should be indicated. Switching GOOSE to ON the alarm should disappear.

1.3.3 MAC – address

This is not the MAC-address of the Ethernet controller of the TR1200IP. It´s the GOOSE MAC-address. It will be set during the system configuration unique for each GOOSE – message manually or automatically. The value given by the system configuration must be set here. With this MAC-address the receiving device expects the GOOSE-message.

1.3.4 IEC 61850 name (IED – name)

If the default ICD-file of the TR1200IP is imported into the system configurator the IED-name must be given. The default name *Template* must be changed according the name rule. The text part of the IED-name *TR1200IP* is fixed. The user set a number between 000 and 999 using the Web-page for GOOSE (see fig.3). The fixed text and the user given number result in the IED-name. In our example *TR1200IP504*. This full string must be used as IED-name in the system configuration tool.

1.3.5 GO – ID (GOOSE – ID)

This string is fixed and must remain unchanged in the system configuration tool. For information it will be shown because the GO-ID is part of the header of a GOOSE telegram. GO – ID is named *ZIEHL_TR1200IP*

1.3.6 App – ID (Application – ID)

This value will be given by the system configuration tool or will be set there manually. It´s an important property of the GOOSE-message. It´s a hexadecimal number e.g. App-ID = 15 (decimal) result in App-ID = 0F (hexa decimal) which must be set here. System configuration tools indicate this value different as hex or dec number. You must be careful with App-ID > 9.

1.3.7 Monitoring time min / max

The Max-time is the cyclic interval for the GOOSE – message if no change occurs. Every 2 s all measuring points are updated. Therefore a value from 2000 – 5000 ms will be recommended. Typically the default value 5000 ms from the ICD-file can be used. The Min-time determines the time for the spontaneous GOOSE after a change of one of the temperature values greater given by the Deadband value. 10 ms is the default value. If these values are changed in the system configuration tool they must be adapted here also. Settings are done in milliseconds.

Note: For the GOOSE – telegram a setting *Time Allow to live* exist which is transmitted with each GOOSE – telegram. Very often this setting is used on receiver side for GOOSE failure detection. Time Allow to live is calculated to 2 times Max-time. If the receiver does not receive a GOOSE – message during *Time Allow to Live* a GOOSE – failure alarm can be indicated on receiver side and previous received RTD-values are used but indicated now as ´Invalid´ because no update occurs. For SIPROTEC 4 devices Max-time must be smaller than 30 s.

1.3.8 Deadband

The deadband define which temperature jump lead to a spontanous GOOSE – message after Min-time. Recommended value is 2 degree Celsius. A smaller value results in high GOOSE – traffic, because small temperature changes due to measurement inaccuracy in the range of ±1degree are likely. Small temperature changes inside the deadband range are integrated with the positive amount. This integration method result in spontanous GOOSE – messages even if a temperature change is not outside the deadband. In this case the actual temperature value for this measurement point will be send with the GOOSE – message.

1.3.9 Config revision (Configuration revision)

This value will be given during the system configuration. TR1200IP always uses the value 1 and it cannot be changed. If a system configuration tool changes this value due to a change in the GOOSE configuration it must be set to 1 manually for the GOOSE – telegram of the TR1200IP. Otherwise the SIPROTEC – devices will not receive the GOOSE – message any more after a parameter set update from the system configuration.

Note: An often error after system configuration changes is a wrong Config revision. Please pay attention to this value coming from the system configuration.

1.4 Network configuration

For the connection of one or more TR1200IP to an IEC 61850 network the electrical 10 Mbit/s Ethernet interface will be used. Typically the unit will be connected to an Ethernet switch which must include electrical 10 MBit/s Ethernet interfaces. If SIPROTEC devices are used in a RSTP – ring configuration the root switch or an upper switch can be used for the connection of TR1200IP. Network redundancy protocols like RSTP, PRP or HSR are not supported by TR1200IP. Network integration must be done via external switches or a Redbox. The IP – addresses of TR1200IP must be within the network segment defined for the whole IEC 61850 network.

1.5 Special measurements indicating RTD - sensor interruption

Failures on measurement points are indicated with the following values:

Sensor not connected (Sensor nc):	+980 Grad
Sensor short circuit:	-999 Grad
Sensor break:	+999 Grad
Sensor value to high :	+860 Grad
Sensor value to low:	-200 Grad

The quality indication of such a measurement in the GOOSE telegram is Invalid-Failure (0042hex) to indicate that it is not a true measurement value. Due to the quality Invalid-Failure this value is not used in the SIPROTEC device and will be shown with *n.a.n (not a number)* in the display. Such a value is not used in the logic editor (CFC) of the SIPROTEC – device.

Further information is in the operation manual from Ziehl.
https://www.ziehl.com/en/products/detail/TR1200IP-40

If a failure is detected by the device on a measurement point the failsafe relay state change from *True* to *False*. This state is also transmitted with the GOOSE – message and can be used in the receiving device.

2 Configuration with DIGSI 4

2.1 Creating a project with SIPROTEC 4 devices and an IEC 61850 station with Edition 2

To a new or existing DIGSI 4 project the protection and field devices with IEC 61850 capability are added and an IEC 61850 station. The workflow is described in the Online help of DIGSI 4. The protection and field devices are set to Edition 2. Since version 4.9 of DIGSI 4 (available since 2014/10) external devices with IEC 61850 capabilities are not added in the DIGSI – Manager but now imported in the system configurator (refer to chapter 3.1). Furthermore SIPROTEC 4 devices must be added to the IEC61850 station to configure them in the system configurator with IEC 61850 features.

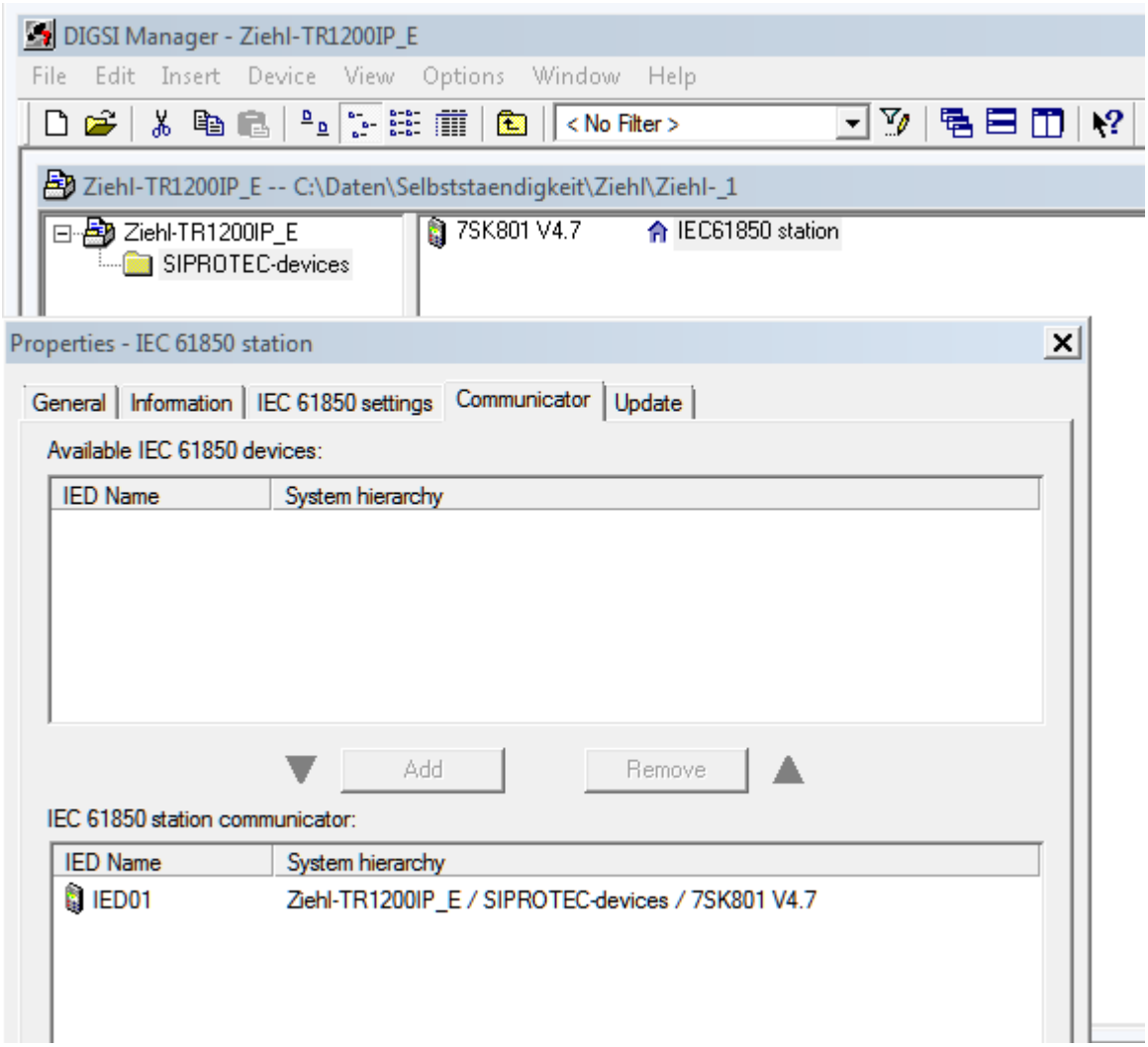

Fig. 4: Motor protection device 7SK80 and the IEC61850 station in the DIGSI – Manager

2.2 User defined measurements and user defined indications

The motor protection device 7SK80 shall receive temperature measurement values with GOOSE – messages. To configure the device with data objects for receiving and further processing it will be opened Offline. After storing the device all IEC 61850 relevant data objects will be written into the ICD – file and can be used afterwards in the system configurator. For SIPROTEC 4 devices an ICD-file is created according the used functions and the configured user defined data objects.

To the Configuration matrix a new group IEC61850 will be added which include GOOSE – measurements and data objects derived from it. The name IEC61850 can be freely chosen. 5 temperature measurements shall be received, displayed and the first value will be assigned to the logic editor (CFC) for further processing. The Configuration matrix must be in the view *Measured and metered values* only to work with the measurement values.

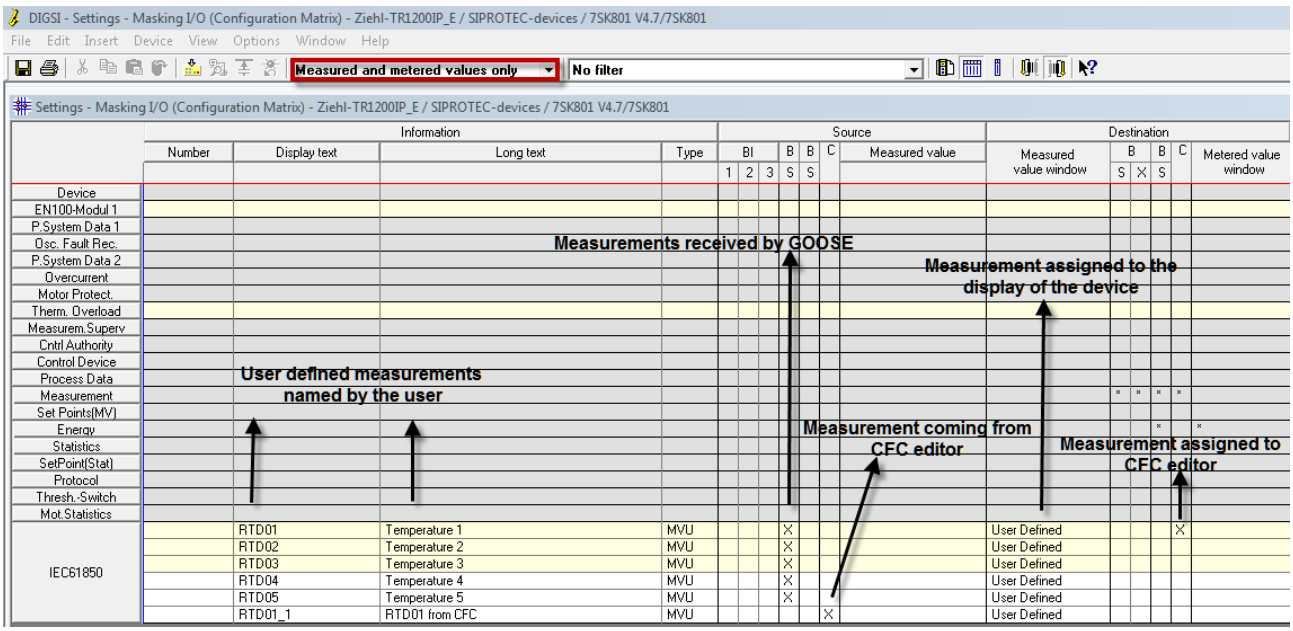

Fig.5: DIGSI 4 Configuration matrix for measurements received by GOOSE

The measurement which shall be received by GOOSE is defined in the *Information catalog* as *External operating value (MVU)*. Via Drag and Drop this data objects are added to the group IEC61850 and a *Display text* and *Long text* is given (RTD01, RD02 … RTD05). This measurement must be assigned to the system interface as *Source*. In this step the *IEC 61850 name* of the measurement must be given and the *measurement value description* for the format in the device display. This is repeated for all 5 measurements which shall be received by GOOSE. The first measurement *RTD01* will be assigned to the CFC (Destination). The measurement processed in the CFC is added from the information catalog as data object *measurement (MVU)* via drag and drop and named *RDT01_1* (*RTD01 from CFC*). It´s assigned to CFC as Source (-> coming from CFC). All measurements are assigned to the device display as *User Defined*. Later we can see the values in the device display or in the online view of DIGSI 4 (refer to chapter 4, figure 18).

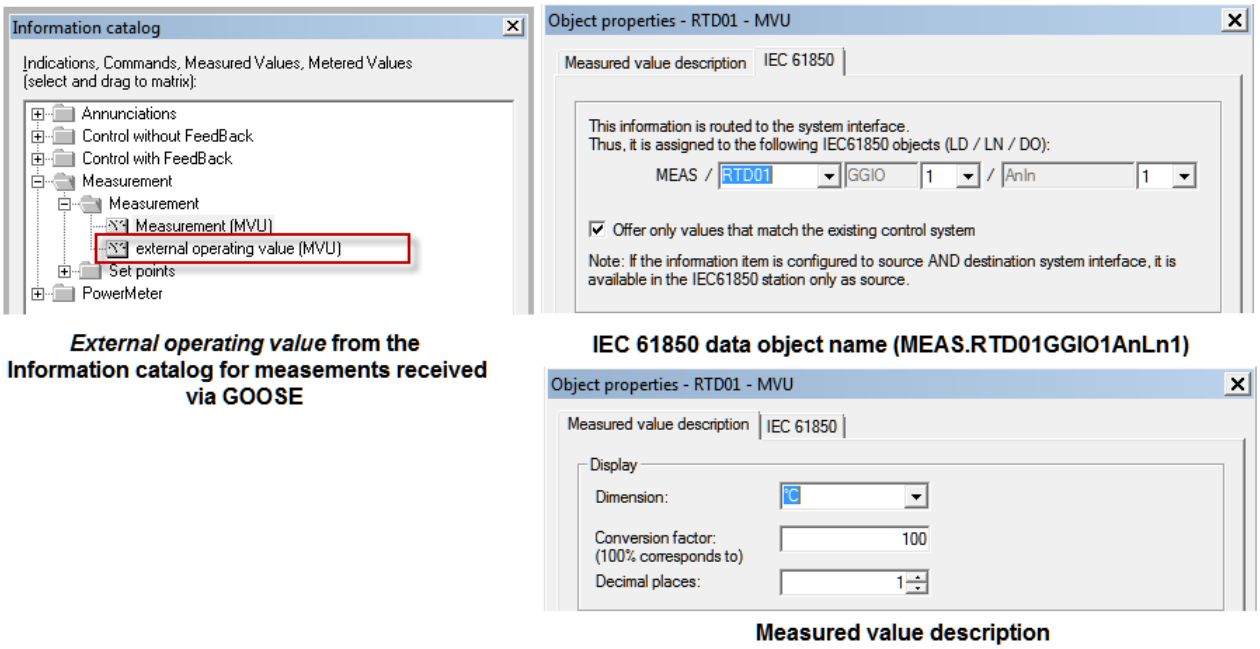

Fig. 6: Measurement for GOOSE with it´s properties

In the CFC shall be checked if the measurement is valid and an indication shall be given if a temperature limit will be reached. The Configuration matrix must be switched to *Indications only*. User defined *Single Point (SP)* are added from the Information catalog, named accordingly and assigned to CFC, LED and the operational buffer.

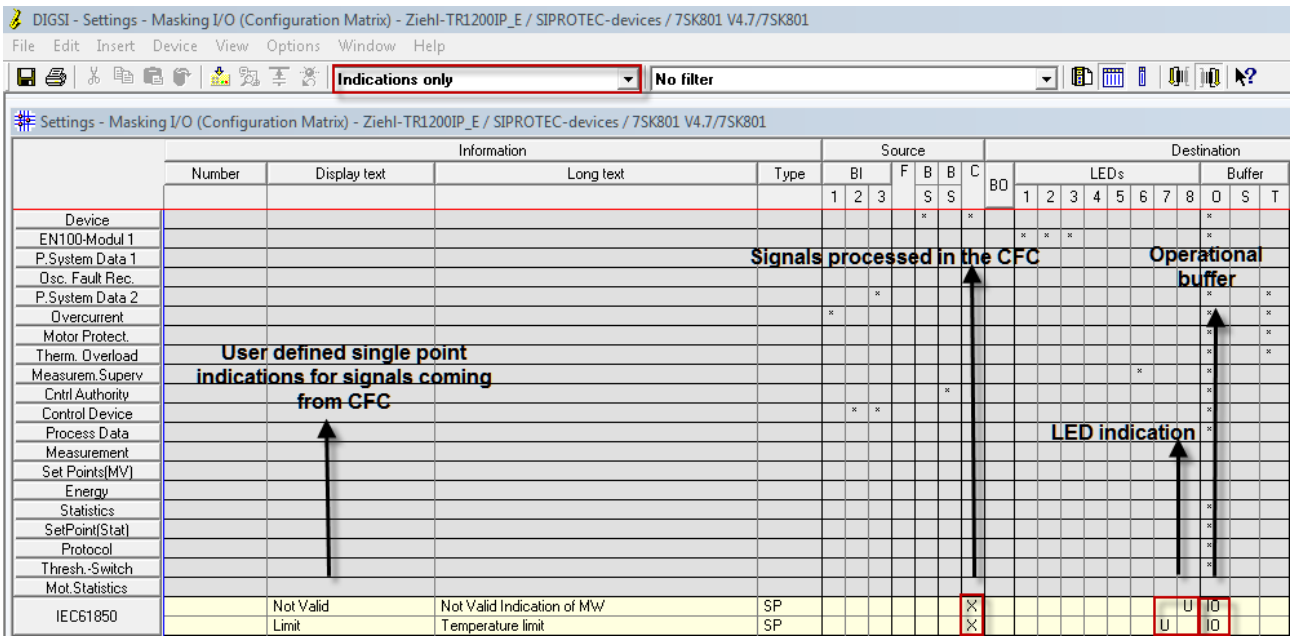

Fig. 7: From CFC processed indications for measurement 1

After this configuration is done the device must be saved. On the one hand to use the signals and measurement in the CFC and on the other hand to create the ICD – file for the device which is used later in the system configurator.

2.3 Settings for the user defined logic inside the CFC - editor

The first measurement shall be processed in the CFC. In the CFC logic various applications are possible using different CFC - blocks. This is one example

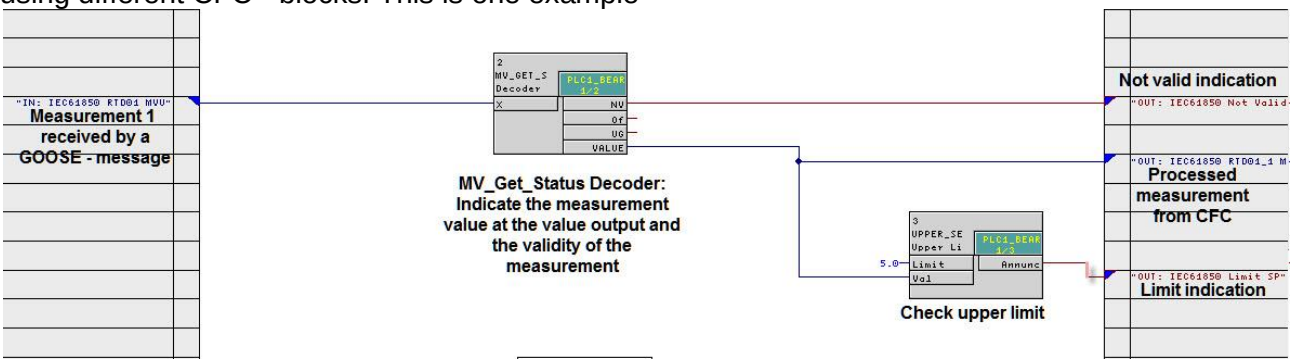

Fig. 8: Processing of measurement 1 in the CFC – logic editor

The measurement received by GOOSE will be assigned to a CFC-block *MV-Get-Status*. At the output *Value* the measurement is available for further processing. It is connected to an *Upper Setpoint* block, which checks a temperature limit. If the temperature exceeds 5 degree a binary signal *Limit* will be indicated as *True*. Furthermore the measurement is connected to the right sidebar of the CFC to show it in the device display. The NV output of the decoder *MV-Get-Status* indicates if the measurement is valid or not. Not Valid is indicated if the measurement is no longer received by GOOSE. Reason may be a problem in the sending TR1200IP or in the network connection. In this case the last valid measurement is used. Not valid is indicated if the GOOSE – message is transmitted with a test bit and the SIPROTEC 4 device is in normal operation mode. The negated NV – signal (= Valid) can be linked to an AND block together with the Limit indication and an alarm is only given if the temperature value has exceeded the limit and is valid at the same time.

The CFC plans for measurements are processed in the *Slow PLC*, because changes are possible in the range of some seconds. Thus allow to use a high number of CFC – blocks. After the PLC – programming is done the plan must be compiled and stored. Afterwards the CFC – editor will be closed and device configuration stored again. The DIGSI device will be closed and we go back to the DIGSI Manager. Data for the IEC 61850 system configuration are no available for this device.

Protection settings of the device are not in the scope of this application.

3 Configuration inside the system configurator

3.1 Import of SIPROTEC 4 devices and TR1200IP into the system configurator

The SIPROTEC 4 device must be added to the *IEC61850 station* (Right mouse click to the station -> Object properties -> Communicator -> Add). SIPROTEC 4 devices are added to the IEC 61850 station inside the DIGSI manager. Double clicking on the IEC61850 station opens the system configurator. The ICD / CID – file provided by Ziehl for TR1200IP will be now imported into the system configurator. It´s an external device, which are imported with their IEC 61850 description file. This workflow is valid from version 5 of the Siemens system configurator (since 2014/10 with DIGSI 4.9). For former versions external devices must be added in the DIGSI manager. Disadvantage is that the DIGSI manager is necessary for treatment of external IEC 61850 devices. The new workflow is a step from Siemens to an enhanced interoperability for external devices.

In the system configurator first use the option *Devices*. Right mouse click on the symbol IEC61850 station open a window Add IEC61850 device(s). Browse to the folder of the ICD-file and import it. During import the file will be validated and checked for IEC 61850 conformances. Files which are not valid cannot be used to avoid mistakes due to wrong configuration files.

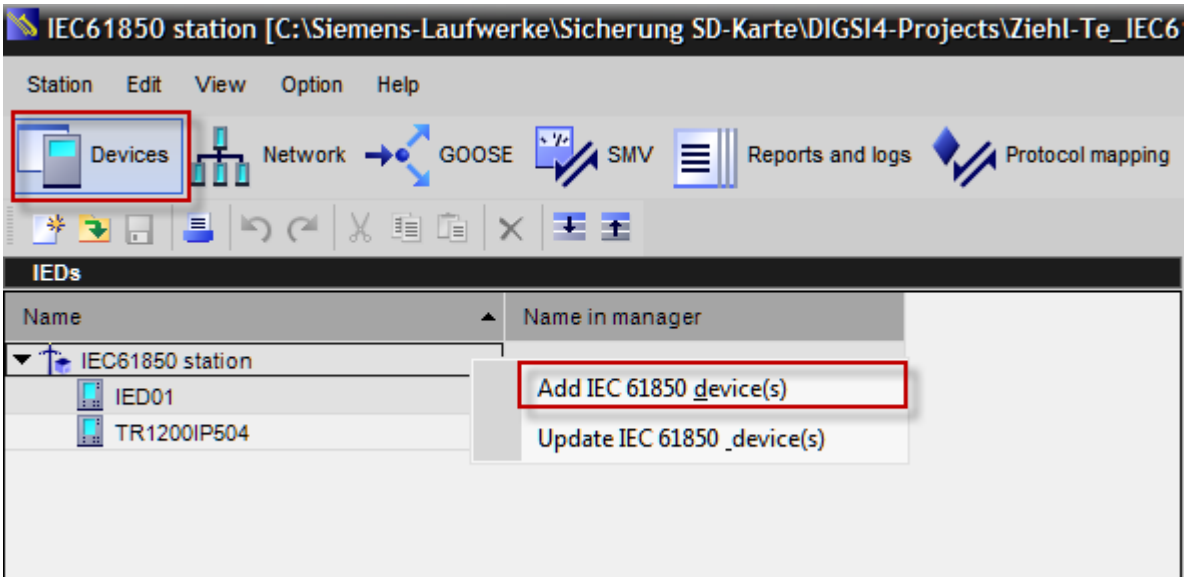

Fig. 9: Import of external devices into the IEC61850 station

In this IEC61850 station we have already imported a device description file and rename it to TR1200IP504. Details of the import and renaming shall be shown with a second configuration file for TR1200IP. The default ICD/CID – file use the name *TEMPLATE* as IEC61850 name. This name will be automatically changed by the system configurator without warning and another name is given which is not according the naming rule for TR1200IP (refer to chapter 1.3.4). Therefore this name must be changed afterwards. We name the second imported device *TR1200IP002*. On the GOOSE-page of TR1200IP in the browser therefore the number is 002 required for this device.

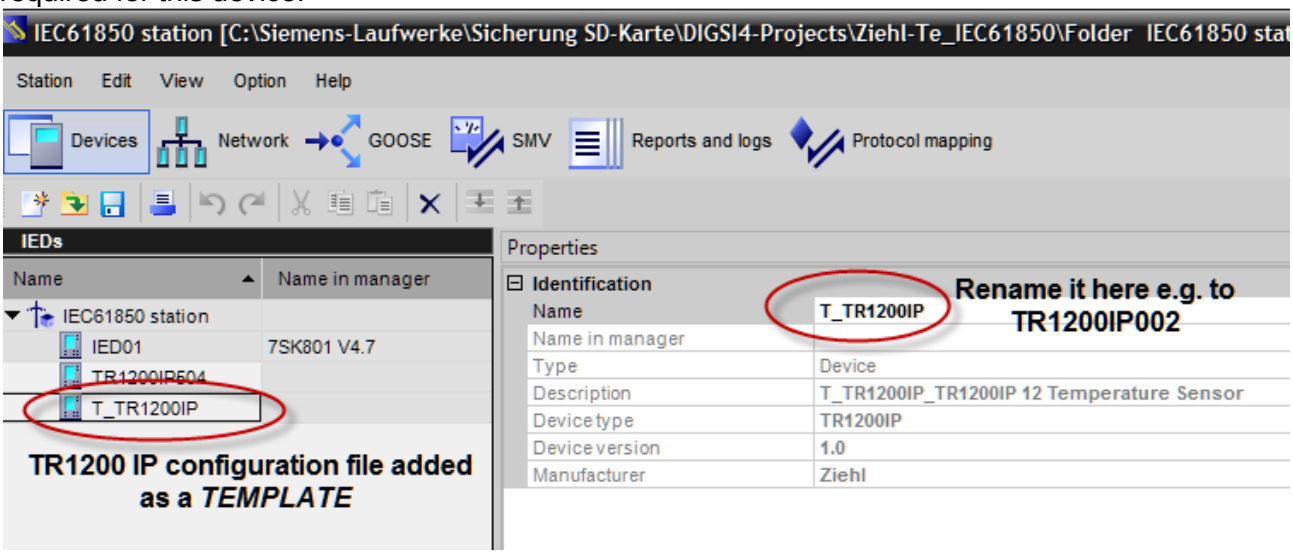

Fig.10: Change of the IEC61850 name for a device added with device name *TEMPLATE*

Next we choose the option *Network*. The imported device is assigned to another network (*W01*) und must be shifted to the network of the other devices (*NONE*). The network name is not important and can be changed by the user. All devices exchanging GOOSE – messages must be within the same network. Therefore the IP-address, Subnet-mask and the Standard Gateway must be added. It should be verified that this IP-address will be later used in the device. It can be set for TR1200IP with the browser or with buttons on the device. Network *W01* is afterwards empty and can be deleted.

The address planning for the network is under the responsibility of the system designer.

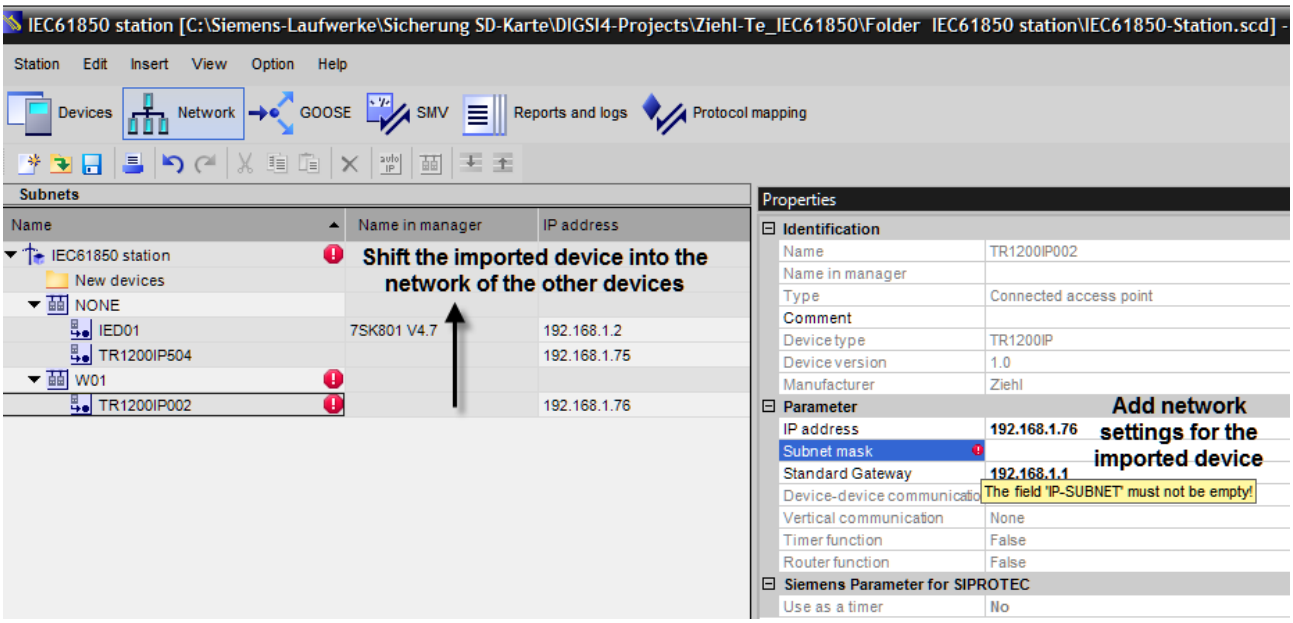

Fig. 11: Network settings in the system configurator

3.2 Configuration of a GOOSE – application with communication connections

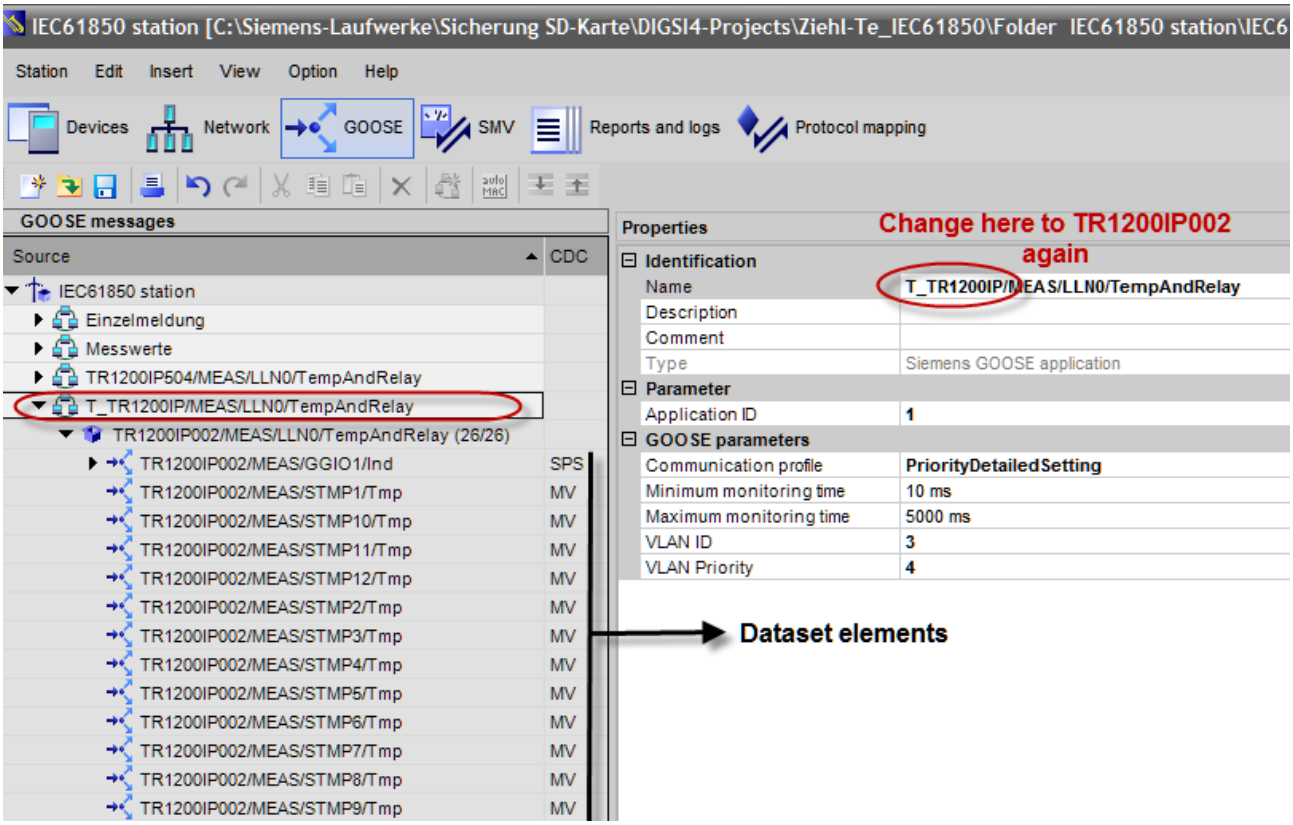

Fig.12: Change of the IEC61850 name under the GOOSE option

We shift to option *GOOSE*. Due to an error in the system configurator the changed *IEC6850 name* will not be changed in the GOOSE view. Therefore we must change to name here again. The file structure for the GOOSE dataset in afterwards correct. In the dataset you can see the relay state as a data object SPS (Single Point) and the 12 temperature measurements as data object MV (measurement value). Each value has quality information and therefore the dataset includes 26 elements. If you click to an element within the dataset you can see details on the right side in a property window.

The following steps will be done with TR1200IP504 which we have imported before and treated like written for TR1200IP002.

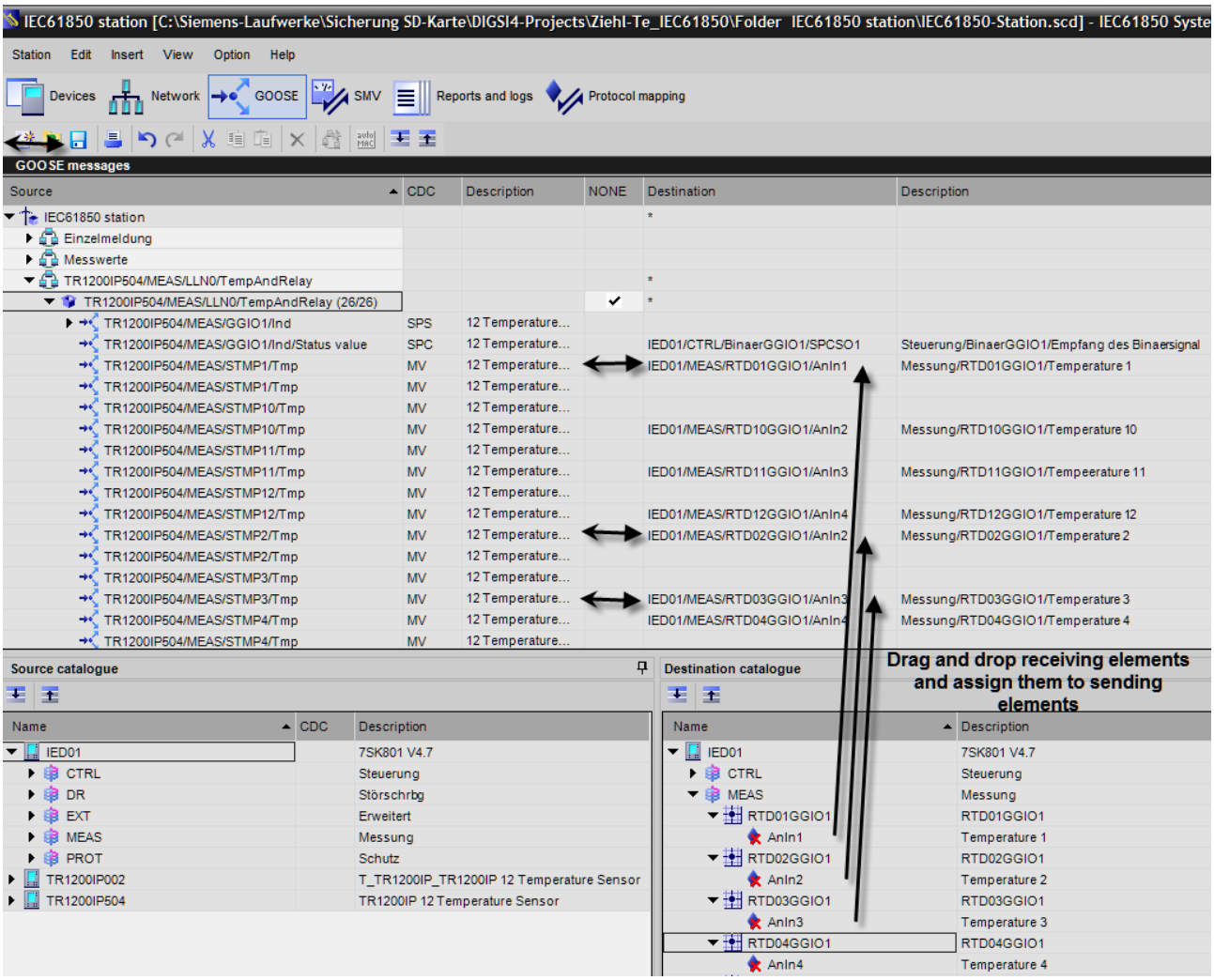

Fig.13: Assignment of temperature values received by GOOSE to elements of the dataset from TR1200IP504

In the *Destination Catalogue* you will find for the protection device 7SK80 named IED01 (IEC61850 name) under the Logical Device MEAS the data objects for receiving temperature measurements from TR1200IP. These values have been defined before in the Configuration matrix. They are shown with their IEC61850 name and a description. Via Drag and Drop you can assign these values to elements of the dataset of TR1200IP504. If one connection is ready a new line is created. Here you can assign the same temperature value to another protection device. Note: This added line does not create a new element in the dataset of TR1200IP504. Step by step we assign 5 temperature values.

In the next step we must set the properties for the GOOSE control block the GOOSE – settings. These values are described in chapter 1.3.3 – 1.3.9 and must be set afterwards with the browser under the GOOSE – page in the device TR1200IP504. The GOOSE – message of TR1200IP504 will be sending out exactly with these values. The SIPROTEC device is also updated with these values. Only if the values match exactly in both devices the GOOSE message will be received.

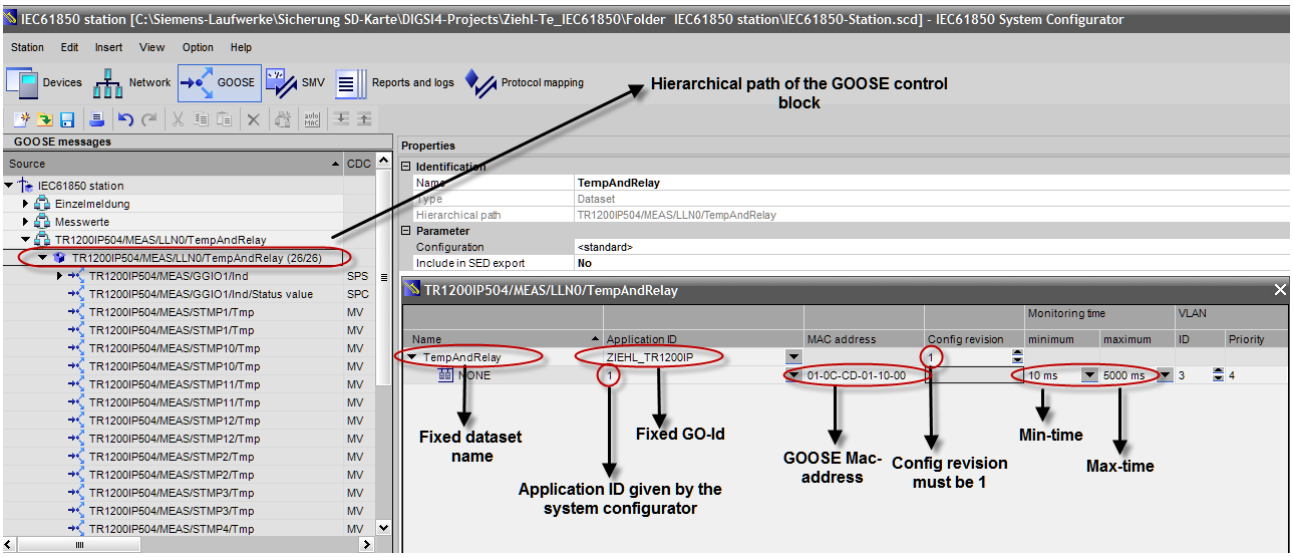

Fig. 14: Settings for the GOOSE - message

If you click on the line on the left side for the hierarchical path of the GOOSE control block you will get a property window on the right side. Click on the entry *<standard>* and three points appear at the end of the line. Click on this points and you will get the property window with the settings of the GOOSE – message.

The Application ID (App ID) will be assigned by the system configurator for each configured GOOSE application. This value must be set as hex-value in the GOOSE page.
The dataset name and the GO-Id are fixed and it's forbidden to change them here.
The default GOOSE Mac-address from the template ICD-file for TR1200IP is 01-0C-CD-01-10-00. The first 4 hex – values are fixed and defined for GOOSE in the IEC 61850 standard. If you have several TR1200IP devices in the network it is recommended to change the MAC-address for the first imported device immediately to avoid address conflicts for the devices imported afterwards. For example chose 01-0C-CD-01-10-01 for device 1 and 01-0C-CD-01-10-02 for device 2. Double MAC-addresses will be recognized by a system configurator and lead to an error message. You can also select that the system configurator automatically set the MAC-addresses. Important is that you **must** use this value here in the TR1200IP.
The Config revision may be counted up by the system configurator if a change in the GOOSE configuration will be done. It must be set here always to the value 1.
The Min-time and Max-time are displayed according the setting in the ICD-file. If you change these values here they must be changed on the GOOSE-page also.

3.3 Transfer of GOOSE - setting to TR1200IP

Like written in chapter 1 there is no automatic transfer of GOOSE settings to TR1200IP. The settings displayed for GOOSE from the system configurator must be set manually with the GOOSE – page with a browser. Don´t forget to *Save Config*. After a short time TR1200IP is sending out GOOSE messages with the settings from the GOOSE – page.

Furthermore the IP-address shall be changed to the value of the system configurator to interrogate the device via the network.

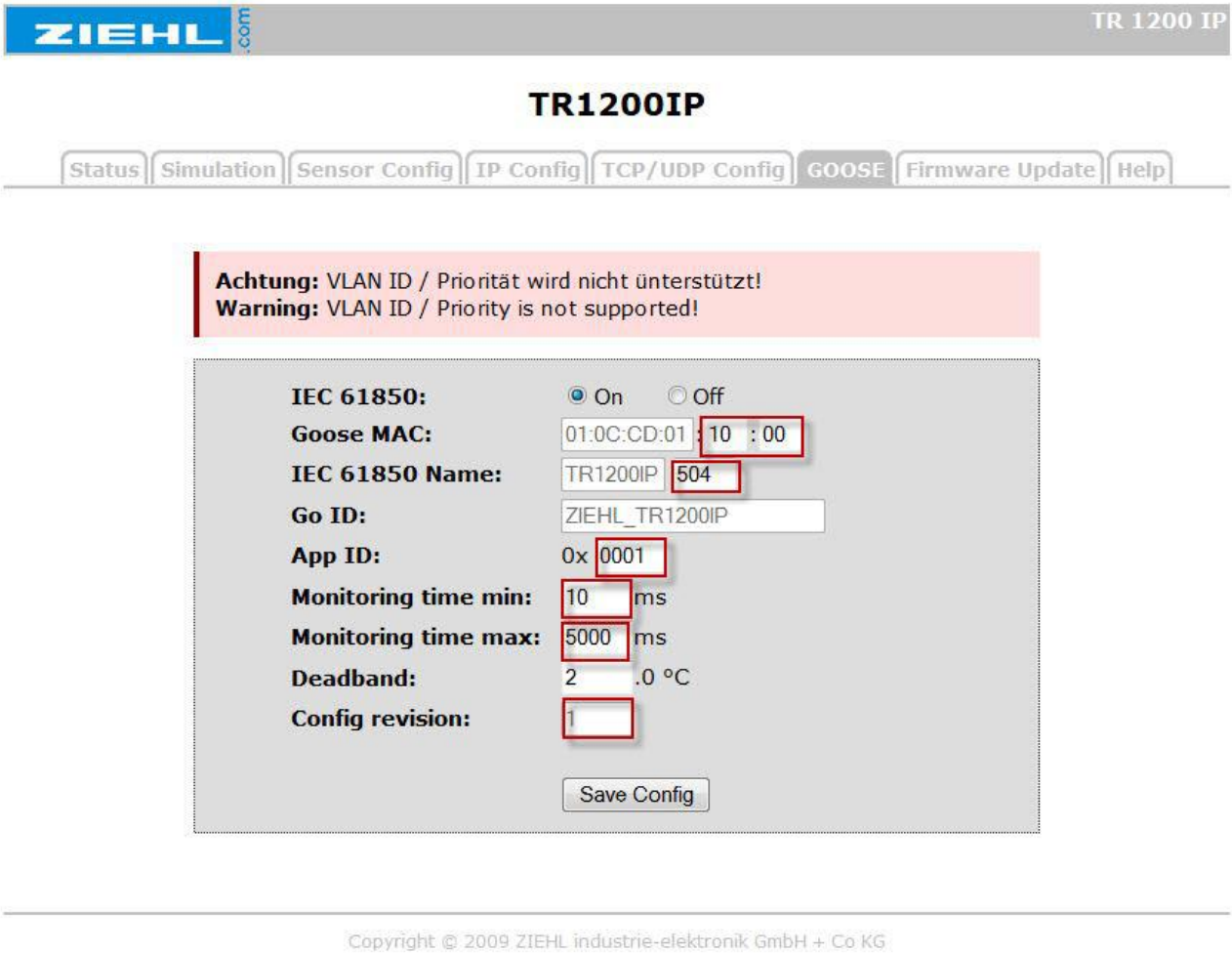

Fig. 15: Setting given by the system configurator for TR1200IP504 device.

3.4 Device update with the IEC 61850 system configuration

After all connections and settings for GOOSE are done the result must be stored under *Station -> Save*. Afterwards under *Station -> Export* different IEC 61850 files can be exported. The most important is the SCD – file (*Station -> Export -> IEC61850 station*) which includes the complete IEC 61850 station. SCD – files can be imported in other tools e.g. test tools (GOOSE – Inspector or IEDScout) or setting tools from other vendors.

The system configurator is closed now. The SIPROTEC 4 devices need an update with the actual system configuration. Right mouse click onto the IEC61850 station in the DIGSI manager opens an object property page. Go to the page *Update* and start it. All SIPROTEC 4 devices with changes in their IEC 61850 configuration will now be updated. That needs time dependent on the number of devices which must be updated. There are no changes for TR1200IP here.

In the next step the SIPROTEC device will be opened Offline (double click on the device and select Offline). In the DIGSI 4 device view select *Device DIGSI -> Device*. The default password is *000000* (six times zero). Then select the interface (Serial, USB or Ethernet) and the parameter set will be transferred to the device. After settings are accepted by the device it makes a device reset. Important diagnosis data are written for the EN100 – module homepage of the device which can be interrogated later by a browser.

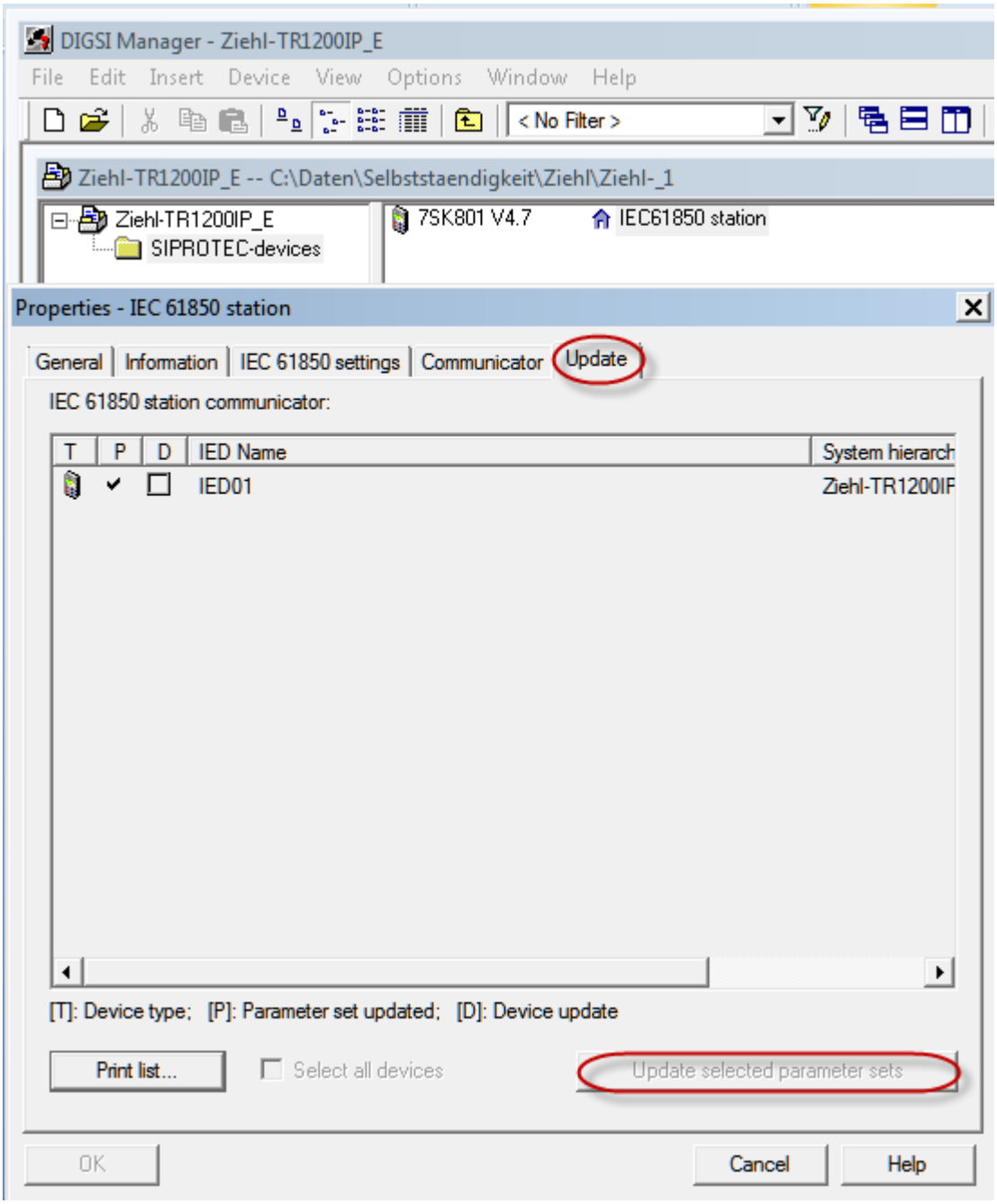

Fig. 16: Device update with the IEC 61850 system configuration

4 Test and diagnosis

After the IEC 61850 configuration is loaded successfully into the SIPROTEC 5 device and TR1200IP tests can be performed. The following chapters explain some test features with inbuilt functions of the devices and separate test software, which show the GOOSE – messages on the Ethernet network.

4.1 Test with the module homepage of the SIPROTEC 4 device

The Ethernet module of the SIPROTEC 4 device (named EN100) includes a diagnosis server which can be interrogated by a browser. With the http://IP-address/home of the device (e.g. http://192.168.1.2/home) you can open the module homepage. From there you can reach some diagnosis pages which show a successful connection to TR1200IP via GOOSE – messages.

Very helpful is the *Startup Log*. These log show GOOSE – messages with their properties sending by the device. Also GOOSE – messages which shall be subscribed by the device are shown in detail. The GOOSE – settings coming from the update done before und must be identical to those in the system configurator. Beside the hierarchical path of the message the expected MAC-address, the Conf. revision, the GO-ID and the App-ID are shown. Also data objects which shall be received are shown.

If there is no accordance to the values from the system configuration the device update was not successful. Important is to check, that TR12000 IP sending the GOOSE – message with exactly those values shown on the Startup Log. The successful reception of GOOSE – messages can be checked with the page *Statistics*. A counter *nGooseHit* will be increased with each valid received GOOSE – message. If the counter *nGooseMiss* is increased the GOOSE messages are not successfully received.

Further information to the online diagnosis of the module homepage you will find in the IEC 61850 manual from Siemens.

Fig. 17: Startup log of the module homepage after the IEC 61850 device update and device reset

4.2 Online testing with DIGSI 4

With DIGSI 4 there are different diagnosis possibilities. You can check the operational values e.g. if the limit 5 degree is exceeded. Temperature values can be set by simulation in TR1200IP. If the validity of a GOOSE – message in the CFC is checked and assigned to an LED the LED-state OFF indicates a successful reception of the GOOSE – message. If the connection is interrupted the LED state should be ON. Furthermore the measurement values can be checked with the device display or with DIGSI 4 if you are Online with the device. You see in this example (Fig. 18) that the float value from temperature 1 indicated with 55.4 degree is rounded to 55 degree as output value from the *MV-GetStatus* block in the CFC. This value will be used for the limit block (refer to chapter 2.3).

If you make a sensor short circuit (measurement value = -999 degree) or a sensor interruption (measurement value = 999 degree) in the TR1200IP the SIPROTEC 4 display shows n.a.n (not a number) and this high values are not used in the CFC – logic.

Note: With the GOOSE – Inspector you see this measurement value e.g. -999 degree with the quality 0042hex (Invalid – failure) in the GOOSE – telegram.

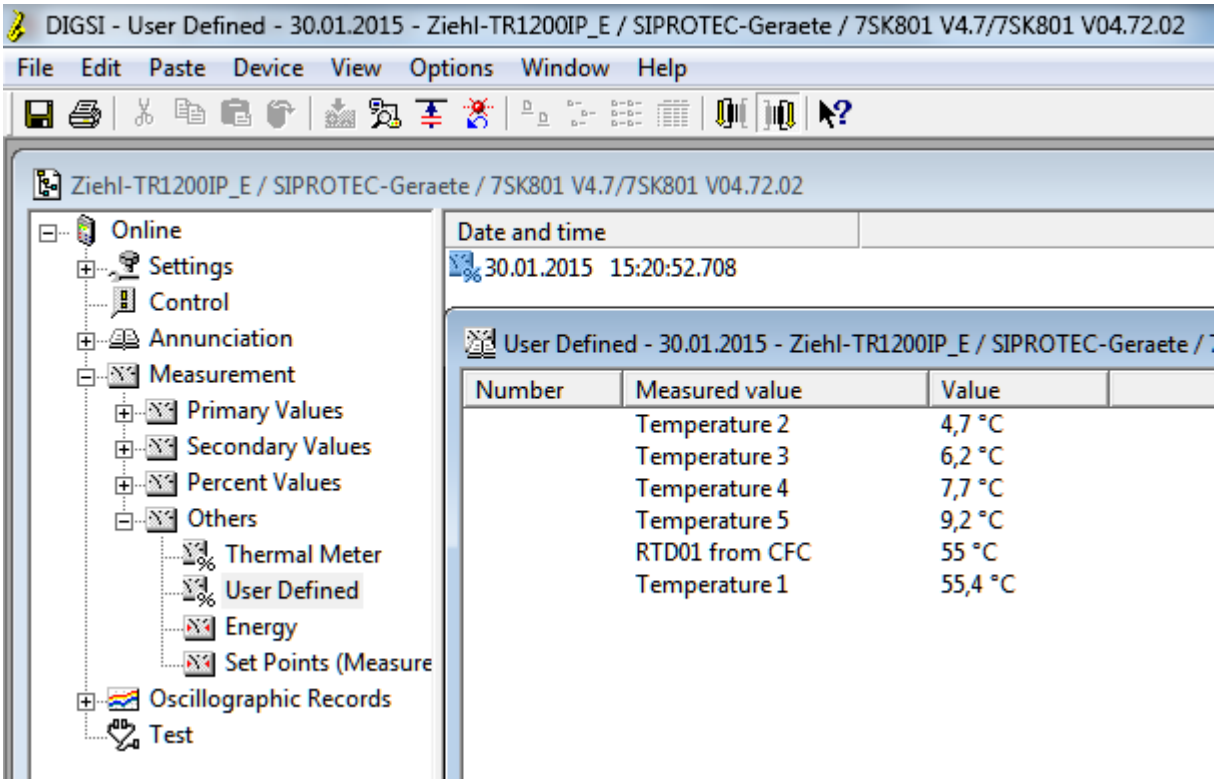

Fig.18: Online display of temperature values received by GOOSE and measurement 1 (*RTD01 from CFC*) processed in the CFC in DIGSI 4

4.3 Temperature simulation of the TR1200IP

With the browser you are able to simulate temperature measurements of TR1200IP. One of the 12 measurement values will be simulated. You have the choice to send the GOOSE – telegram with or without test bit. If the SIPROTEC – device is in normal operation a GOOSE – telegram with test-bit is not used in the device. Former temperature values will be displayed. Sending measurement values without test bit should take place only during commissioning e.g. to test limits in the SIPROTEC device which may cause an alarm or trip. Advantage of the test feature is that you can simulate high temperatures also which are possible in motor insulation or in transformer oil due to overload.

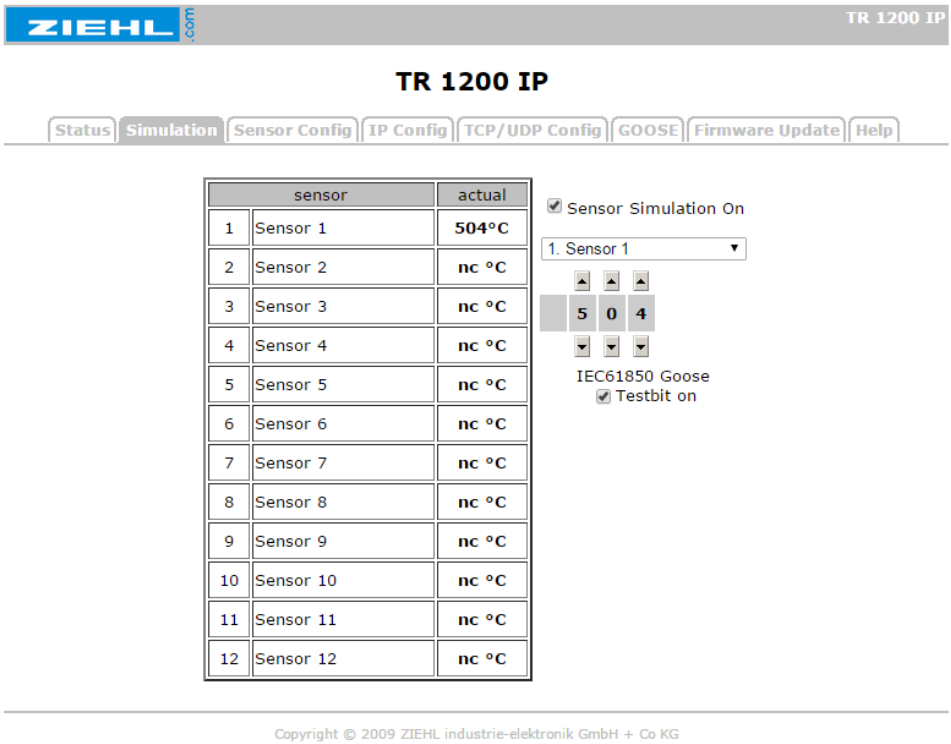

Fig. 19: Sensor simulation of the TR1200IP

Note: In a critical network (Keyword: Cyber Security) with external network access the Web – server in TR1200IP can be deactivated after commissioning. A network attacker cannot access to the server and simulate high temperature values.

4.4 Online test with the PC-software GOOSE – Inspector

The GOOSE – Inspector is software protected with a dongle which monitors the GOOSE – messages on the network. The real time monitor is especially optimized for GOOSE – messages. The software include powerful filter functions e.g. you can filter out only the GOOSE – messages from TR1200IP (refer to fig. 20). All settings of the filtered GOOSE – messages are indicated and can be compared easily with the settings done in TR1200IP. Also the measurement values with the quality information are displayed. If you load the actual SCD-file of the project into the GOOSE – Inspector all Online monitored properties of the GOOSE messages are compared with the content of the SCD – file and validated. Differences are shown which allows checking the actual project. A special feature is SAM (Siemens Application Monitor). This view is similar to the system configurator of Siemens and shows all GOOSE – connections for Siemens devices.

Also GOOSE – messages on the network which are not defined in the SCD – file are monitored and shown. This give a fast overview of all GOOSE – messages on the network. Further information you will find on the homepage of the tool manufacturer under https://www.ib-boeser.de

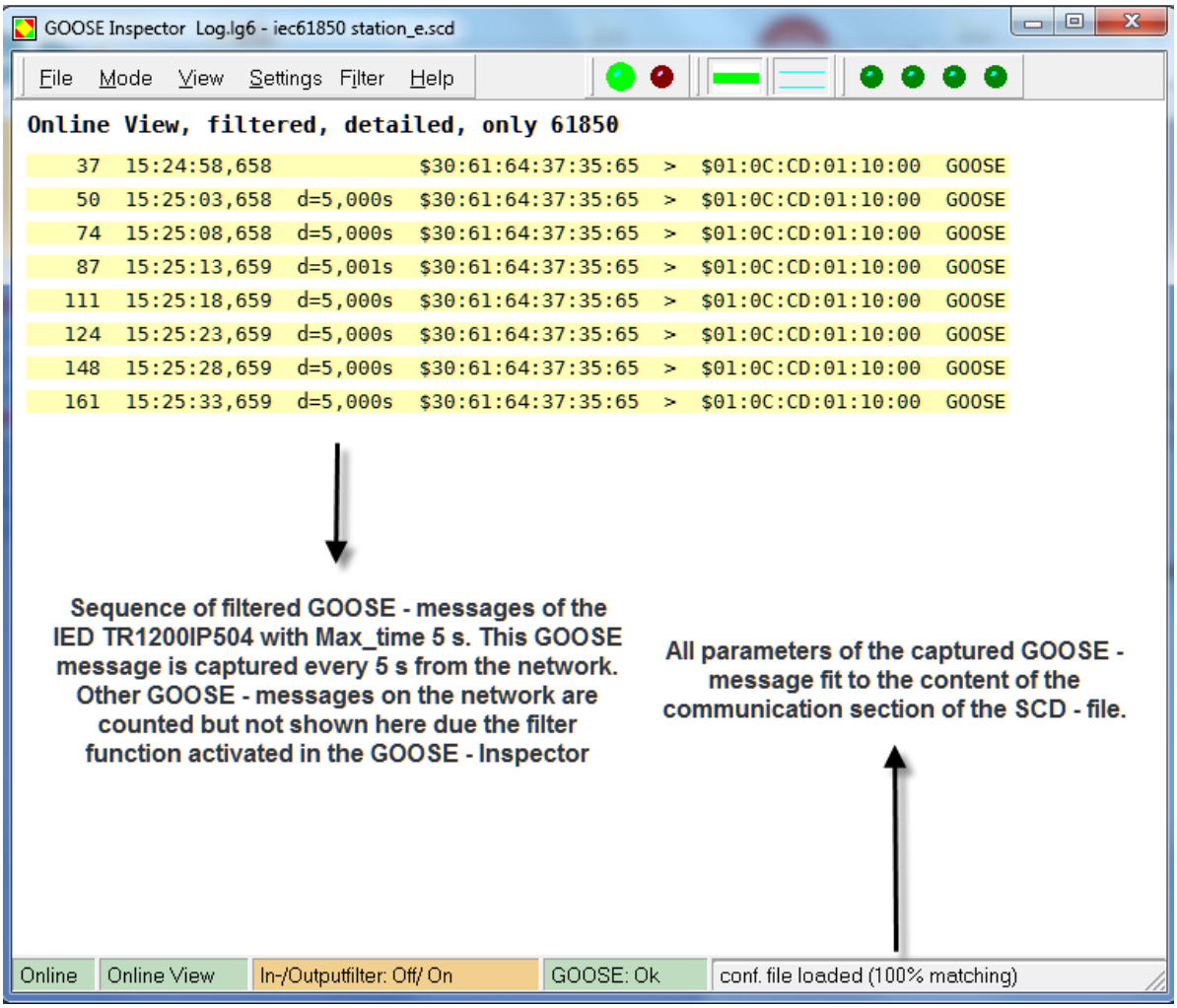

Fig. 20: Monitored GOOSE – messages of TR12090 IP

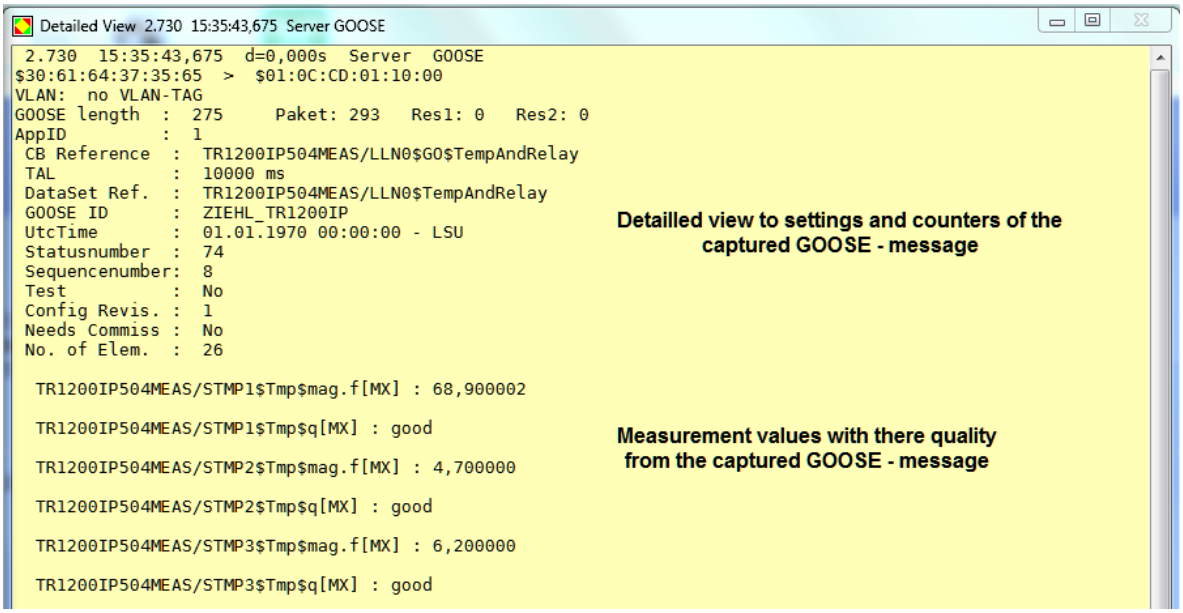

Fig. 21: GOOSE settings and measurements captured from TR1200IP

4.5 Online test with the PC-software IEDScout 4 from test device company Omicron

Also the IEDScout allows a detailed analysis of the GOOSE – traffic on the network. Similar to the GOOSE – Inspector it´s possible to filter single GOOSE – messages and compare it with the content of the SCD – file. IEDScout version 4 support Edition 1 and Edition 2 of IEC 61850. Further information and a test version is available from the homepage of the test device manufacturer OMICRON.

https://www.omicronenergy.com (search „IEDScout“).

4.6 Online test with Wireshark (former Etherreal)

The software Wireshark (former Ethereal) spread worldwide and is often used to monitor the data traffic on Ethernet networks. Meanwhile filter functions for IEC 61850 GOOSE and MMS (client server communication) are available. Though the software has not the comfort features of GOOSE – Inspector and IEDScout especially for GOOSE – messages. Filtering GOOSE – messages with the MAC – address and programming filters with Wireshark need special knowledge. Content of SCD – file cannot be used for traffic validation. Advantage is that Wireshark is very popular and free and good documented through worldwide use by Ethernet experts. Previously a special version of Ethereal for IEC 61850 from Herb Falk was available.

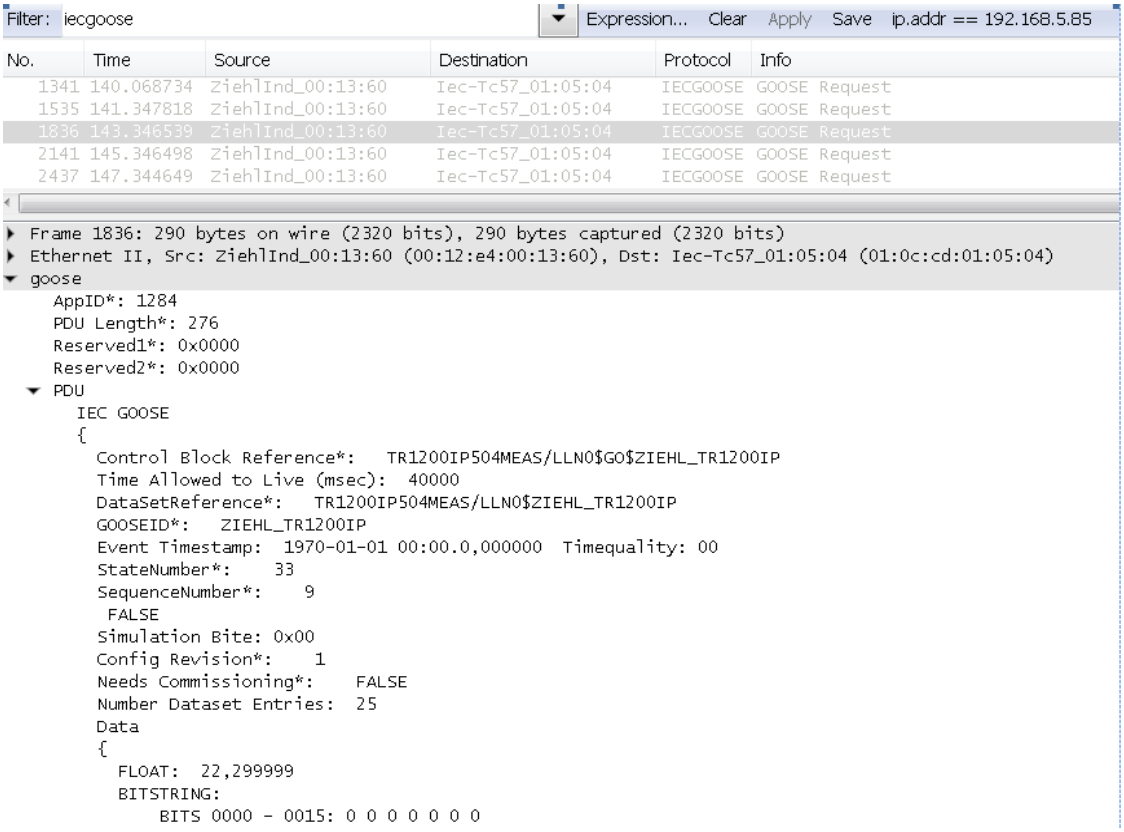

Fig. 23: GOOSE – message captured with Wireshark

Note: The captured values here are different from the values from the application