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Applications for RTD-Box TR800 Web (Ethernet)　　7XV5662-7AD10

In this document the measurement of temperatures, currents or voltages in a 7SK80x via the Universal Relay TR800 Web in an Ethernet-network (LAN) is described.

The Universal relay TR800 Web has 8 measuring / sensor inputs and can by using these measure up to 8 temperatures with Pt 100 elements.

Three conductor thermo elements are supported. For two conductor operation the measured conductor resistance can be compensated for with a corresponding setting.

Alternatively it is possible to measure up to 8 voltages in the range from 0-10 V DC or currents in the range from 0/4-20 mA DC. The output can be scaled and the denomination (C°, V, mA, %) can be adapted.

Note: SIPROTEC 4 Protection devices can only process 6 measured values per "RTD-Box",
i.e. with two RTD-Boxes a maximum of 12 measuring inputs are supported. All measured values are scaled and indicated in °C in the protection device.

The measured value output to the protection device is done via Ethernet network with RJ45 connectors.

All settings are conveniently done using a Web-Browser (e.g. Internet Explorer).

Note: *This application guide is only intended as additional user information and it is a prerequisite that the user has knowledge of the general operation and usage of the device and its basic functions as described in the device manual.*
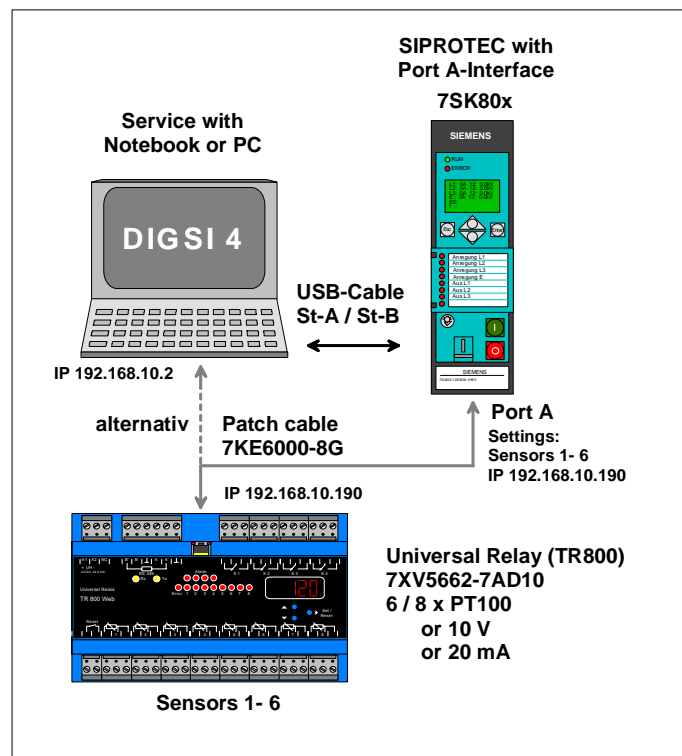
Application 1: Up to 6 Measured values with a TR800 Web via Ethernet

If one Universal relay TR800 Web is sufficient for the capturing of up to 6 measured values,
then it may be connected via a double screened CAT5 patch cable (1:1 or crossed over) directly to the protection device (e.g. 7SK80x / Port A).

The protection device is set using DIGSI 4 running on a Notebook via the USB-front interface.

The Universal Relay TR800 Web is set using a Web Browser running on the Notebook via the Ethernet interface.

Tip: If during commissioning a common switch is temporarily applied using three patch cables, the protection device can be set from a PC using DIGSI 4 in parallel with the TR800 Web (refer to Application 2).

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Application 2: Up to 12 Measured Values using two TR800 Web via Ethernet

If two TR800 Web are needed for the measurement of up to 12 measured values a switch that is suitable for the substation environment (e.g. RUGGEDCOM RS900) must be used. The switch, both TR800 Web, the protection device and the operating PC make up a sub-net that is connected via patch cables. DIGSI 4 and a Web browser can run in parallel on the PC. It is therefore possible to set one of the two TR800 Web and the protection device in parallel while in service.
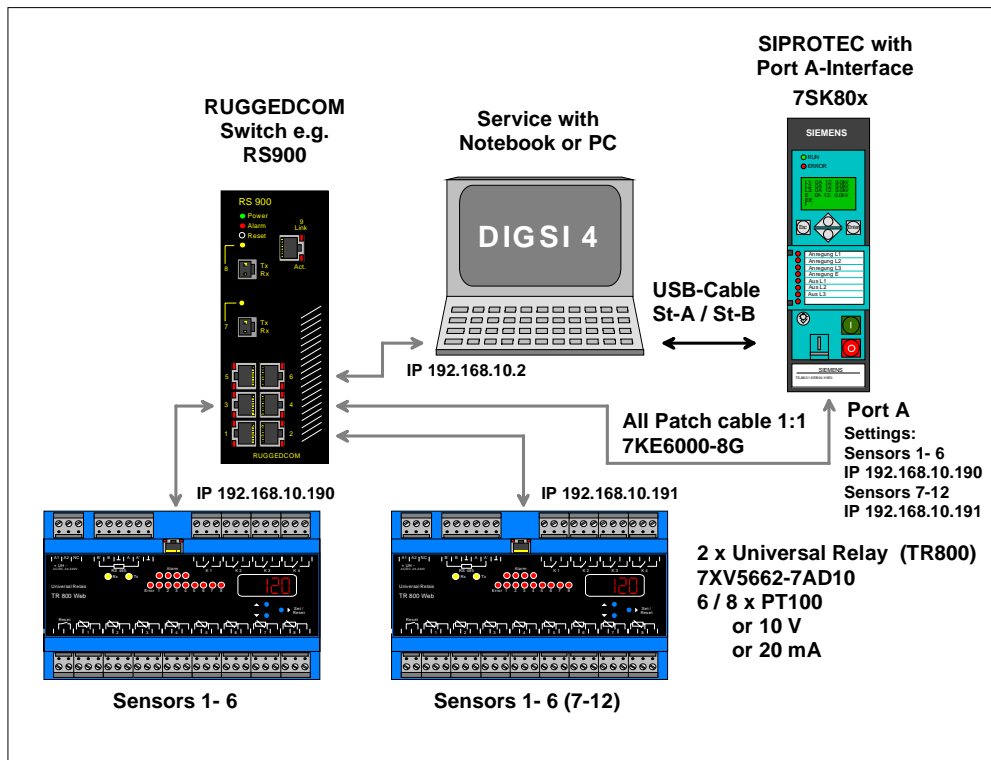
Note: The network must be restricted to those devices that are directly communicating with the Universal Relay. This may be a dedicated network segment or a seperate V-LAN-Segment.
The simultaneous operation of the Protection Devices (e.g. 7SK80x) with DIGSI 4 is permitted.

Setting of the Protection Device using DIGSI 4

The Notebook is connected with the front interface of the protection device, e.g. 7SK80x, using an available USB interface (1.1 / 2.0). A USB-cable with Plug-A to Plug-B is required for this purpose (e.g. from the accessories with DIGSI 4.82).

The protection device is inserted as new device in DIGSI 4 with corresponding MLFB and then initialized.

Subsequently the object properties of the device, the Ethernet interface and the measured values acquisition is set and saved.

The protection device must have an Ethernet-Interface „Port A", (not EN100 / Port B).

Note: When setting the parameters of the Ethernet interfaces of all the devices in the network segment, different **"IP addresses"** within the same address range (e.g. 192.168.10.0 - 254) must be applied.

Example: See table

| Subnet-Mask	255.	255.	255.	0
IP address (Switch)	192.	168.	10.	1
IP address (PC)	192.	168.	10.	2
IP address (TR800 - 1)	192.	168.	10.	190
IP address (TR800 - 2)	192.	168.	10.	191
IP address (7SK80)	192.	168.	10.	200
IP address (max.)	192.	168.	10.	254

![SIEMENS]
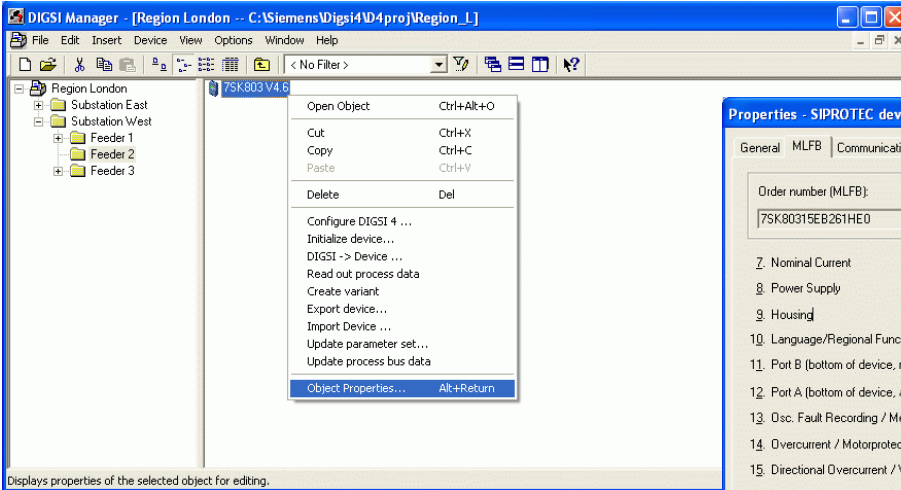
If the Ethernet interface „Port A" has already been installed at the factory as indicated by the "**Order number (MLFB)**", this can be checked under "**Object properties …**", „**MLFB**".
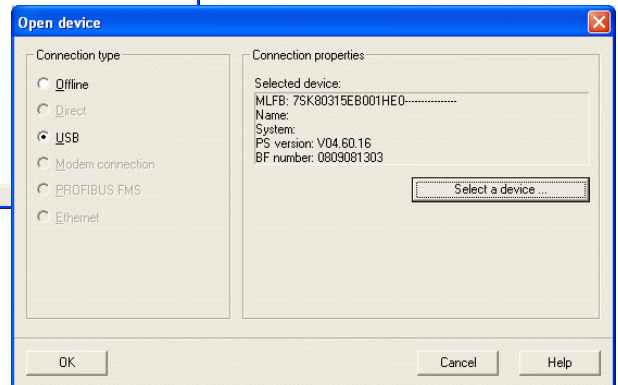
Save with **"OK"**
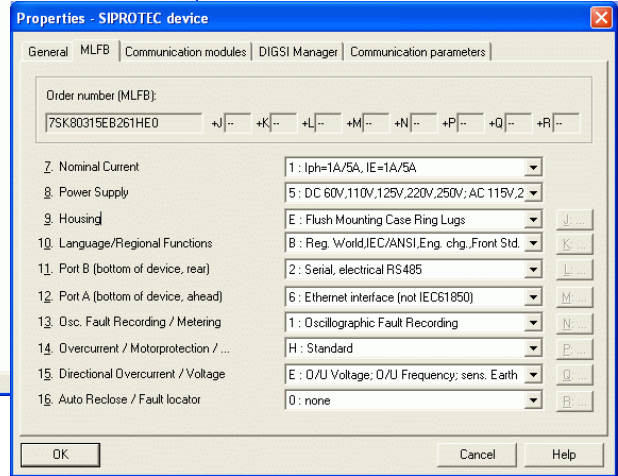
If the interface was retrofitted, the **"Object properties …"**, - „**Communication modules**" must be opened and then be changed accordingly.
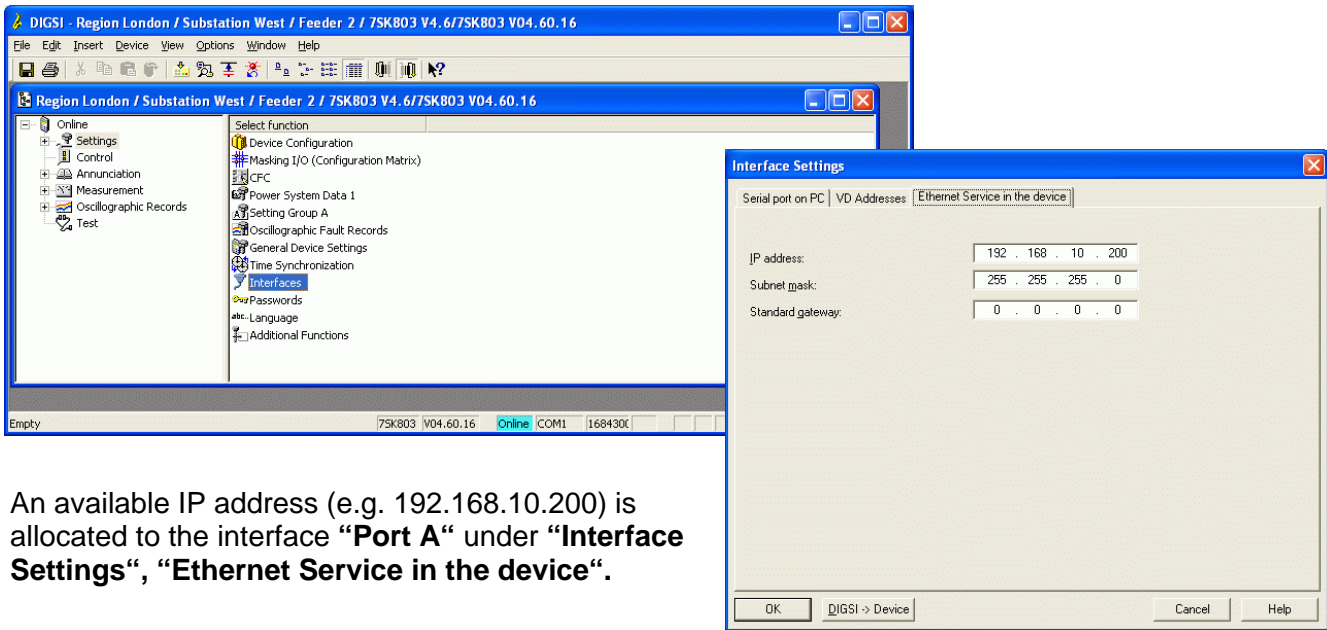
Save with **"OK"**
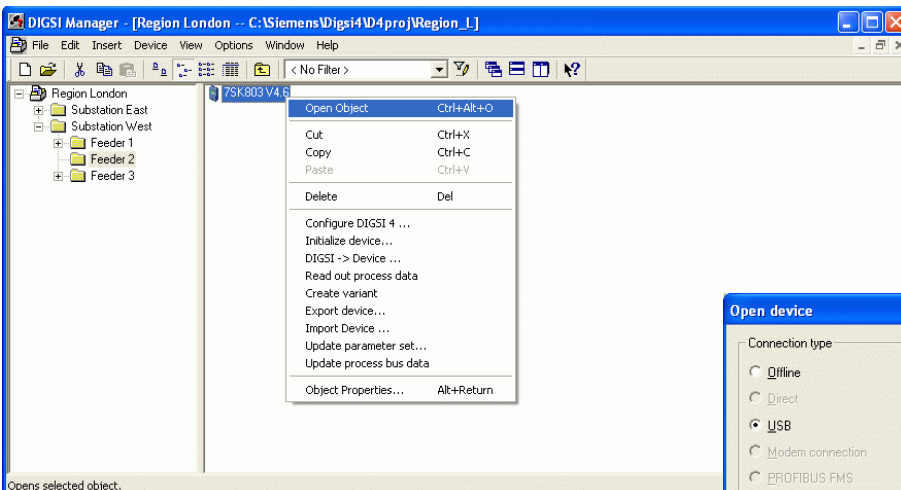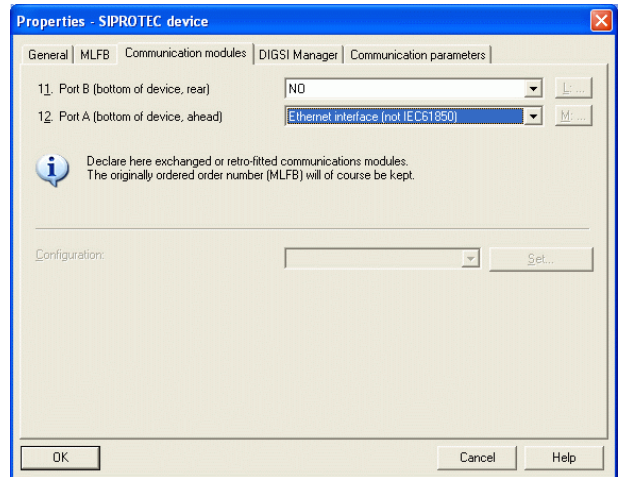
Open the protection device in DIGSI 4 with the connection type **"USB"** and **"Select a device …"**.
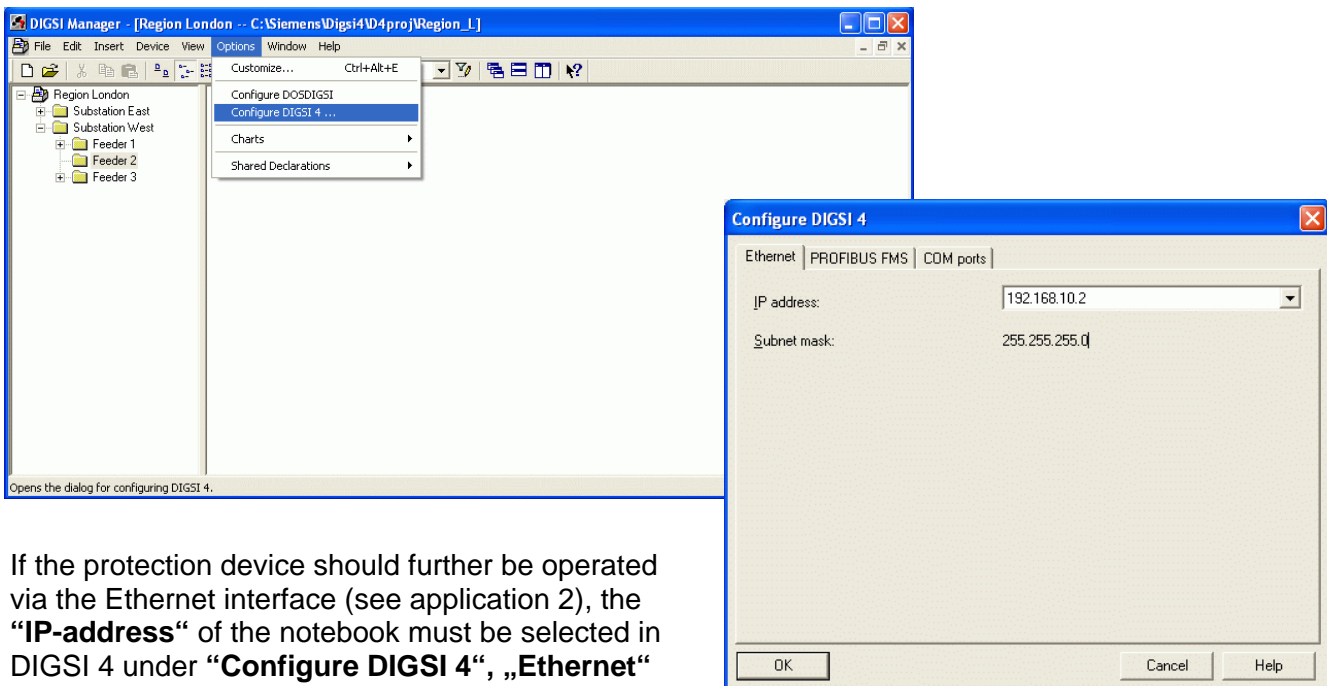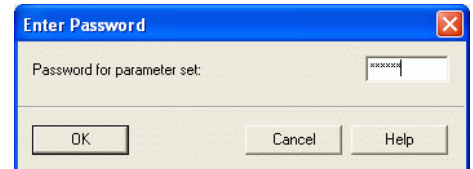
Continue with **"OK"**

An available IP address (e.g. 192.168.10.200) is allocated to the interface **"Port A"** under **"Interface Settings", "Ethernet Service in the device".**

Save in the protection device with **"DIGSI -> Device"**

After entering the password, continue with **"OK"**

If the protection device should further be operated via the Ethernet interface (see application 2), the **"IP-address"** of the notebook must be selected in DIGSI 4 under **"Configure DIGSI 4", „Ethernet"**

NOTE: For DIGSI 4.82 on, the IP addresses of all the available Ethernet interfaces of the PC/notebooks are available for selection in the pull-down menu.

Take Care: If no <u>**"IP address"** has yet been selected</u>, or if the <u>**"IP address"** has been changed</u> (e.g. automatic allocation by HDCP), the space will be empty.

**An IP address must be selected here,
otherwise the operation of the protection device via Ethernet is not possible.**

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The protection device is either connected via a CAT5 patch cable (cross over) directly or with a CAT5 patch cable (1:1) via a switch to the notebook.

Further settings of the protection device can now be applied with DIGSI 4 either via the USB front interface or the bottom Ethernet interface "Port A".
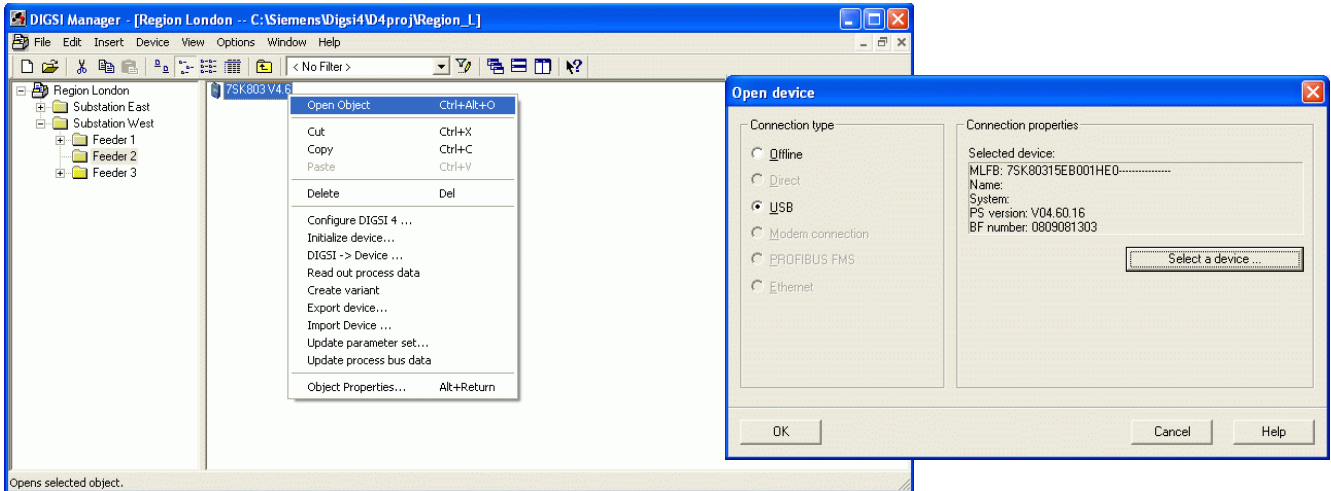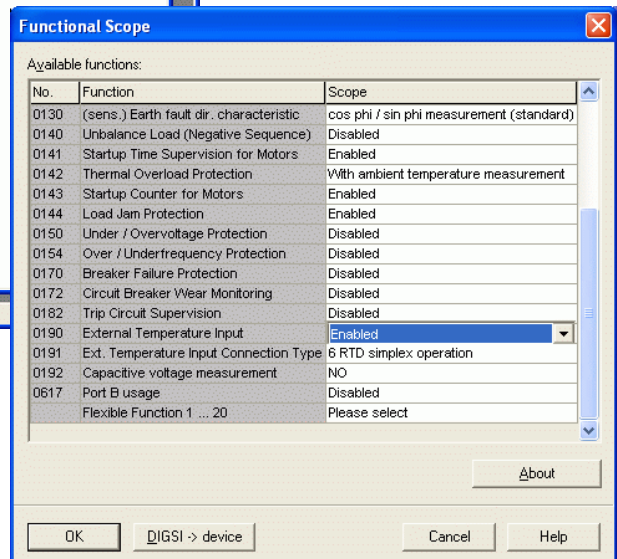

In the window **"Open device"** the device may be selected directly with **"Connection type" – "USB"** , or via **"Ethernet"** the connection can be directly established.

Continue with **"OK"**
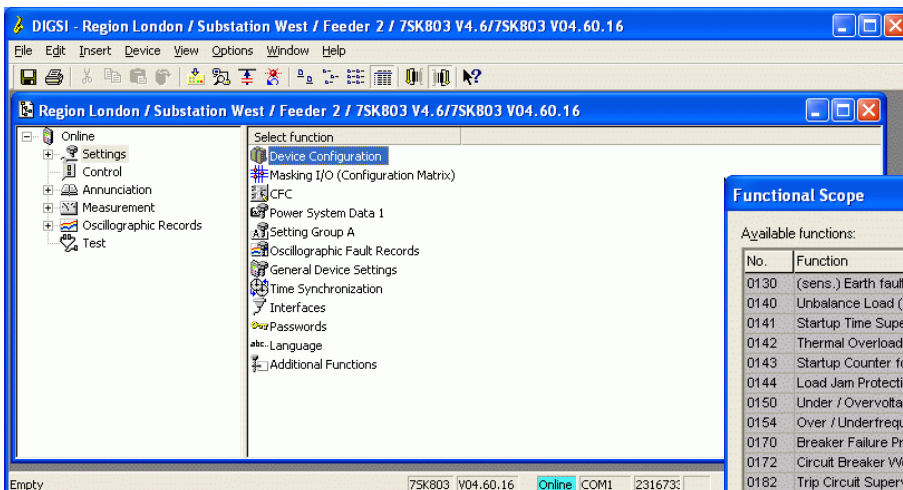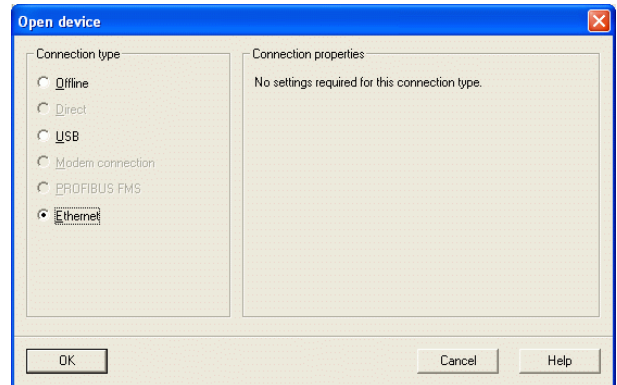
If the protection device is opened, under **"Settings"**, **"Device Configurations"** and **"Functional Scope"** (scroll down) the **"External Temperature Input"** can be **"Enabled"**.

The **"Ext. Temperature Input Connection Type"** is set to "6 RTD simplex operation" in the factory default settings at time of delivery and must be changed accordingly for both applications.


Application 1:

If only the 6 measured values of one RTD-Box TR800 Web must be interrogated by the protection device, the selection
"Ext. Temperature Input Connection Type",
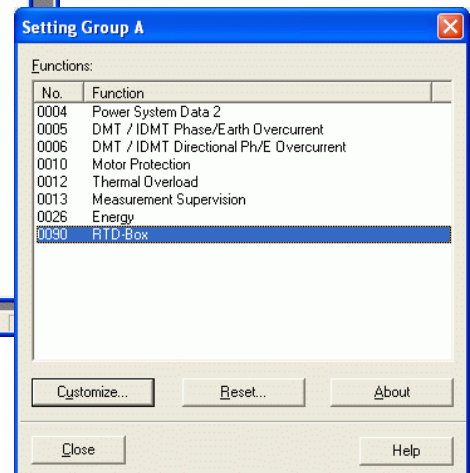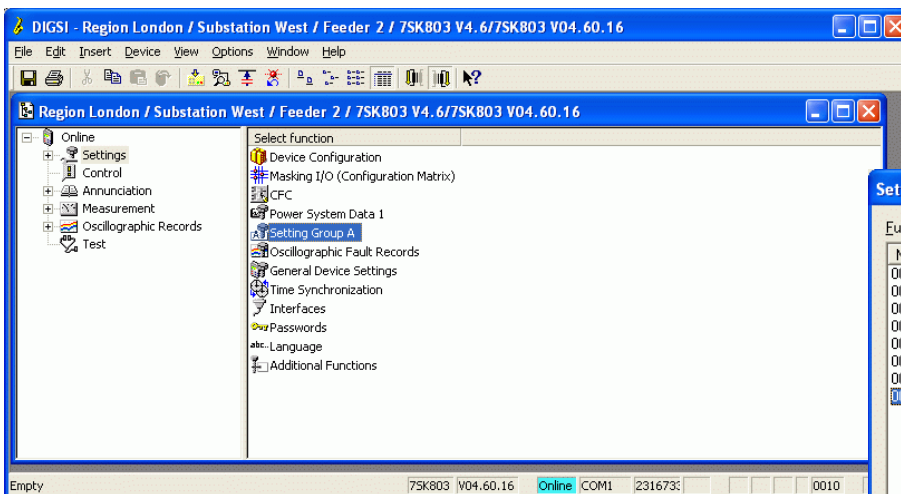**"6 RTD Ethernet"** must be applied.
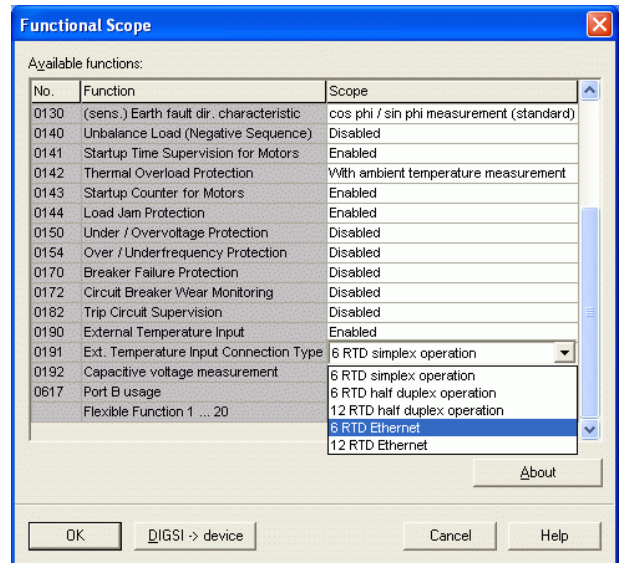
Application 2:

If both sets of 6 measured values each from two RTD-Boxes TR800 Web must be interrogated by the protection device, the selection
"Ext. Temperature Input Connection Type",
"12 RTD Ethernet" must be applied.
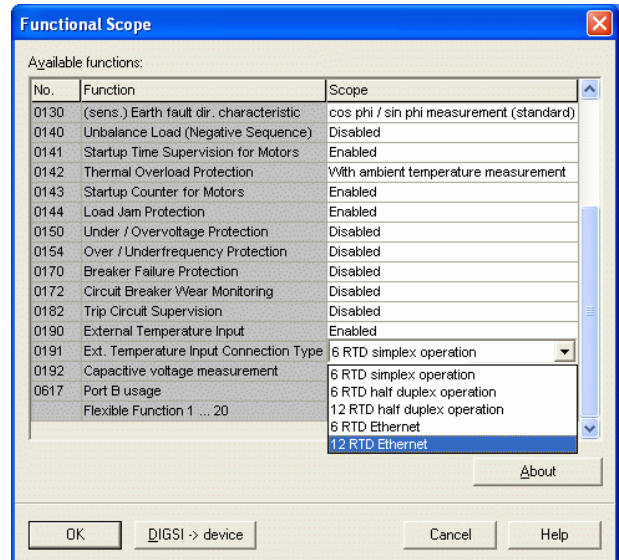
Save with **"OK"**

Under **"Setting Group A"** the function **"RTD-Box"** must be opened and **"Customize …"** must be selected.

In the following section the protection device is set with the UDP-Serviceport and IP-Addresses of the RTD-Box(es). The protection device will later retrieve the measured values at these addresses

Application 1:

If only **one RTD-Box** is connected (6 RTD Ethernet), the parameters are applied under **"RTD 1-6 Com"** .

The **"UDP service port in the RTD box"** may be, but does not have to be changed.

The **"IP address(x) of RTD box …"** must always be in the address range **(192.168.10.xxx)** and is entered from the top down. Example: **192.168.10.190**
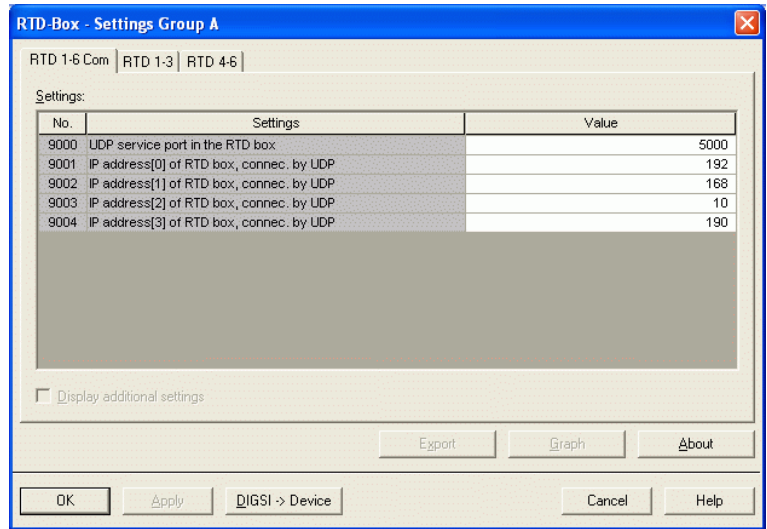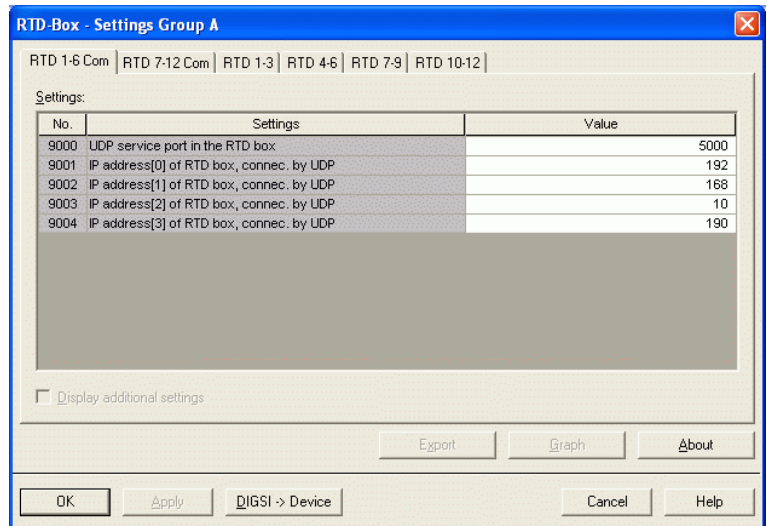

Application 2:

If **two RTD boxes** are connected (12 RTD Ethernet), the first parameters are entered under **"RTD 1-6 Com"**.

The **"UDP service port in the RTD box"** may be, but does not have to be changed.
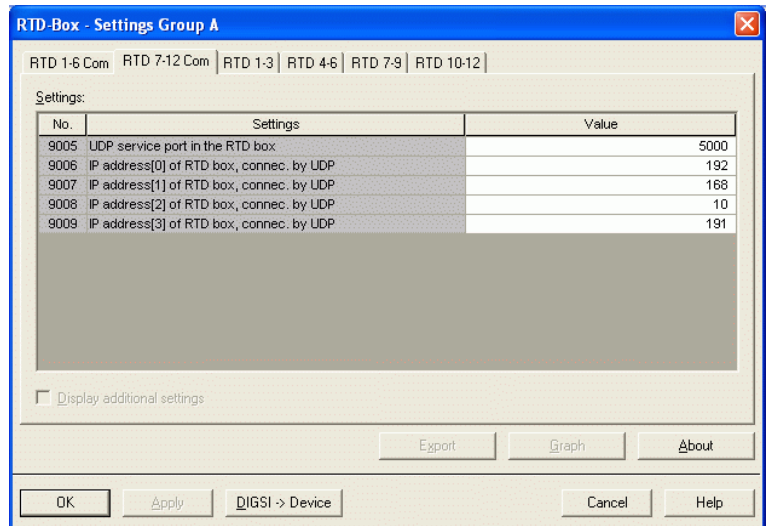
The first **"IP address(x) of RTD box …"** is entered from the top down. Example: **192.168.10.190**

The second parameters are entered under **"RTD 7-12 Com"**.

The **"UDP service port in the RTD box"** may be, but does not have to be changed.

The second, <u>different</u> **"IP address(x) of RTD box …"** is entered from the top down. Example: **192.168.10.191**

In the next step all the required measuring inputs are configured. Depending on the application, 6 measuring inputs are available in 2 or 4 setting pages.

In the following example only the first measuring input is configured.
he same procedure applies to the others.

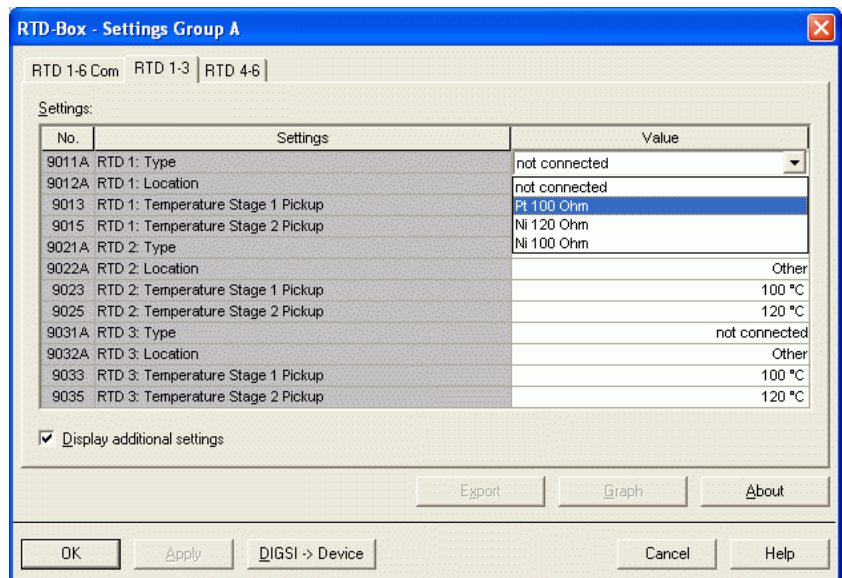In the start menu only the pick-up values of the temperature stages are displayed.

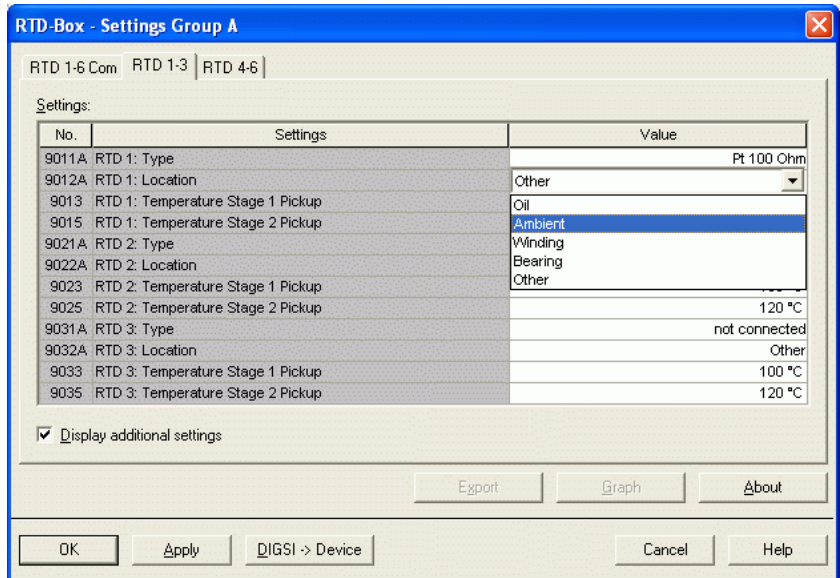A check in the check-box **"Display additional settings"** displays additional settings.
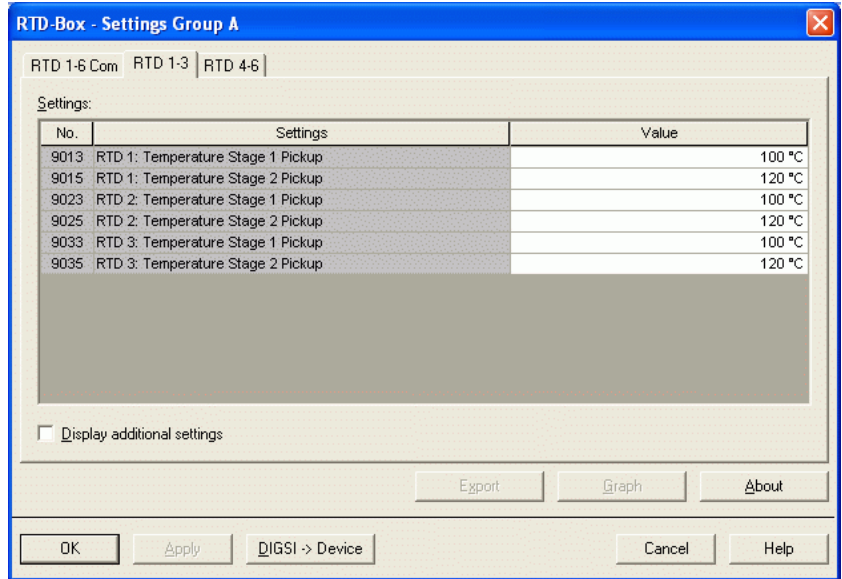
In the window **"RTD 1-3"** the settings for the
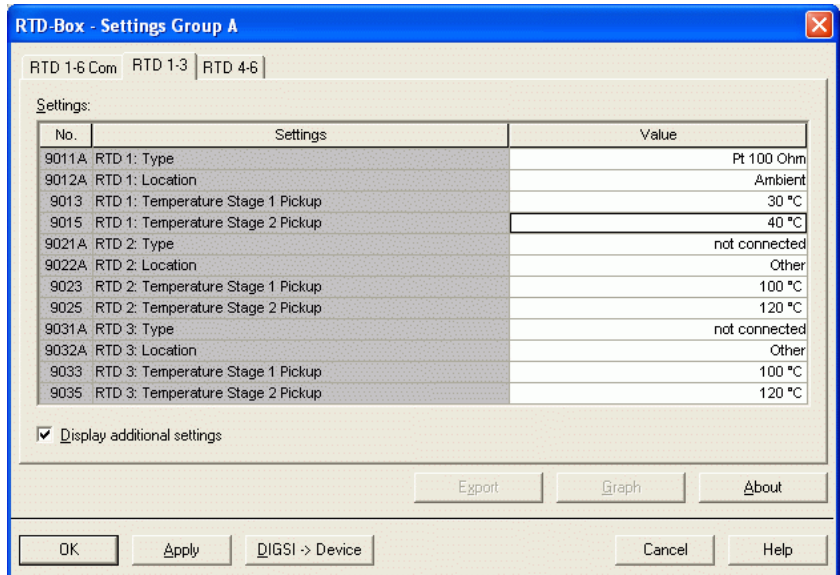first three measuring inputs can now be applied.
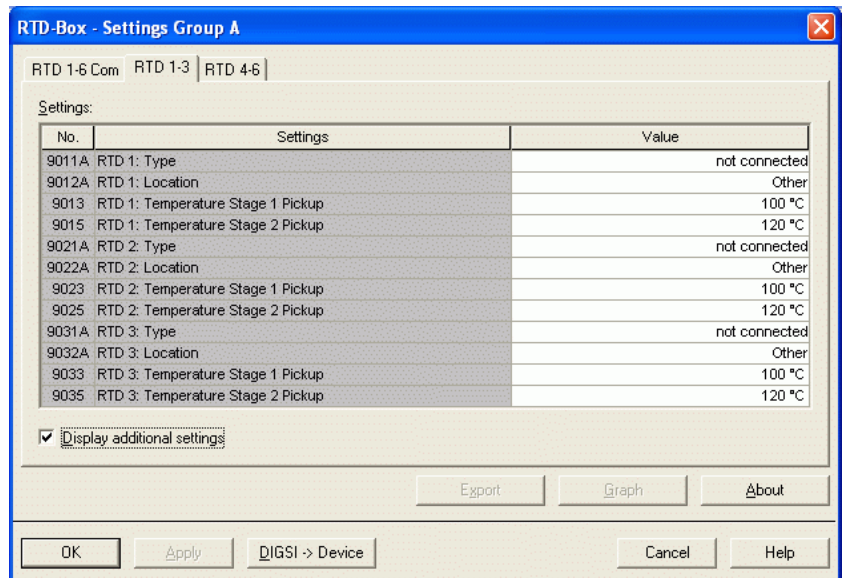
First, the **"Type"** of the thermo element e.g. Pt 100 Ohm is selected for **"RTD 1".**

In this menu a **"Location"** can be selected for the measured value **"RTD 1"**
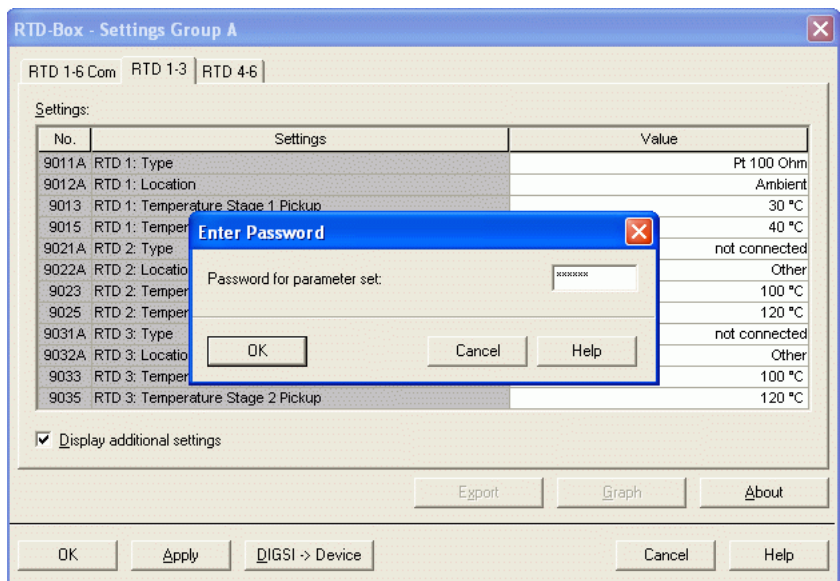

Under **"Temperature Stage x Pickup"** two pick-up thresholds for alarms may be entered for the measured value **"RTD 1"**.

When all measuring inputs have been configured, the settings are transferred with the button **"DIGSI -> Device"** to the device.

The process is concluded by entry of the **"Password"** and **"OK"**.

Note: Save settings to "file".

The measured values will later be displayed in **DIGSI 4** under „**Measurement"** – „**Others"** – „**RTD-Box Measuring Values"**, or in the **Display of 7SK80** under „**Measurement"** – „**RTD-Box"**.

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Setting the RTD-Box TR800 Web using the Web-Browser

The RTD-Box is set using a PC/notebook via the Ethernet interface with a Web Browser e.g. Internet Explorer. Before the Web Browser is started, several settings on the PC and RTD-Box must however be applied.

Preparing the RTD-Box:

In its delivery state the RTD-Box has the **IP address 10.10.10.10**. The **"Username"** and **„Password"** are empty, the menu is opened by mouse click on "**OK"**.

If the IP-Address is unknown it can be read out on the display by means of the navigation keys. If the bottom key is pressed twice (Output IP) and then the right key is pressed once, the IP-Address is displayed in blocks.

By changing over the red toggle switch (to the left) and pressing the reset key (next to the Ethernet plug) the IP-Address is fixed to **10.10.10.10** following the boot sequence.

Note: Only one RTD-Box with the Address 10.10.10.10 may be connected in the network at any given time.
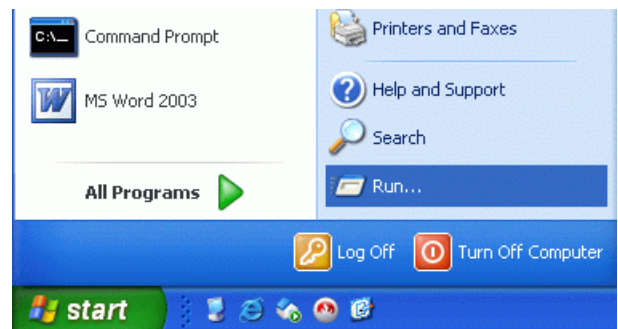
Preparing the PC/Notebook:

The notebook automatically derived via DHCP an IP-Address (company LAN), or it is set with a fixed IP-Address (e.g. in a network segment of the protection devices). For operation of the RTD-Box with the Notebook both IP-Addresses must be in the same network segment, or the IP-Address of the RTD-Box must be routed to the PC.

Routing is the simplest solution as the basic settings of the PC/Notebook do not have to be changed. Routing is done in the Console and is only active until the next new start-up of the PC/Notebook.
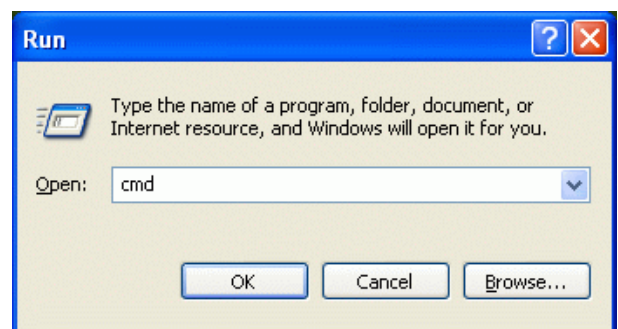
Initially the Command-Console (DOS-window) is opened.

Select "**Start"** and then **"Run…"**.

Enter the command **"cmd"**.

Confirm with **"OK"**

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The window with the active prompt (e.g. `C:\Dokuments and Settings\Alle>`) is opened.
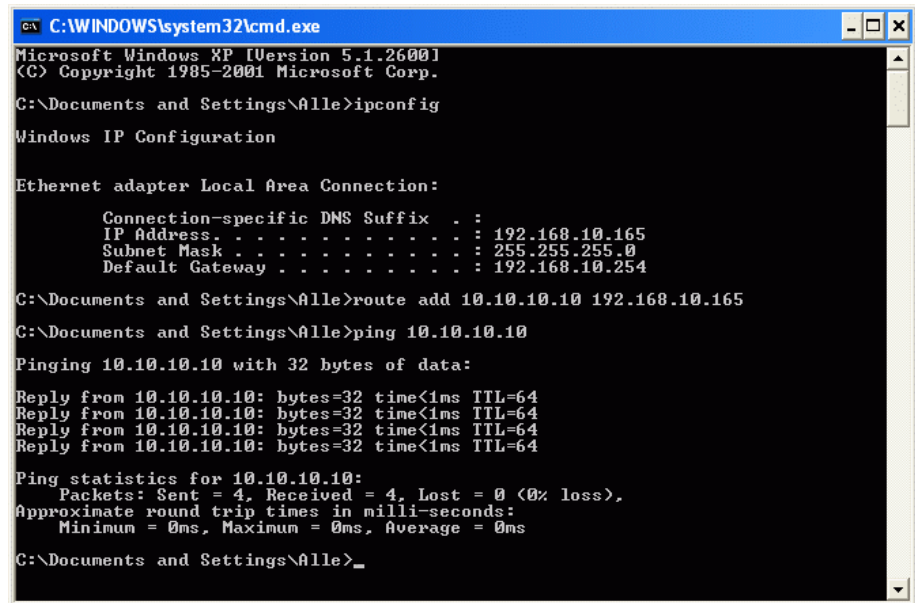The commands are always entered following the **">"**.

Initially the present IP-Address of the PC/Notebook is read out, then routed and finally the connection is tested.

Read out IP-Address with:

"ipconfig"

In this case the IP-address is:

192.168.10.165

Route with:

**"route add
10.10.10.10
192.168.10.165"**

Test with:

"ping 10.10.10.10"
The RTD-Box answers!

Open TR800 Web Interface:

Now start a Web-Browser (e.g. Internet-Explorer), enter the IP-Address 10.10.10.10 and start by pressing "Return".

Initially the Username and Password must be entered and confirmed with **"OK"**.

If there is no login assigned when initially starting, simply press **"OK"**.

If the window is opened, the language can be selected by clicking on the corresponding flag at the top left hand side.

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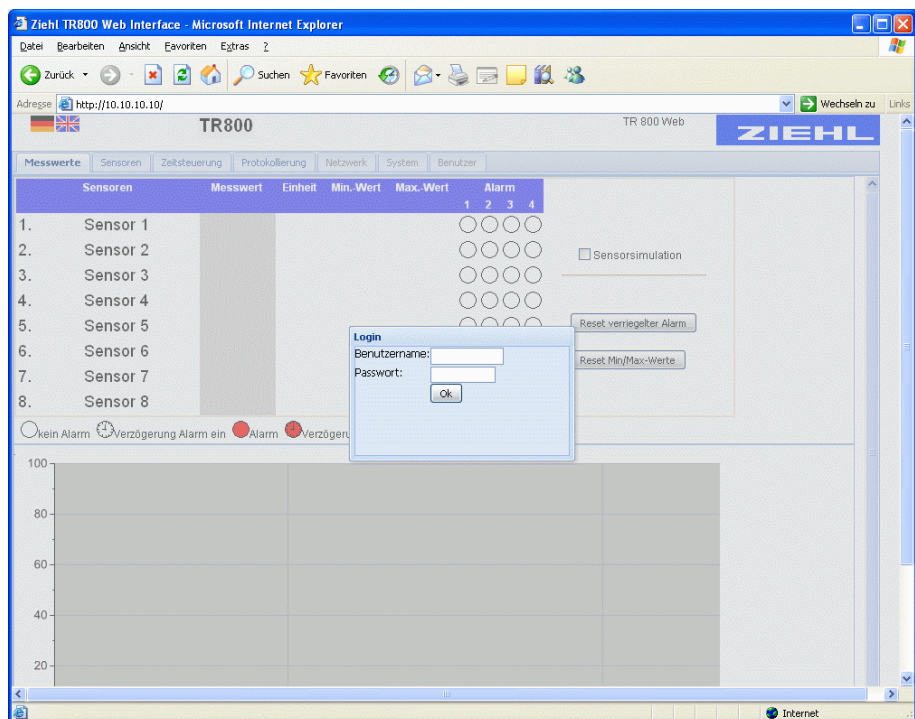
Set Network parameters:

Initially the **"Network"**-parameters are set. These parameters must correspond to those of the notebook and protection device (see note on page 2). The protection device requests the data from the RTD-Box(es) using this data (see page 7).

In the section
"Network TCP/IP":
„**manual configuration**"
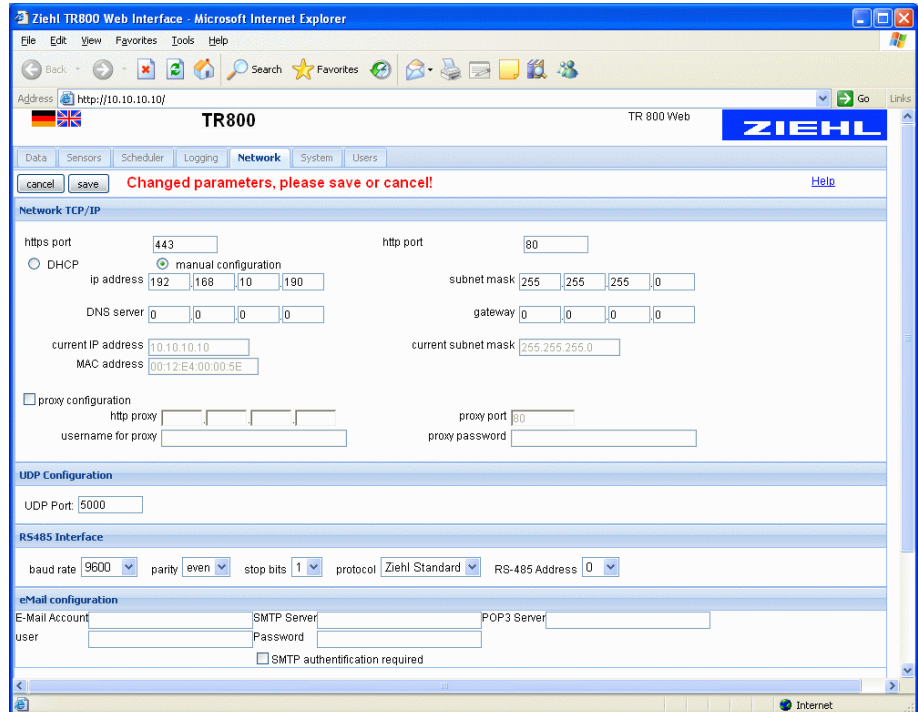must be entered.

Application 1:

For the <u>first</u> RTD-Box enter the **"ip address"** (e.g. 192.168.10.<u>190</u>) here.

Application 2:

For the <u>second</u> RTD-Box enter the **"ip address"** (e.g. 192.168.10.<u>191</u>) here.

Enter the **"subnet mask"** (e.g. 255.255.255.0 for both RTD-Boxes.

In the section **"UDP Configuration"** the **"UDP Port"** may be left unchanged at "**5000**".

Optional settings:

Optional settings are**"https-port"** and **"http-port"**, as well as a **"DNS server"** and a **"gateway"**. For the simplest application described here, changes are not necessary.

Below, the current settings such as the **"current IP address"**, **"current subnet mask"** and the **"MAC address"** are shaded grey.

If communication takes place via a proxy server, the corresponding settings can be applied under **"proxy configuration"**.

Right at the bottom of the window, the **"eMail configuration"** provides the required information regarding the **"E-Mail Account"**. This enables the sending of eMails in the case of faults or when thresholds are reached.

The setting for the **"RS485 Interface"** are not relevant for Ethernet communication.

Save the **"Changed parameters, please save or cancel!"** with the **"Save"** button.

Saving of the settings also resulted in the saving of the new IP address in the RTD-Box.

To obtain access to the RTD-Box via Ethernet with the new ip-address the following must be done.
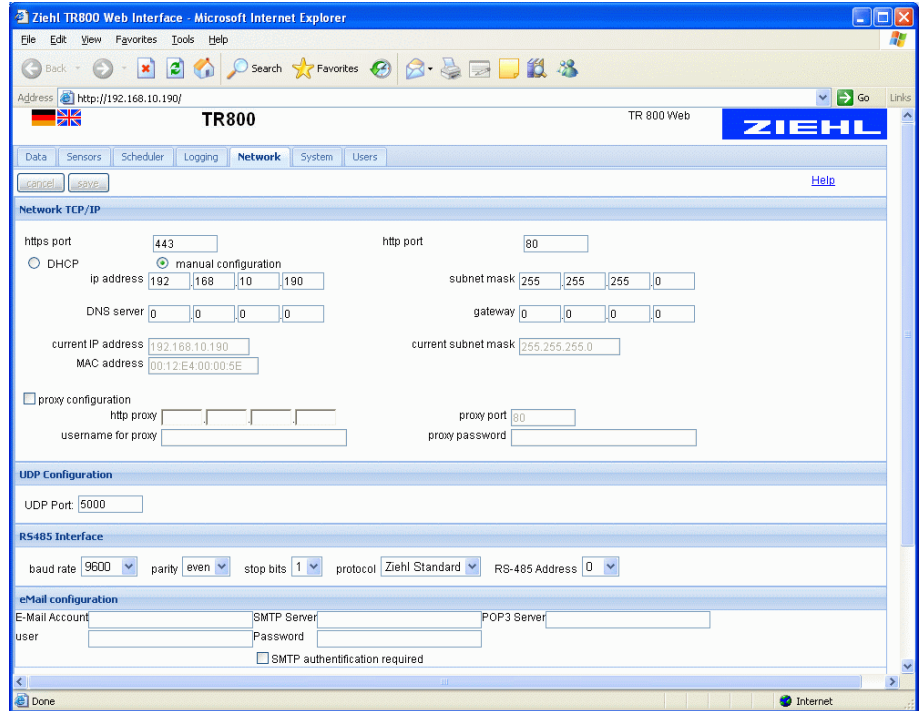
Change position of the red toggle switch (to the left)

Press the re-set key next to the toggle switch.

After the boot sequence the IP-address is fixed to **192.169.10.190**.

Close the Browser and re-start it with the new IP-Address (192.168.10.190).

Now all the further settings (also via a network) can be applied..

Sensor / measuring input settings:

The 8 **"Sensors",** or measuring inputs may be set individually as follows.

1. Sensor setting

The **"Sensor-Name"** may be individually set (is not transferred to the protection device).

Select the **"Sensor Type"**, e.g. **"Pt 100"**.
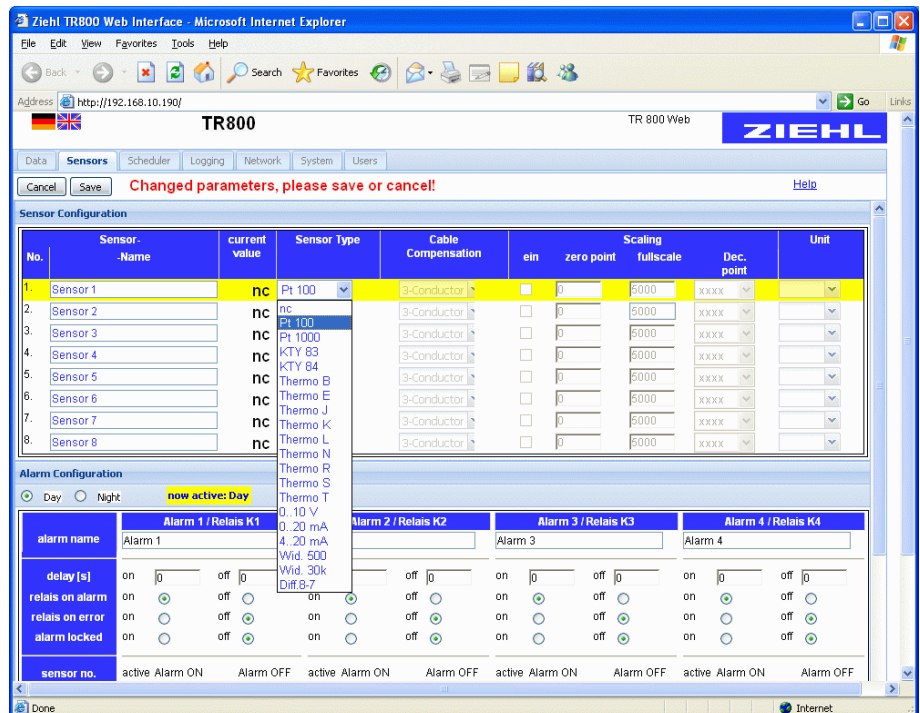
"3-Conductor" or **"Cable Compensation"** for the 2-conductor operation can be applied in OHM.

2. Sensor settings

The **"Sensor-Name"** can be indidvidually set

Select the **"Sensor Type"** e.g. **"0..20 mA"**.

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If the measured value has to be scaled, check the box under **"Scaling" "on"**.
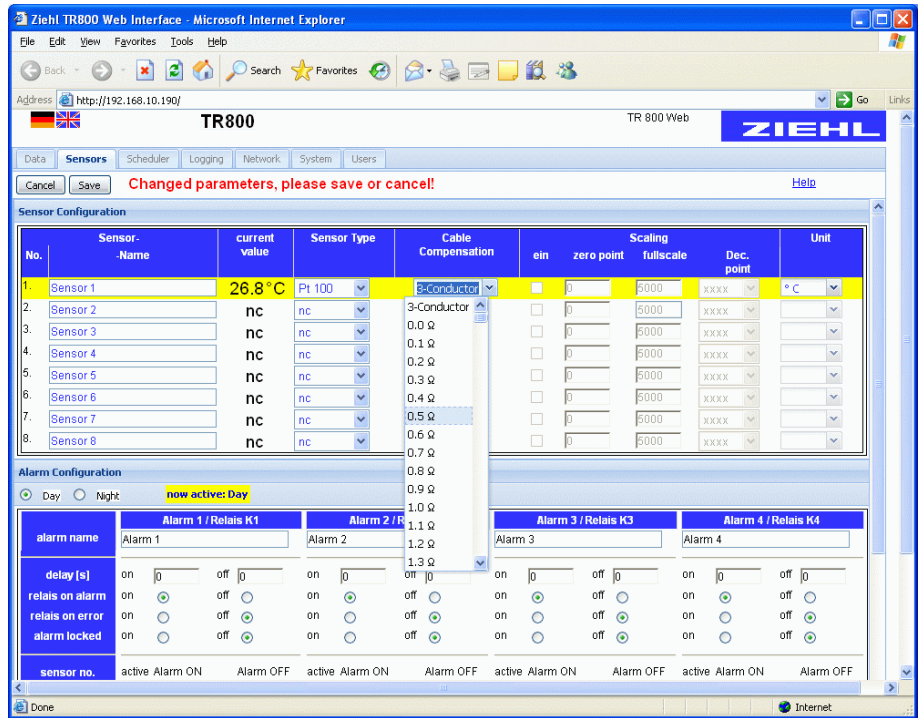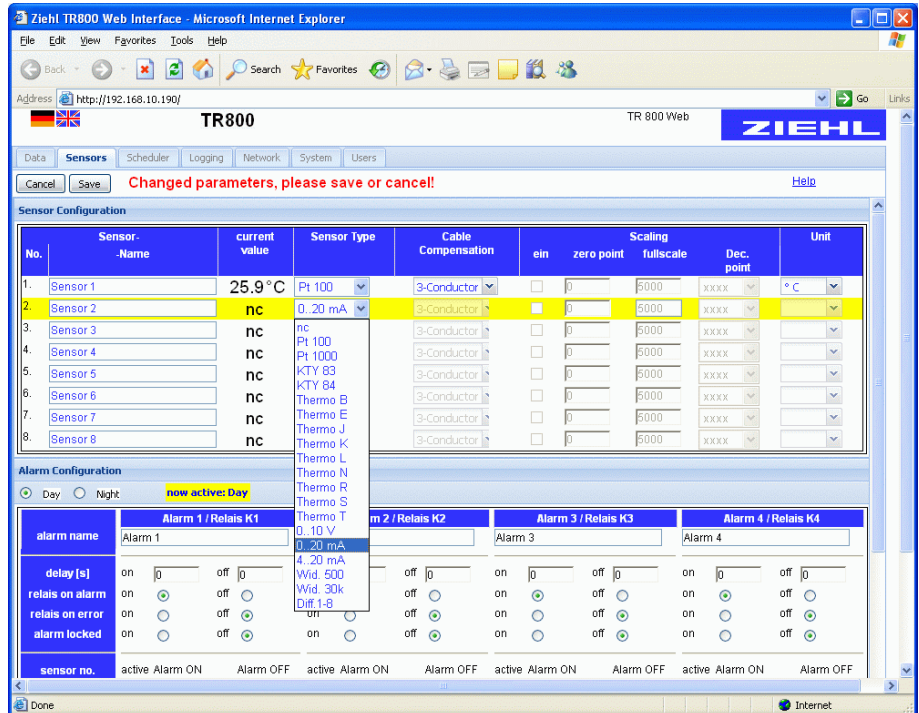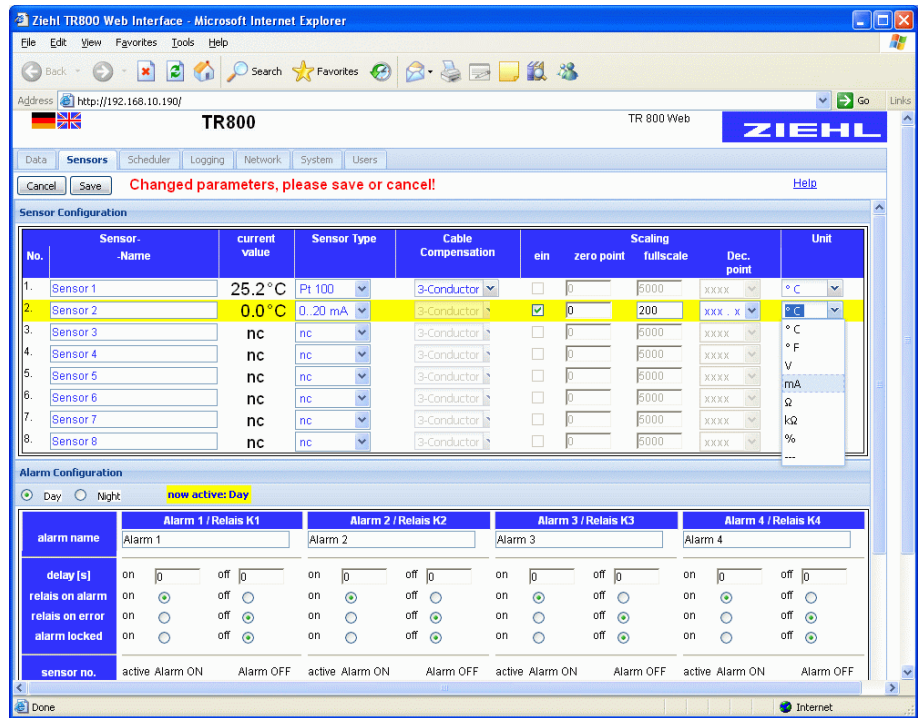
Example 1: Scaling

„zero point":	0
„fullscale":	200
„Dec. point" :	xxx.x
„Unit":	mA

(see screenshot on right)

Nominal Current **5.1 mA** is in

„current value":	5,1 mA
Device 7SK80:	51 °C

Further examples:

Type	Zero point	Fullscale	Dec.Point	Unit	nom. value	curr. value	7SK80
0..20 mA	0	20	xxxx	mA	5.1 mA	5 mA	5 °C
0..10 V	0	100	xxx.x	V	9.5 V	9.5 V	95 °C

**The measured values are always displayed in the protection device
without a decimal point scaled in °C!
This has to be considered when setting the temperature thresholds.**

Processing of the measured values in protection functions

Alarms and measured values of the thermal functions can be transferred to a substation control system or may be exchanged between devices via "IEC 61850 GOOSE".
Please observe the following notes for measurement of analog values.

If the device is utilized for reading in 20 mA current interfaces, of 0-10 V voltages (max. 6 per device) the following must be observed.

The analog values 1-6 in the SIPROTEC – device are available for processing in the integrated Thermofunction. These values are transferred with the protocol (RTD protocol) that is also used for transferring the temperatures if Pt 100 sensors are connected to the device. A measured analog value of e.g. 7.4 mA is (scaled accordingly) transferred as the value 74 and displayed in the SIPROTEC – device as a measured temperature of 74˚ degrees (see example 1 above).

If an analog value has to be monitored with a threshold of 7.4 mA by the Thermofunction in the SIPROTEC – device, then a value of 74˚ C must be set for this threshold and the measuring point must be configured as Pt100. If a second threshold of 12,4 mA has to be set, then the 2nd temperature threshold in the SIPROTEC – device for this sensor input must be set to 124˚ C. The SIPROTEC device would indicate a temperature value of 124° C when this threshold is exceeded.
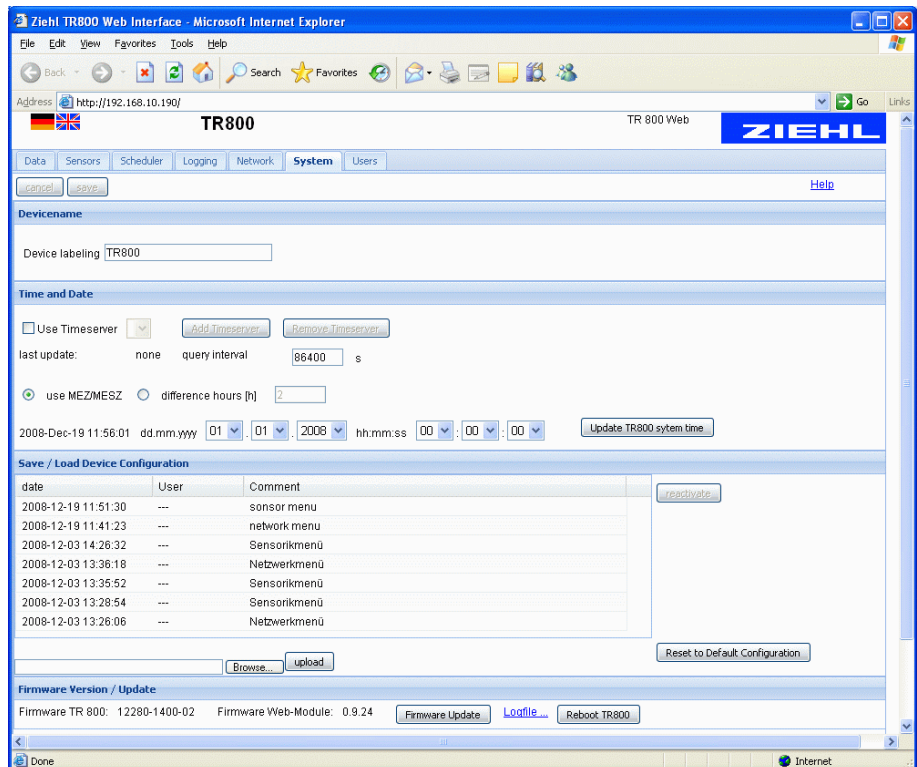
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In the window **"Data"** the measured values of the 8 **"Sensors"** are displayed with scaling.

By checking **"Sensorsimulation"** it is possible to simulate sensors. This simplifies the commissioning with a protection device without connected sensors.
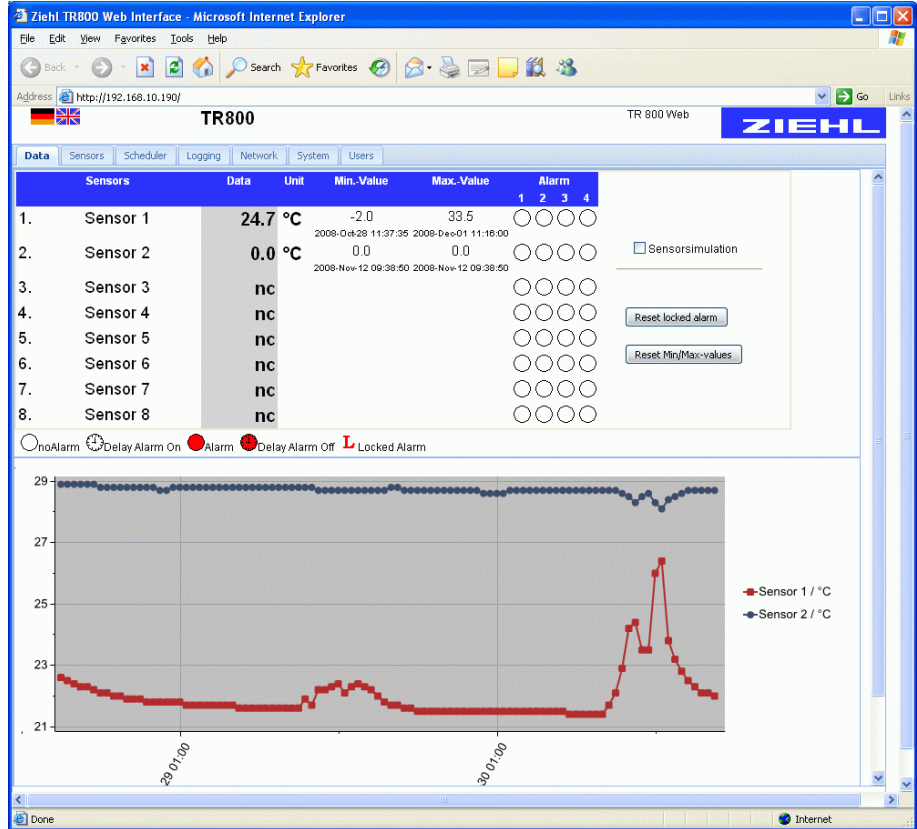
In the window **"System"** it is possible to insert a **"Timeserver"** under **"Time and Date"**, or the **"System time"** may be updated manually.

Under **"Save / load Device Configuration"** it is possible to save and load customer specific or factory default settings.

Under **"Firmware Version / Update"** the present Firmware-Version is displayed, or a **"Firmware-Update"** may be carried out.

If the RTD-Box(es) and the protection device are correctly connected to the network, the measured value of the RTD-Box(es) are interrogated by the protection device and are available there.

Please refer to the device manuals for detailed descriptions of the settings in the devices.

Wish you much success