Operating Instructions

GOSSEN METRAWATT

SMART**CONTROL** | ECS

Energy Management-System

3-349-423-03

4/5.19

2013

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1 Range of Applications

Diverse Data Collector and Data Messenger

The SMARTCONTROL renders energy consumption measurable without delay in a detailed fashion, and thus controllable. This, in turn, is the **basic prerequisite** for a great variety of **measures for the reduction of energy consumption** and costs, for example with regard to:

- Optimized utilization
- Contracting
- Component modernization
- Conversion

The SMARTCONTROL is an **inexpensive, user-friendly, easy to integrate data logging system**. This is the prerequisite for quickly establishing efficient, sustainable, widespread energy management for buildings and properties.

Amongst other data, the SMARTCONTROL is capable of recording the following:

- Meter readings (electrical power, heat, water, gas etc.)
- Temperatures (inside, outside, inlet, return etc.)
- Statuses (burner and pump on-times etc.)
- Analog signals from external signal converters and measuring transducers (pressure, humidity etc.)
- M-Bus protocol (up to 450 meters), ModBus, SBus, CLBus, LON

One of the system's important advantages is its ability to access all relevant data at any time – quickly and conveniently.

We are at your disposal and can provide you with solutions if you want to make actual energy consumption more transparent in the future, and optimize it as well.

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1 SMARTCONTROL Manager Software

1.1 Installation

Prerequisites:
A commercially available PC is adequate for initial use with several sources of data or measuring channels. We recommend a system which fulfills the following minimum requirements:

- **Supported operating systems:**
  Windows XP Professional, Vista Ultimate 32 bit,
  Windows 7 Professional 32 and 64 bit, Windows Server 2003 R2 32 bit,
  Windows Web Server 2008 R2 SP1
- Processor as of 1 GHz (Intel x86 compatible), at least 512 MB RAM
- 19" LCD monitor (resolution of at least 1024 x 768) or equivalent
- Administrator rights

Notes concerning installation:
Depending upon the utilized type of communication channels, the following systems have to be installed:

- TCP/IP: All required interfaces are included with the operating system.
- ISDN: CAPI interface (included with your ISDN card).
- Analog modem: The SMARTCONTROL Manager initializes and communicates with all commercially available modems directly via the serial port. After the modem has been detected and installed by the operating system it must be deactivated, because the operating system would otherwise interfere with the connection.
- GSM modem: GSM modems are also connected directly to the serial port.

Attention: USB modems are not supported!

Installation procedure:

1. Insert the CD-ROM into the appropriate drive.
2. If the "auto-start" function has been activated, the initial page of the setup program is displayed automatically. Otherwise double click the SCM...exe file which is included on the CD.
3. Install the SMARTCONTROL Manager and follow the instructions which appear in the dialog boxes.
4. The setup program creates appropriate menu items under *Start -> Programs -> GMC-I*.
5. Start the SMARTCONTROL Manager.

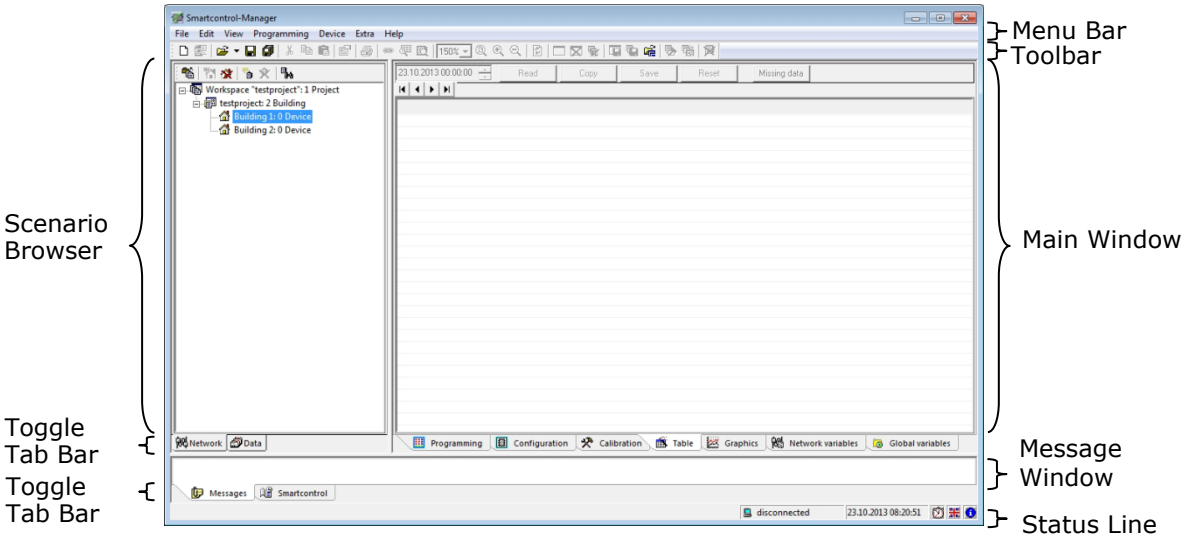
1.2 Overview

The tasks which can be executed with the SMARTCONTROL Manager include configuration and programming of the SMARTCONTROL, as well as acquisition and display of its measurement data.

1.3 User Interface

In addition to the main window, the user interface for the SMARTCONTROL Manager includes the following elements:

- **Menu bar**
- **Toolbar(s)**
- **Main window**
- **Message window**
- **Status line**
- **Scenario browser**
- **Toggle tab bars**



Various pull-down menus are available in the menu bar depending upon the main window, the active document or the drawing.

Menu Bar

File Edit View Programming Device Extra Help

The menu bar includes the following functions:

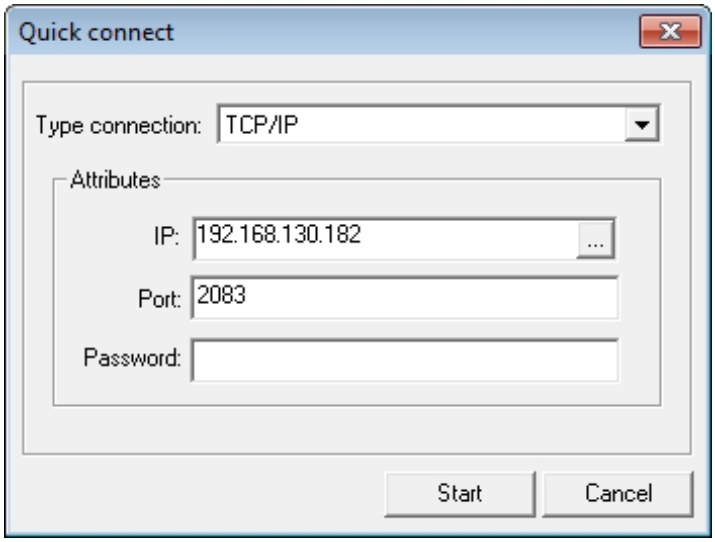
- File (new, open, close, save, exit etc.)
- Edit (cut, copy, paste)
- View (show and hide user interface elements, colors etc.)
- Programming (create and administer programs)
- Device (establish connection to SMARTCONTROLs, read in programs)
- Extras (find SMARTCONTROL, delete measurement data, prepare flash card)
- Help (assistance, information etc.)

Toolbar(s)

The SMARTCONTROL Manager makes it possible to select frequently used menu items directly from the toolbars. For example, the following functions are made available depending on which element has been activated in the scenario browser, depending on the selected element and depending on whether or not, for example, a connection has been established with a SMARTCONTROL:

- New project or workspace

- Quick connect: connection to a device without creating/opening a workspace.

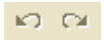


A window appears in which a device can be searched for by clicking the "…" button, or an address can be entered directly. Please note that data read in in tabular format cannot be displayed as a graphic in this mode.

- Open a workspace

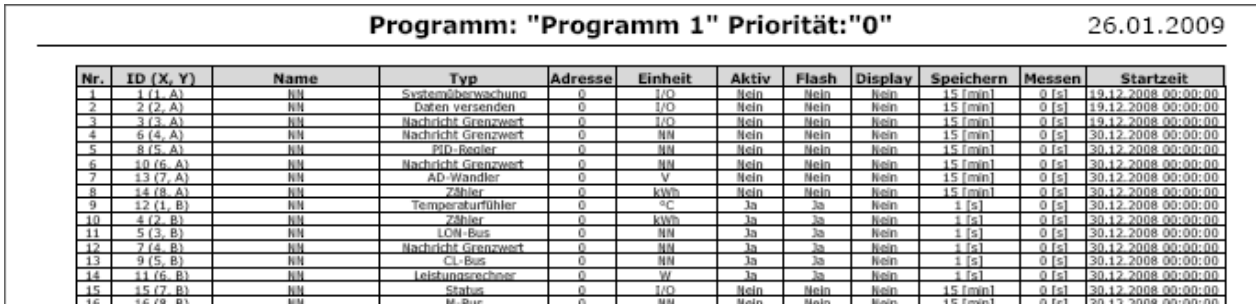
- Save the workspace

- Cut, copy, paste

 - Undo or repeat last action

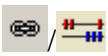
- Attributes

- Print current program (main command characteristics only)



Programm: "Programm 1" Priorität:"0" 26.01.2009

Nr.	ID (X, Y)	Name	Typ	Adresse	Einheit	Aktiv	Flash	Display	Speichern	Messen	Startzeit
1	1 (1, A)	NN	Systemüberwachung	0	I/O	Nein	Nein	Nein	15 [min]	0 [s]	19.12.2008 00:00:00
2	2 (2, A)	NN	Daten versenden	0	I/O	Nein	Nein	Nein	15 [min]	0 [s]	19.12.2008 00:00:00
3	3 (3, A)	NN	Nachricht Grenzwert	0	I/O	Nein	Nein	Nein	15 [min]	0 [s]	19.12.2008 00:00:00
4	6 (4, A)	NN	Nachricht Grenzwert	0	NN	Nein	Nein	Nein	15 [min]	0 [s]	30.12.2008 00:00:00
5	8 (5, A)	NN	PID-Regler	0	NN	Nein	Nein	Nein	15 [min]	0 [s]	30.12.2008 00:00:00
6	10 (6, A)	NN	Nachricht Grenzwert	0	NN	Nein	Nein	Nein	15 [min]	0 [s]	30.12.2008 00:00:00
7	13 (7, A)	NN	AD-Wandler	0	V	Nein	Nein	Nein	15 [min]	0 [s]	30.12.2008 00:00:00
8	14 (8, A)	NN	Zähler	0	kWh	Nein	Nein	Nein	15 [min]	0 [s]	30.12.2008 00:00:00
9	12 (1, B)	NN	Temperaturfühler	0	°C	Ja	Ja	Nein	1 [s]	0 [s]	30.12.2008 00:00:00
10	4 (2, B)	NN	Zähler	0	kWh	Ja	Ja	Nein	1 [s]	0 [s]	30.12.2008 00:00:00
11	5 (3, B)	NN	LON-Bus	0	NN	Ja	Ja	Nein	1 [s]	0 [s]	30.12.2008 00:00:00
12	7 (4, B)	NN	Nachricht Grenzwert	0	NN	Ja	Ja	Nein	1 [s]	0 [s]	30.12.2008 00:00:00
13	9 (5, B)	NN	CL-Bus	0	NN	Ja	Ja	Nein	1 [s]	0 [s]	30.12.2008 00:00:00
14	11 (6, B)	NN	Leistungsrechner	0	W	Ja	Ja	Nein	1 [s]	0 [s]	30.12.2008 00:00:00
15	15 (7, B)	NN	Status	0	I/O	Nein	Nein	Nein	15 [min]	0 [s]	30.12.2008 00:00:00

 - Establish/end connection to the SMARTCONTROL. Not active until a SMARTCONTROL has been selected in the scenario browser.

- Read all programs from the SMARTCONTROL. Not active until connection has been established to a SMARTCONTROL.

- Display current values from the programs. Only available in the "Programming" tab.

- Zoom the main window. Only available in the "Programming" tab.

- Various zoom factors can be entered directly with the dropdown list.

- Zooming can be increased by one step with this button.

- Zooming can be decreased by one step with this button.

- The zoom factor can be reset to 100% with this button.

- Refresh device data (only refreshes the selected tab). Not active until connection has been established to a device.

- Add a new program / delete the selected program / delete all programs.

- Export selected program as a file / export all programs as a file/ import program from file.

- Transmit and test/save programs, restart device. See section 2.16, "Reset", before restarting.

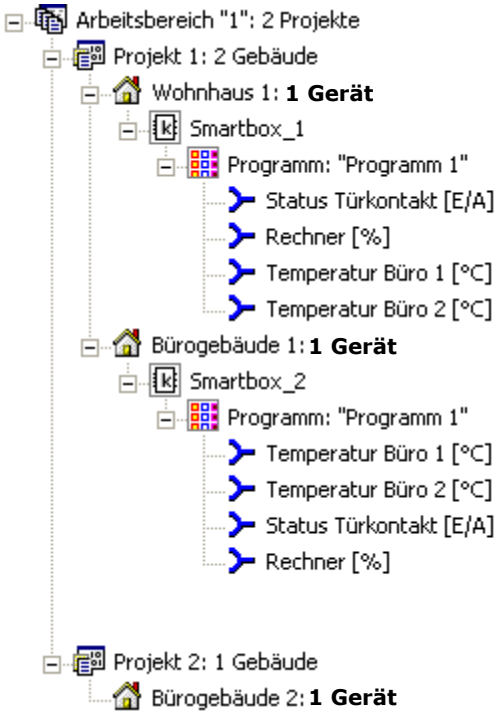
 - Online help

Status Line

Information regarding menu items, as well as other system information, is displayed here.

Scenario Browser

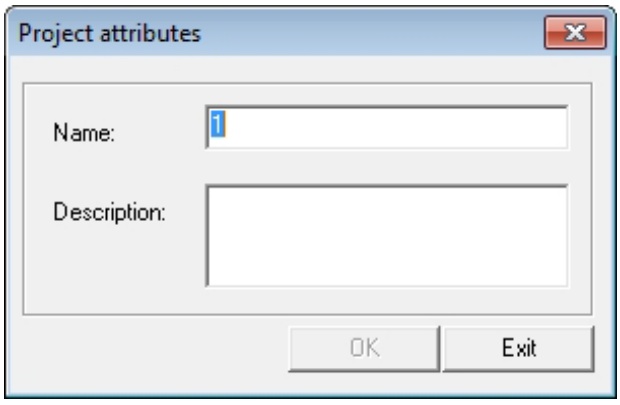
All objects which pertain to the current workspace are displayed in the scenario browser in a clear-cut fashion.
The following rough breakdown applies:



Workspace consisting of, for example:

- Project 1
  - Building 1
    - Data source 1
      - Program
        - Command 1
        - Command 2
        - Command 3
        - Command 4
  - Building 2
    - Data source 2
      - Program
        - Command 1
        - Command 2
        - Command 3
        - Command 4
- Project 2
  - Building 3

All objects offer attributes and methods which can be accessed via a **context menu (right-hand mouse key)** or **toolbars**. For example, attributes can be displayed, or various functions are displayed.

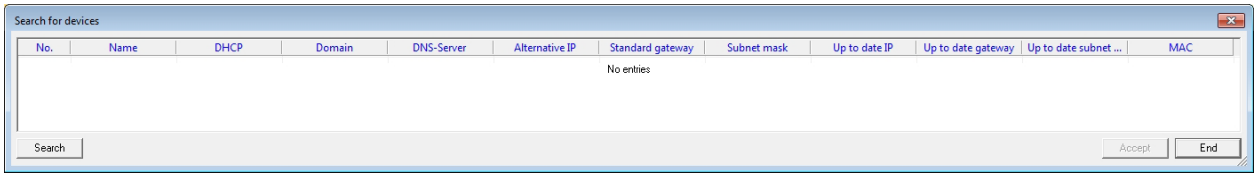


For example, information regarding the element selected in the scenario browser is displayed in the "Project attributes" box shown above. This information can be modified and supplemented.

Network Toolbar

- Close workspace / new building / remove building / new device / remove device / find device.

"Search for devices" is active when a building has been selected. In this way, devices can be searched for by means of broadcast via TCP/IP connection.



Found devices can be marked and transferred directly to the building. In addition to this, network data such as the TCP/IP address of a device which has been found are displayed.

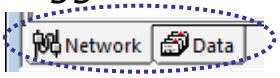
Data Toolbar

Read in measurement data / delete read in data / read in network variables / read in global variables / tabular view / graphic view

OPC Server Toolbar

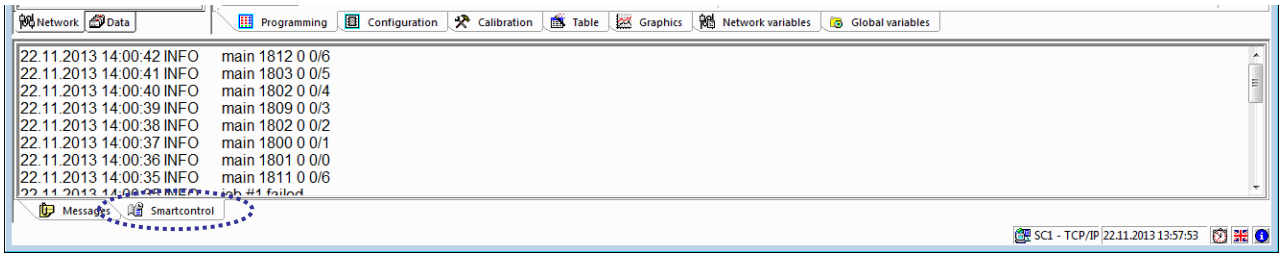
New network / add networks from workspace / import OPC server structure / export OPC server structure / find network / OPC server status / start or stop OPC server / refresh configuration

Toggle Tab Bars



Various modes can be selected with the toggle tab bars. The windows directly above the respective bars are then switched, for example from a network view to a data view.

Message Window

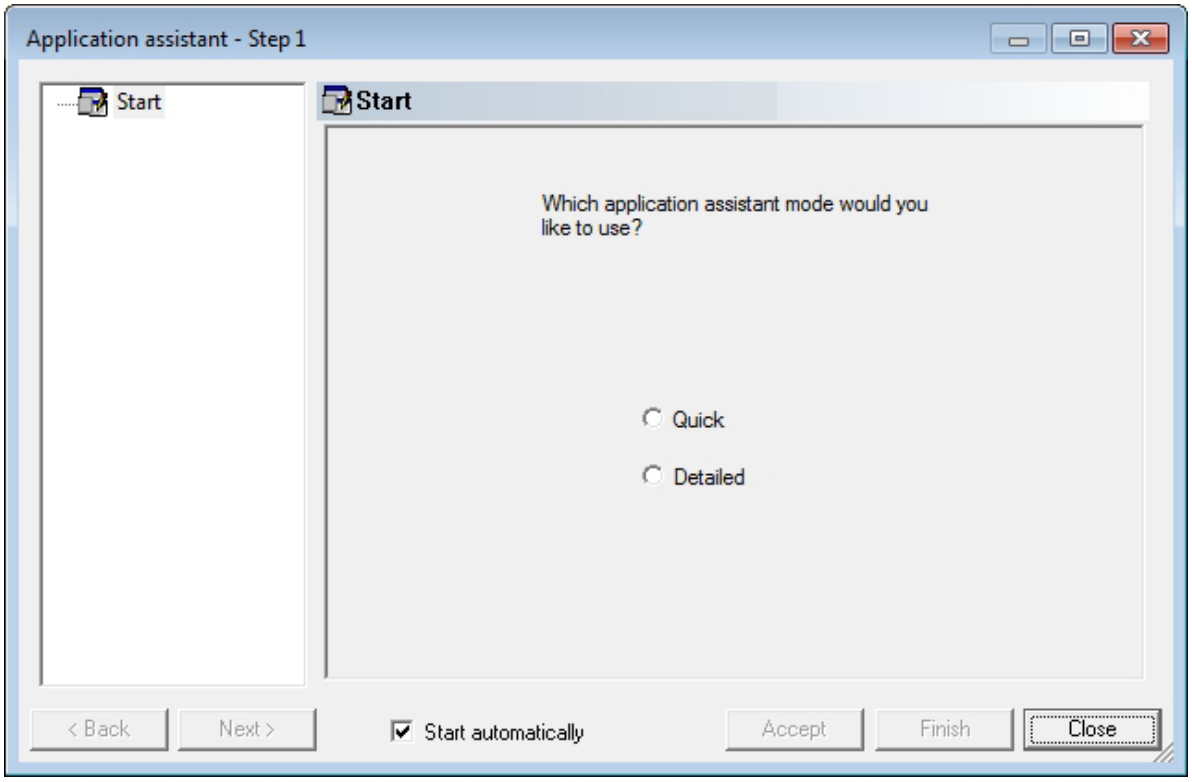


Continuous messages concerning current operations in the SMARTCONTROL are displayed in the message window. This is above all helpful when you need to know exactly how the SMARTCONTROL reacts during certain operations.
The read-out window is only active if a TCP/IP connection has been established.

Numeric Format for Entering Values

Please use the English numeric format when entering values: decimal point instead of decimal comma. Example: Enter the number 3.33 instead of 3,33 for the calculator command.

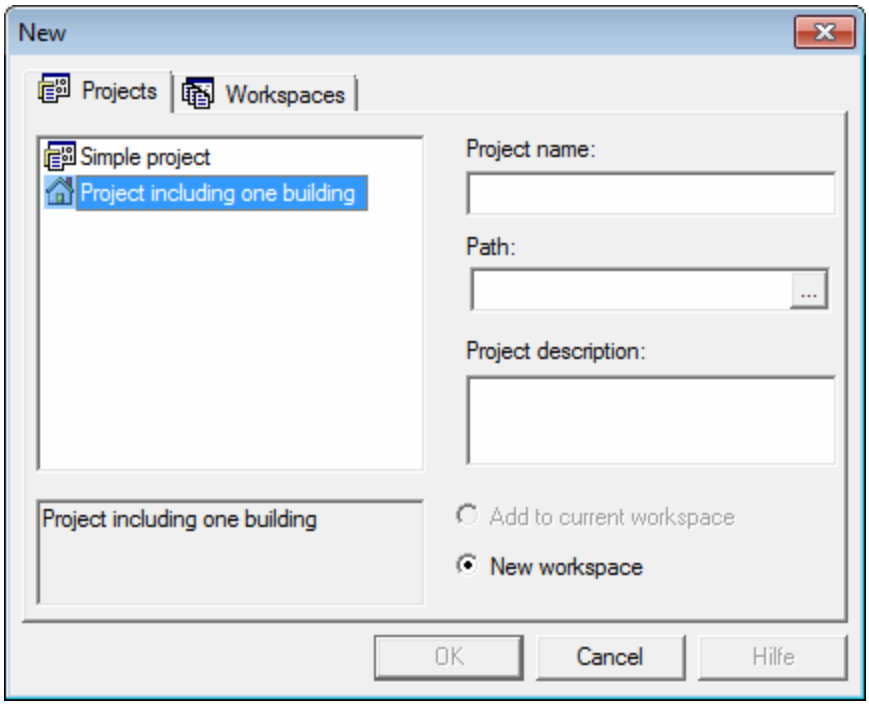
1.4 Entering Projects, Buildings and Devices With the Application Assistant



A dialog can be accessed by clicking "**Application Assistant**" in the "**File**" menu, which guides the user step-by-step to a finished workspace including project, buildings etc. The selected entries are accepted by clicking "**Finish**". Detailed entries can be made, or the procedure can be shortened by making only the most important entries after activating "**Quick**".
Additional entries can also be made subsequently. These steps are self-explanatory and are discussed in the following section.

1.5 Entering Projects, Buildings and Devices Without the Application Assistant

After clicking "**New**" in the "**File**" menu, a window appears with which a simple project, or a project including one building, can be entered. Depending upon whether or not a workspace has already been created, a new one can be defined in the "**Workspaces**" tab, or an existing one can be searched for.

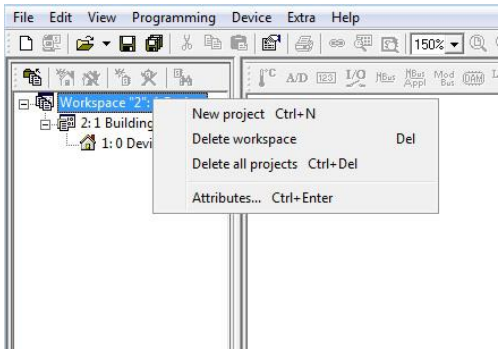


Enter a clear-cut project name. The project path can be entered either directly, or can be selected after clicking the ... button.

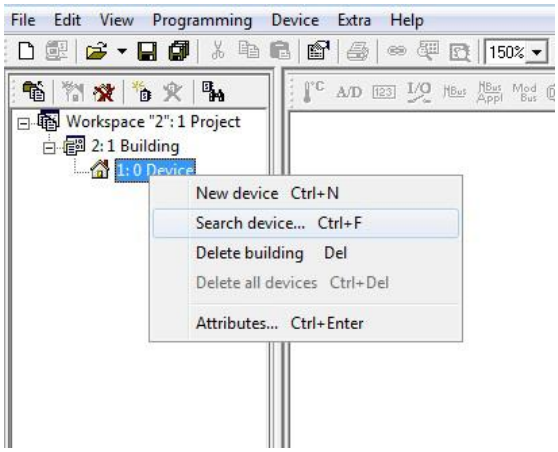
In the case of a "project including one building", the building data have to be entered after acknowledging with "OK".
Several projects can be created within a single workspace after clicking "**New**" in the "**File**" menu.
The workspace is saved in the SBM file format after clicking "**Save as**" in the "**File**" menu.
It's advisable to make backup copies of all data on a regular basis.

Workspaces which have been saved to memory can be re-accessed by clicking "**Open**" in the "**File**" menu.

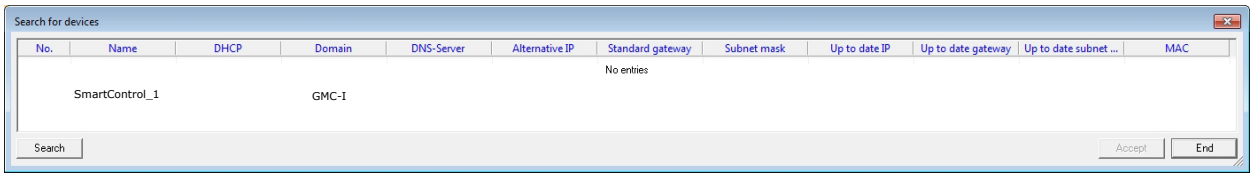
After clicking a project with the right-hand mouse key, new buildings can be added, projects and buildings can be deleted, and attributes can be viewed.



After clicking a building with the right-hand mouse key, a new SMARTCONTROL can be added to the building -> “New device”.

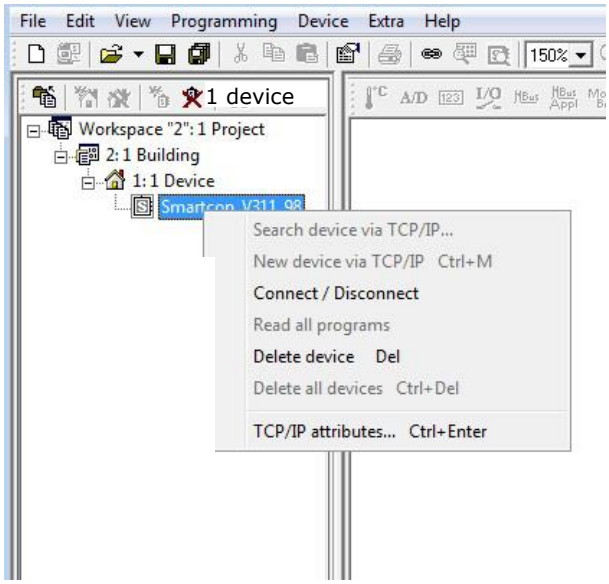


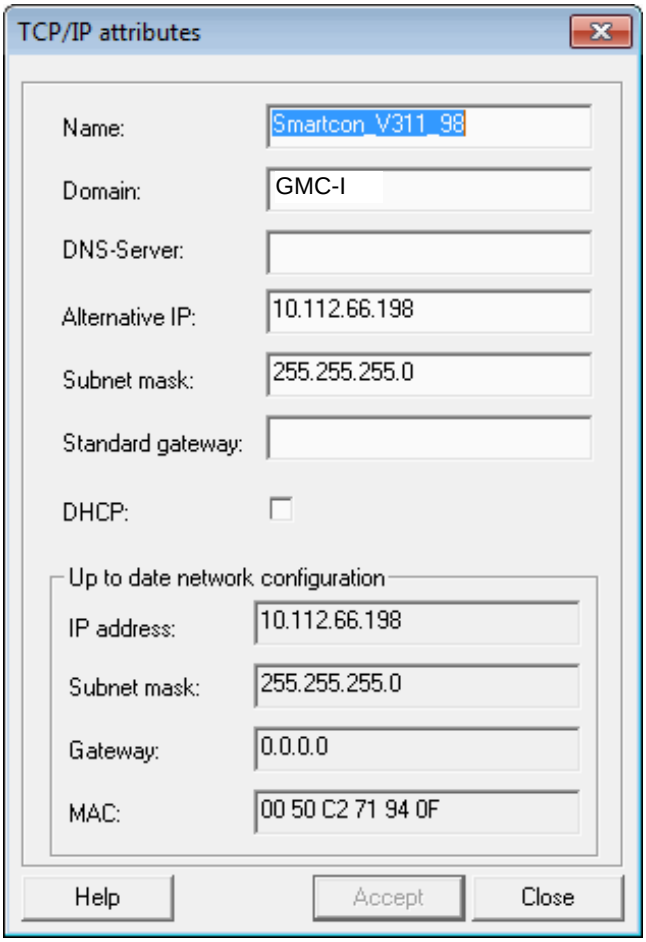
If a network connection is used, any SMARTCONTROL within the network can be found and then transferred to the building -> “Search device …”.
SMARTCONTROLs are now searched for by means of broadcast via UDP.



Found SMARTCONTROLs can be marked and transferred directly to the building. In addition to this, network data such as TCP/IP addresses of SMARTCONTROLs which have been found are displayed.

If the connection is to be established via a network, and if the interconnected PC or laptop is listed in another network as 192.168.130.XXX, the SMARTCONTROL’s network address can be changed.
Right click the SMARTCONTROL to this end, and select “TCP/IP attributes”.

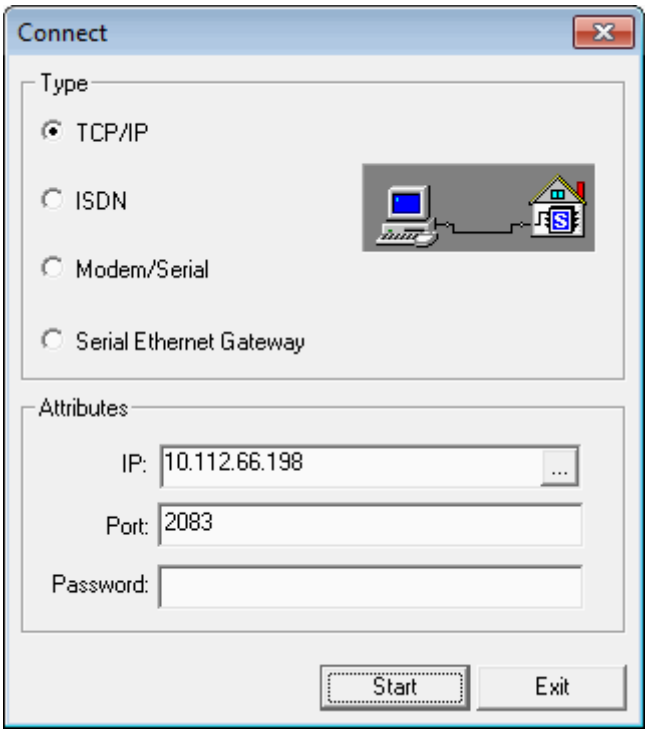




Now ascertain the SMARTCONTROL's own IP address and subnet mask (for example with the ipconfig command), enter it to a DOS console (run -> cmd and then ipconfig) and adapt the SMARTCONTROL's IP address accordingly:
Enter a new IP address (free IP within the network, other than the SMARTCONTROL's own IP address) and the same subnet mask.
Specify a gateway and a DHCP server if applicable.
Then click "Accept".
The TCP/IP data are transferred automatically.
Any existing connections are reset by the SMARTCONTROL.
Activation of the new network attributes may take several minutes.
If you have physical access to the box, you can execute a reset in order to speed up this activation.

As of firmware version 2.5.08, up to two DNS servers can be entered – separated by a semicolon.

The following window appears after double clicking a SMARTCONTROL:



A selection must be made as to whether connection will be established via TCP/IP, ISDN, a modem, a serial cable or a serial gateway.
Refer to the section entitled *Configuration* regarding additional prerequisites for establishing a connection.

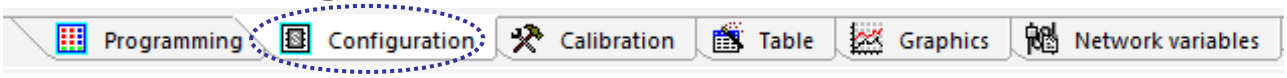
In the case of connection via TCP/IP, either the SMARTCONTROL's IP address or its name can be entered.
Upon shipment from the factory, the name is "SMARTCONTROL" and the IP address is 192.168.130.190.

In the case of connection via ISDN, a telephone number and, if applicable, a password must be entered.

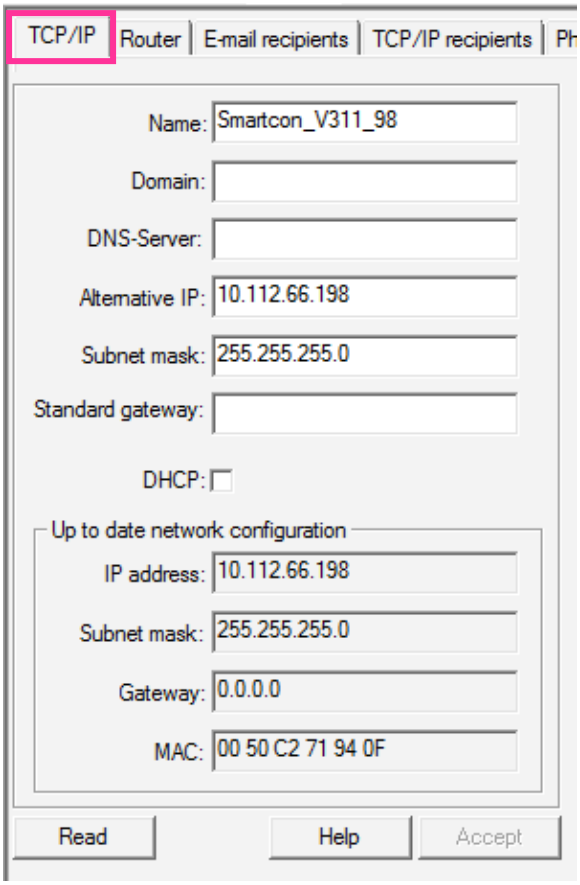
In the case of connection via modem / serial interface, the PC's serial interface must be entered, and if applicable as password.
If a modem is used the telephone number must also be entered.
If necessary, standard modem initialization must be adapted.

After connection has been successfully established, additional menu items become available in the toggle tabs.

1.6 The "Configuration" Tab

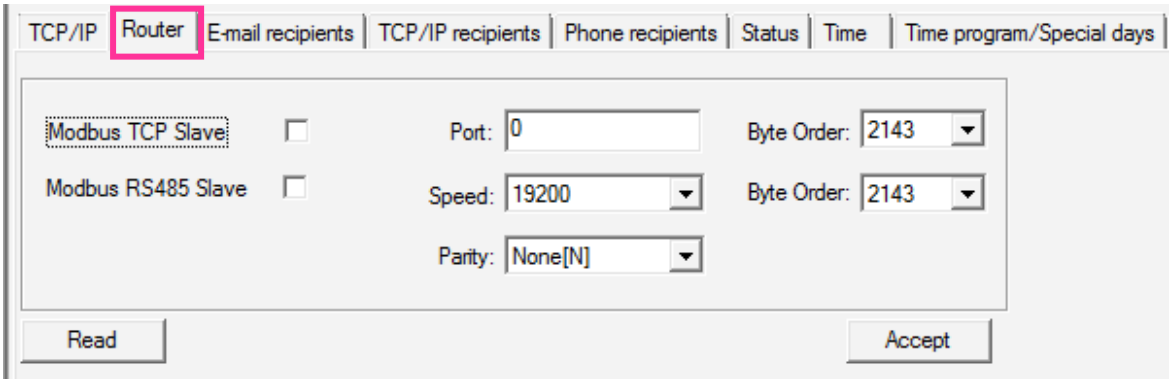


TCP/IP



The current TCP/IP configuration can be viewed and edited here. The "Read" button is used to display current data from the SMARTCONTROL and the "Accept" button transfers the configuration changes to the SMARTCONTROL.

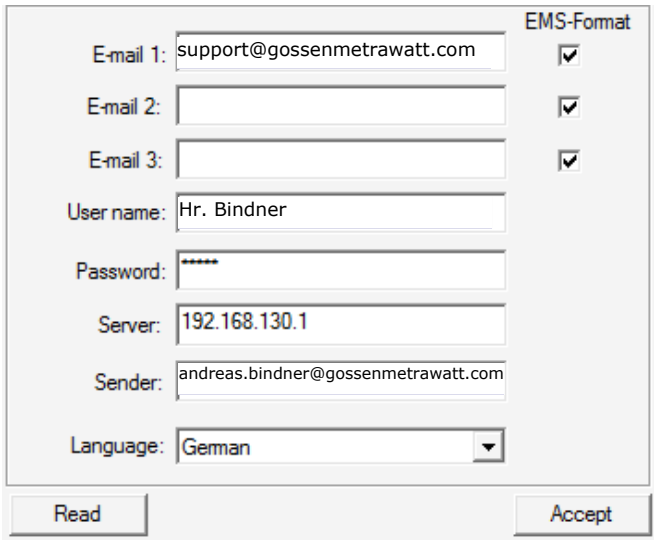
Router



The router tab can be used to specify whether the SMARTCONTROL will communicate with other devices via Modbus TCP and/or per Modbus RTU when in the slave mode.
Please note: Functionality depends on the firmware.

Attention: If RS 485 "Slave" is activated, normal "Master" communication is no longer possible via the RS 485 bus, i.e. Modbus, ASCII, M-Bus etc.

e-mail Recipients

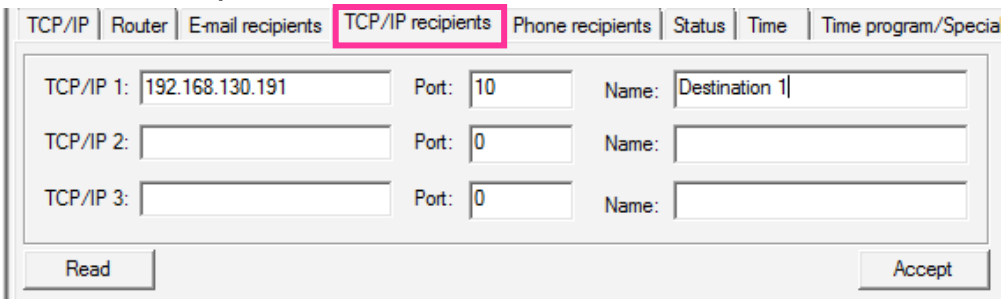


Recipients of outgoing e-mails can be specified in this tab.
This is only possible if the SMARTCONTROL is connected to a network via TCP/IP.

A user name and a password must allow for access to the e-mail account in an SMTP server entered next to "Sender". The address of the SMTP servers from which the e-mails are to be sent is entered to the "Server" line.

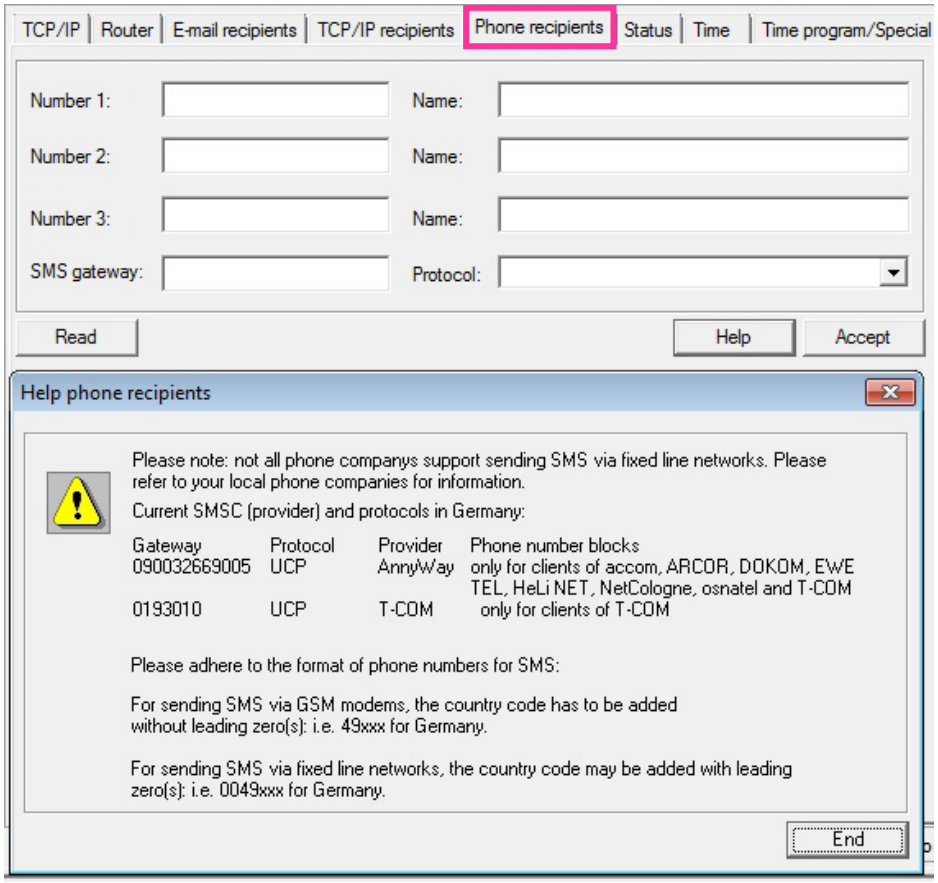
Several recipients can be entered to each line, separated by semicolons.

TCP/IP Recipients



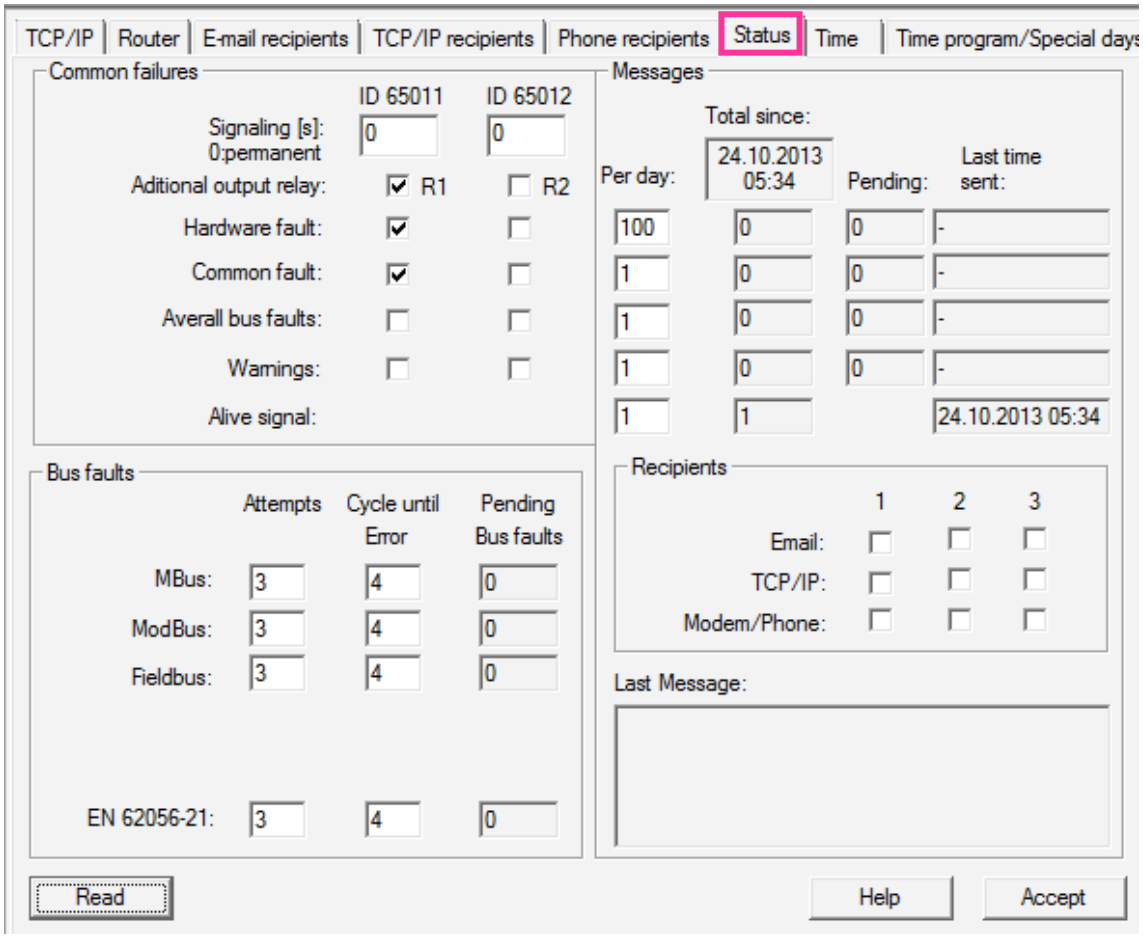
A destination can be entered here for the transmission of messages.

Phone Recipients



Three recipients of SMS messages can be specified in this tab. This function can only be used if the SMARTCONTROL is connected to the telephone network via modem or GSM. Please observe additional limitations, for example transition from the landline.

Configuring Error Indication *Tip: Refer to the online help as well!*



You can specify how long which error messages will be indicated at which relay with the help of the "Status" tab.

Explanation of error types:

Hardware faults:
The device is defective and must be replaced. These faults may occur in the event that fatal errors have been indicated for an internal controller (e.g. A-D converter, flash memory, network etc.) during write and read operations.

Common faults:
These occur, for example, when a connection is interrupted, a bus device no longer responds or an invalid command has been received.

Bus faults:
The relay is activated if errors from field devices are indicated in the logs.
This means that although communication to the device is functional, the device is indicating an internal or external error.

Warnings:
Acoustic indication of errors which have little or no effect on performance. These include, for example, login attempts with an incorrect password and attempts to enter non-existing commands.

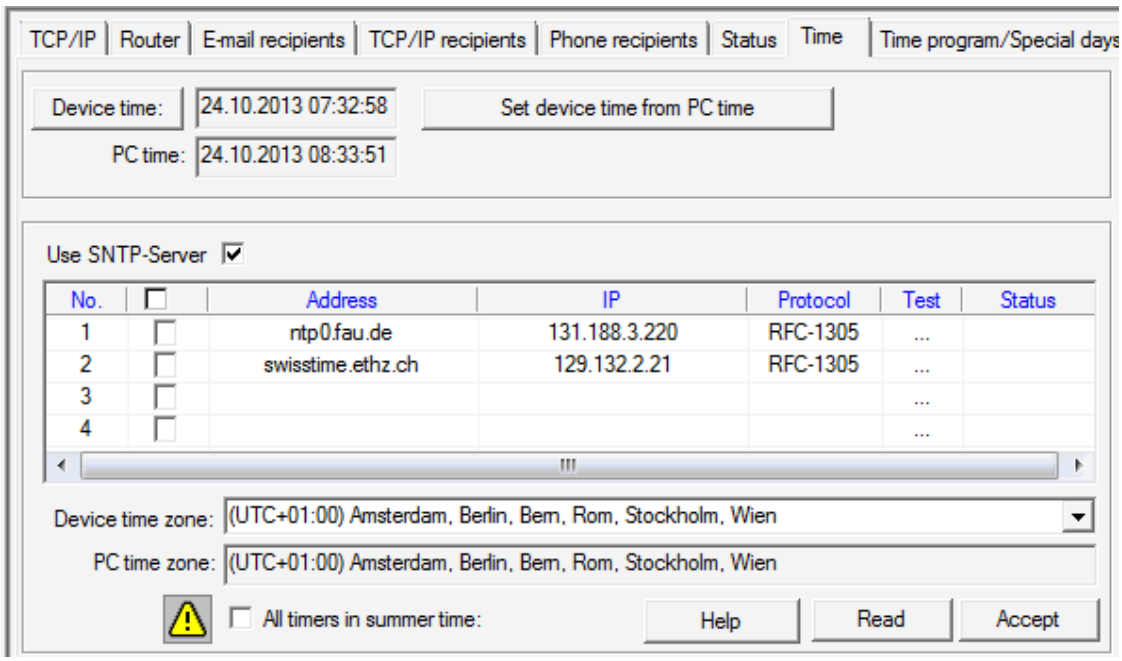
If you are planning to use, or are using, the relays for other purposes, do not make any entries here.

Bus faults:
Entries can be made here which stipulate after how many resubmissions and cycles a fault will actually be indicated. The error counter is incremented once per command.

Recipients:
Entries can be made here to specify who will receive which message.

The messages indicate how many messages have been generated since the system was started up.

Time



Time is read out of the SMARTCONTROL after clicking "Device time".
SMARTCONTROL clock time can be synchronized to PC time by clicking the corresponding button.

Daylight savings time / standard time:
SMARTCONTROL time always runs **without changing over to daylight savings time!**
This means that all values are saved with the time stamp for the locally selected device time zone **without time shift**!
Conversely, retrieval of saved values always functions **without daylight savings time**!
The processing data server (e.g. GMC-I Controlling) can then decide for itself whether or not the values will be displayed with or without adjustment for daylight savings time.
For control tasks, it's possible to enter a checkmark to "Timer programs according to daylight savings or standard time".
In this way, daylight savings time (according to the EU standard) is taken into consideration in the timer programs.

SNTP:
Several SNTP servers can be specified if the "Use SNTP server" checkbox has been activated. After it has been entered, a server can be checked by clicking the "Test" button.
The settings are saved to the SMARTCONTROL by clicking the "Accept" button.

Please note: Not all time servers support this protocol.

A gateway may have to be entered to the TCP/IP attributes, in order to be able to reach the time server via the Internet.

Attention:
In the case of only one time server (e.g. internal company time server) deviation may not exceed 1 minute! "External" time is otherwise rejected.
In order to eliminate this restriction, enter the same time server twice.

Time Server (RFC 1305 protocol)

As of firmware version 2.0.22, current time can be queried via RFC 1305 protocol by the SMARTCONTROL.
Use this option to implement simultaneous read-out at different locations in a local network. Sample scenario: The respectively current billing period is ascertained at a central location by means of a synchronization pulse. This may deviate from current local time. This synchronized clock time is then transferred to the other SMARTCONTROLs via time server. In order to transfer clock time to the other SMARTCONTROLs, enter exactly one SNTP server with the "Master's" IP address to the "Time" configuration page for the clients. If you enter more than one server (possibly including one or more on the Internet), the internal (actually correct) server may be rejected due to a deviating measuring period.

Observe the following as well:

Be absolutely sure that clock times are not set from different sources. This would otherwise result in measuring periods which are too short or too long at the point in time at which time is corrected. Data are rendered useless in this case.
If a time server is used, it's thus absolutely essential to deactivate time synchronization which usually runs automatically at the data management server when polling data.

Note:
"Simultaneous" Read-Out of Data Points

If you've connected, for example, an M-Bus network with M-Bus meters to a SMARTCONTROL, this may influence the point in time of read-out:
Depending on which ID has been assigned to the commands for saving and reading out data (any may be affected), they may be read and saved with a considerable time offset.
If no errors occur at the M-Bus meters (repeated unsuccessful read-out leads to further delays), the time offsets are always roughly the same for all data points.

There are different methods for assuring or correcting time synchronization of the data to be recorded:

1. First of all, it's advantageous to read out and save internal data points (pulse inputs, temperatures and analog inputs) at the respective point in time.
   Enter them to a separate program sheet for this reason. Assign a higher priority level to this data sheet, for example 1. Enter slow M-Bus commands to a program sheet with a priority of, for example, 9. This assures that internal data are read and saved first.

2. Slow M-Bus data can be read out synchronously with meters which, for example, are capable of making use of the "Sync" signal. Please refer to the "M-Bus Application" instructions for further information in this regard.

Time Correction (removed as of firmware version 2.5.12)

Modem

For analog modem modules:
The number of rings until the modem answers a call can be entered here.

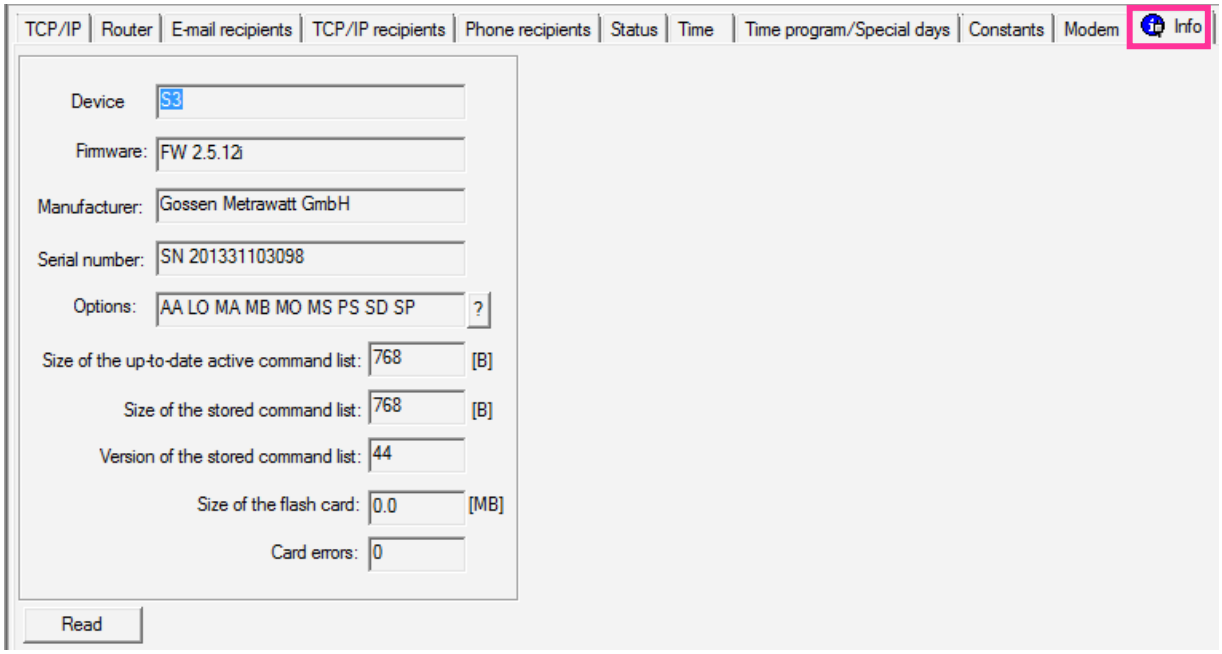
Caution: If no setting is entered, or if the number of rings is set to 0, the analog modem does not answer at all!

For ISDN modules:
If available, an MSN can be entered here.

For GSM modules:
If a GSM module has been installed, the PIN for the SIM card must be entered here.

Information

Various information regarding the SMARTCONTROL such as device, firmware version, manufacturer and serial number is displayed here.

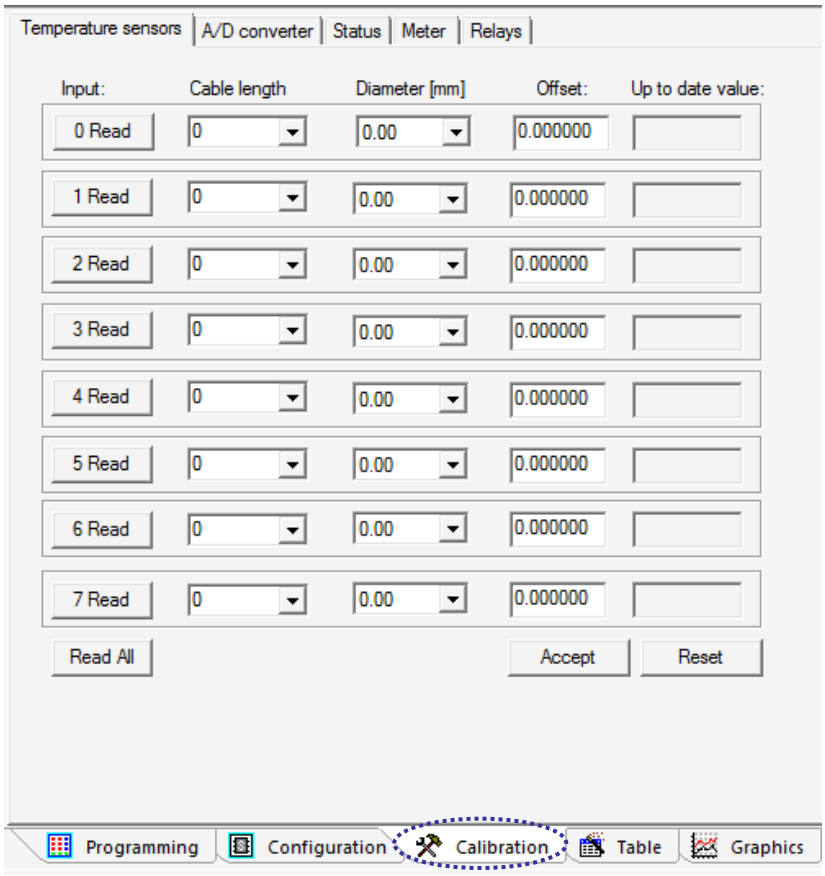


Details:
Device type: SB for series 1 SMARTCONTROLs, S2 for series 2 devices
Firmware: currently installed firmware version
Options: list of included firmware options. Further information regarding actually enabled options can be accessed in the "Extras" menus under "License Management". The individual abbreviations are described in detail in the "Options" section.
Size of the up-to-date active command list: currently running program.
Size of the stored command list: stored program (active again after restarting).
Version of the stored command list: this number is increased by 1 for each new command list. This makes it possible to enter new data points automatically.

1.7 The “Calibration” Tab

The 8 temperature inputs (T0 - T7, terminals 1 - 16),
the 8 analog inputs (A0 - A7, terminals 17 - 32) and
the 8 digital inputs (IS0 - IS7, terminals 33 - 48)
can be calibrated with this tab, and their current data can be displayed.

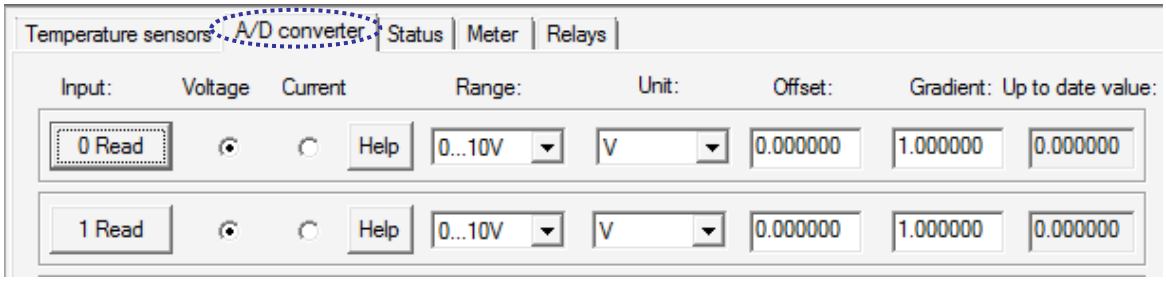
Temperature Sensor



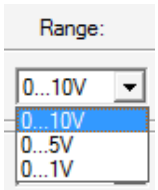
Inputs 0 through 7 can be read in individually, or all together by clicking the “Read All” button.
All of the offsets are written to the SMARTCONTROL after clicking the “Accept” button.

After entering cable length and the cross-section for the individual inputs, the program calculates an offset, i.e. distortion of measured values caused by cable resistance are taken into account automatically through the use of a correction factor.
This offset can also be entered manually. For example, if temperature at input 1 deviates from the actual value by plus 1°, this can be compensated for by entering an offset of “-1”.

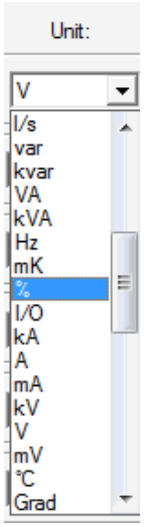
A-D Converter



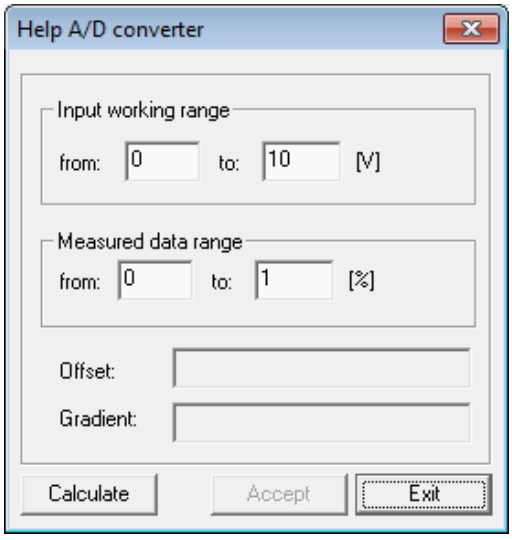
Selection must be made as to whether a voltage or a current signal will be measured.



The measuring range can be changed.



The unit of measure for the quantity to be measured can be specified.

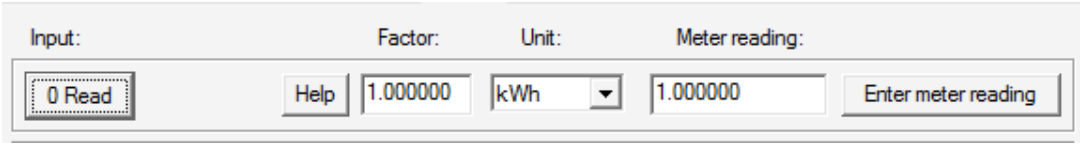


With the help of an offset and a gradient, the measured analog signal can be directly converted into the measured unit of measure.
The dialog box shown at the left appears after clicking the "Help" button.

Example: humidity sensor with current output of 4 to 20 mA for 10 to 100% humidity.
Offset and gradient are ascertained by clicking the "Calculate" button.
Now simply accept the calculated values for offset and gradient.

Meter (digital inputs)

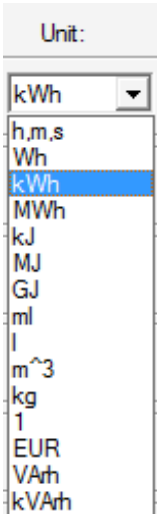
Pulse, status, tariff and synchronizing signals can be adjusted.



A meter factor can be specified.
For example, if a meter generates 1000 pulses per kWh, the meter factor is 1/1000 = 0.001. After clicking the "Help" button, a window appears which can be used to calculate the meter factor.

If the pulses originate from a transformer operated meter (current), we do not recommend entering the transformation ratio here.
Reason: In this way, the display of the SMARTCONTROL meter reading can be compared with the display at the electrical meter.

For low-voltage systems, a voltage transformation ratio can be entered as well.



The **Unit** of measure must be specified. **Status signals** can also be processed (e.g. burner on-time, door contact etc.).

If applicable, the momentary meter reading can be entered.

Do not use factors of less than 0.0001. Use a smaller unit of measure instead: 0.005 Wh instead of 0.000005 kWh.

Tariff data, for example high tariff (HT) and secondary tariff (ST) can be processed as well.

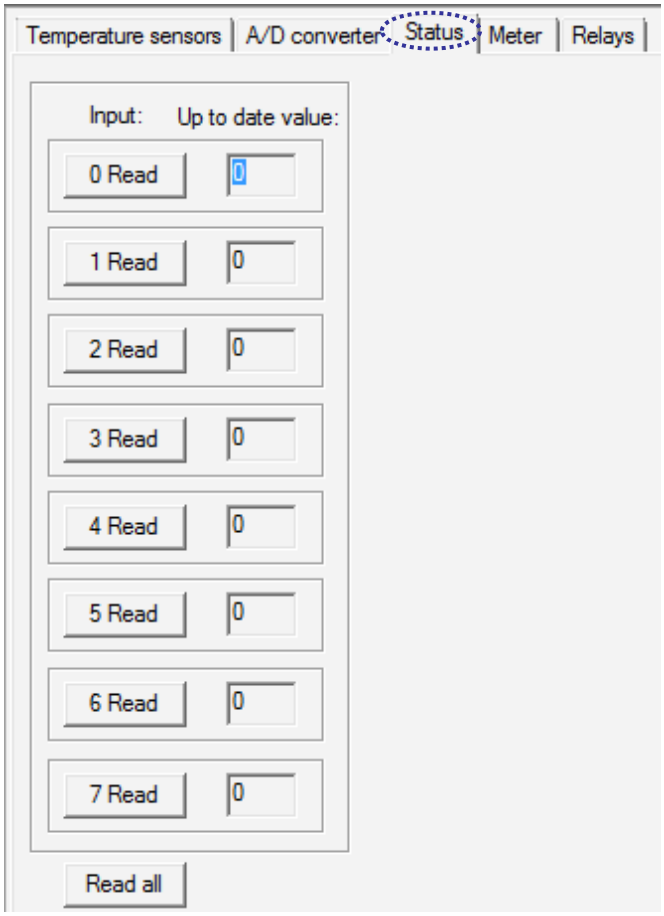
3 tariff inputs can be selected: IS1, IS3, IS5.
Pulses received by the respectively previous inputs, namely IS0, IS2 and IS4, are allocated to HT or ST.

For example, the tariff field next to IS1 can be selected. Then, depending on logic high or logic low for tariff switching at IS1, the meter pulses at IS0 are allocated to HT or ST. Internally, the HT meter reading is allocated to input 0 and ST to input 1, and is displayed after clicking “Read”.
Commands for HT and ST must be set up in the programs for data logging.

Switching back and forth between HT and ST by is accomplished by means of a lead at the meter to which 230 V is applied in the case of logic high, and 0 V in the case of logic low. As a rule, logic low corresponds to HT, and logic high to ST.
This signal is read out to a relay with a floating contact.
The floating contact is connected to IS1, IS3 or IS5. In the case of logic high the floating contact is closed, and a logic high signal is also applied to IS1, IS3 or IS5. The meter is thus internally switched from an HT meter with IS0, IS2 or IS4 to an ST meter with IS1, IS3 or IS5.

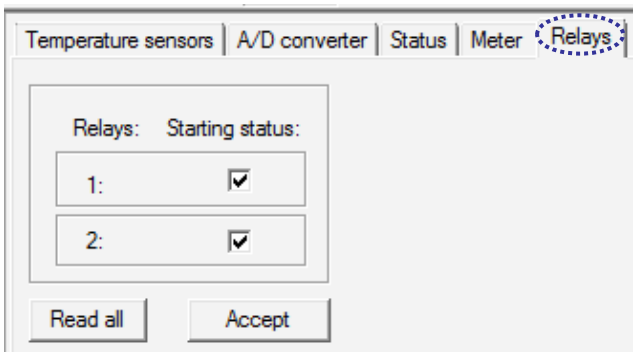
Input IS7 can be used for synchronization if a quarter-hour synchronizing pulse is available. The meter is synchronize to the next quarter hour.

Status (digital inputs)



The current status of the digital inputs is displayed here as either 0 or 1.

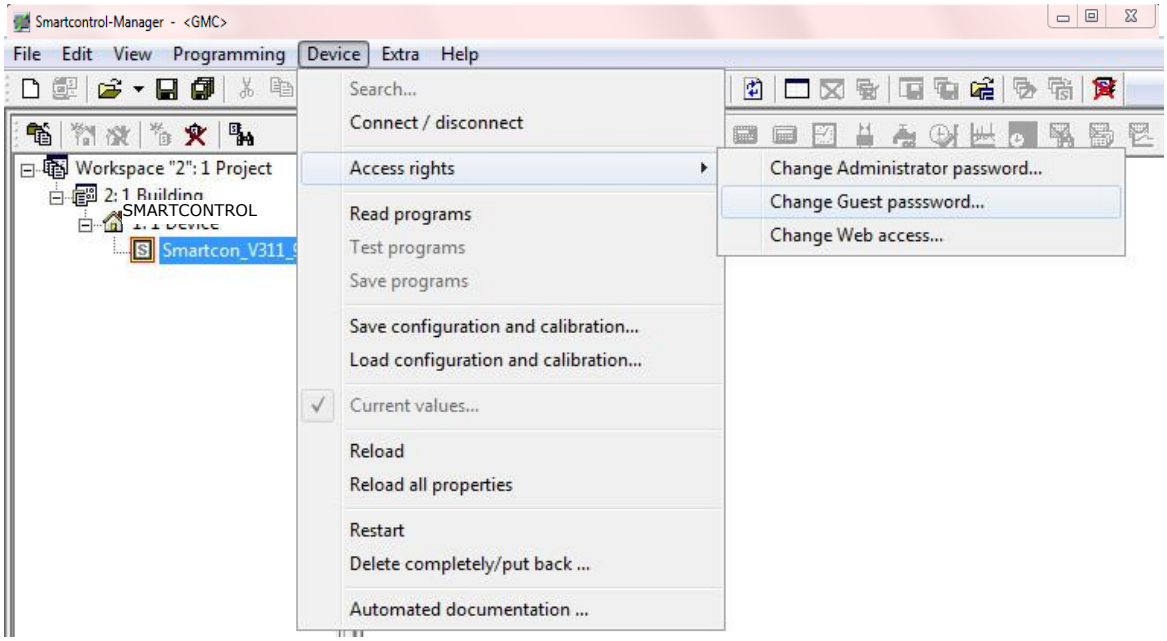
Relay Start Status



The status of the on-board relays after SMARTCONTROL is started can be set here.
The status is updated immediately after clicking the “Accept” button.

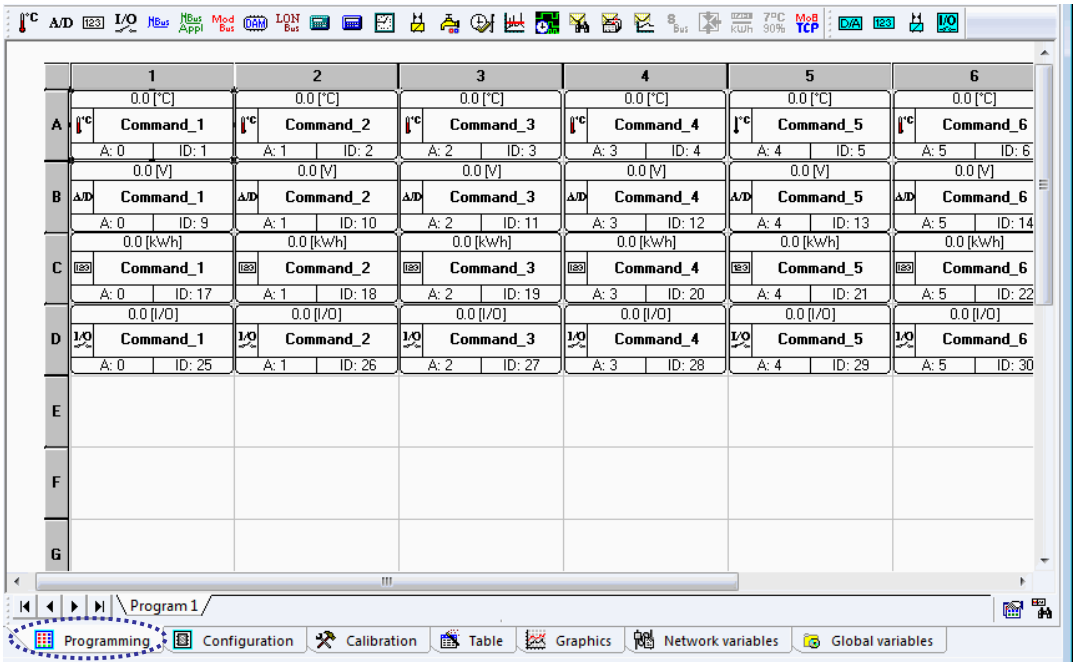
Access Rights

The administrator and the guest passwords can be changed under access rights.



- Click the “Device” menu
- Click “Access rights” in the menu.
- Select the password to be changed, i.e. either administrator or guest password.
- Change the password.
- Save your settings.

1.8 The “Programming” Tab, Commands



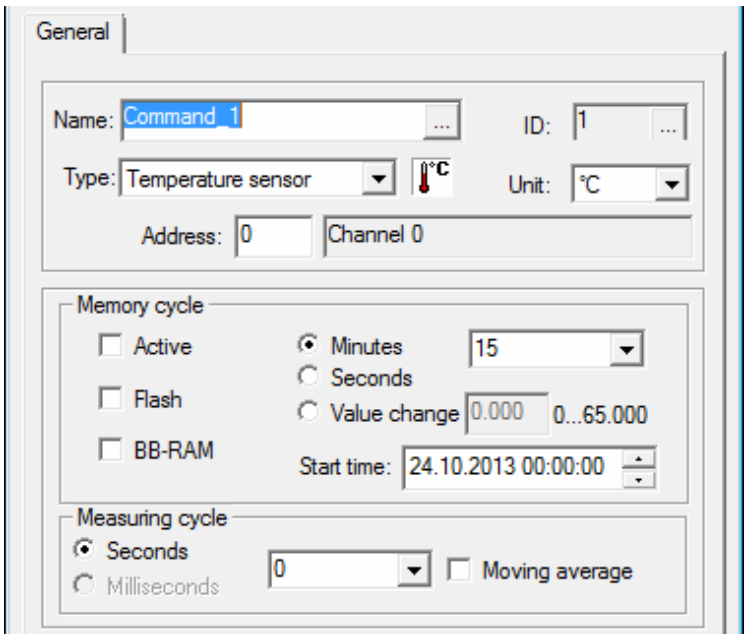
The names of the current programs appear above the **Programming** tab.
Up to 16 programs can be added, and programs can be deleted or renamed after right clicking the program, or by clicking the appropriate button in the toolbar.
Programs can be saved to and read from a data file.

A **command** can be added after right clicking the white area.

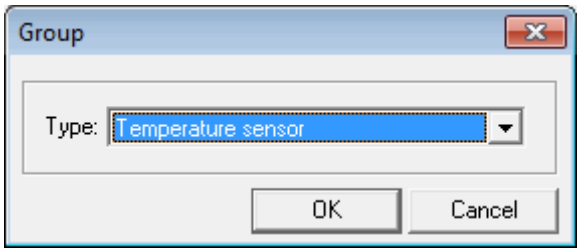
Data can only be read out, and calculations, for example, can only be started by means of commands.

After adding the first program with the button, the user is asked whether or not default commands should be created. If yes, the layout shown above appears.

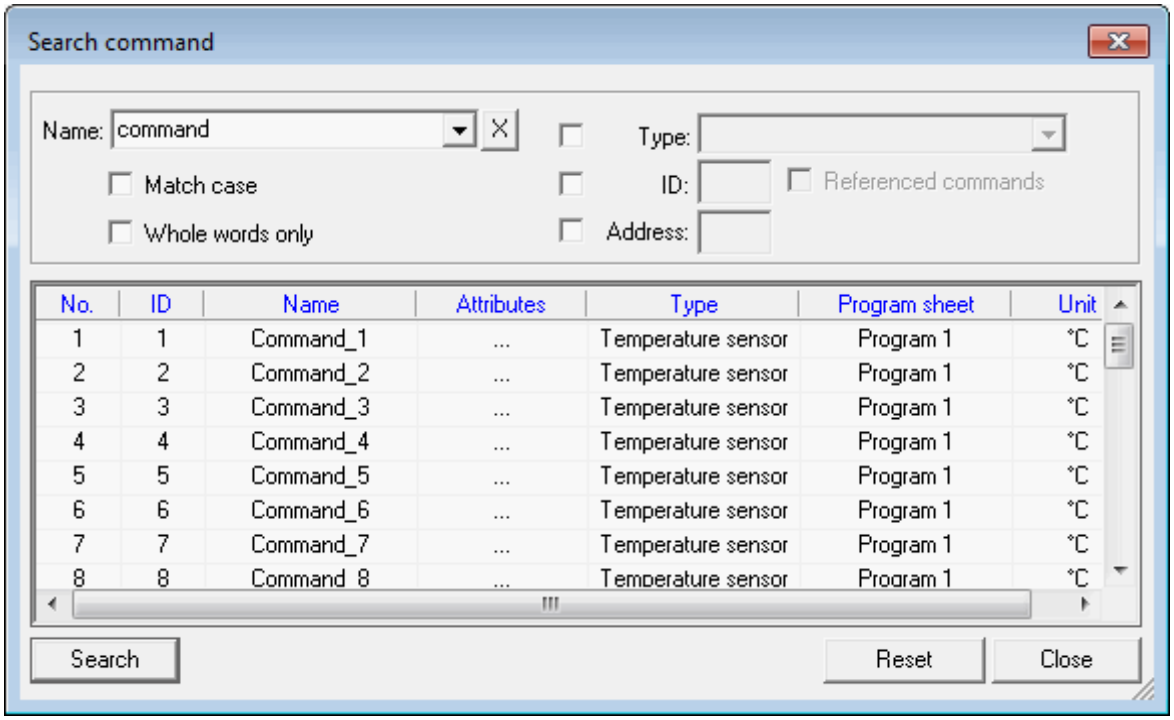
The attributes of a given command can be accessed by double clicking it, or by clicking it with the right-hand mouse key.



It's advisable to enter a clear-cut designation as a **name**. The name can have a length of up to 18 characters. The group can also be selected (...).



As of version 1.7.0.1, all referenced commands can be searched for this **ID** by clicking the ... button.



The **Type** can be selected under **General**, and additional entry fields appear depending upon which type is selected. These are described below along with the individual types (e.g. timer program).
If applicable, select the input's **address**. Input type is set up automatically. With meters, for example, the digital inputs are linked, and with temperature sensors the temperature inputs are linked. Thus address 3 (selected here) refers to temperature input 3 or the corresponding terminals which belong to T3.
Please enter the **Unit** of measure.
If **Active** is selected, the input is activated and is able to read in data, and if **Flash** is selected, the data are saved to flash memory.

The **"BB RAM"** option is only available for boards as of version 3 und for up to 5 "Temperature", "Analog" and "Formula Calculator" commands. The current value in BB RAM at the RTC is saved and is then available after a restart, a firmware update or a power failure. Important: A fully charged battery is a prerequisite!

Start time is the day, hour, minute and second on which the first value is acquired, and serves as a reference time point for all subsequent cycles.
The **measuring cycle** entry specifies how many seconds elapse between sampling cycles. Observe the following:

Sampling Cycle	Time
0	Off
1	1 second
60	1 minute
3600	1 hour
86400	1 day
604800	1 week
...	...

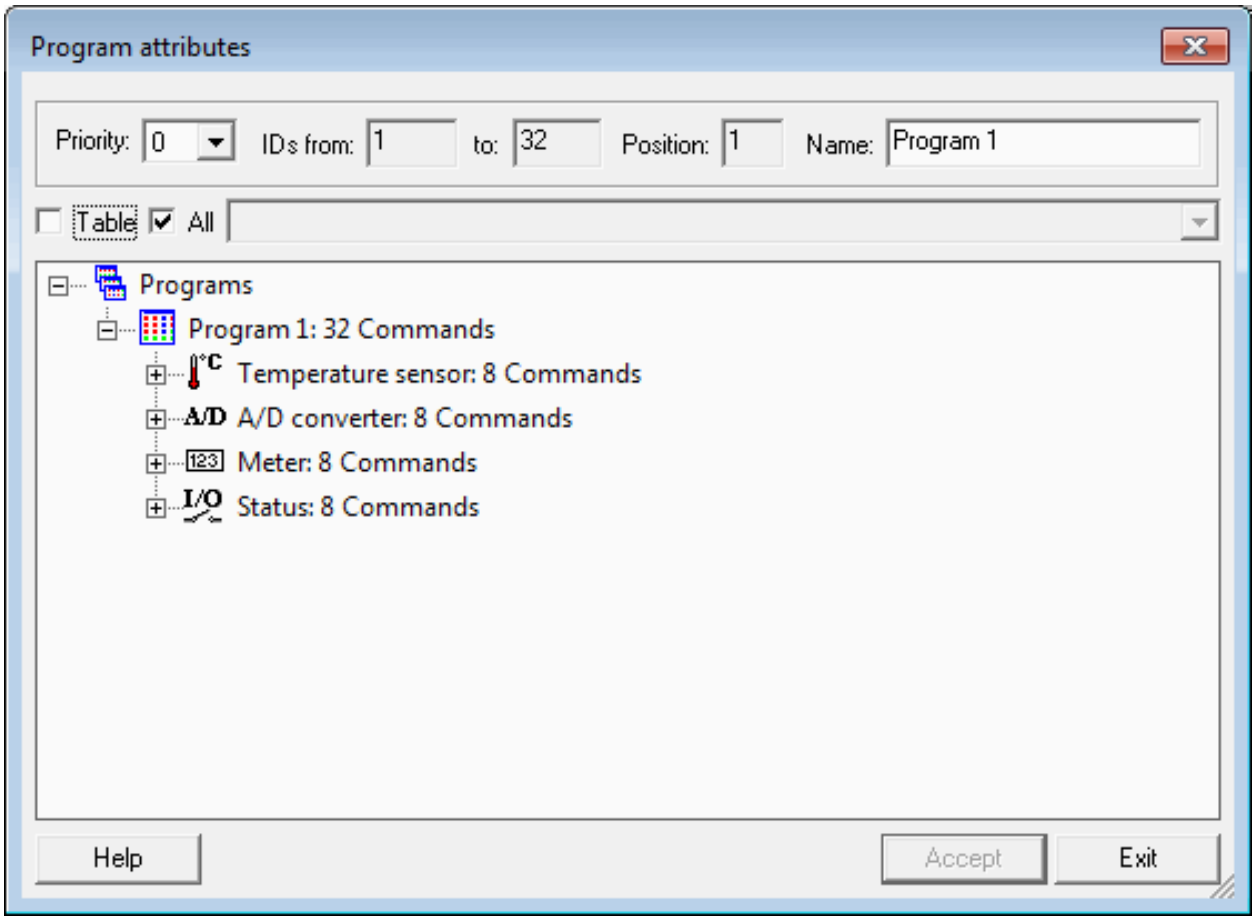
The **memory cycle** specifies the interval at which values are written to flash memory.

Measuring cycle:
For analog signals (temperature sensor, A-D converter, calculator etc.):
Measurement is executed based upon the measuring cycle interval and an arithmetic mean value is generated from the values which occur during the measuring cycle timespan. This mean value is then continuously available for all other commands (PC as well).
If the "moving average" function is also activated, the arithmetic mean value from the previous cycle (and its weighting) is taken into account too.

For all other types of commands, the measuring cycle has a respectively specific significance:

- **Peak load optimization**: measuring cycle = evaluation/switching cycle
- **Status** and **status integral**: sampling interval of the status signal
- **Meter**: the internal value is refreshed
- **Timer program**: no significance
- **Relay**: evaluation/switching cycle for the switching conditions
- **Heat or cold calculator**: same as analog

Program Priorities



As of firmware version 1.4.12, it's possible to assign different priorities to various programs. In this way, important commands can be executed with preference.
In particular control procedures in combination with slow fieldbus protocols (e.g. M-Bus) can be optimized with this function.

Priority is determined for all commands on a program page. How it works:

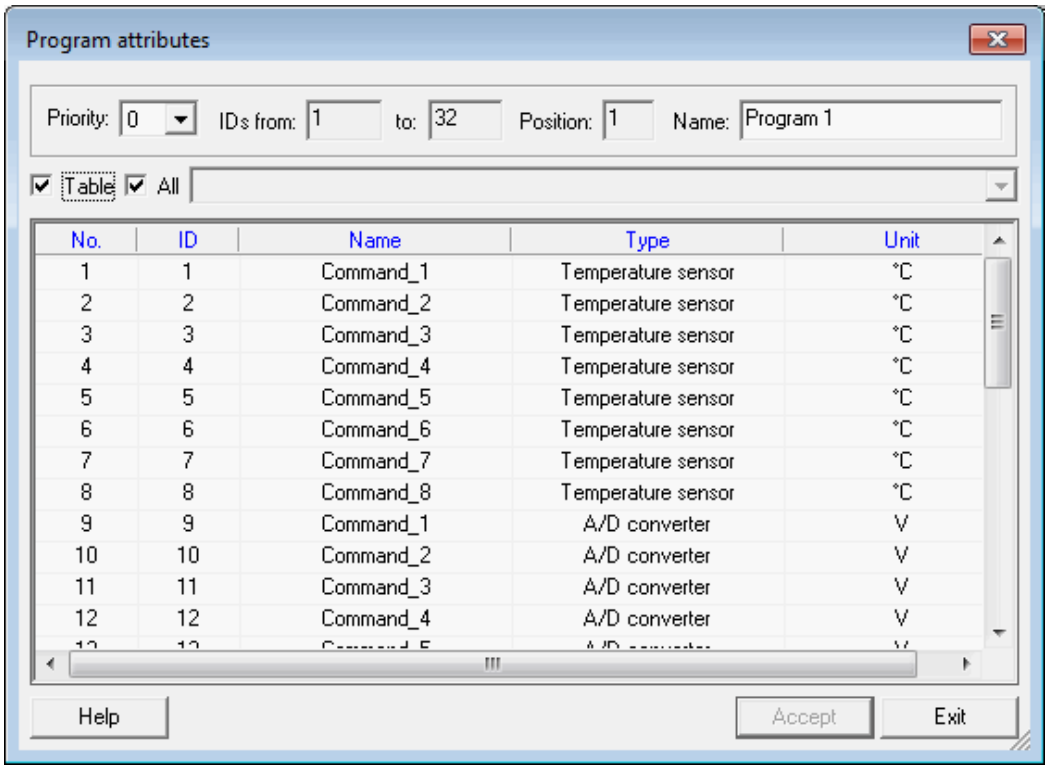
Priority 0:
All commands are executed immediately in the order of their internal IDs.
This is the standard procedure and is used as long as nothing to the contrary has been specified.

Priorities 1 through 5:
All commands are executed immediately, and in order, in accordance with their priorities.
Programs with priority 1 are executed first.

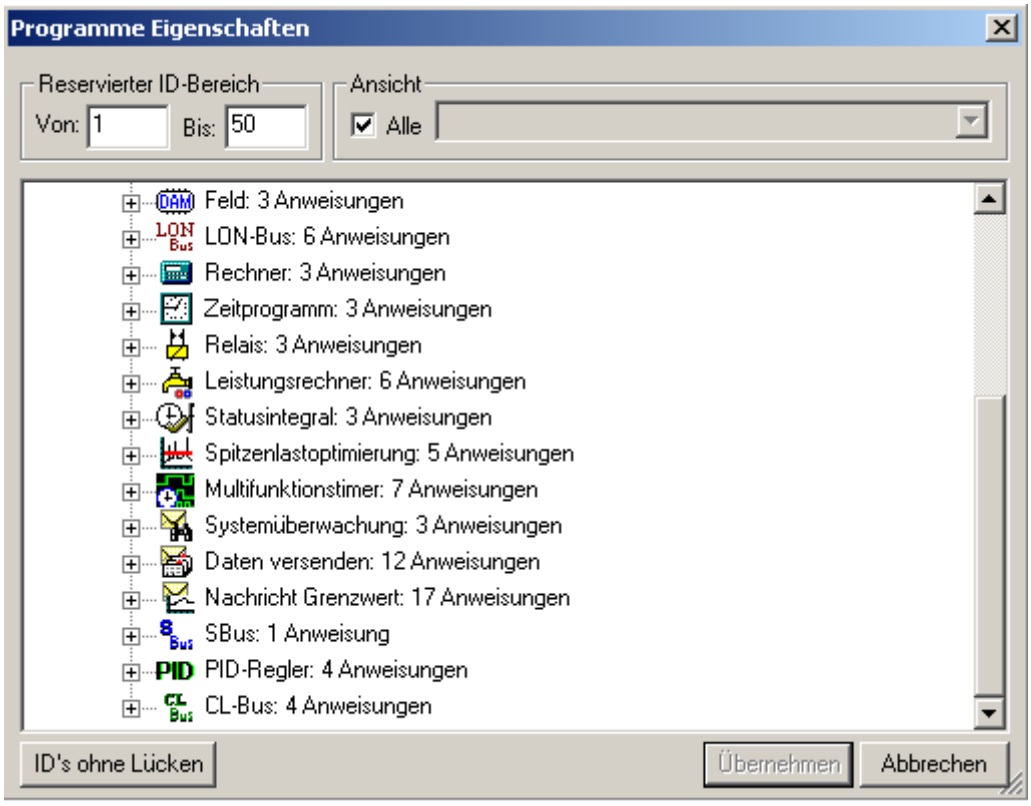
Priorities 6 through 10:
All commands are executed individually, as long as no other commands with higher priorities are pending.
Programs with priority 6 are executed first.

Program Command Attributes in Tabular View

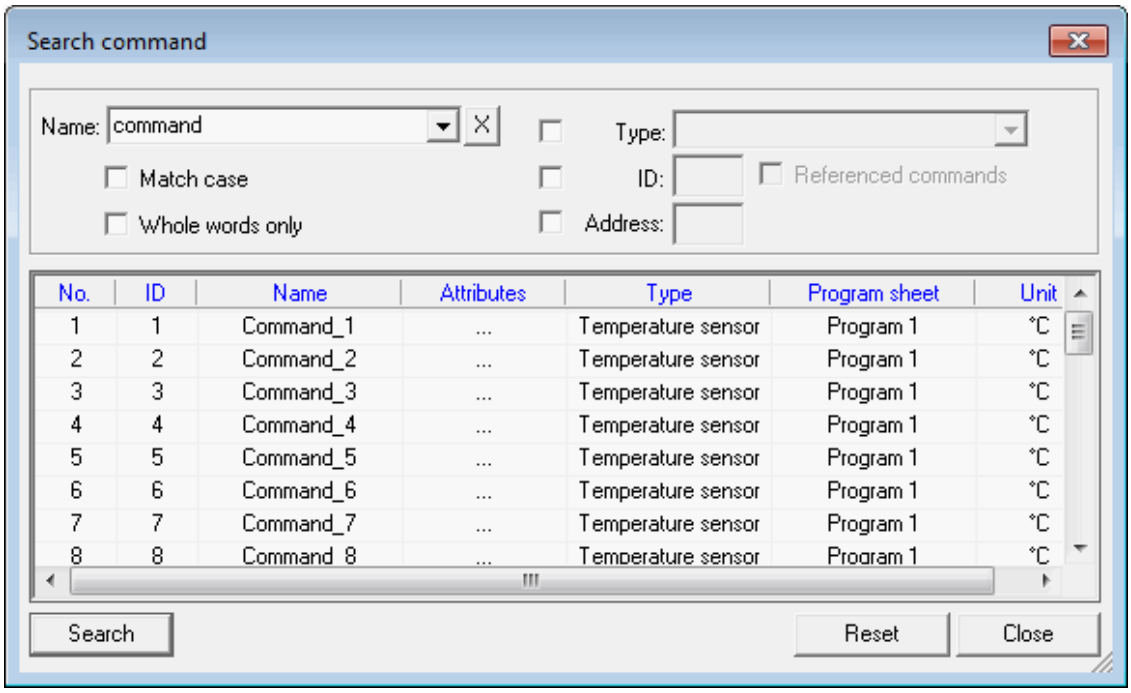
As of version 1.7.0.1, all command attributes can also be edited in the tabular view.



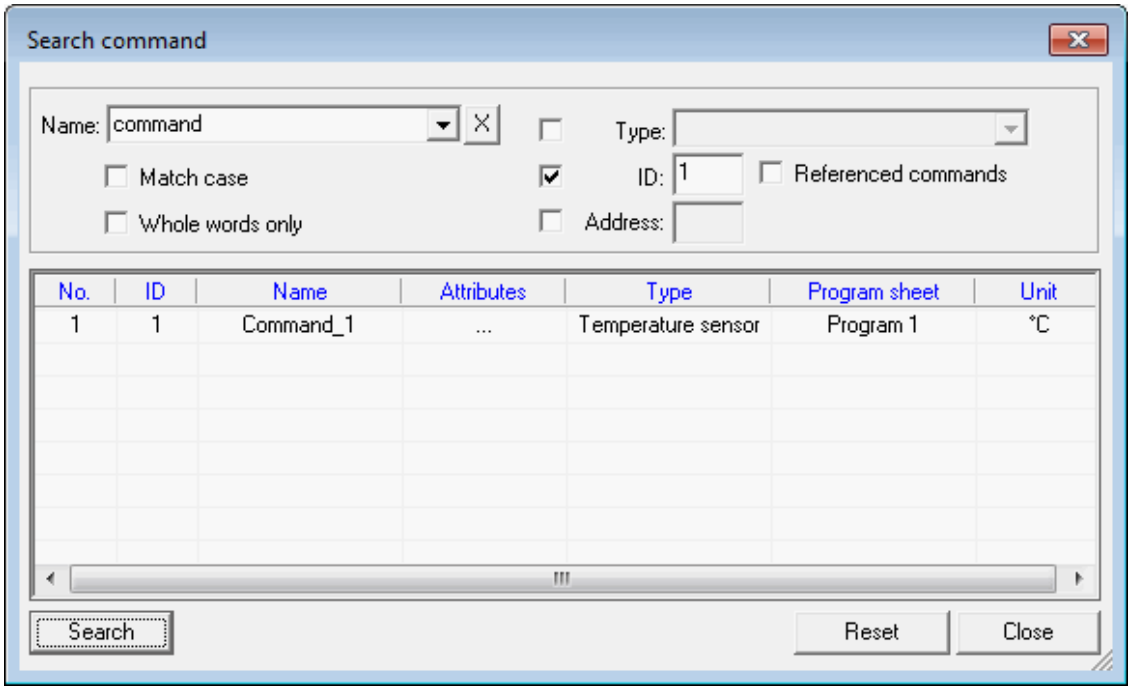
As of version 1.7.0.1, all programs can be converted with uninterrupted IDs. It's also possible, for example, to convert a reserved range of IDs.



Finding Program Commands



As of version 1.7.2.0, all referenced commands can be found for any given ID.



Transmitting Programs to the SMARTCONTROL and Starting Them

Programs are transmitted to the SMARTCONTROL and tested by clicking the "test programs in SMARTCONTROL" button , but they are not permanently saved to memory.

The "save programs to SMARTCONTROL" button is then enabled, by means of which the programs can be permanently saved to the SMARTCONTROL.

Restarting the SMARTCONTROL

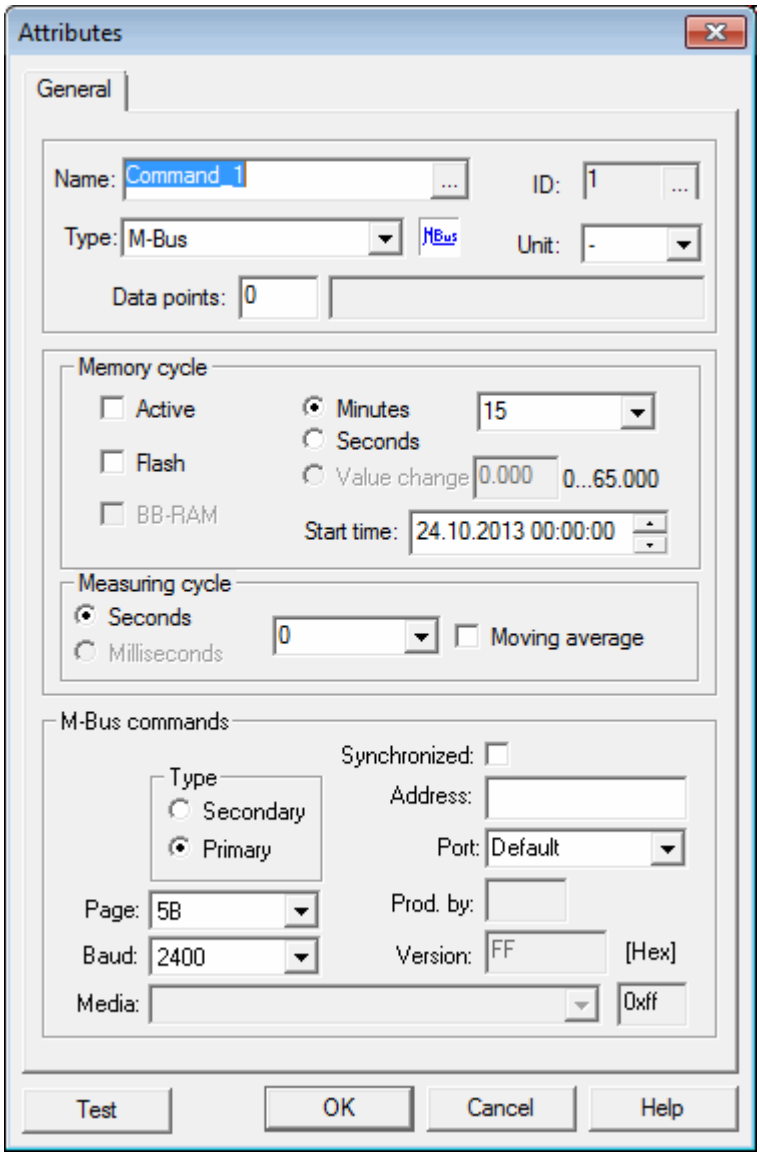
Observe the section entitled "*Shutting Down and Restarting SMARTCONTROL*" in order to obtain recordings from the last 20 minutes which have been saved to RAM before restarting.

The SMARTCONTROL can be restarted by clicking the button.
Depending upon the type of connection, communication with the SMARTCONTROL is not possible for a given period of time (approx. 2 seconds with TCP/IP, approx. one minute with GSM).

M-Bus Command Type

The M-Bus (metering bus) is a European standard for remote meter reading, and can also be used for all other types of consumption meters, as well as various sensors and actuators (source: http://www.m-bus.com/).
The SMARTCONTROL Manager can communicate with all devices which function in accordance with M-Bus standard **EN 1434-3**, and which are connected to the M-Bus serial port at the SMARTCONTROL via a level converter. Primary or secondary addressing can be used for the individual meters.
However, the SMARTCONTROL Manager **cannot** configure various devices from the individual manufacturers. This must be carried out by the manufacturer of the respective device, or with the software intended for this purpose, or you can use the "M-Bus Application" command (further below) in order to configure the device's parameters.

M-Bus commands can be generated automatically in a file after selecting "Generate M-Bus command" in the "Extras" menu.



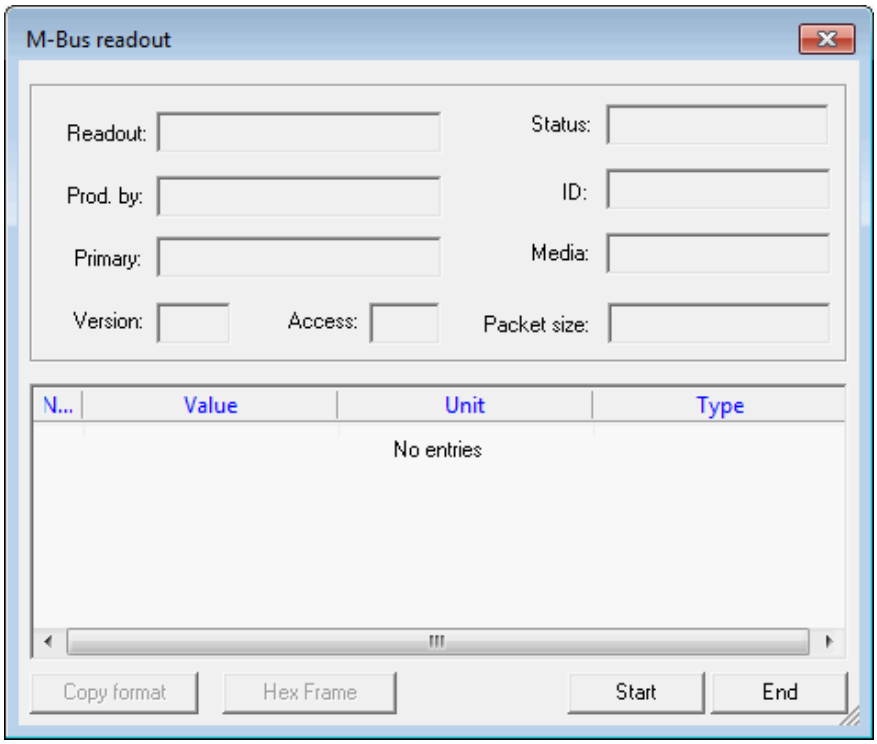
Manual procedure: -> Select the M-Bus command type.
The number of data points supplied by the M-Bus can be entered under address (top left) and broken down (see M-Bus frame analyzer below). If this number does not coincide with the data points actually supplied by the M-Bus, the SMARTCONTROL does not save any data for the respective device!
Manual entry in the bottom section:
In the case of **primary** readout, the **address** and the **baud rate** must be entered.
In the case of **secondary** readout, the following are also available for selection: "**Manufacturer**", "**Version**" and "**Medium**".

The following can be entered:

1. **Address:** primary or secondary address (secondary: max. 8 digits – in case of more digits use the last 8 – querying usually works this case as well).
2. **Manufacturer:** 3 character manufacturer designation (M-Bus compliant).
3. **Version:** additional manufacturer-specific selection (hexadecimal). Leave this field empty, or enter "FF".
4. **Medium:** additional selection of a medium. Leave this field empty as well, or use the selection menu.
5. **Port:** interface selection. The standard serial M-Bus interface at the SMARTCONTROL is the default setting.

6. **Synchronized:** can be used in combination with synchronizable M-Bus meters and the "M-Bus Application" command type.

A new window appears after clicking the Test button by means of which the respective M-Bus device is retrieved.



The current device is read out after clicking the "Start" button.

Function of the M-Bus Fame Analyzer within the M-Bus Command:
As of firmware version 2.0.17, received M-Bus data can be further processed directly at the SMARTCONTROL, e.g. for limit value observation.
Enter the number of values received from the meter to the general address field at the top left in the M-Bus command to this end.
The M-Bus data are broken down as a result. The corresponding values can be accessed via the network variables list. The ID is the same as with a fieldbus:
Virtual ID = 10,000 + ID of the M-Bus command x 100 + numeric value.
Example: the ID of the top command is 29. As of 12901, the corresponding data points are then available under Network Variables -> Readout. The units of measure are taken from the M-Bus.
These network variables can then be further processed by the SMARTCONTROL, e.g. for calculator commands.
Date and time entries, as well as all values with a bit length of more than 32 bits, cannot be broken down.
No information regarding bit length is displayed in the user interface, and thus it's not possible to say which values can and cannot be analyzed. Please refer to the manual or the appropriate software tools provided by the device manufacturer in this regard.
Refer to the online help as well!

Caution:
If the received number doesn't correspond with the entered number, the values in the network list are rendered invalid and the M-Bus frame is not saved!

M-Bus Application Command Type

M-Bus devices can be addressed at times other than during "normal" MBus read-out with this command, for example in order to enter new settings to the devices from a remote location via the SMARTCONTROL Manager (depending on the device, for example, change transmitted page, new primary address …), or, for example, to cause the devices to save the current status and transmit it after a delay.

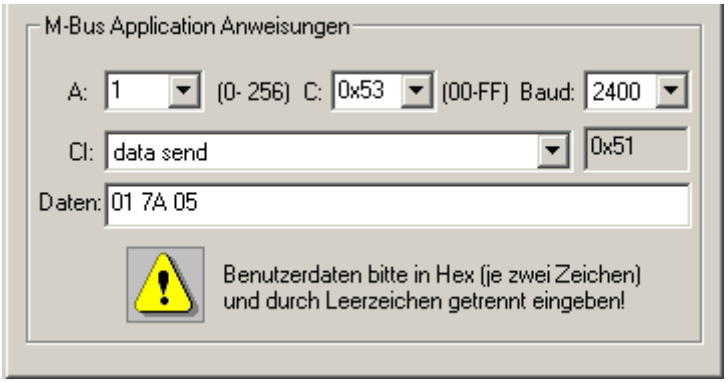
Read the corresponding protocol descriptions for the respective devices to this end.
This command can also be used, for example, to start simultaneous read-out in a larger M-Bus network.

Example 1:
Set the C field to 0X00 (is converted to M-Bus-Sync),
or
set all fields manually:
address (field A) to 255 (broadcast to all),
C field to 0x53 (transmit data to slave),
CI field to "synchronize action" (0x54) and
leave the data field empty.
How it works:
The command is (should be) started roughly 1 or 2 seconds before the respective quarter hour (e.g. set start time to 00:59:58). Furthermore, the command must be in a separate program sheet with a higher priority than the M-Bus meters to be read out.
A so-called sync signal is then transmitted to broadcast address 0xFF immediately before M-Bus read-out is started (as a rule every quarter hour).
In response, all M-Bus devices which support this command * save their current meter readings. These meter readings can then be read out at leisure before the next quarter hour starts.

* This command is not supported by all M-Bus devices. In addition to this, further settings at the devices themselves are also required.
Please contact the manufacturer/supplier of your M-Bus devices for further information.

Example 2:
Setting a new primary address at a device:

Prerequisite: The device must allow resetting (parameters configuring mode available?).
Please refer to the manufacturer's manual for details.
The fact that only one device with the primary address to be changed may be present within the M-Bus network remains unchanged!
For example, if several meters with the default address (primary = 0) are in the network, the following procedure **cannot** be used!
Procedure:



Enter the old primary address to field "A" and enter 0x53 to field "C" (write user data).
Set field "CI" to "data send" (= parameterization).

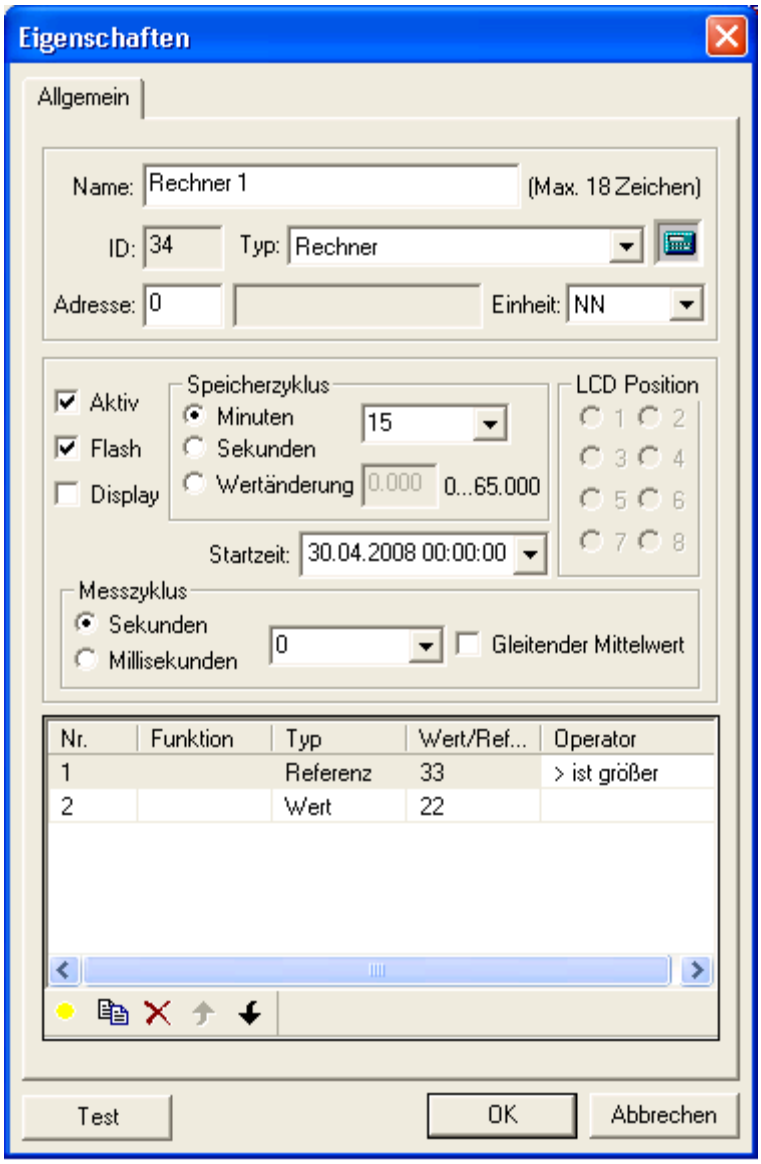
Then write the following character string, separated by blanks, to the “Data” field:
01 7A XX

Replace “XX” with the new primary address.
According to M-Bus definitions, you can use addresses 1 through 250!
Please note that the address must be entered in hex format:
01 through FA.

Attention:
Make sure that the same primary address is not assigned to any other devices! Otherwise it won’t be possible to address these devices with their primary addresses.
Corresponding documentation and identification of the meters with their primary addresses will help you to avoid faulty installation.

Calculator Command Type

Note: Use the new formula calculator for complex calculations with several expressions (see following section).



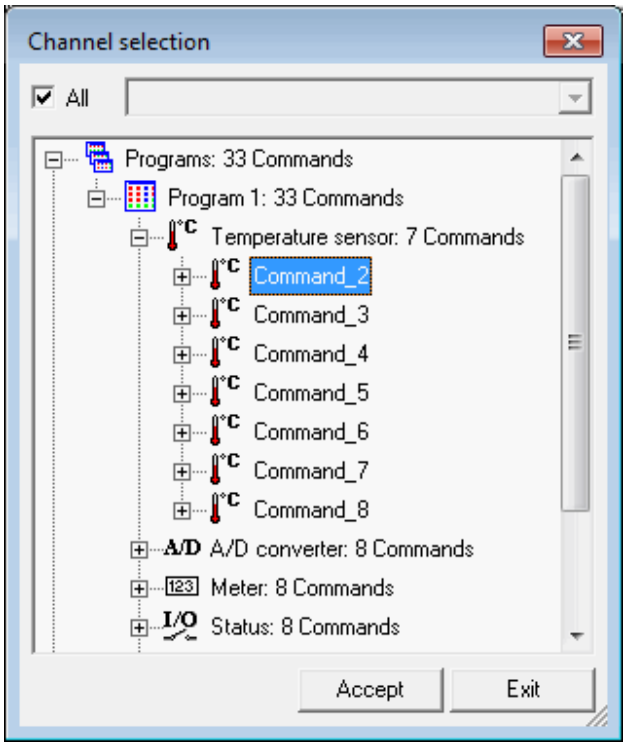
Rules regarding precedence of multiplication and division before addition and subtraction are not observed.
Enter numbers using the English numeric format, i.e. decimal point instead of decimal comma.
Example: 3.33 instead of 3,33.

A new command line is created after clicking the button. The operator of the first command line cannot be configured until the second line has been created.
A function can be selected by clicking the box underneath "Function" in the respective line.
Meanings:

! :	Negation
? :	Logic: converts all values <-0.5 and >+0.5 to 1 and all others to 0.

Functions such as sine and tan can also be selected.

These functions can then be linked with either values (numbers) or references (program commands, e.g. a temperature channel) via operators (calculation functions) such as "+" or "*".
After clicking "Value" or "Reference" you can switch, for example, from "Value" to "Reference".
Calculator commands do **not** work with meter readings.
If several lines have been filled in, you can move the values up or down with the buttons.
If "Reference" has been selected, a dialog box appears after clicking the button, at which a program command can be selected directly.



In the above example, temperature 1 is read in as a reference, and comparison takes place to determine whether or not it's greater than 22°. And thus the command reads out a 1 as soon as temperature exceeds 22°, or otherwise 0. This function can be tested with the "Test" button.

Up to 40 command lines are possible per command.

If a measuring cycle of greater than 0 is entered, only one mean value is generated during the memory cycle. For conditions, for example, this means that if the condition is true, 1 is added to the internal (mean) value.

For control tasks which are intended to act immediately and without delay, the memory cycle should thus be set to, for example, 1 second and the measuring cycle to 0. Do not activate the "Flash" checkbox in this case.

Be sure to adhere to the correct sequence when programming conditions for a calculator. Reason: There are not brackets. Processing takes place in the order in which the conditions appear.

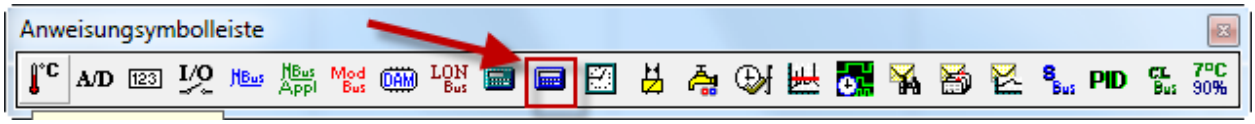
Example: Condition A OR condition B AND condition C

This means that the result of (condition A OR condition B) is linked to condition C (AND).

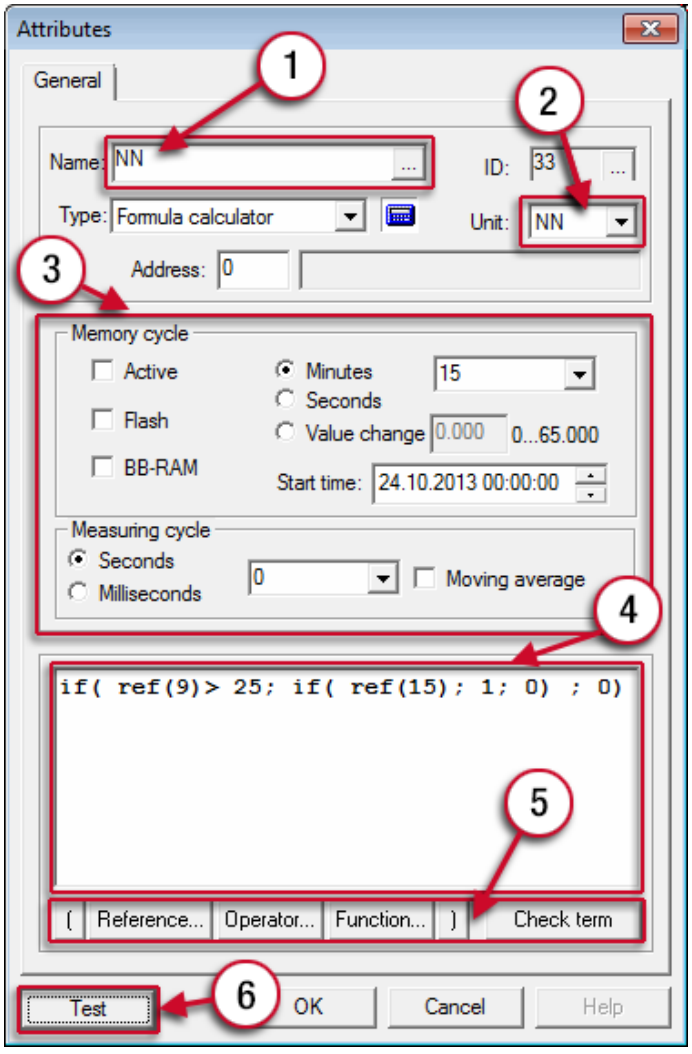
It does **not** mean that condition A is linked with (OR) the result of B+C.

Formula Calculator Command Type

The formula calculator makes it possible to combine various values with each other. In this way, current sensor values, meter readings or other data can be used for calculations. The formula calculator allows for the use of brackets and nesting of individual functions, providing you with flexibility in setting up calculations.



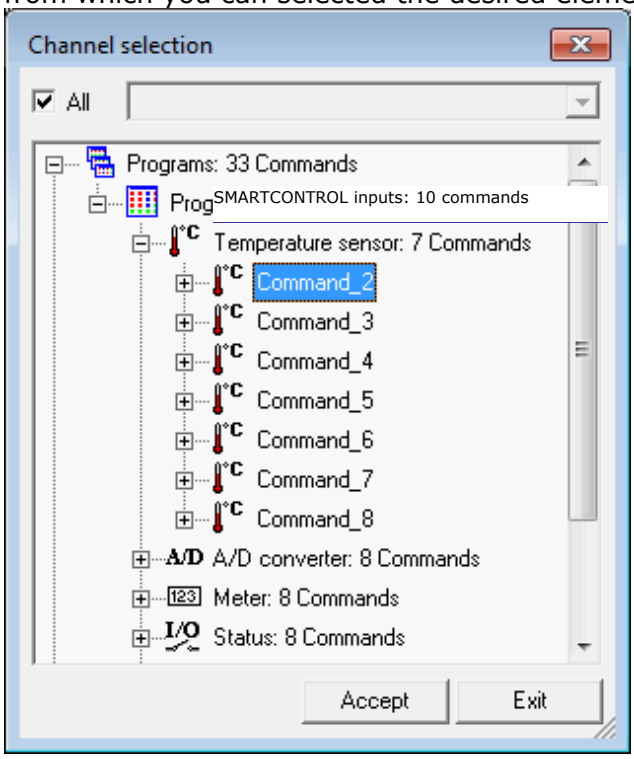
Drag the icon (identified in red) into the program sheet in order to use the formula calculator. Select the calculator and press "Ctrl+Enter", or right click the module and select "Attributes".



This display shows the attributes of the new formula calculator.

1 The name of the application can be freely selected.
2 Unit (of measure): Selection can be made from 40 units of measure. If NN is selected, no unit of measures is assigned to the response value.
3 Memory cycle and measuring cycle settings
4 Formula display window
5 Formula writing tools
6 Test: calculates and displays results. Always check the results of your formulas in order to detect programming errors as early as possible.

The formula writing tools provide you with support in creating your own formulas. You can insert values from a sensor, from meters, from other devices or from one of the calculators with the "Reference" function. A dialog box opens after clicking the "Reference" button, from which you can selected the desired element.



Tip: You can change or check the reference by selecting the number X in the brackets (ref(X)) and clicking "Reference". Or you can select the number X, right click it and then access the attributes.

You can also use the result of a function. Click the "Function" button in order to use one of the following functions:

Function	Description
abs()	Absolute amount (always a positive number without rounding to a whole number)
cos()	Cosine calculation (argument in degrees)
cosh()	Hyperbolic cosine
exp()	Exponential function. exp(2) = e², where e represents the Euler number
if(;;)	IF command for evaluating expressions. if(condition; response value for condition TRUE; response value for condition FALSE)
ln()	Natural logarithm (log of base e)
log()	Logarithm of base 10
NOT()	Negates the expression. Response value 1 where -0.5 < expression < 0.5, otherwise response value 0
rand()	Generates a random number. The range is specified in the brackets.
root()	Extracts the square root
sin	Sine calculation (argument in degrees)
sinh	Hyperbolic sine
tan	Tangent calculation (argument in degrees)
tanh	Hyperbolic tangent
TRUE	Checks whether or not the expression is true. Response value 0 where -0.5 ≤ expression ≤ 0.5, otherwise response value 1

The functions can be nested within each other.
Example 1:
root(abs(ref(1)))
The square root of the absolute amount of the value of reference 1.

Example 2 from the figure:

```
if(ref(1) > 25;
        if(ref(2) < ref(1); 1; 0);
        0)
```

ref(1) is the reference to the inside temperature sensor.
ref(2) is the reference to the outside temperature sensor.

When inside temperature is greater than 25°, checking takes place to determine whether or not outside temperature is lower. If this is the case, the response is 1, or otherwise 0. The response value could be used in order to operate a remote actuating mechanism via a relay.

All expressions can be linked to each other with the help of the operators (an expression is a natural number, a response value, a reference or a function).

Operand	Description
+	Addition
-	Subtraction
*	Multiplication
/	Division
^	Power x^2 corresponds to x^2
<	Less than comparison, results in 1 if left expression is smaller than right expression, otherwise 0
=	Equal to comparison, results in 1 if left expression is equal to right expression, otherwise 0
>	Greater than comparison, results in 1 if left expression is greater than right expression, otherwise 0
AND	If the value of **one** of the expressions is ≥ -0.5 and ≤ 0.5, the AND comparison results in 0, and otherwise 1
OR	If the value of **both** of the expressions is ≥ -0.5 and ≤ 0.5, the OR comparison results in 0, and otherwise 1
XOR	If the value of **only one** of the expressions is ≥ -0.5 and ≤ 0.5, the XOR comparison results in 1, and otherwise 0

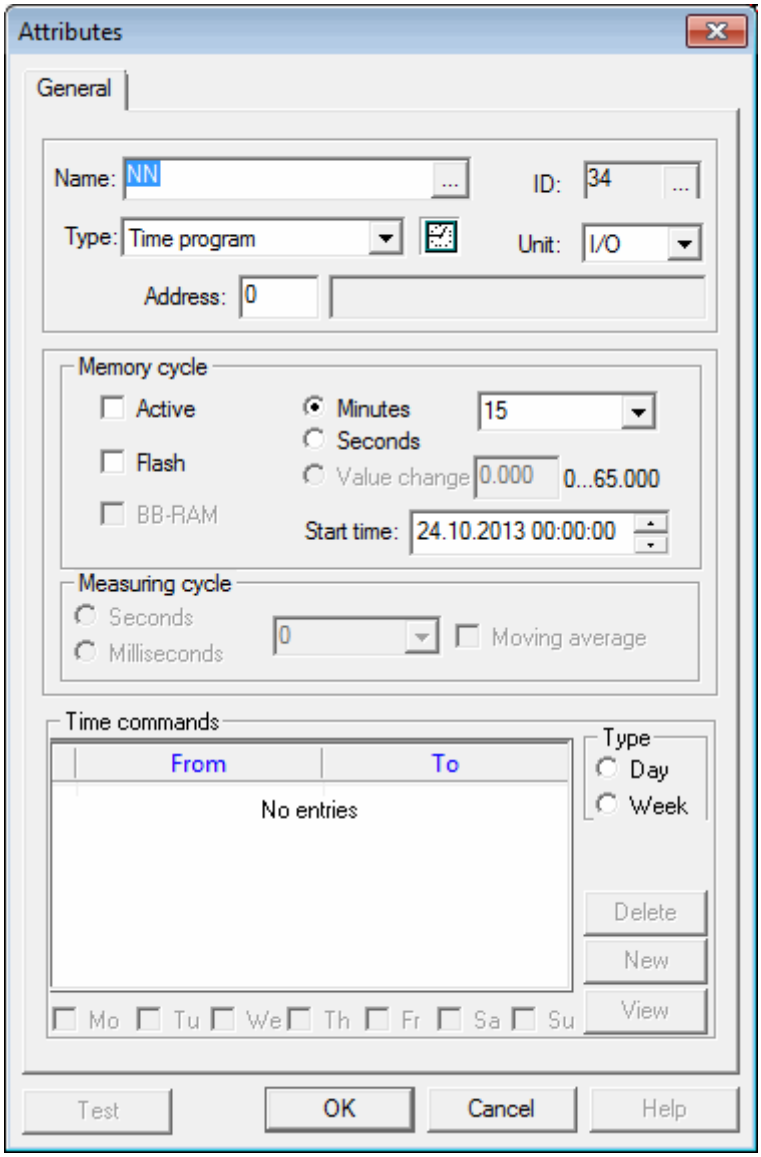
Caution:
Rules regarding precedence of multiplication and division before addition and subtraction are not observed. The expressions are processed in the order in which they have been entered. Brackets are observed.

Example:
3 + 4 * 7 results in 49, instead of the expected 31.
3 + (4 * 7) provides us with the correct result.

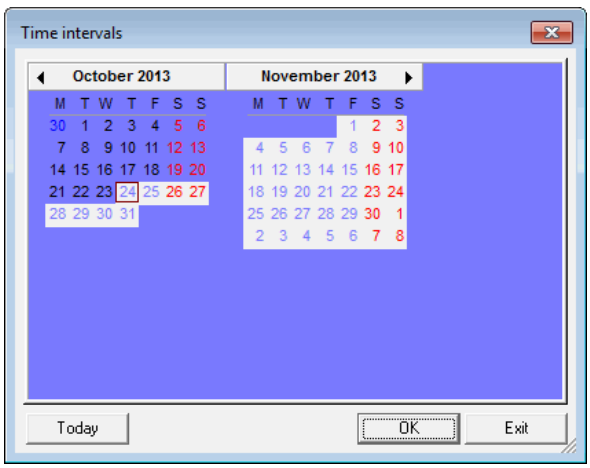
The same applies to logic expressions.

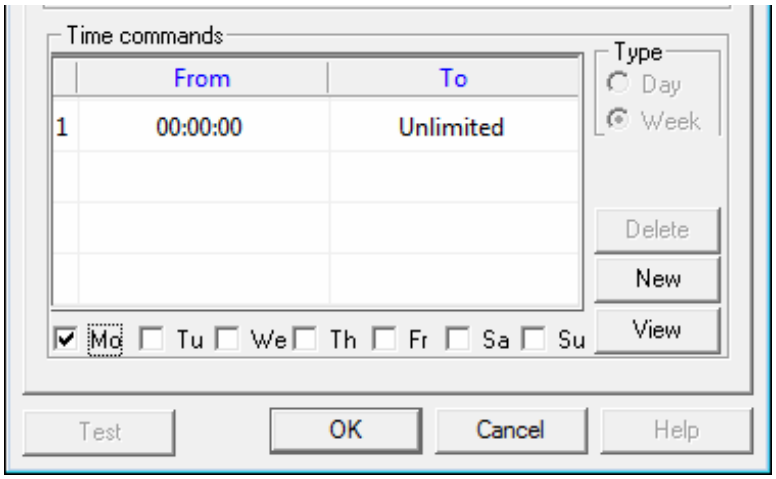
Example:
Condition A has a value of 0, and conditions B and C are 1.
A & B || C results in 1 => (0 & 1) = 0, 0 || 1 = 1
In contrast, C || B & A results in 0 => (1 || 1) = 1 & 0 = 0
C || (B & A) provides us with the correct result due to the use of brackets.

Timer Program Command Type

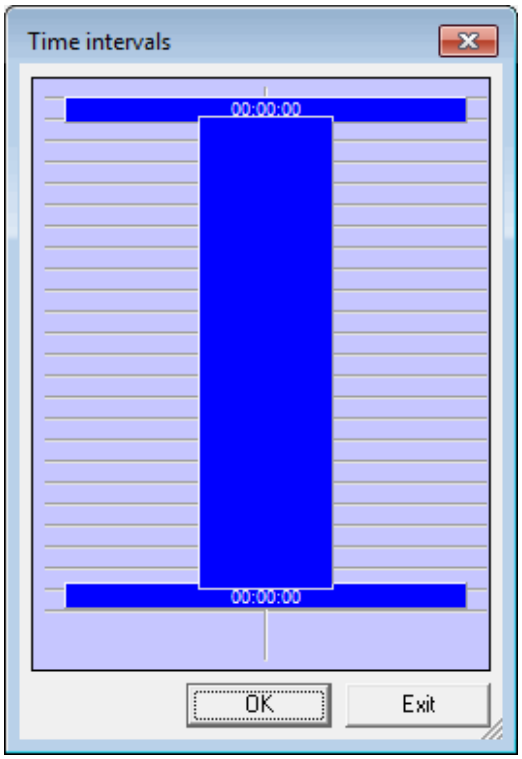


Date-specific calendar days can be entered under “Day”, and switching times can be entered during these days.
A calendar window appears after clicking the “View” button. A date can be selected from this window.



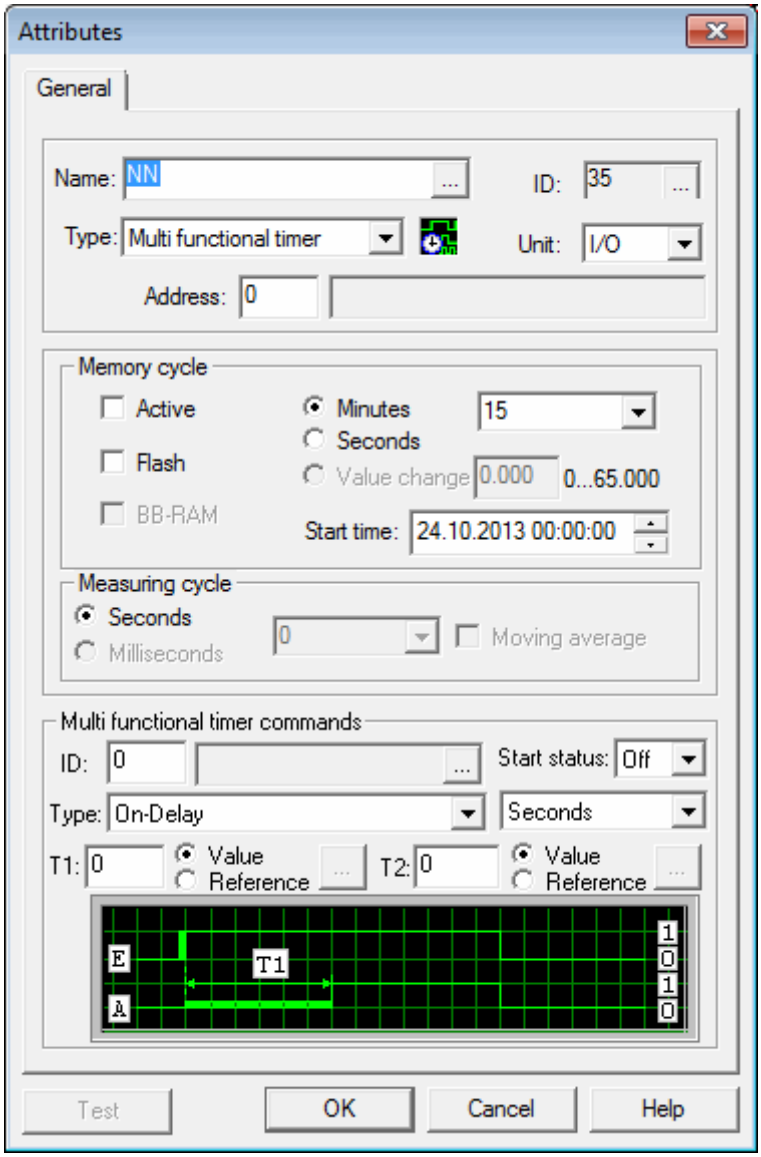


Weekdays on which switching takes place a certain times each week can be entered under "Week".
A day window appears after clicking the "View" button. The switching time can be changed here.



The command can be checked by clicking the "Test" button.

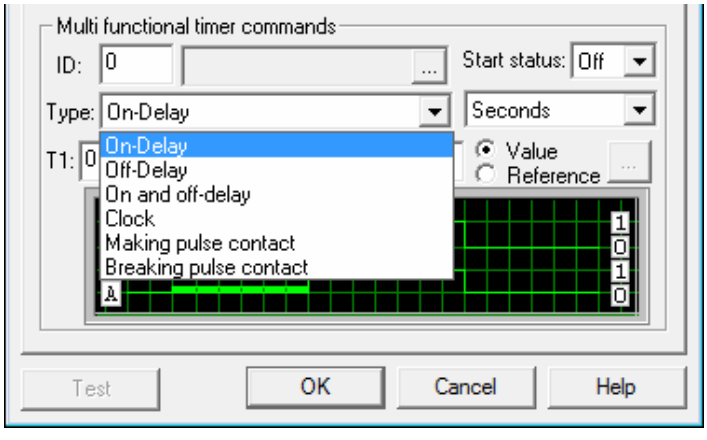
Multifunctional Timer Command Type *Tip: Refer to the online help as well!*



The multifunctional timer is capable of generating diverse time-linked output signals.

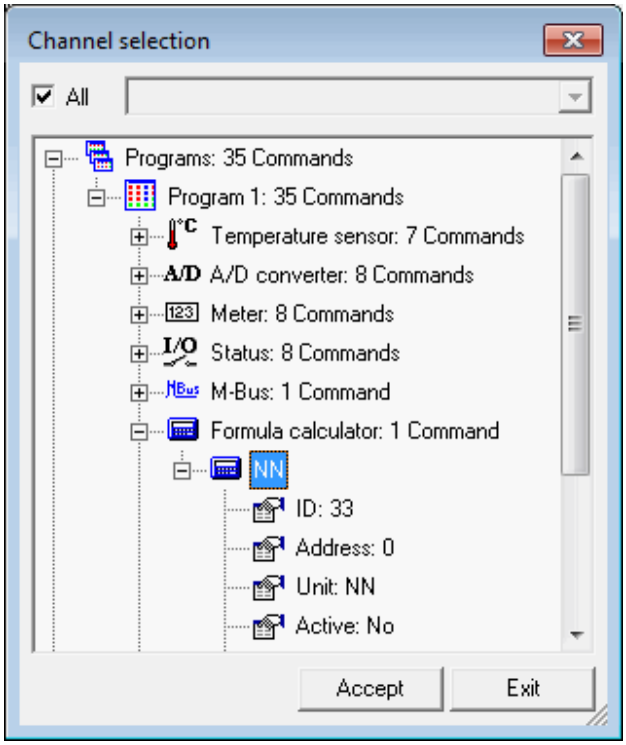
The measuring cycle can be specified in milliseconds for a faster reaction.

The following types are possible:



Response delay: delayed switch-on
Off delay: delayed switch-off
Clock: pulse as output signal
Making pulse contact: immediate switch-on, delayed switch-off
Breaking pulse contact: immediate switch-off, delayed switch-on

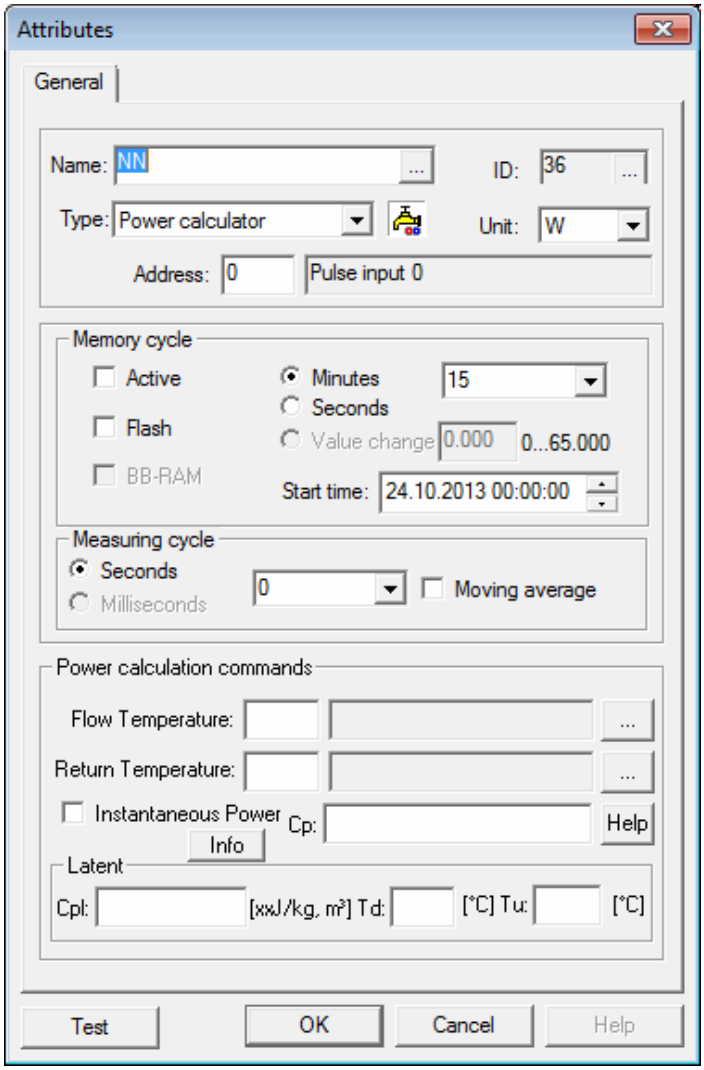
A channel is specified which functions as an input signal, e.g. for response delay (in the above screenshot calculator "T boiler > 60").
After clicking "...", a window appears in which a program command can be selected.



T1 has various functions depending on command type. Time can be selected in seconds or milliseconds. With the response delay command type, T1 is the response delay duration. T2 is time from switch on to switch off.

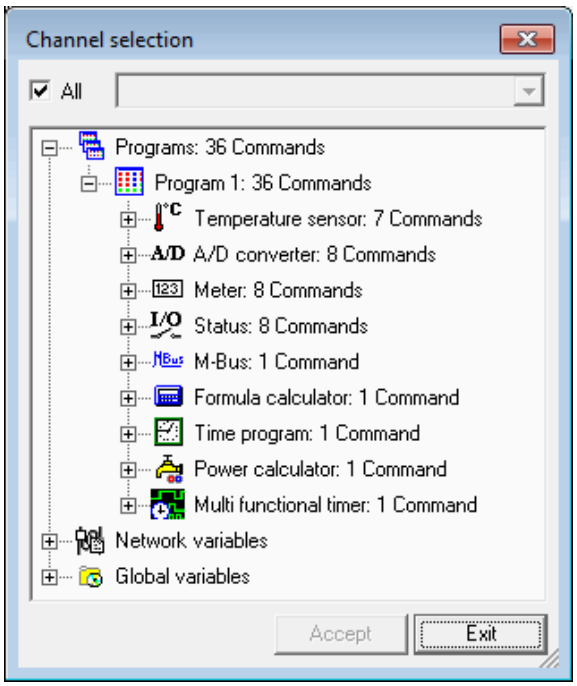
In the above example:
As soon as calculator "T boiler > 60" reads out a 1 signal, and the condition for "T boiler > 60" is thus fulfilled, the input of the multifunction relay receives a 1 signal.
Delay time entered at T1 (response delay) is then started.
After delay time has elapsed, the multifunction relay is switched to 1.
T2 is time from switch on to switch off. Where T2 is 0, switch-off does not occur until calculator "T boiler > 60" switches to 0.
If calculator "T boiler > 60" switches to 0 and back to 1 during T1, re-switching occurs, i.e. response delay time is started over again.

Power Calculator Command Type Tip: Refer to the online help as well!



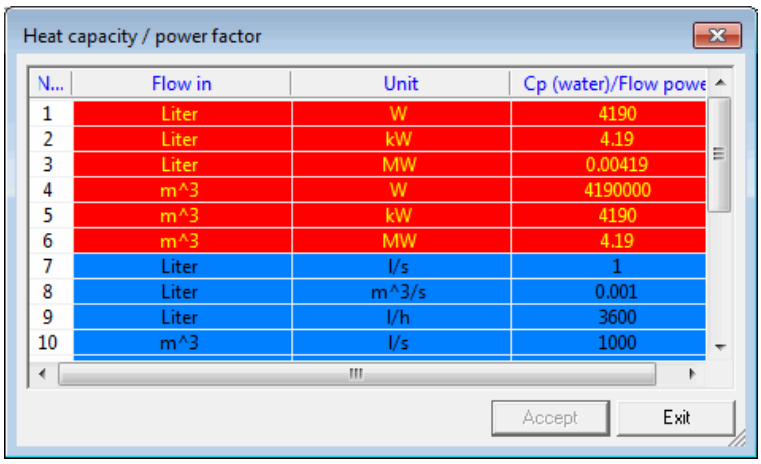
A heat/cold quantity calculator can be set up with this command.
Prerequisites:
- A flow meter with pulse input
- Temperature sensors for flow and return must be connected to the SMARTCONTROL

The address of the pulse input is entered to “Address”, and the program command ID for the flow/return temperature sensor is entered to “Flow/Return Temperature”.



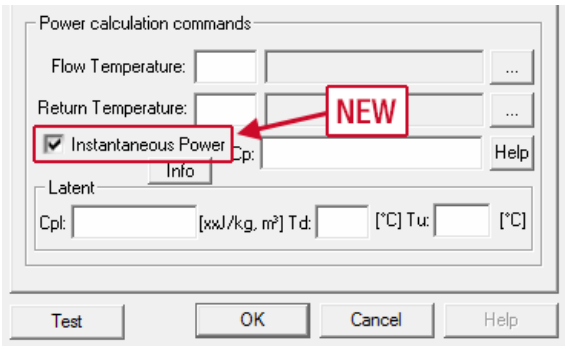
After clicking “...”, a window appears in which the program commands can be selected.

The thermal capacity of the medium has to be entered. After clicking “Help”, an appropriate window appears.



The corresponding line can be selected depending upon the flow meter's unit of measure and the desired output unit of measure.

In addition to this, latent energy quantities which are released or extracted at certain temperatures can be entered under "Latent" in the command's attributes window.



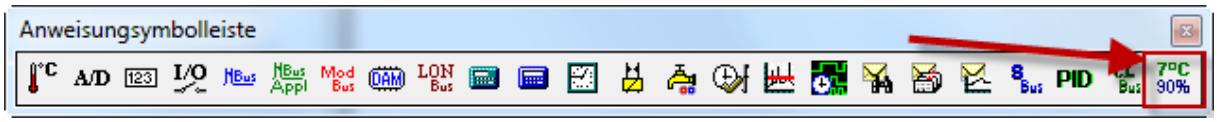
New: Instantaneous Power
Instantaneous power is calculated from the difference in time between two pulses. There is **no** equalization of the current power value at the end of the sampling period with the actual meter readings.

Because the calculation takes place during the measuring cycle, pulses received in the meantime cannot be taken into consideration. And thus the values are **not** comparable with the power values calculated from the meter readings.

Latent heat cannot be taken into account with this option.

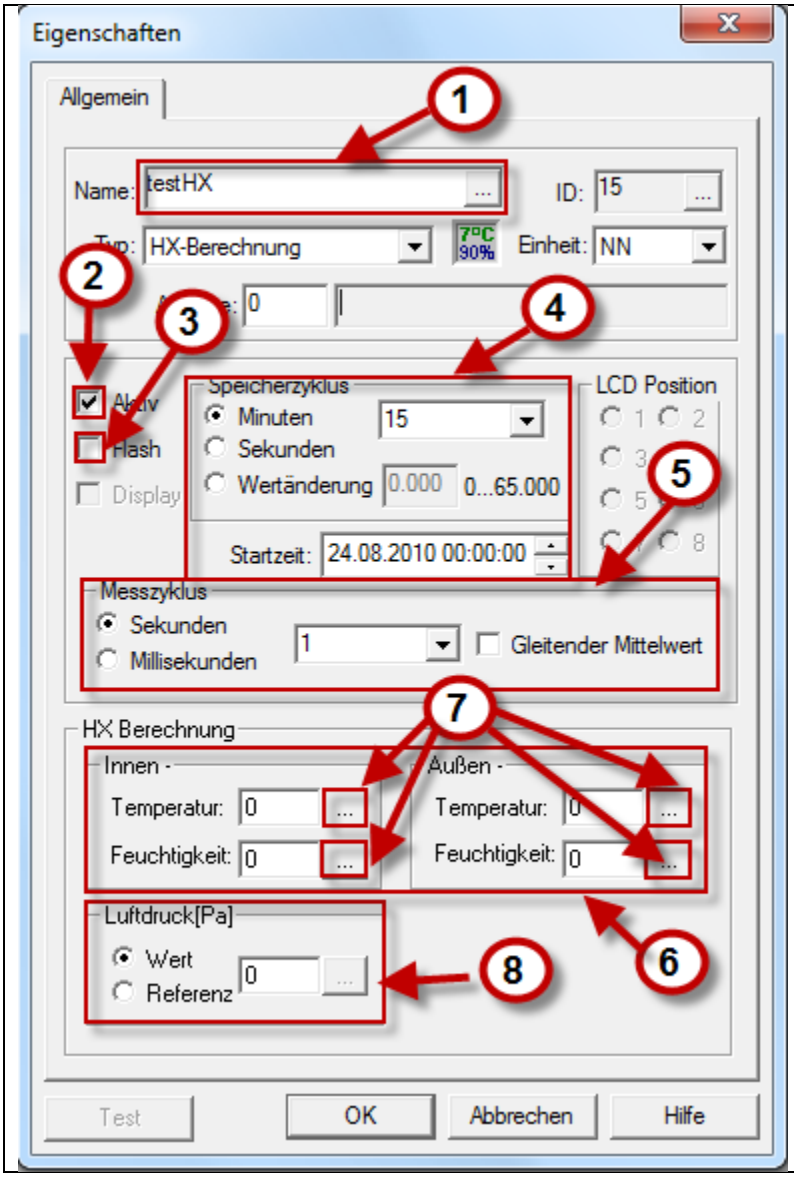
HX Calculator Command Type (humid air) Tip: Refer to the online help as well!

In the case of HX calculation, absolute atmospheric humidity in kg per kg, dew point temperature in °C and total energy in kJ per kg are calculated from air temperature and relative atmospheric humidity.



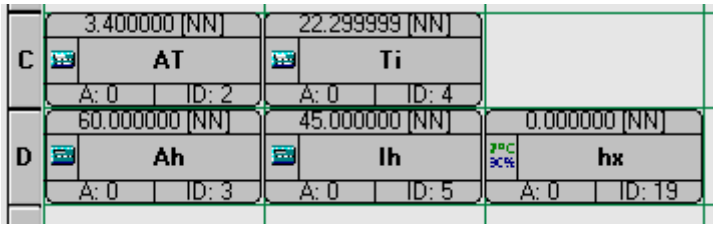
- Add the HX calculator (identified in red) to the program sheet by dragging it out of the toolbar.
- Select the HX calculator and access its attributes with the "Ctrl+Enter" key combination, or by right clicking the module and selecting "Attributes" from the context menu.

The attributes window for the HX calculator appears.



1	Application name
2	Activates/deactivates the function
3	Storage of data to flash memory at the SMARTCONTROL
4	Specifies the memory cycle (only if 3 is active)
5	Measuring cycle settings (if mean value is desired)
6	Setting for sensors for HX calculation
7	Opens the selection window for references
8	Air pressure value from a sensor, or entered manually (default value: 101,325 Pascal)

In order to increase accuracy, e.g. at higher altitudes or for other systems, “air pressure” can be either entered as a constant value between 80,000 and 120,000 Pa, or referenced to an address with an air pressure sensor in Pa. **If the entered or transmitted value falls short of 80,000 or exceeds 120,000 Pa, the standard value of 101.325 Pascal (1013 mbar) is used for calculation.**
The standard application is intended to compare two different atmospheric states. Normally, these are inside and outside temperature. If only one atmospheric state needs to be calculated, the references must be entered twice. Values from individual sensors can also be displayed separately, in order to assure better control/clarity.



The calculated values appear in the network variables in the order shown below.

No.	Name
1	Inside temperature
2	Outside temperature
3	Difference
4	Inside humidity
5	Outside humidity
6	Difference
7	Absolute inside humidity
8	Absolute outside humidity
9	Difference
10	Inside energy content
11	Outside energy content
12	Difference
13	Inside dew point
14	Outside dew point
15	Difference

Example

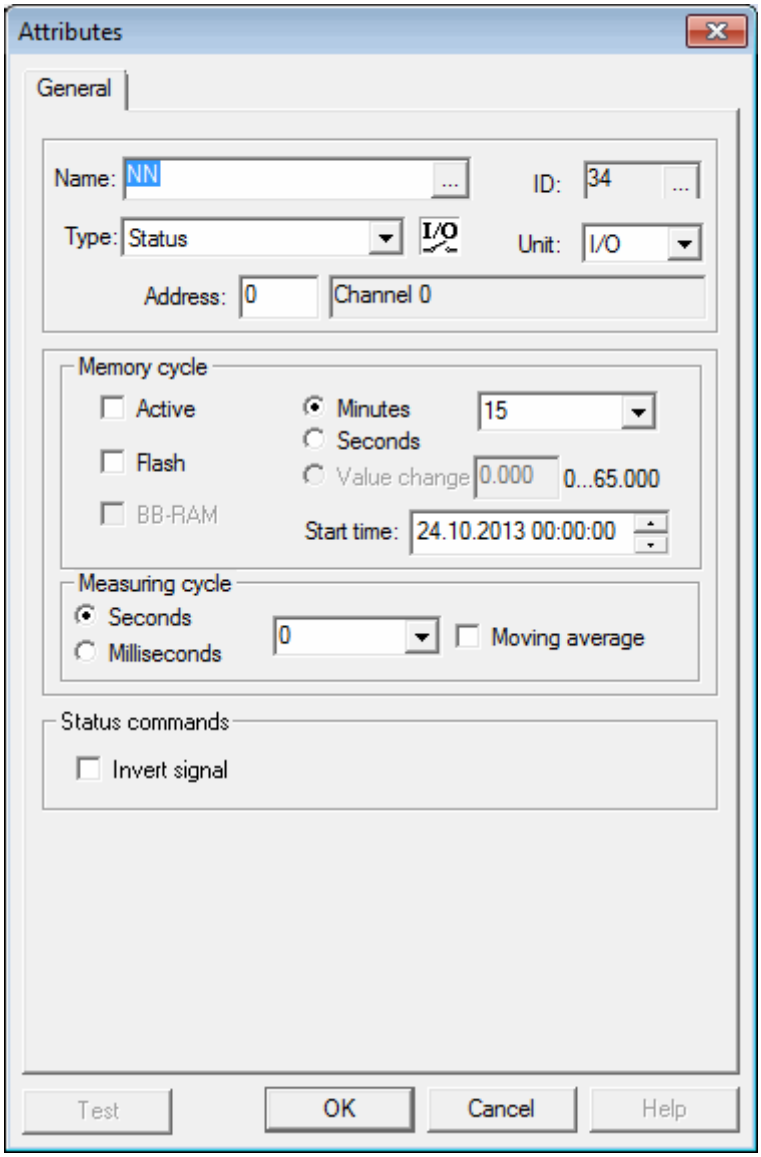
No.	Name	Network ID	Status	Entry time	Value	Unit
1		10101	0	24.10.2013 08:10:00	0.000000	-
2		10102	1	24.10.2013 08:10:00	6319.000000	-
3		10103	1	24.10.2013 08:10:00	19702671360.000000	Wh
4		10104	1	24.10.2013 08:10:00	3.700000	MW
5		10105	1	24.10.2013 08:10:00	1680.000000	-
6		10106	1	24.10.2013 08:10:00	110.000000	-
7		10107	0	24.10.2013 08:10:00	0.000000	-
8		10501	0	24.10.2013 08:15:00	0.000000	-
9		10502	1	24.10.2013 08:15:00	6319.000000	-
10		10503	1	24.10.2013 08:15:00	19702978560.000000	Wh
11		10504	1	24.10.2013 08:15:00	3.700000	MW
12		10505	1	24.10.2013 08:15:00	1680.000000	-
13		10506	1	24.10.2013 08:15:00	110.000000	-
14		10507	0	24.10.2013 08:15:00	0.000000	-
15		10601	0	24.10.2013 08:20:00	0.000000	-
16		10602	1	24.10.2013 08:20:00	6319.000000	-
17		10603	1	24.10.2013 08:20:00	19703281664.000000	Wh
18		10604	1	24.10.2013 08:20:00	3.700000	MW
19		10605	1	24.10.2013 08:20:00	1680.000000	-
20		10606	1	24.10.2013 08:20:00	110.000000	-
21		10607	0	24.10.2013 08:20:00	0.000000	-
22	Command_7: Value1	10701	0	24.10.2013 07:55:00	0.000000	-
23	Value2	10702	1	24.10.2013 07:55:00	6319.000000	-
24	Value3	10703	1	24.10.2013 07:55:00	19701749760.000000	Wh
25	Value4	10704	1	24.10.2013 07:55:00	3.700000	MW
26	Value5	10705	1	24.10.2013 07:55:00	1680.000000	-

Example: Damp Basement
In order to dry out a basement it’s important to only open the window when there’s no danger that warm, humid outside air will condense onto the cold basement walls. And thus in addition to an outside sensor with hygrometer, a temperature sensor is also required at the most unfavorable, i.e. coldest spot.
If the dew point temperature calculated by the HX calculator (e.g. -3.2 °C) is higher than the temperature of the basement wall, the window can be opened in order to dry out the basement.

Example: Controlling a Ventilation System
Above all, the task of a ventilation system is to transport an adequate supply of fresh air into the building and to exhaust used, humid air. The building is kept dry in this way, and ventilation losses are minimized. Ventilation systems with heat recovery withdraw some of the energy from the warm flow of exhaust air, thus further reducing ventilation power requirements.

Use the integrated HX calculator, for example, in order to control your ventilation system in the winter such that room humidity does not drop below 30%. This can be accomplished by only turning your system on when outside air has a high water content (e.g. > 4 g per kg). If your indoor air is already too dry, power and/or running time should be reduced as well.

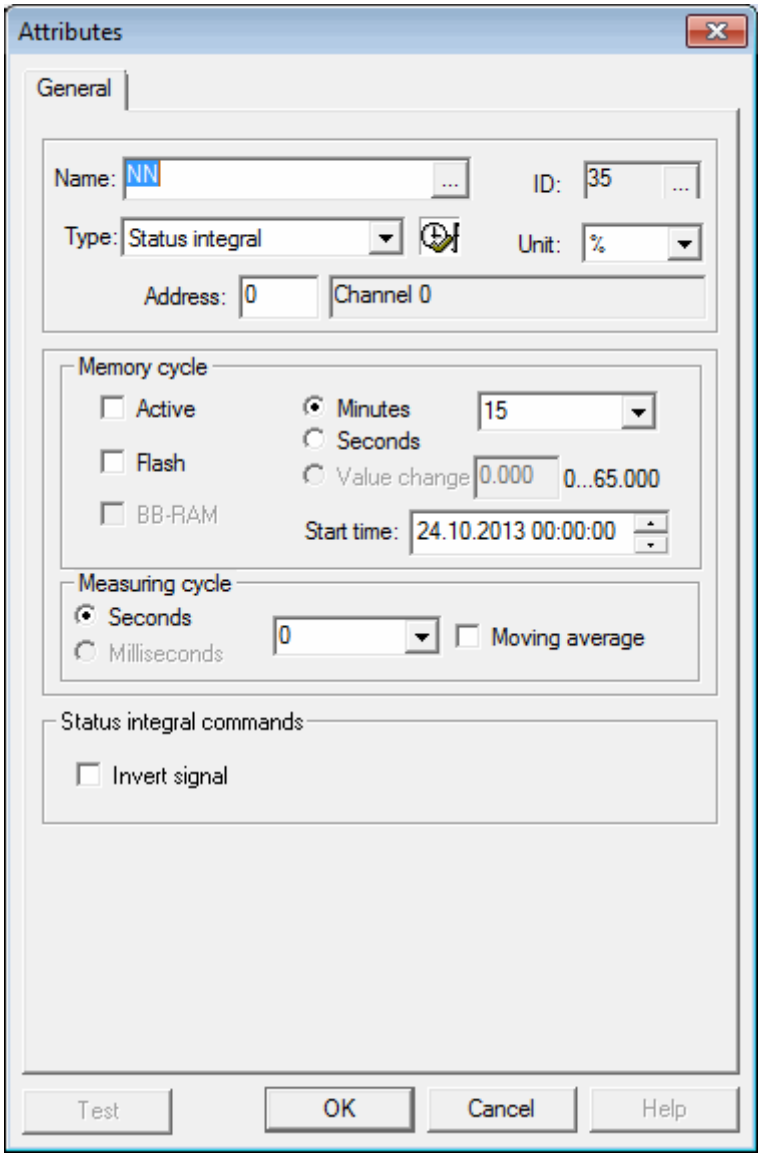
Status Command Type



The status command polls the digital input specified in "Address" once per measuring cycle. Changes of state are saved no more frequently than once per **measuring** cycle. Saving always takes place once per **storage** cycle, regardless of whether or not a change in state has taken place.

"Invert signal" changes a 0 output signal to a 1 output signal and vice versa.

Status Integral Command Type



The status integral polls the digital input specified in “Address” once per measuring cycle.

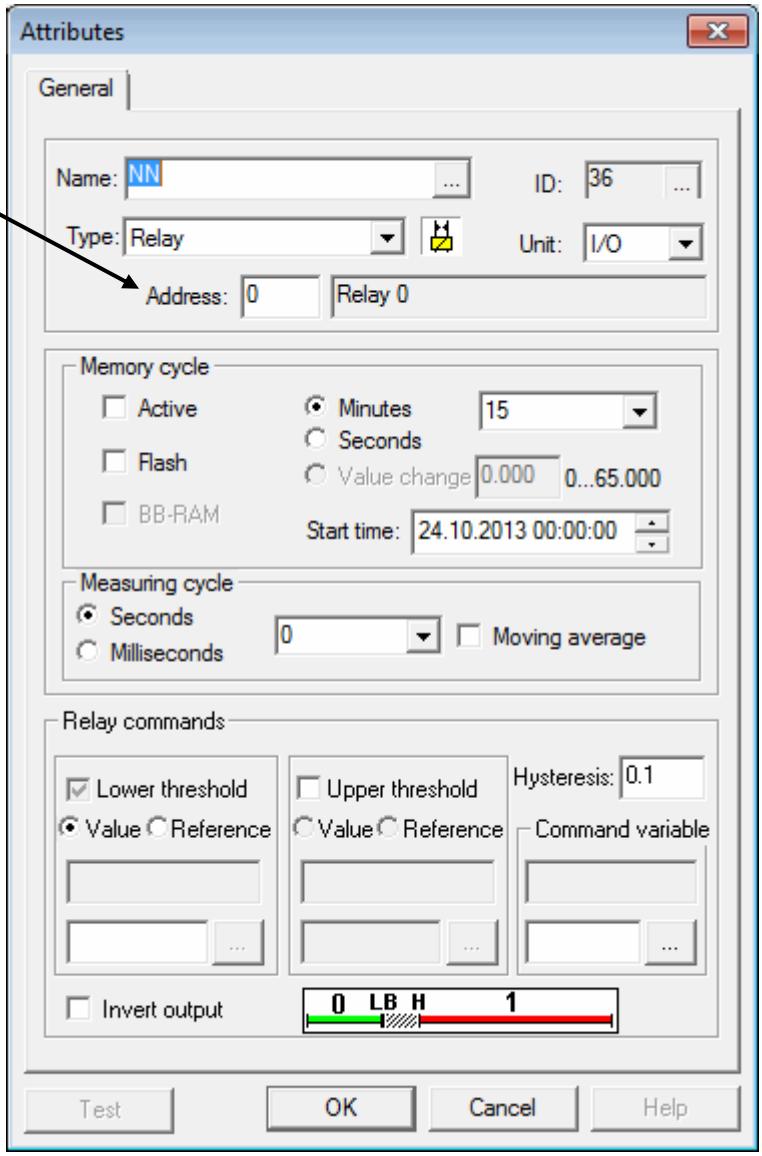
The internal “denominator” register is increased by one after each read operation.
The internal “meter” register is also increased by one for each read value which is not equal to 0 *.
If the command value is polled, the quotient of the meter and the denominator is read out, i.e. a value expressed as a percentage (between 0 and 1) which indicates how long the input signal has a value within the selected save cycle.
Moving average:
In order to avoid large jumps, the mean value of the respective previous storage cycle is averaged into the new cycle.

The command can be used, for example, to determine how long a machine, a boiler, a pump etc. has run per memory cycle (hour, quarter hour day etc.), in order to be able to generate corresponding limit values and alarm messages.

* All values less than -0.5 and greater than +0.5 are not equal to 0.

Relay Command Type

Procedure:



The address specifies the relay outputs. Address 0 or 1 is interpreted as the onboard relay address.

All other addresses are interpreted as command IDs. These are then executed immediately after a change of value.
-1 is entered under "Address" if intermediate results for subsequent calculations are desired.

With regard to the lower threshold, either a value can be entered, or a channel can be entered as a reference. After clicking the ... button, a window appears in which a channel can be selected.
With regard to the upper threshold as well, either a value can be entered, or a channel can be entered as a reference.

The measuring cycle for this command can be specified either in seconds or milliseconds. If the measuring cycle is specified in milliseconds, the relay reacts more quickly to status changes.

Entering a hysteresis assures that a given period of time elapses between breaking and making operations.
A large hysteresis results in fewer switching operations, but this makes the controller more sluggish.

How it works:

If the command variable is larger than the lower threshold, the relay is switched to 1. If the command variable is larger than the upper threshold (if the upper threshold has been activated), the relay is switched back to 0.

Example:
If the Command_1 signal with ID 1 climbs to 1, it's greater than 0.8 and the relay output is switched from 3 to 1.

By inverting the output, the switching logic can be reversed: a "greater than" condition is changed to a "less than" condition.
Additional conditions can be represented by means of calculators or time functions.

Peak Load Optimization Command Type

1 Preface

The peak load optimization function integrated into the SMARTCONTROL includes comprehensive setup options which allow for effective prevention of excessive loads. This description is **not** a set of instructions for laying out and/or implementing a peak load optimization function! This must be taken into separate consideration in each individual case, and the prevailing conditions must be taken into account.

With regard to installation, please observe the user's manuals and installation instructions as well.

Test your settings in any case and check the results which should be expected in the field as well. Set targeted power to a correspondingly low level to this end (e.g. momentary power).

Ancillary conditions, for example temperature, change continuously in a running system. Results should be checked at regular intervals for this reason, and readjusted if necessary.

2 Peak Load Optimization

General:

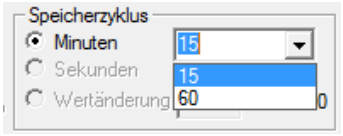
The relays are connected using failsafe logic. This means that:

- Relay off: no peak load to be expected: device on
- Relay on: peak load to be expected: device off

The relay which is to be controlled with the entries made for this command is entered under address.

It must be assured that the SMARTCONTROL is synchronized at regular intervals. The use of a quarter-hour synchronizing pulse from an electrical meter is best. This ensures that the SMARTCONTROL's measuring periods are identical with those of the energy supplier.

Memory Cycle / Start:



Specifies the **measuring period** and must be set to 15 minutes for electrical power and 60 minutes for gas. Optimization is not **started** until **after** a new measuring period has begun!
If a new command list (program) is uploaded to the SMARTCONTROL, or if the SMARTCONTROL is restarted, the peak load optimization algorithm waits until a new period begins. Power measured during this start-up phase is used for the generation of a mean value for the first controlled measuring period.

Priority

The priority determines as of which point in time during the measuring period this relay may be switched off. The measuring period is broken down into 5 equal segments to this end, or for gas into 12.

Priority 1 means that the relay may be switched off immediately.

The following priorities are arranged according to time:
Priority 2 means that the relay may be switched off after the first segment of the measuring period is concluded, priority 3 after the second segment is concluded etc.

Example with electrical power (15 min. / 5 segments):
Priority 2: Switch device off no earlier than 3 minutes after the measuring period has begun.

Example with gas (60 min. / 12 segments):
Priority 4: Switch device off no earlier than upon completion of the full hour.

The following must be observed:
A measuring period **other than** 15 or 60 minutes may also be entered! In this case, however, the priority function is disabled and mean value generation for the calculation of momentary power may react differently!

Enabling:

Any desired (analog) data point is specified here. If the value is greater than 0.5 or less than -0.5, peak load optimization is enabled for the respective relay.
It's advisable to use the calculator command type for this data point in order to define enabling logic. However, a relay can also be used for the logic. A valid relay number, for example 99, is then entered to the relay command as an address.

0 means: enabling not used.

Meter Input / Targeted Power:

Only pulse inputs at the SMARTCONTROL can be used as meters. It must be assured that the meter input reads out the correct unit of measure:

- kWh is converted to kW, and
- m³ is converted to m³/h.

If a different unit of measure is used when the meter inputs are calibrated, targeted power must also be adapted to the utilized unit of measure!

Enter desired **targeted power** in kW or m³/h. The peak load calculator then attempts to arrive at precisely this value. This value should be adapted to any special technical object and control conditions.
In concrete terms:
Targeted power should be set to a lower value if it must be assured that targeted power is not exceeded under any circumstances.
Targeted power can be set to the same value or higher if it may be exceeded occasionally.

The following must be observed:

One peak value optimization with individual settings is created for **each** device or group of devices to be switched off, i.e. for **each** relay output which needs to be switched.
Cross-links (when device 1 off, then ...) can be implemented via enabling in combination with additional commands (e.g. calculator type command).

Measuring Cycle

The measuring cycle determines how frequently the specified conditions will be checked. Several points must be observed in this respect:

- Corresponds, at the same time, to the clock cycle ("pulsing during measuring cycle")

- Influences measurement of momentary power: the shorter the measuring cycle, the shorter the time period during which momentary power can be ascertained.

In concrete terms, this means that if the metering device furnishes only rough or very few signals, the measurement of momentary power is very inaccurate. In this case it's advisable to activate the **"moving average"**.

How it works:

A new maximum targeted power value is calculated for each measuring cycle based on the already "consumed" quantity allotment (shown in the diagram below as a thick black dashed line from the end of measuring cycle 3 to the end of the measuring period). If momentary power exceeds the calculated maximum targeted power value, maximum monitoring is activated.

Moving average:

The "moving average" is calculated in a special way for peak load optimization:

Mean power from the just elapsed measuring period
+ mean power from the currently active measuring period
+ averaged power from the preceding measuring cycle
+ power from the just elapsed measuring cycle (not shown in the diagram)
÷ divided by 4

Example:

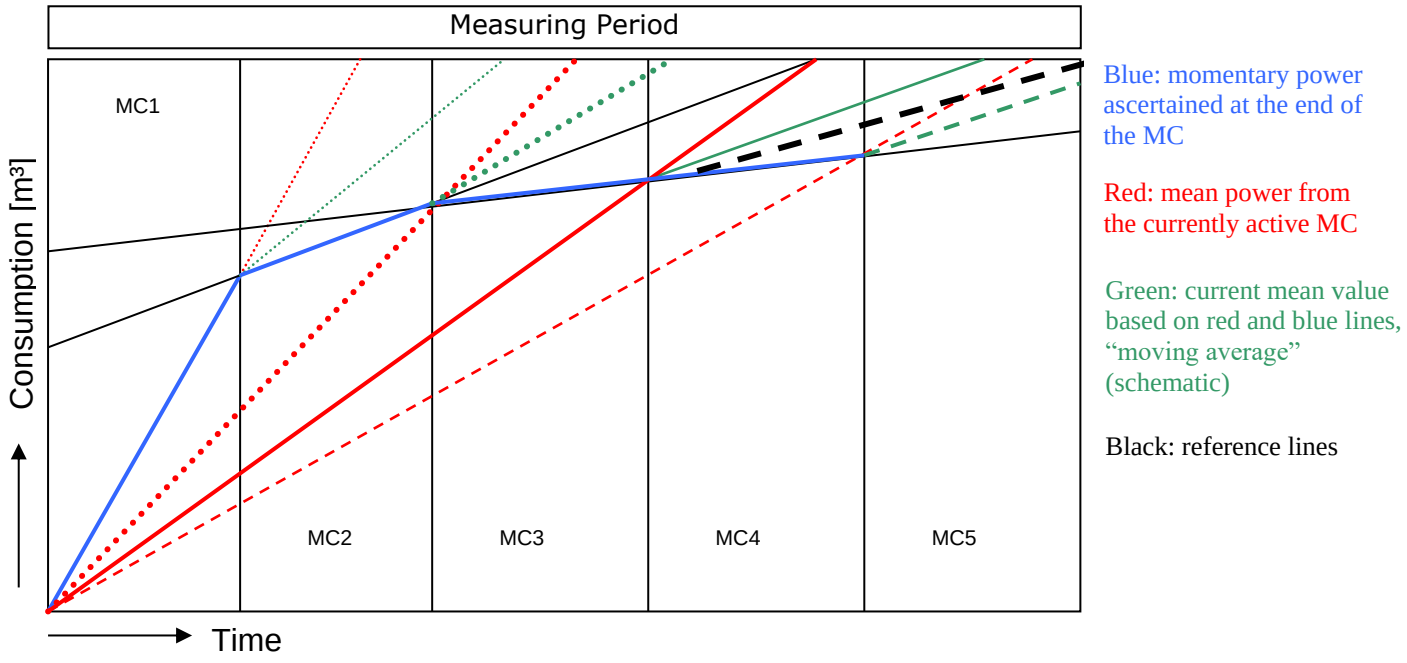


Figure 1: Diagram Demonstrating Function of the Moving Average Value (simplified)

Explanations:
The X-axis (MC 1 through 5) symbolizes the time axis over a complete measuring period.
The measuring cycle (MC) is identical to the priority timespan in the sample diagram. If the measuring cycle is shorter than the priority timespan, switching operations may occur at intermediate times!
The Y-axis symbolizes permissible consumption for the measuring period (top edge of the diagram).

Example: transition from measuring cycle 3 to measuring cycle 4:

Currently ascertained power would result in enabling (restart) in this case. The moving average increases power based on the previous measurement, so that the device remains switched off.
Average power does not drop to below maximum power until the transition to MC 5, so that the device can be started up again.

The same applies in the event that relatively low power has been ascertained at the beginning of a measuring period, and power does not drastically increase until the middle or end of the period. Shutdown is thus delayed for as long as possible.

Moving Average "Off":

Even **without** a "moving average", the calculation of momentary power is averaged to a certain extent:

Mean power from the currently active measuring period
\+ power from the just elapsed measuring cycle
÷ divided by two

In this "operating mode", peak power optimizing reacts in a much more aggressive fashion. Devices may be switched of too early, and unnecessarily.

The "moving average" function should only be deactivated for non-critical devices.

Optimization Type:

- "**Immediately Off**":
  The relay is activated immediately if an excessive value is anticipated. It remains active until the anticipated violation is no longer pending.

- "**Pulsing During Measuring Cycle**":
  The relay is switched off and back on again in every measuring cycle if an excessive value is anticipated. Power is thus cut in half on the average.

- "**On/Off**":
  Switching times are in line with the specified minimum and maximum on and off-periods.
  Please note: The specified on and off-periods take **precedence** over peak power optimization and enabling!

Recording (flash ring buffer):

It's advisable to record all switching operations to the flash ring buffer in order to document peak load characteristics. The "Flash" checkbox is activated to this end.
The recorded logic values from -1 through 16 have the following significance:

(-1) Initialization (synchronization) or error
(0) No peak load expected. This value is written at least at the end of every measuring period, or at the transition from active to inactive.
(1) Peak load shutdown active (relay has picked up).
(2) Peak load shutdown active, but switching output not enabled.
(4) Peak load shutdown active, but switching output within a limit ("pulsing during measuring cycle" or "On/Off" rule).
(8) Peak load shutdown active, but time outside of priority.
(16) No peak load expected. However, the output has been activated due to the minimal off-period.

All values from -1 through 16, not including 0, are written for every measuring period, so that a complete analysis can be subsequently completed. All conditions are added up, so that it can be determined which rule or rules have overridden peak power optimization.

Recommended Settings:

Depending upon the type of machine, characteristics and performance may differ greatly in the event of maximum shutdown. For this reason, it must be determined in advance whether or not a given machine is a viable candidate for maximum shutdown!
The settings shown here represent typical values only. They must be calculated separately for each device/project, and tested in the field.

For electrical power:

- Memory cycle: **15** minutes (standard billing period)
- Measuring cycle: 30, 45, 60, **90** or 180 seconds
- Moving average: **On**
- Meter input: Energy pulse input to be monitored
- Priority: For non-critical devices: **2**-3, otherwise **4** to 5
- Targeted power: Max. power; for non-critical devices: -20%
  For important machines: 0 to -10%
- Type: Depends upon project/device
- Min. and max. times: Depends upon project/device
- Enabling: Depends upon project/device

For gas:

- Memory cycle: **60** minutes (standard billing period)
- Measuring cycle: 60, 100, 150 or **300** seconds
- Moving average: **On**
- Meter input: Energy pulse input to be monitored
- Priority: 4 to 9 (corresponds to 15 or 40 min. respectively)
- Targeted power: Power; for non-critical devices: -10%
  For important machines: 0 to -5%
- Type: Depends upon project/device
- Min. and max. times: Depends upon project/device
- Enabling: Depends upon project/device

3 Cyclical Results Checking

Results should be checked at fixed intervals, and programming should be adjusted if necessary. Flexible reactions are thus assured in the event of changing circumstances.

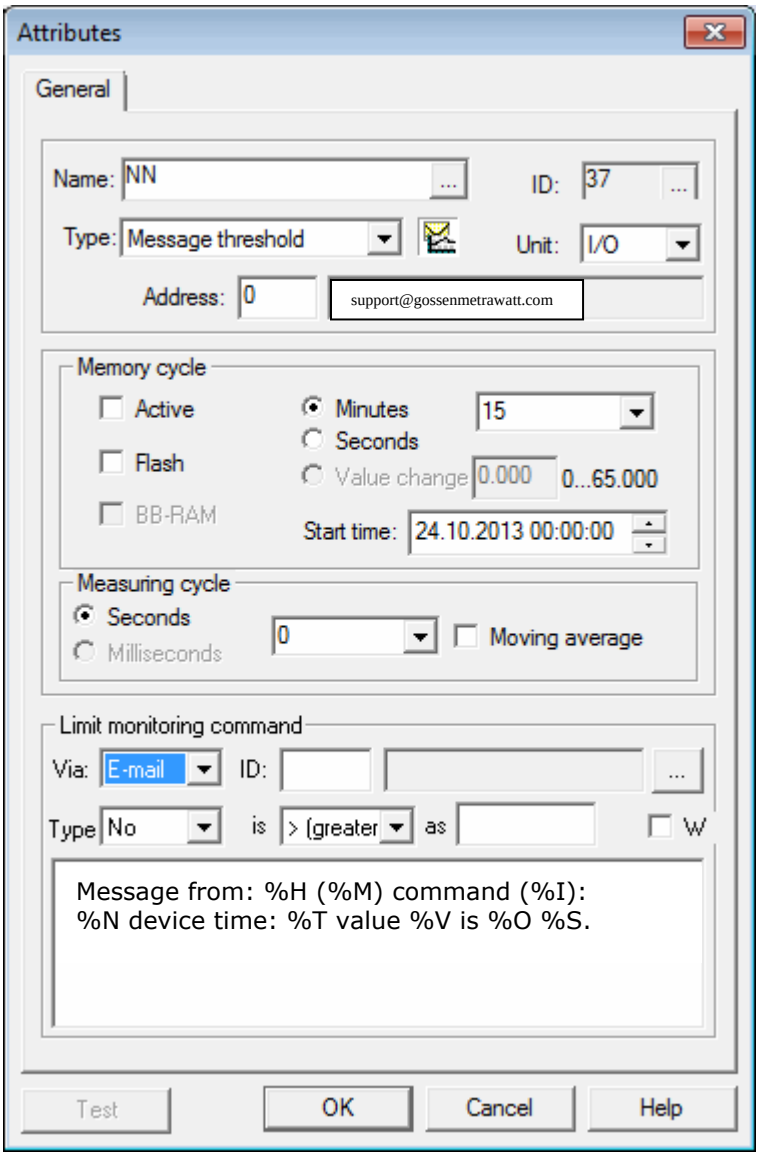
Message Threshold Command Type *Tip: Refer to the online help as well!*

Prerequisites for e-mail:

- **TCP/IP connection** with access to an e-mail server

Procedure:

1. Create a "Message Threshold" command.
2. Set the type to "e-mail".
3. Enter the number of the e-mail address to which the e-mail will be sent to the address field. Additional addresses can be entered, separated with commas (e.g. 1,2).
4. Set the command to active.
5. Set the memory cycle:
   If the respective condition is fulfilled, e-mails are sent at the frequency specified here.
6. Set the measuring cycle:
   The condition is checked every xxx seconds. In this way, messages are also sent **at intermediate times** if the respective condition is fulfilled, **but never more frequently than once per memory cycle.**
7. Set the "ID" to the command to be compared. If applicable, use the multifunctional timer in order to receive immediate notification.
8. Deactivate "standard format". This is only required for special, computer-based messaging functions.
9. Format the message.
10. Special placeholders are included below.



Set the destination phone numbers in the "Configuration / e-mail recipients" tab as follows:

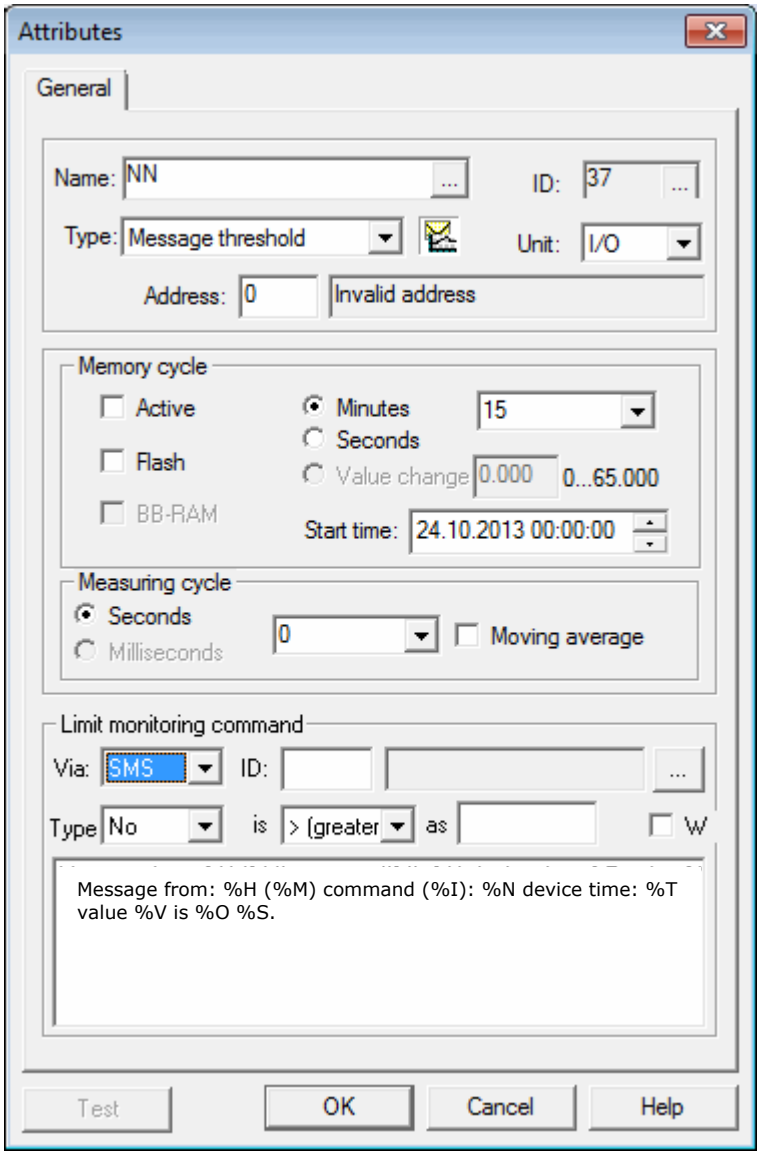
- Enter up to three recipient addresses.
- Enter the server's IP number (DNS name resolution has not been activated for space reasons).
- A user name and password can also be entered, if this is required by your service provider.
- Enter the return address. For some e-mail service providers, this must be the same as the mailbox owner's address.

The individual placeholders included in the test field are as follows:

%H:	Name of the SMARTCONTROL
%M:	MAC address of the SMARTCONTROL
%I:	Command ID
%N:	Name of the command
%T:	Date and time of the message
%V:	Value (real number)
%O:	Value of the operator (<, >, =)
%S:	Comparative value
%B:	Serial number of the SMARTCONTROL
%#XXX:	Value of another command (XXX = 3-place command ID)

Transmit the command to the SMARTCONTROL by clicking the "test programs in SMARTCONTROL " button, and save the programs to flash memory by clicking the "save programs to SMARTCONTROL " button.

Message Threshold Command Type, SMS



Prerequisites:

- SMARTCONTROL with **ISDN** module and the recipient's service provider: Telekom, Arcor or DoKom, or
- SMARTCONTROL with **GSM** module and card with enabled SMS function
- **Analog** modem upon request!

Procedure:

1. Create a "Message Threshold" command.
2. Enter the number of the destination telephone to which the SMS will be sent to the address field.
3. Activate the checkbox.
4. Set the memory cycle: messages will be sent at this interval if the respective condition is fulfilled.
5. Set the measuring cycle:
   The condition is checked every xxx seconds. In this way, messages are also sent at intermediate times, but never more frequently than once per memory cycle.
6. Set the type to "SMS".
7. Set the "ID" to the command to be compared. If applicable, use the multifunctional timer in order to receive immediate notification.
8. Deactivate "standard format". This is only required for special, computer-based messaging functions.
9. Format the message by making the desired entries to the text field. The special placeholders are explained in the section entitled "Message Threshold, E-Mail".

The following must be observed:

Set the phone recipients in the "Configuration / Destination Telephones" tab as follows:

For **SMS via GSM:**
Phone recipients for SMS services begin with the country code:
Germany: 49, Austria: 43, Switzerland: 41, France: 33, Italy: 39
Example for Germany: Enter **49**173xxxx instead of **0**173xxxx.

If SMS messages are sent via the **landline**, a leading zero (**0**) , e.g. **0**173xxxx or two leading zeros (**00**), followed by the country code, must be used, for example **0049**173xxxx.

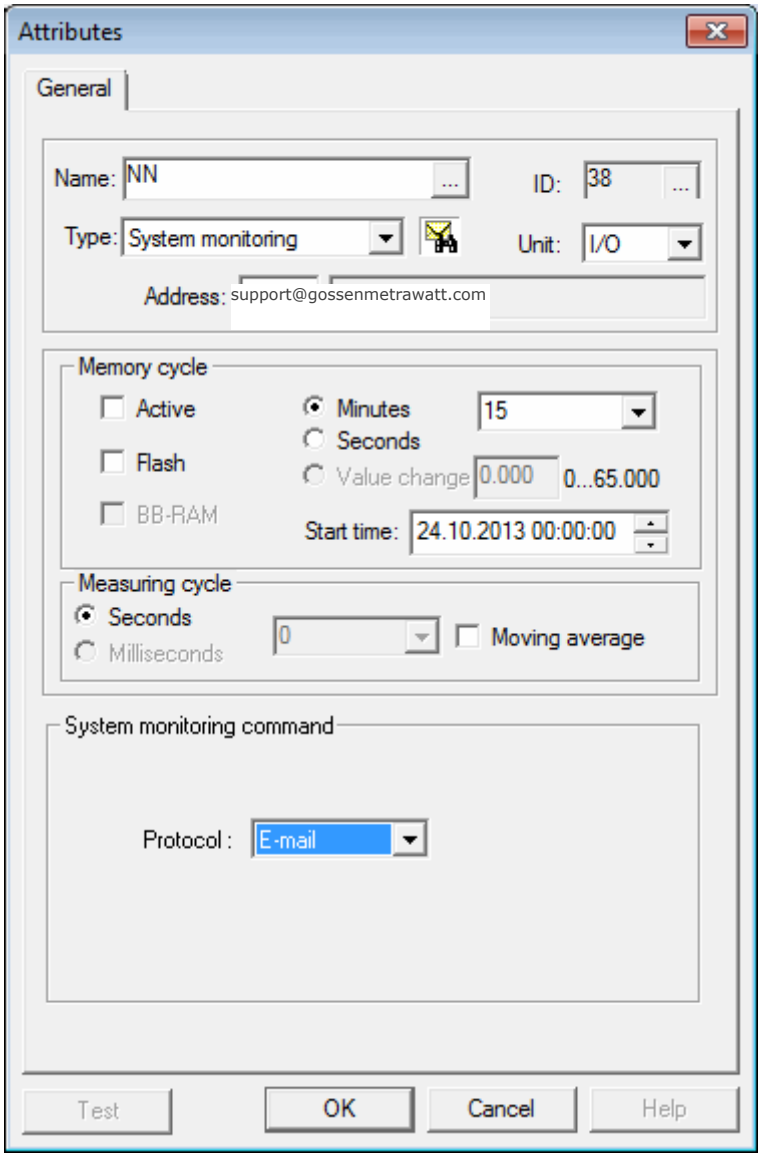
-> Acknowledge by clicking the "Accept" button.

Messages which include more than 160 characters will be cut short.

Messaging commands do **not** work using meter readings as a reference.

Transmit the commands to the SMARTCONTROL by clicking the "test programs in SMARTCONTROL" button, save the programs to flash memory by clicking the "save programs to SMARTCONTROL" button and break off the connection so that the SMARTCONTROL has an open line.

System Monitoring Command Type



This command transmits a formatted system message to the destination which is entered under “Address” and pre-configured in the “Configuration” tab, for example an e-mail address or a phone number for an SMS.

Memory cycle:
The message is transmitted during the save cycle.

Field Command Type

Prerequisites:

- **Fieldbus module connected to the RS 485 bus** (interfaces 9, 10 and 12, see Chapter 6. Connections Overview, Revision V3**Fehler! Verweisquelle konnte n icht gefunden werden.**)
- **Firmware for reading or writing from the fieldbus (ASCII)**

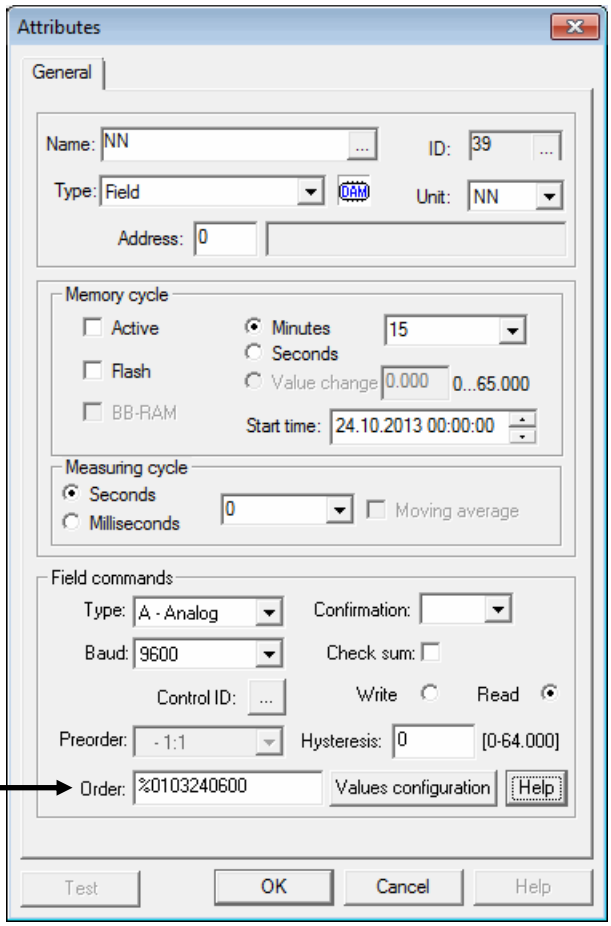
Procedure:

Configuring the Modules

It's best to configure the fieldbus modules with the software included with them, and an RS 485 to RS 232 converter. Alternatively, the SMARTCONTROL can be used as a converter. In this case you'll need special firmware and an available RS 232 port at your PC, as well as at the SMARTCONTROL.

If only a few modules need to be configured, they can be configured manually with the SMARTCONTROL Manager:

First, create a "Field" type command. Leave all of the settings at their default values. Now enter the command to be transmitted to the command window and click the "Test" button.



Examples:

Enter a new address for an RTD module (3 ea. PT100):

%0103240600
  01 -> old address
    03 -> new address
      24 -> sensor and range of values
        06 -> 9600 baud
          00 -> readout in °C

Activate the SMARTCONTROL Manager monitor as well (activate the SMARTCONTROL tab at the right in the bottom window).
Incorrectly entered commands can be detected more quickly here.

Important: Do **not** leave default address "1" unchanged. The configuration of a second device would otherwise no longer be possible at the same bus!

The module is now ready for read-out:

All three channels are read out at the same time with the "#AA" command.

Set device type to "A" for analog signals.

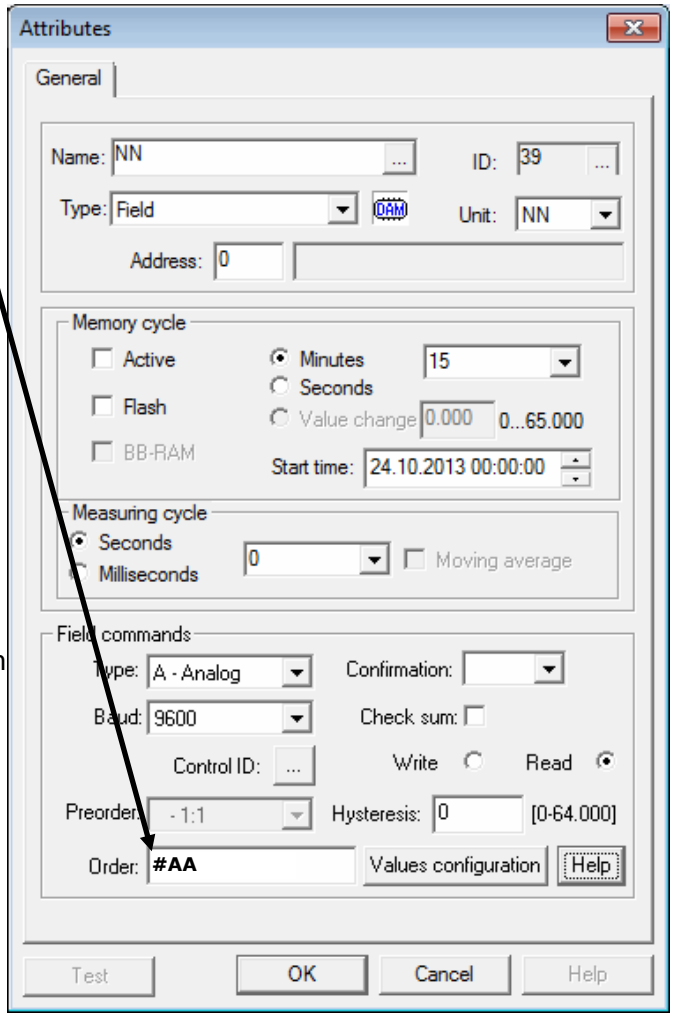
The ">" return message is set in order to determine whether or not returned data are valid.

The checksum is set in order to assure increased transmission reliability. However, this must also be programmed into the modems themselves!

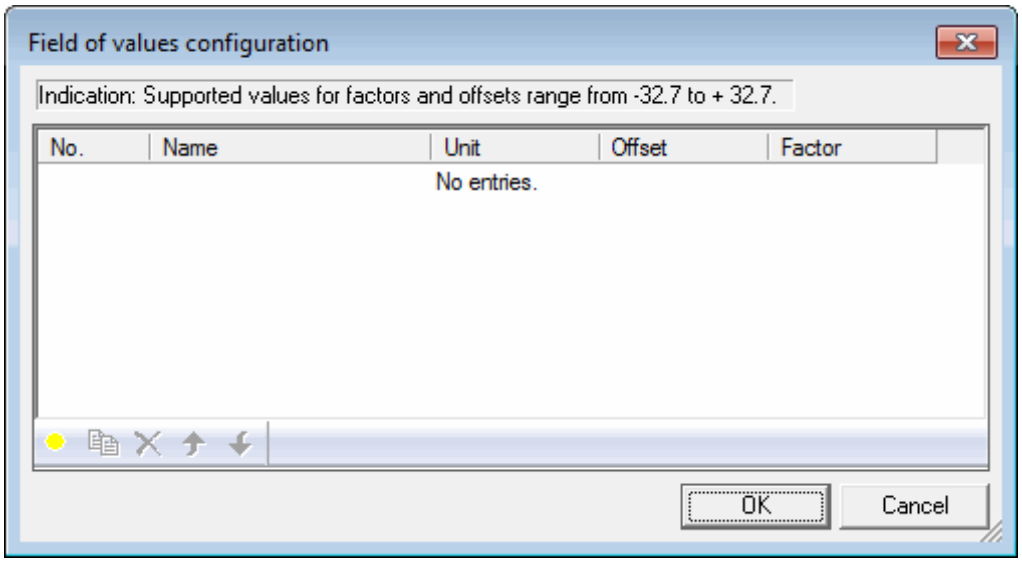
The hysteresis is taken into consideration for both write and read access.
Read: Only those data are saved which lie outside of the specified hysteresis.
Write: Only those values are written which lie outside of the specified hysteresis, or values are written for each memory cycle (at least once per hour).

Unnecessary fieldbus communication can be avoided in this way.

"Controller ID" and "Preorder" are only required for write operations and are described below.



The following dialog box appears after clicking "Configure Values":



The values can be changed after clicking the individual fields.
New values can be added after clicking , and the order of the values can be changed with the scroll keys.

If the inputs which are returned by the module have been defined in the value configuration, they can be accessed directly via the network variables table. Continue with the section entitled “Network Variables” to this end.

Example for boiler temperature (T boiler. T mean):

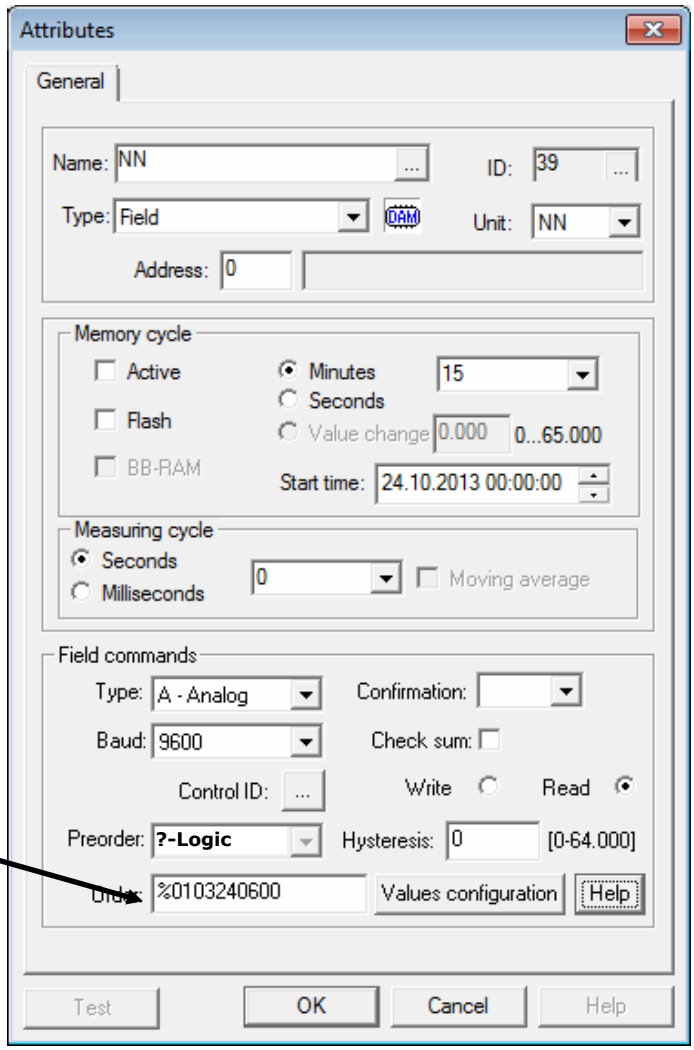
Virtual ID = 10,000 + ID of the fieldbus command x 100 + numeric value

Virtual ID = 17,202 =
10,000 + 72 x 100 + 2

Control and Regulation with Fieldbus Modules

The following applies in this case as well:
A new fieldbus address must first be assigned to the respective module:

%0102400600
01 -> old address
02 -> new address
40 -> for DIO modules
06 -> baud rate
00 -> format



A module with 7 relay outputs (type xx67) serves as an example in this case

Afterwards, check to make sure that the module responds to the new address.

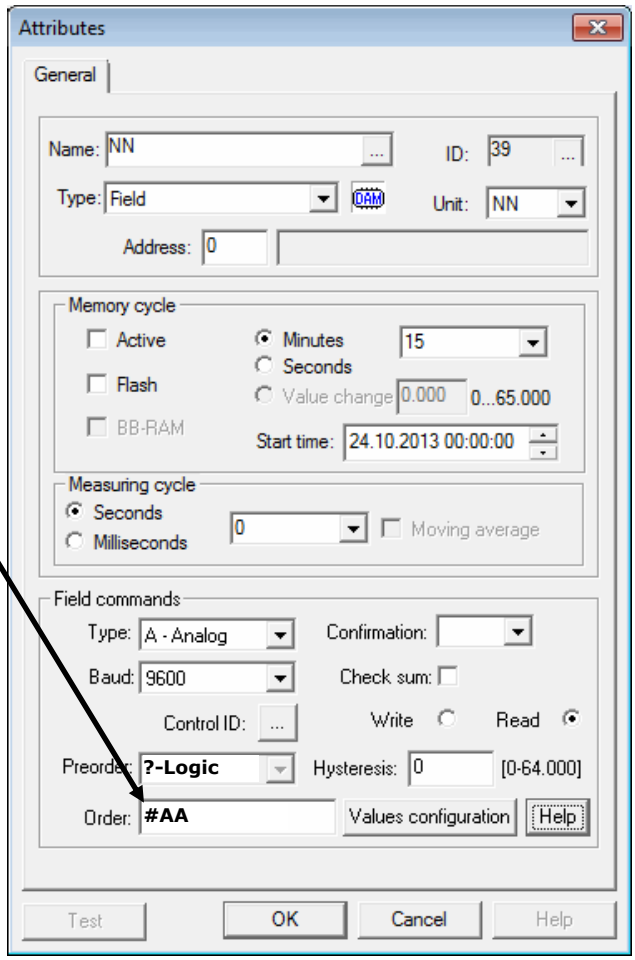
With the command:

#AA

The status of all
7 inputs is read in:

The result, "7F" in hex, is the digital equivalent of 7 x 1 or decimal = 127. This means that all 7 relays are activated.

All seven of the module's outputs can now be set at once, or the relays can be set individually.



Activating and deactivating individual relays:

The following command …

#0213%02X
  02 -> address
    1 -> set individual relay
      3 -> relay no. 4 (0-based)
        %02X -> Variable which will be replaced by the value of the address.

… switches relay no. 4 on and off in accordance with the following conditions:
Either a calculator or a relay command can be used for the logic. A relay command has the advantages of variable limit values and the option of specifying a hysteresis, as well as direct linking to the switching module.

Linking means, as shown in the screenshot, that the ID of the switching module is entered to the relay command as the output relay and the ID of the relay command is entered to the fieldbus module. This assures that switching commands are executed immediately after a change to the relay command. The same applies to peak load optimization, to calculator commands for the status inputs, to the timer program and to the multifunctional timer.

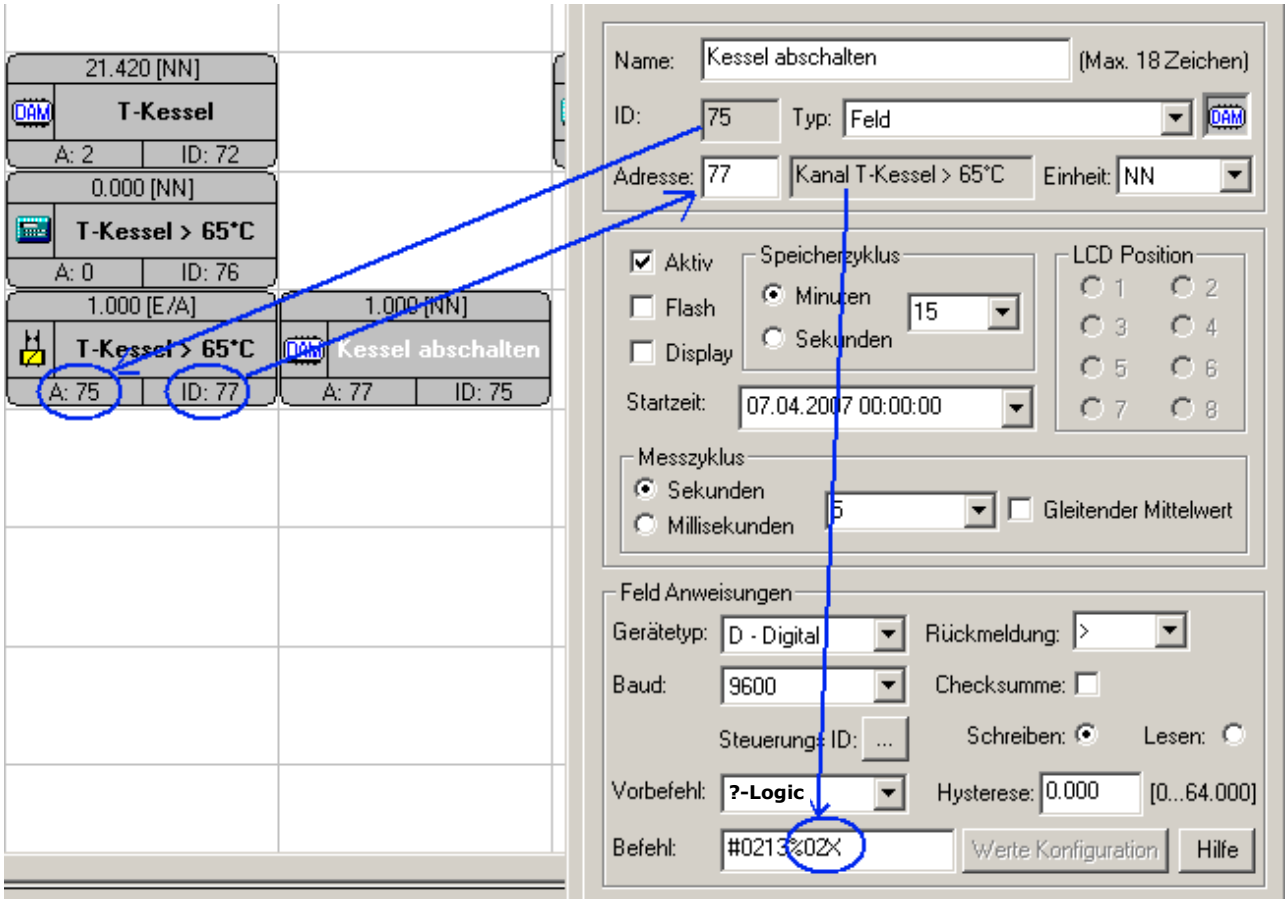
Attention: IDs of greater than 2 are reserved for the relays mounted to the PCB, and are thus interpreted as internal relays!

The value which is actually to be written (in order to switch off the boiler) is entered with the following character string …

%02X

… within the command. This character string is replaced by the value associated with the specified ID during operation:

% : Beginning of the replacement character string.
02 : The character string to be replaced must have a length of two characters. Shorter character strings are filled out with a 0.
X : Format in capital letters HEX, and at the same time the end of the replacement



Example 2: %5.2f

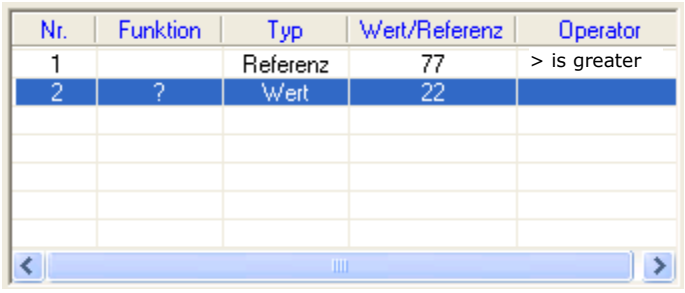
5.2 : Write no more than 5 characters with 2 places after the decimal point.
f : Floating point number

With the help of the preorder, which can have the following values:

!	: Negation of the value of the command ID	(0.5 > X > -0.5)
?	: Clear-cut yes/no	(0.5 < X < -0.5)
I	: Integer	(whole number rounded to ± 001 [1)])
F	: Floating point number	
1:1	: The command is used 1:1, i.e. without value linking, the values of the application IDs can be prepared before use in formatting.	

1 Whole number: example: -1.99 is rounded off to –2.0, 3.99 to 4.0 and 3.98 to 3.0.

Example 3:
A calculator provides only unclear logic due to mean value generation, for example 0.85. If this value were used directly, 00 would always be entered in the subsequent formatting ("%02X").
0.85 is changed to 1 as a result of the "?" preorder.



Activating or deactivating groups of relays:

With the command …

#020A%02X

… an entire group of relays can be activated or deactivated with a single command.

Important changes:

Set the preorder to "integer".
Set up a calculator for the control logic in which the relays to be activated and deactivated are specified.

Example 4:

In order to activate relays 2, 3 and 5 simultaneously, create a command which reads out either 22 (binary = 00010110) or 0.

Attention:

Observe when writing to the fieldbus:

Set the measuring cycle to 0. This assures that the current value of the "linked" command is always written, and not the mean value calculated on the basis of the measuring cycle.
Deactivate storage to memory for write commands.
Quotes furnished by the fieldbus while writing values are unusable for evaluations. Use the log function of the controlling command instead.

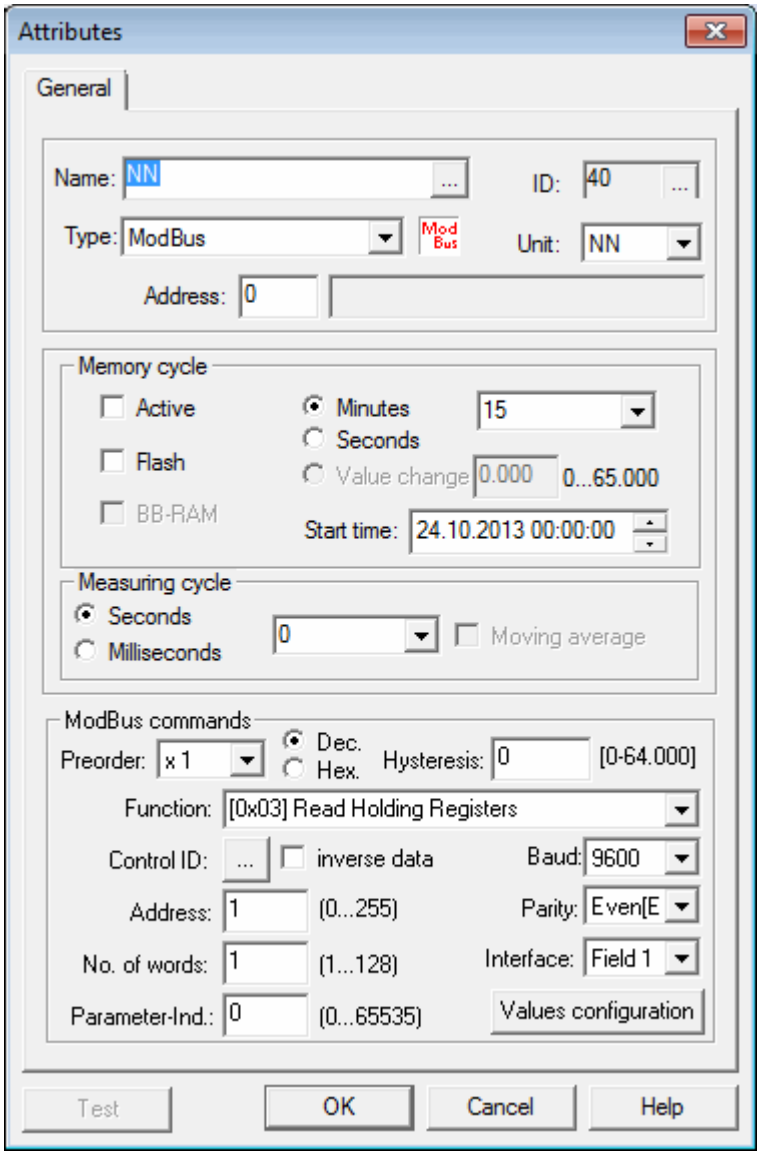
It's **not** possible to apply various groups, or more than one group, to a single module at the same time. Each write operation for a give group always sets **all** relays simultaneously to the specified status. Even if you try to set individual relays separately later on, the group always overwrites all relays.

ModBus Command Type Tip: Refer to the online help as well!

Prerequisites:

- **Connection to one or more Modbus devices via the RS 485 interface at the SMARTCONTROL (fieldbus)** (interface 9, 10 or 12)
- **SMARTCONTROL with installed Modbus firmware**
  (available upon request, instructions for flashing the firmware is included)
- **Complete documentation for the Modbus device to be read out**

The following must be observed:
The general address of the Modbus command identifies the offset value (words, corresponds to two bytes) for read commands within a read Modbus frame!
The value can be used directly for evaluations in the SMARTCONTROL.
In the case of write commands (control / regulation), the address is used as a reference ID for the value to be written.



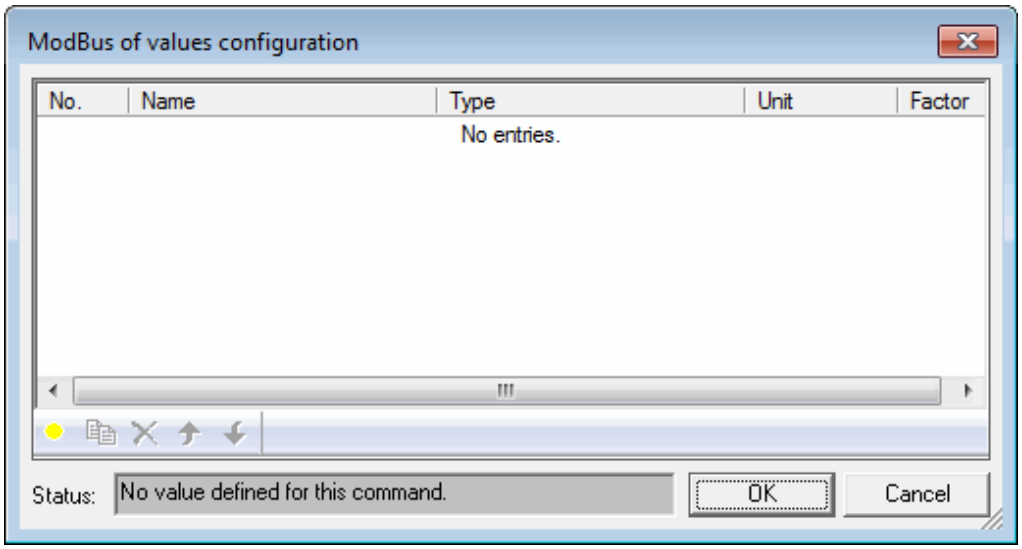
Regarding ModBus:

The device address and the code for specifying the required action, as well as the data to be transmitted and an error test field, are sent by the querying device. The response frame includes fields for acknowledgement, the data, and once again an error test field. Transmission speed, transmission type (ASCII, RTU) and parity must be the same for all devices within a single bus network. **RTU** is the only transmission type currently supported by the SMARTCONTROL.

Procedure:

1. Create a "ModBus" command.
2. Select the unit of measure.
3. Set the command to active.
4. Set the memory cycle.
5. Set the measuring cycle: The field device is read out at the selected interval.
6. Dec./Hex: Decide whether you want to enter the configuration in decimal or hexadecimal format.
7. Enter the desired function (read functions only in this case). Enter the address of the device to be read out to the "address" field (at bottom).
8. Enter the baud rate and the parity which have been selected for the Modbus devices.
9. Enter the number of values to be returned by the device next to "No. of words".
10. Enter the register address of the device to be read out next to "Parameters Index".

11. The following window appears after clicking the “Values Configuration” button:



Data supplied by the Modbus can be defined with the help of this dialog box.

Make an new entry for every value in the command to this end by clicking the button. The values can have various lengths and different data types. Values, for example name and unit of measure, can be changed by clicking the column within the line.

If several lines have been filled in, you can move the values up or down with the buttons.
Data entered here are processed directly by the SMARTCONTROL interface, so that the recorded Modbus data can be evaluated correctly with unit of measure and factor.

The “Status” field indicates whether or not the specified “number of words” in the command corresponds to the stipulated data definition.

The selected values can be checked by clicking the “Test” button.

In the SMARTCONTROL itself, a virtual ID is created for each selected value. Any value can be referenced in the field with this device-internal ID, and can be further processed for evaluations.

In order to write to the ModBus or switch relays, please read the previous section regarding “Control and Regulation with Fieldbus Modules”.

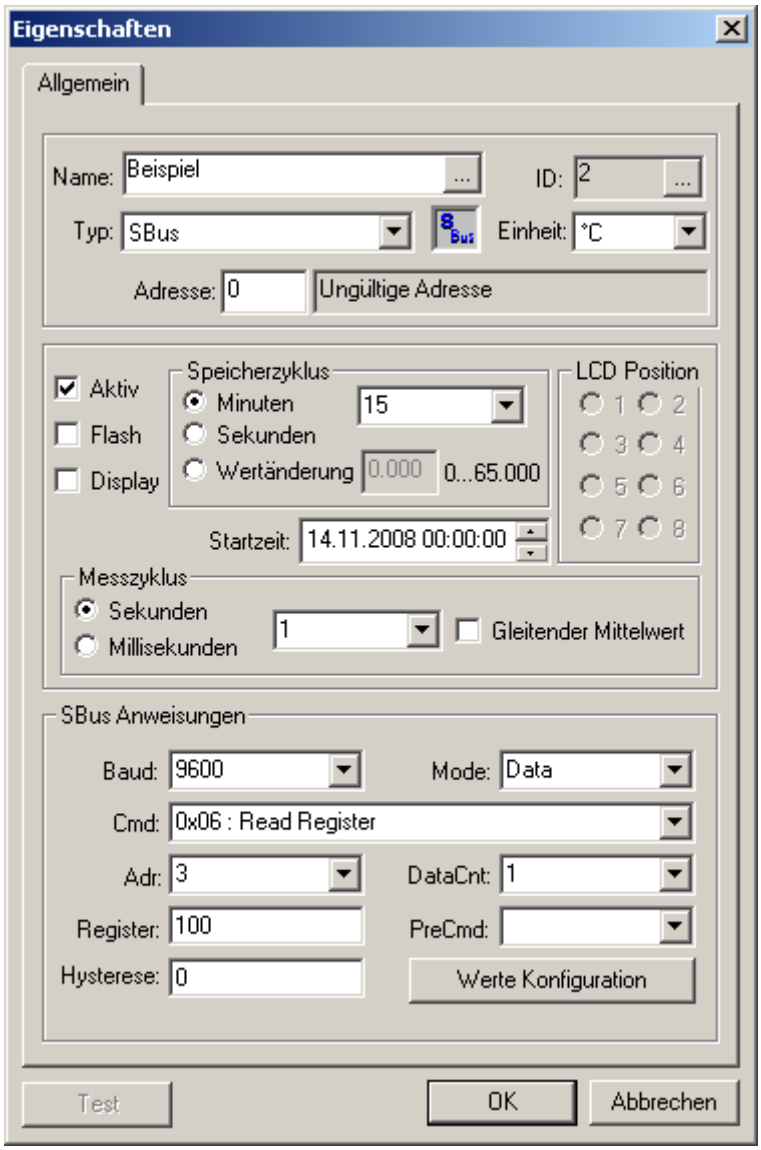
ModBus TCP Command Type Tip: Refer to the online help!

Modbus TCP is new as of firmware version 2.5.08. Documentation is only available in the online help function.

SBus Command Type

Prerequisites:

- **Connection to one or more SBus devices via the RS 485 interface at the SMARTCONTROL (fieldbus)** (interfaces 9, 10 and 12)
- **Complete documentation for the SBus device to be read out**



SBus: The SBus is very similar to the ModBus. The SBus in the SMARTCONTROL functions only as a master. This means that the SMARTCONTROL actively queries the other device.

Baud: Transmission speed

Mode: Please read the description of the SBus device in order to determine whether or not the respective mode is supported.

Cmd: The command which is transmitted to the SBus user.
0x00 : Read Counter
0x01 : Read Display Register
0x02 : Read Flag
0x03 : Read Input
0x04 : Read Real Time Clock
0x05 : Read Output
0x06 : Read Register
0x07 : Read Timer
0x0A : Write Counter
0x0B : Write Flag
0x0C : Write Real Time Clock
0x0D : Write Output
0x0E : Write Register
0x0F : Write Timer
0x14 : Read Status RS0
0x15 : Read Status RS1
0x16 : Read Status RS2
0x17 : Read Status RS3
0x18 : Read Status RS4
0x19 : Read Status RS5
0x1A : Read Status RS6
0x1B : Read Status RS7
Status RS0 … RS7 describes the status of the individual CPUs.

Write is a special SMARTCONTROL firmware option.

Adr:	Address of the SBus user.
DataCnt:	Number of data which are queried. Always 1 in the case of transmission, because only one value can be determined via the address.
Register:	The register in the SBus user.
PreCmd:	See fieldbus modules.
Hysteresis:	See fieldbus modules.
Values configuration:	See fieldbus modules.

PID Controller Command Type Tip: Refer to the online help!

Documentation is only available in the online help function.

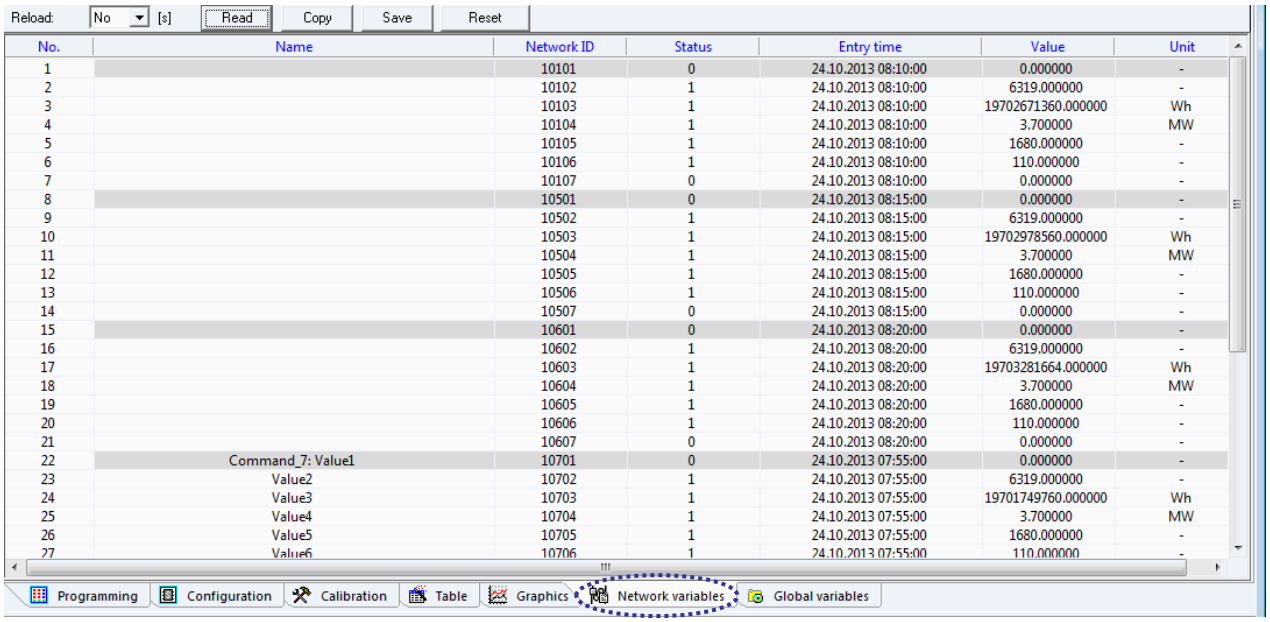
Command Type EN 62056-21 (previously CL-Bus) Refer to the online help!

Documentation is only available in the online help function.

Network Variables

"Network variables" are created automatically by the SMARTCONTROL for Modbus, fieldbus and M-Bus commands with defined values. One or more virtual IDs are assigned to them automatically, which are calculated as follows:

Virtual ID = 10,000 + ID of the fieldbus command x 100 + numeric value



No.	Name	Network ID	Status	Entry time	Value	Unit
1		10101	0	24.10.2013 08:10:00	0.000000	-
2		10102	1	24.10.2013 08:10:00	6319.000000	-
3		10103	1	24.10.2013 08:10:00	19702671360.000000	Wh
4		10104	1	24.10.2013 08:10:00	3.700000	MW
5		10105	1	24.10.2013 08:10:00	1680.000000	-
6		10106	1	24.10.2013 08:10:00	110.000000	-
7		10107	0	24.10.2013 08:10:00	0.000000	-
8		10501	0	24.10.2013 08:15:00	0.000000	-
9		10502	1	24.10.2013 08:15:00	6319.000000	-
10		10503	1	24.10.2013 08:15:00	19702978560.000000	Wh
11		10504	1	24.10.2013 08:15:00	3.700000	MW
12		10505	1	24.10.2013 08:15:00	1680.000000	-
13		10506	1	24.10.2013 08:15:00	110.000000	-
14		10507	0	24.10.2013 08:15:00	0.000000	-
15		10601	0	24.10.2013 08:20:00	0.000000	-
16		10602	1	24.10.2013 08:20:00	6319.000000	-
17		10603	1	24.10.2013 08:20:00	19703281664.000000	Wh
18		10604	1	24.10.2013 08:20:00	3.700000	MW
19		10605	1	24.10.2013 08:20:00	1680.000000	-
20		10606	1	24.10.2013 08:20:00	110.000000	-
21		10607	0	24.10.2013 08:20:00	0.000000	-
22	Command_7: Value1	10701	0	24.10.2013 07:55:00	0.000000	-
23	Value2	10702	1	24.10.2013 07:55:00	6319.000000	-
24	Value3	10703	1	24.10.2013 07:55:00	19701749760.000000	Wh
25	Value4	10704	1	24.10.2013 07:55:00	3.700000	MW
26	Value5	10705	1	24.10.2013 07:55:00	1680.000000	-
27	Value6	10706	1	24.10.2013 07:55:00	110.000000	-

Example:
Six virtual IDs – 11201 through 11206 – are created for a command with device-internal ID 12 and six defined values, and are refreshed for each readout. These IDs allow for access and further work from any command with referenceable input values.

Note:
In order to display the network variables with all of the attributes in the table, the program must be loaded from the SMARTCONTROL. This applies to data point selection as well.

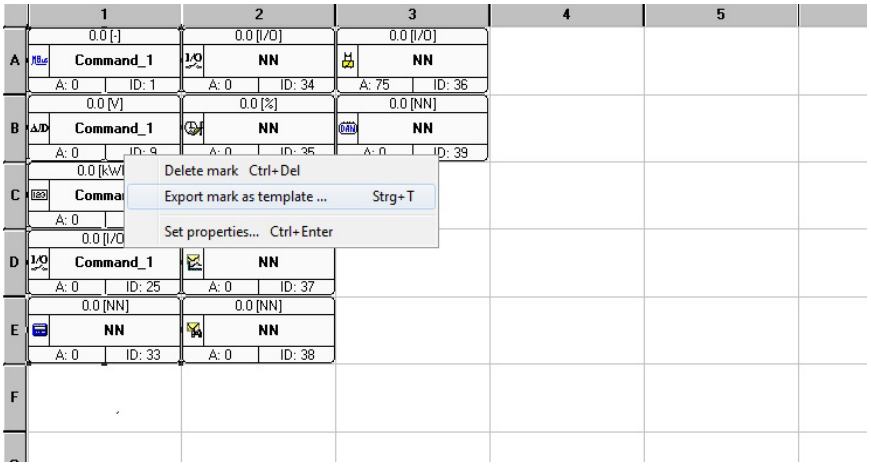
Command Templates

As of version 1.7.1.0 of the configuration software, groups of commands from a program can be gathered into an SBT file as a command template and exported, which can be subsequently imported into other programs as a functional block.

IDs of the commands to be exported which make reference to other commands which will also be exported need not be adapted. Only so-called external IDs (which make reference to ranges outside of the selected command range) have to be furnished with descriptions by the user when exported. During import, reference must be made to IDs which exist in the currently opened program.

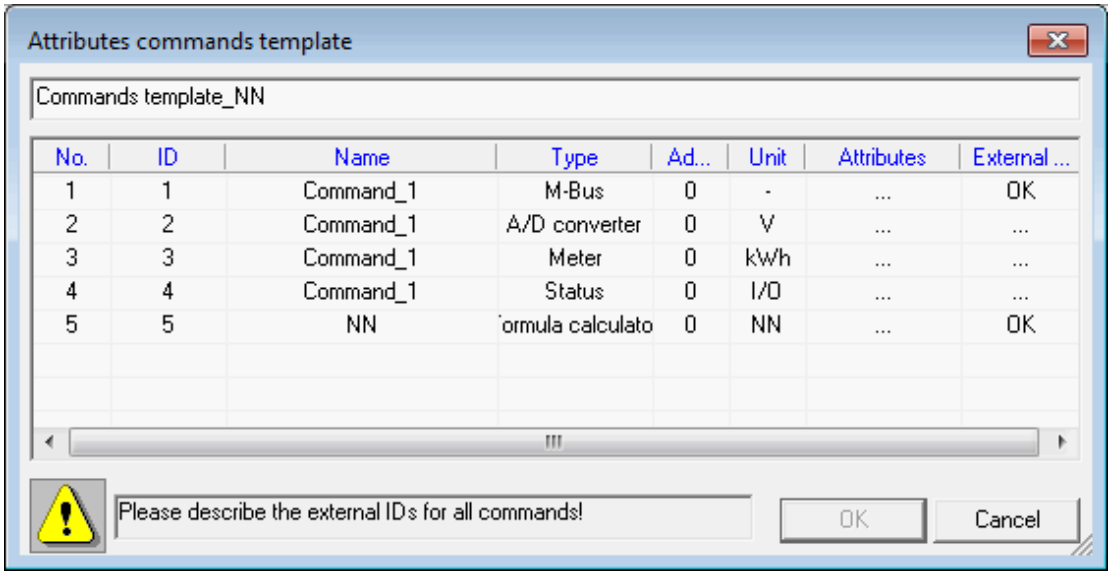
Export Procedure

1 Select the desired commands and acknowledge by pressing the right mouse key.

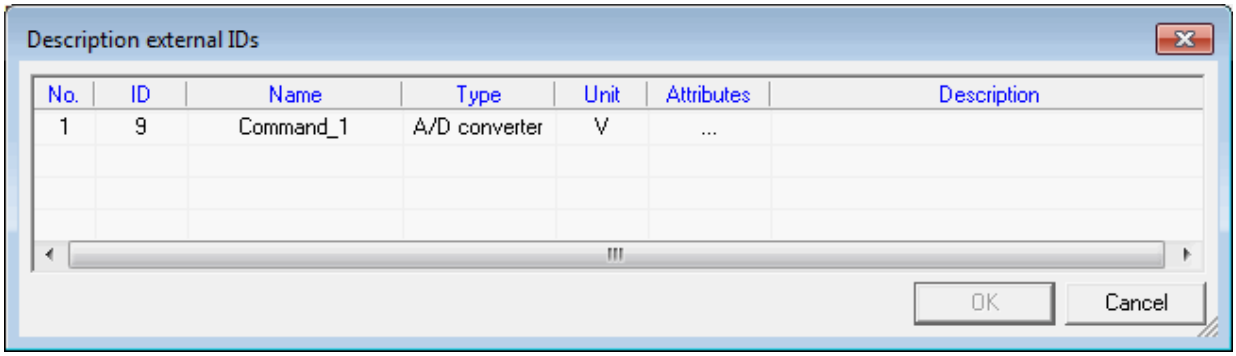


2 Click “Export selection as template”.

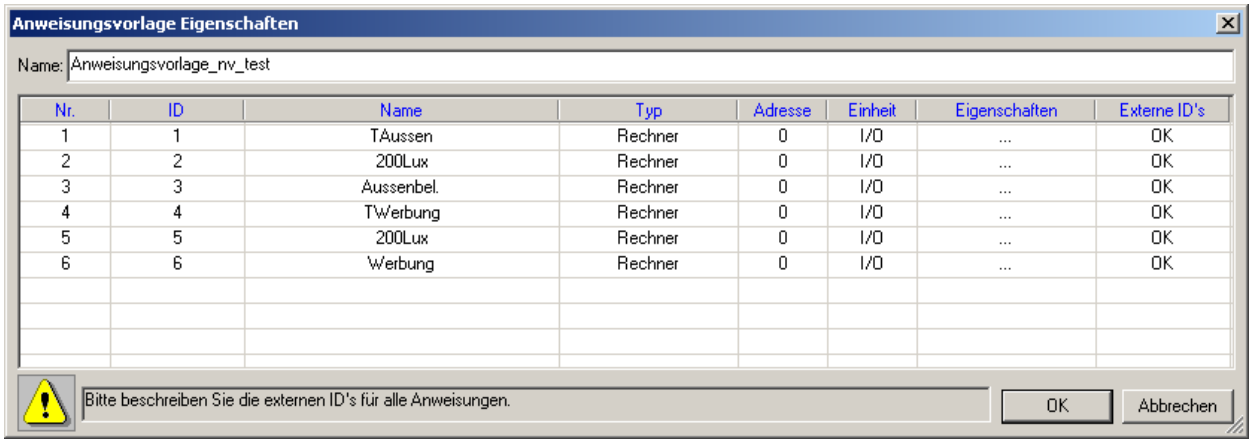
3 A dialog box appears which prompts you to enter a name for the export template, as well as descriptions for the external IDs.



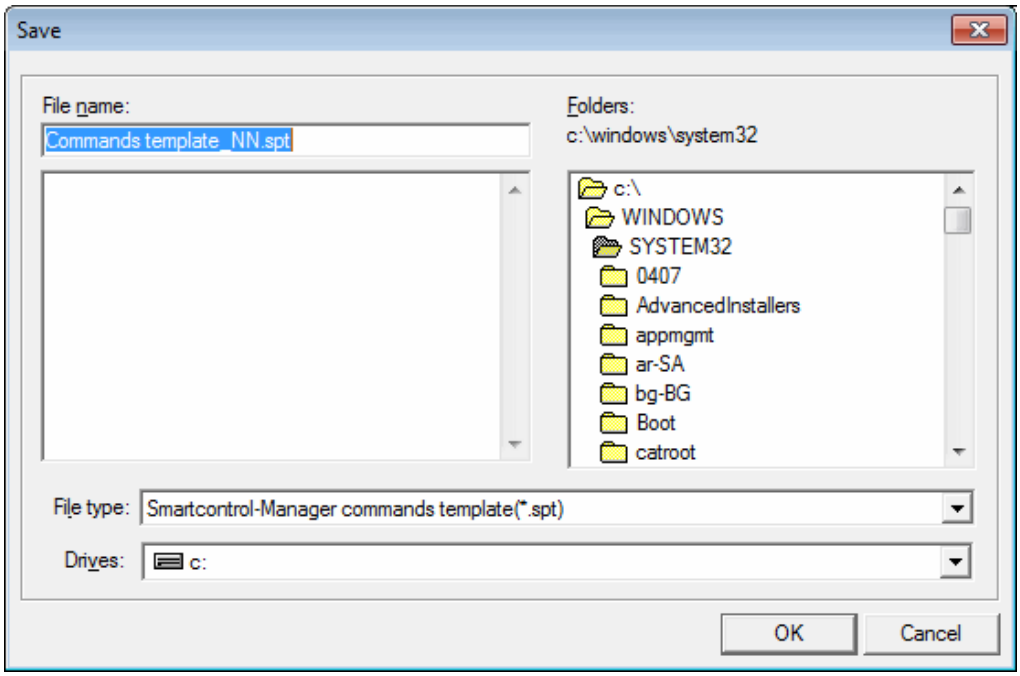
4 After clicking … in the “External IDs” column, a window appears to which the necessary external IDs can be entered line by line.



5 The “OK” button is enabled after the IDs have been entered for all lines.



6 A file selection window appears after clicking the "OK" button. Select a directory path and a file name for the command template here.

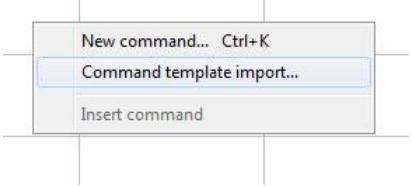


Import Procedure

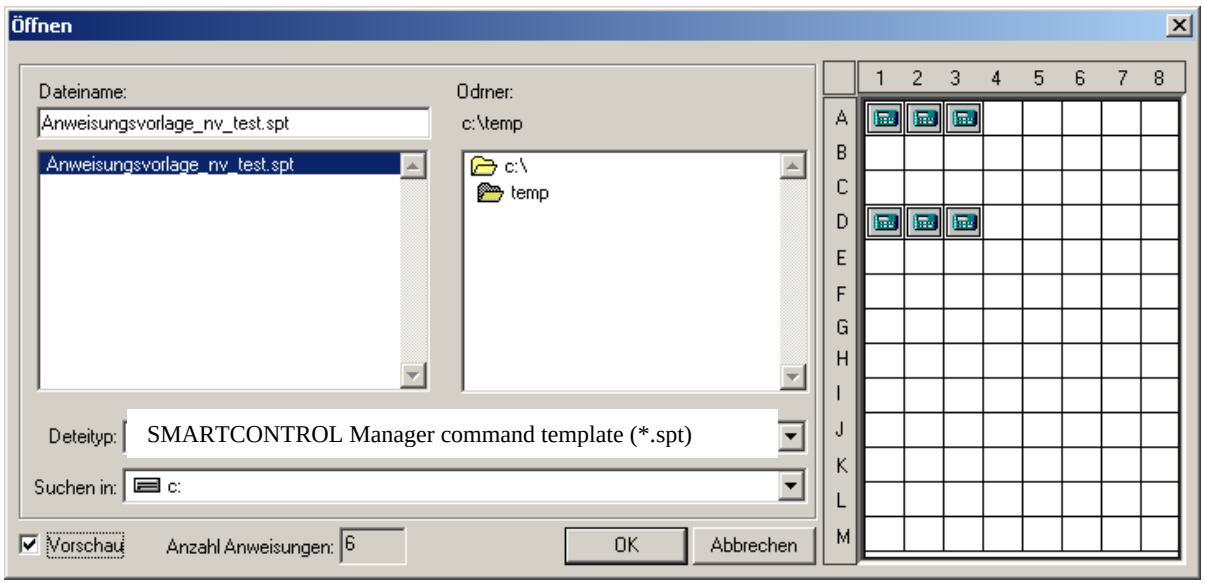
1. Import must be executed after connection has been established to a SMARTCONTROL. The connected network variables cannot otherwise be successfully referenced.

2. In any program list, navigate to the program to which the saved command template will be added.

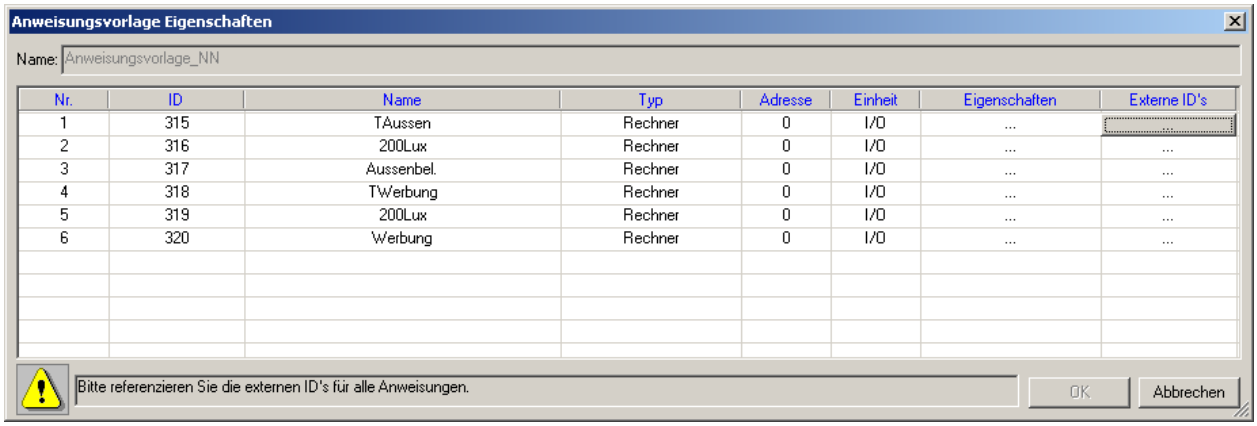
3. Open the context menu in the workspace by right clicking and select "Import command template".



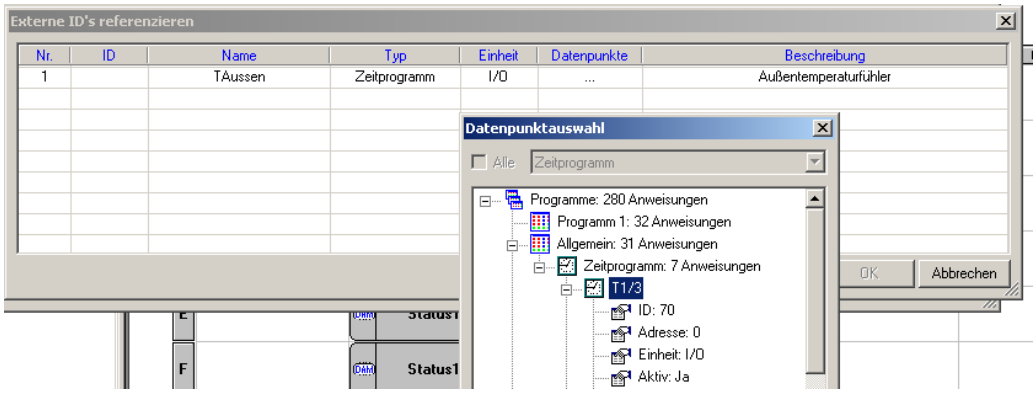
4. Select the command template to be imported in the file selection window which then appears. You can see how many commands are included in the template by clicking "Preview" at the bottom left during selection. This makes it possible to determine whether or not the programs to be imported fit into the program sheet.



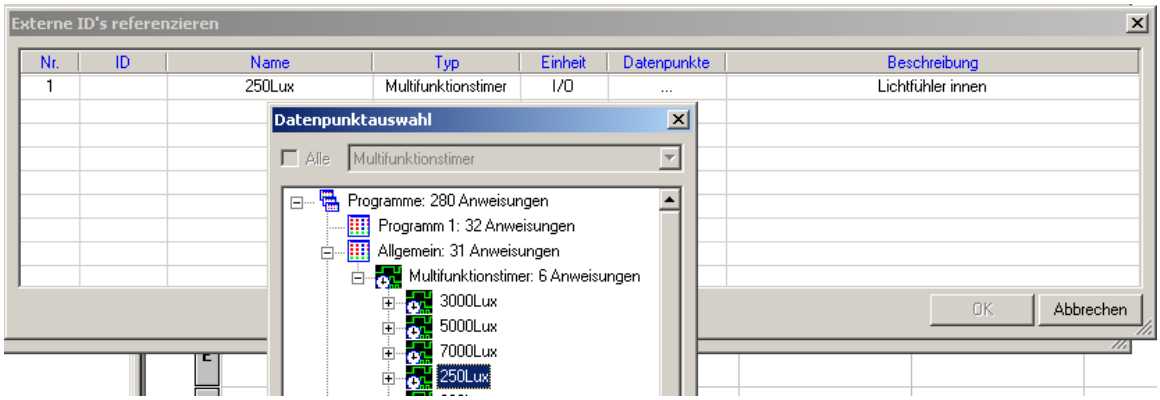
5. The already familiar dialog box for assigning external IDs appears after clicking the "OK" button.



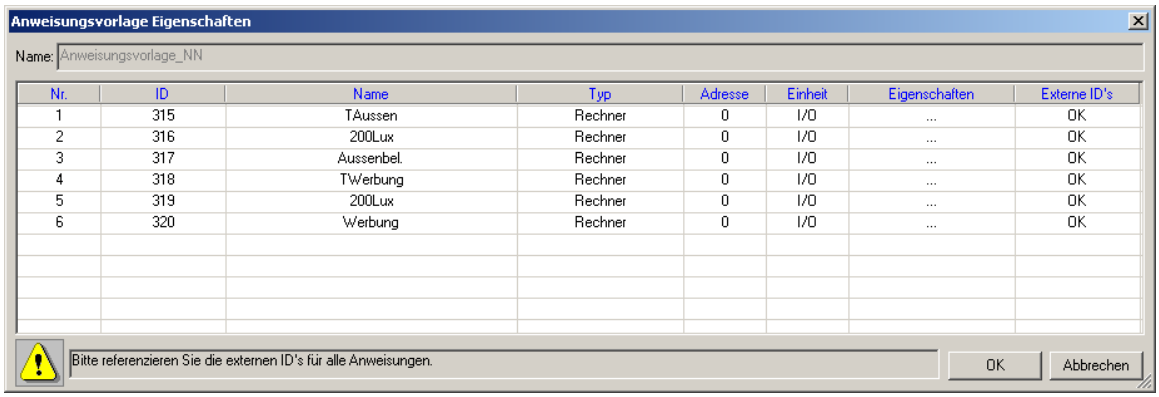
6. The external IDs used in the template can now be linked to the existing data channels in the online connected SMARTCONTROL after clicking the fields in the "External IDs" column.



7. A suitable data point is selected to this end via the "Data Points" field in the "Reference External IDs" dialog box which now appears. The configuration software offers suitable data points of the same type in this field.



8. The “OK” button is once again enabled after all data points have been successfully allocated.



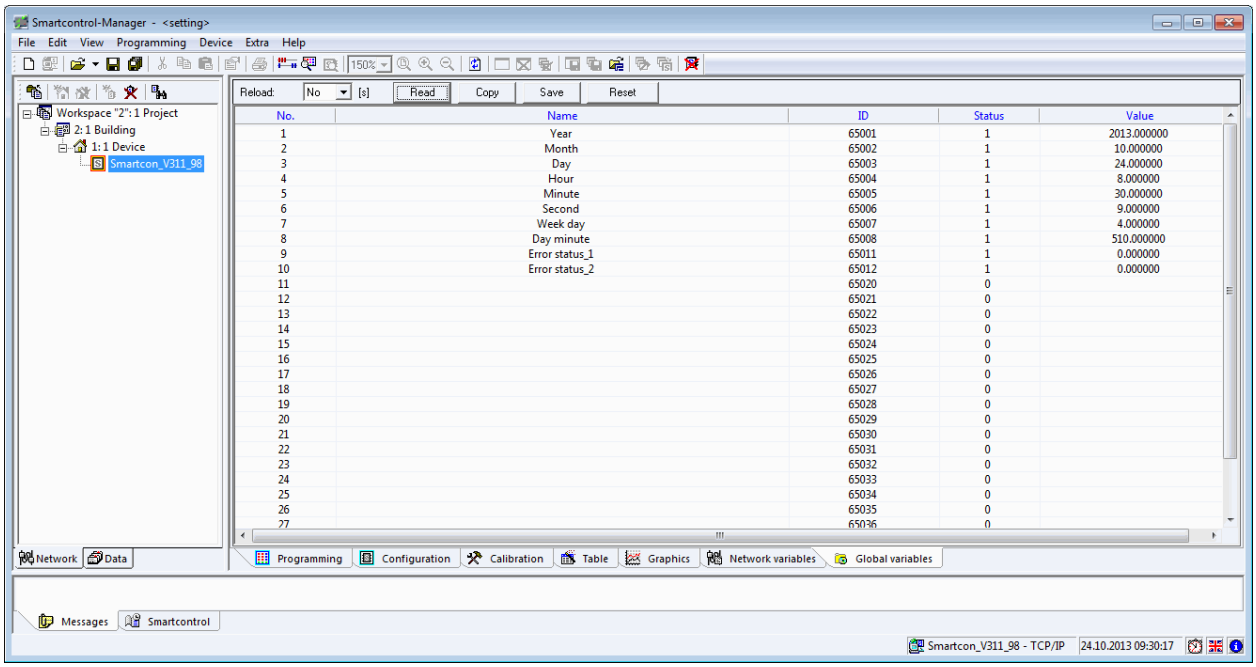
9. All of the commands from the template are added to the open program, and the new IDs are generated correspondingly in the current program sheet.

The following limitations for supported data types still apply to version 1.7.1.0:
M-Bus: Data point, addresses, port, primary/secondary can be entered.
M-Bus application: no support
Modbus: “Device Address” can be entered up to function 4, as well as reference address as of 5.
Status integral: Address can be entered.
Peak load optimization: Address, meter input, target power and enabling can be entered.

1.9 The “Global Variables” Tab

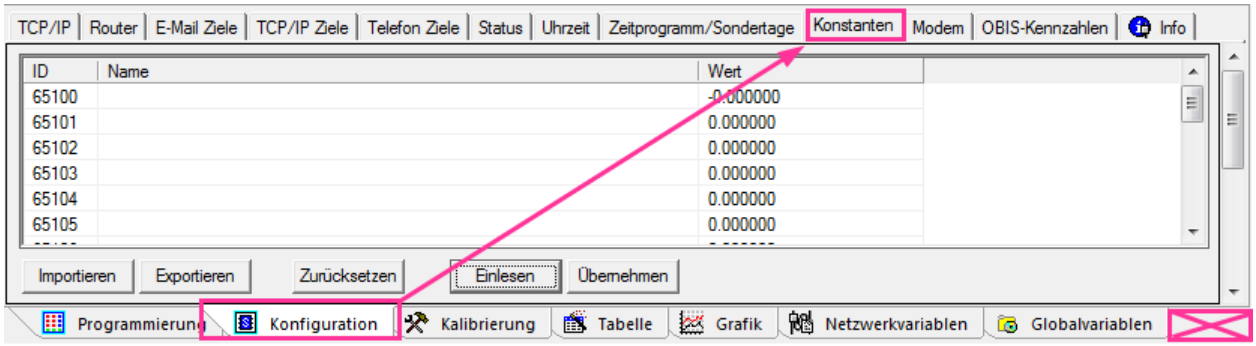
The following global variables are available and can be referenced:

Variable	Value
65001	Current year, e.g. 2008
65002	Current month, e.g. 10 for October
65003	Current day of the month, e.g. 9
65004	Current hour from the SMARTCONTROL , e.g. 12 (CET)
65005	Current minute of the hour
65006	Current second of the minute
65007	Current day of the week, 0 = Sunday, 1 = Monday ...
65008	Number of elapsed minutes for the current day
65011	Status error 1
65012	Status error 2
65020	Current value from the timer program with ID 65020
65021	Current value from the timer program with ID 65021
65022	Current value from the timer program with ID 65022
65023	Current value from the timer program with ID 65023
65024	Current value from the timer program with ID 65024
65025	Current value from the timer program with ID 65025
65026	Current value from the timer program with ID 65026
65027	Current value from the timer program with ID 65027
65028	Current value from the timer program with ID 65028
65029	Current value from the timer program with ID 65029



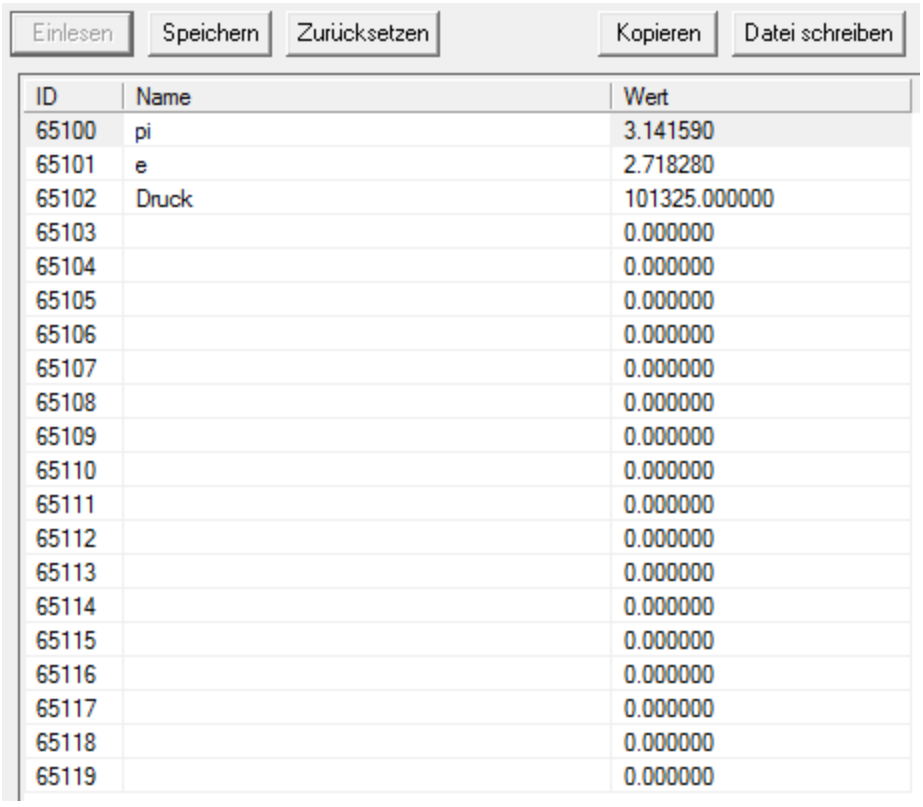
1.10 The “Constants” Tab

Up to 20 contestant values can be entered to the constants tab. This is especially practical if you use certain values again and again in your calculations.



Note: The constants tab has been moved from the main tab bar to configuration!

The name may not exceed a length of 5 characters. The value is a floating-point number.



ID	Name	Wert
65100	pi	3.141590
65101	e	2.718280
65102	Druck	101325.000000
65103		0.000000
65104		0.000000
65105		0.000000
65106		0.000000
65107		0.000000
65108		0.000000
65109		0.000000
65110		0.000000
65111		0.000000
65112		0.000000
65113		0.000000
65114		0.000000
65115		0.000000
65116		0.000000
65117		0.000000
65118		0.000000
65119		0.000000

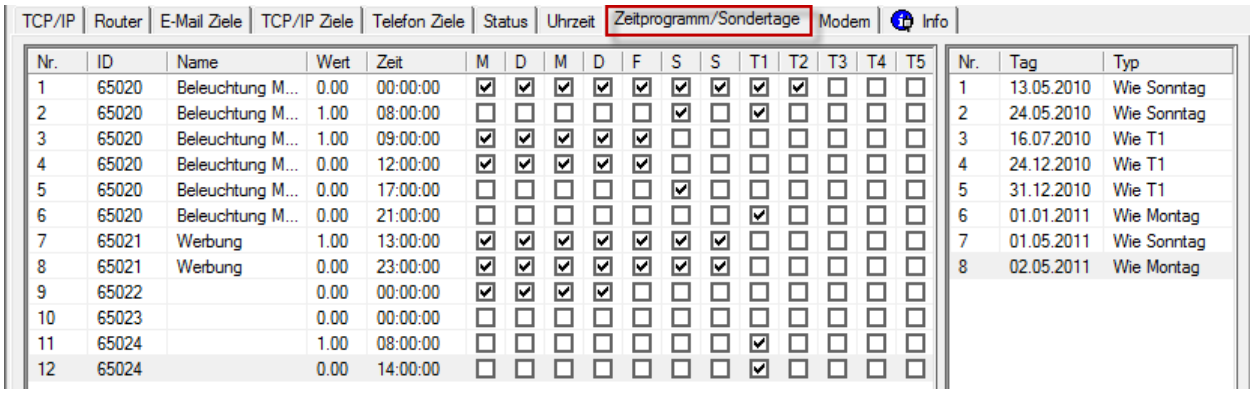
Currently stored constants are displayed in the table after clicking the “Read” button.

Proceed as follows in order to change the table:

- Read in the current table by clicking the “Read” button.
- Change/supplement the values.
- Click the “Save” button.

2. Timer Program / Special Days

A timer program which takes special days into consideration (e.g. holidays, Sundays on which the shops are open for business, inventory days etc.) is required in order to assure smooth operation of the controller.



Nr.	ID	Name	Wert	Zeit	M	D	M	D	F	S	S	T1	T2	T3	T4	T5
1	65020	Beleuchtung M...	0.00	00:00:00	☑	☑	☑	☑	☑	☑	☑	☑	☑	☐	☐	☐
2	65020	Beleuchtung M...	1.00	08:00:00	☐	☐	☐	☐	☐	☑	☐	☑	☐	☐	☐	☐
3	65020	Beleuchtung M...	1.00	09:00:00	☑	☑	☑	☑	☑	☐	☐	☐	☐	☐	☐	☐
4	65020	Beleuchtung M...	0.00	12:00:00	☑	☑	☑	☑	☑	☐	☐	☐	☐	☐	☐	☐
5	65020	Beleuchtung M...	0.00	17:00:00	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐
6	65020	Beleuchtung M...	0.00	21:00:00	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐
7	65021	Werbung	1.00	13:00:00	☑	☑	☑	☑	☑	☑	☑	☐	☐	☐	☐	☐
8	65021	Werbung	0.00	23:00:00	☑	☑	☑	☑	☑	☑	☑	☐	☐	☐	☐	☐
9	65022		0.00	00:00:00	☑	☑	☑	☑	☐	☐	☐	☐	☐	☐	☐	☐
10	65023		0.00	00:00:00	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
11	65024		1.00	08:00:00	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐
12	65024		0.00	14:00:00	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐

Nr.	Tag	Typ
1	13.05.2010	Wie Sonntag
2	24.05.2010	Wie Sonntag
3	16.07.2010	Wie T1
4	24.12.2010	Wie T1
5	31.12.2010	Wie T1
6	01.01.2011	Wie Montag
7	01.05.2011	Wie Sonntag
8	02.05.2011	Wie Montag

As of version 1.7.2.0 of the configuration software, timer programs can be exported from a device as a template in a GTT file, which can be subsequently imported as timer programs into other devices.

Up to 150 switching times can be specified for as many as 20 different programs.

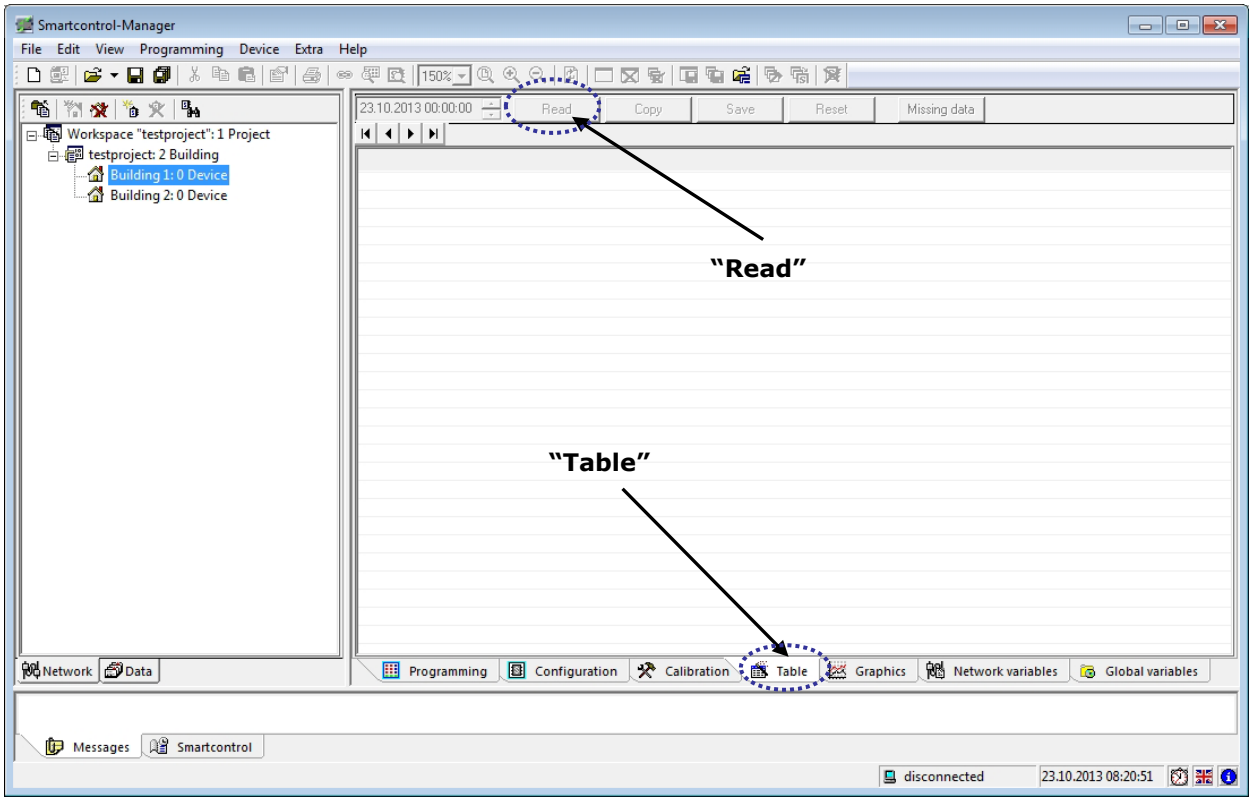
The timer program table has the following buttons:

Import – Import timer program from GTT file
Export – Export timer program to GTT file
Sort – Sorts the table according to ID and time (chronologically)
Reset – Resets all table entries
Read in – Reads timer programs in from the currently connected device
Accept – Transfers all entries to the connected device

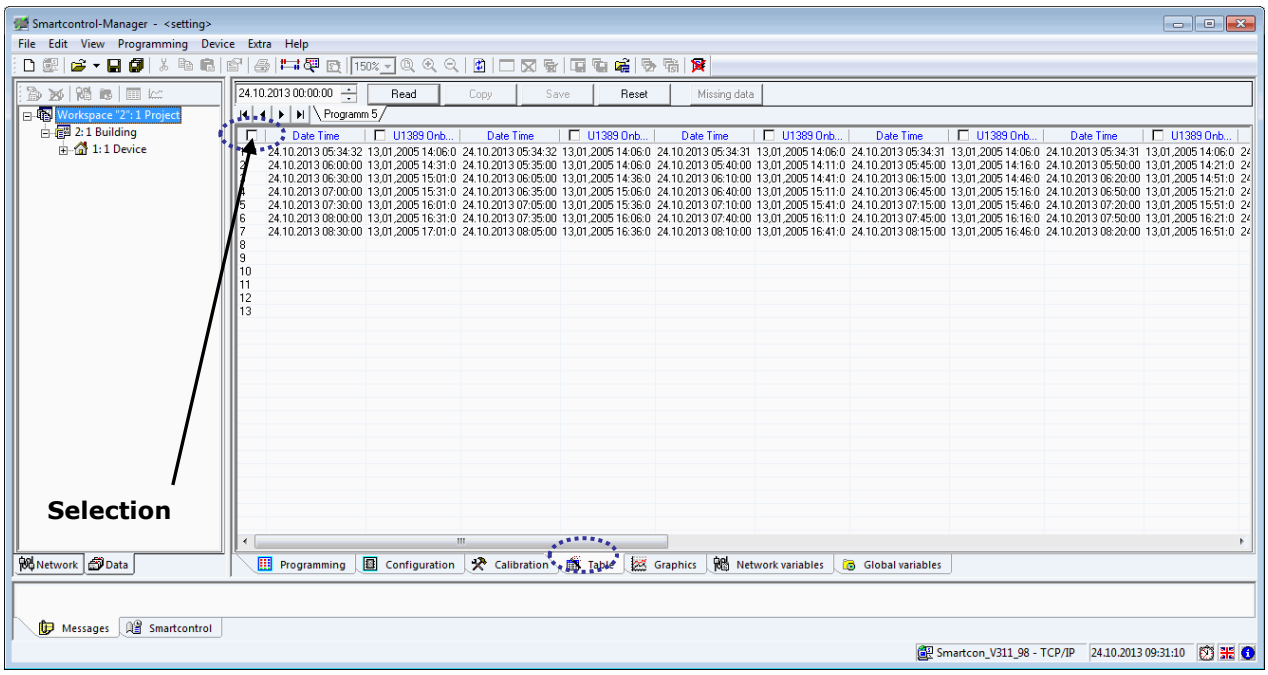
The timer program table has the following columns:

ID – A number between 65020 and 65039 used as a program ID (it's possible to create several programs with the same ID, but with different times).
Name – Program name (all programs with the same ID have the same name as well).
Value – A number which returns the program ID during referencing to a command
Time – Time (e.g. 08:00:00 as switch-on time, 20:00:00 as switch-off time)
M-S – Day of the week
T1-T9 – Special days

3. Reading In Data and Displaying them as a Graphic

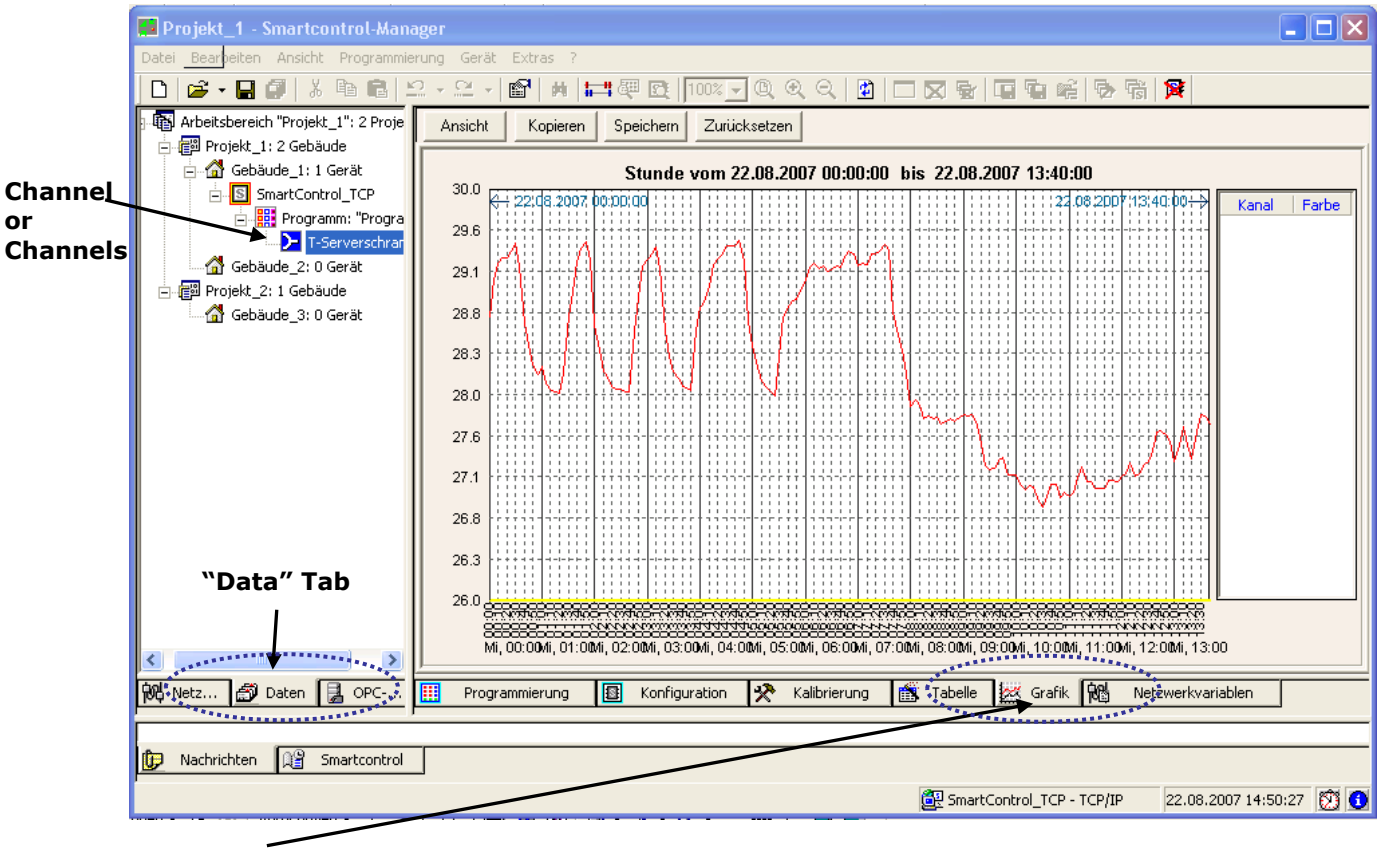


After connection to the SMARTCONTROL has been successfully established, select the "Table" tab, specify the desired readout timespan and click the "Read" button. Data which have been recorded to the SMARTCONTROL are now transmitted, which may take several minutes depending upon connection quality.



The data can now be copied, or exported as a data file which can be processed with the help of a spreadsheet program. Enter checkmarks next to the desired data points to this end, or enter checkmarks for all data points simultaneously as shown in the screenshot with the "Selection" function. The data can be copied to the clipboard by clicking the "Copy" button, or saved as a file by clicking the "Save" button.

If the data need to be imported again using a different timespan, the "Reset" button must first be clicked.



Click the "Graphics" tab.
After readout, channels are made available in the left-hand window under SMARTCONTROL. Simply pull them into the main window in the middle by means of drag and drop. The data

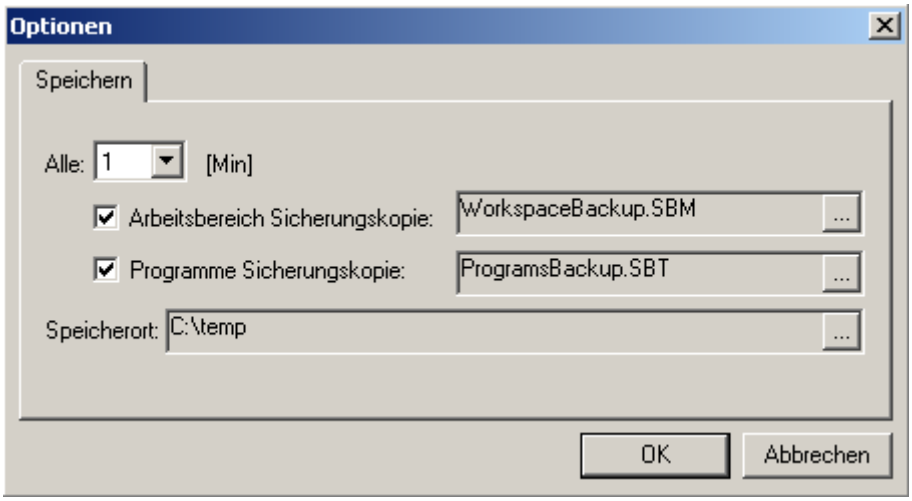
are then displayed as a graphic.
If several channels are displayed in the graphics window, the units of measure along the Y-axis are adapted automatically.
Graphics can be saved as BMP files by clicking the "Save" button, and they can be cleared from the main window by clicking the "Reset" button.

After the data have been read in, the display is switched automatically from the "Network" tab to the "Data" tab. Click the "Network" tab first in order to establish a connection with an additional SMARTCONTROL.

4. Options

4.1 Save

You can enter the current workspace and programs path for the backup copy in the **Save** index tab (**Options** dialog in the **Extras** menu).



4.2 Shutting Down and Restarting SMARTCONTROL

Approximately once every 15 minutes, SMARTCONTROL transfers recorded data from volatile RAM to non-volatile flash memory.
Data stored in RAM which have not yet been written to flash memory are lost in the event of a restart.
A maintenance mode is provided as of firmware version 1.1.34, allowing for immediate saving of data before a restart. After pressing and holding the F1 key (see 14) for 5 seconds, data are written from RAM to non-volatile flash memory.
The blinking pattern at the DIAG LED changes. The SMARTCONTROL can now be shut down or restarted by pressing the reset key (see 15). If no further action is taken after pressing the F1 key, the SMARTCONTROL resumes normal operation after 60 seconds.

4.3 Virtual COM Port

As of firmware version 2.5.05, a virtual COM port can be set up for third party programs. Please refer to the online help for details.

5. FAQs

SMARTCONTROL at a very humid location

If the SMARTCONTROL is used at a location where, for example, excessive condensate can be expected, e.g. at an unheated, outdoor site, the SMARTCONTROL IP65 must be carefully sealed.
At locations of this sort, or in a steamy environment, the SMARTCONTROL must also be equipped with a fully encapsulated PCB.

Assistance provided by the Control Monitor

The SMARTCONTROL Control Monitor is installed along with the SMARTCONTROL Manager or the GMC-I Controlling application. It can be started via Programs -> GMC-I-> Tools/SMARTCONTROL Manager -> SMARTCONTROL Control Monitor. The Control Monitor displays the activities of the SMARTCONTROL Manager in a comprehensive fashion. The Control Monitor provides helpful information during troubleshooting. For example if the "No answer busy" error message appears while querying via modem, the line to the addressed SMARTCONTROL is busy.

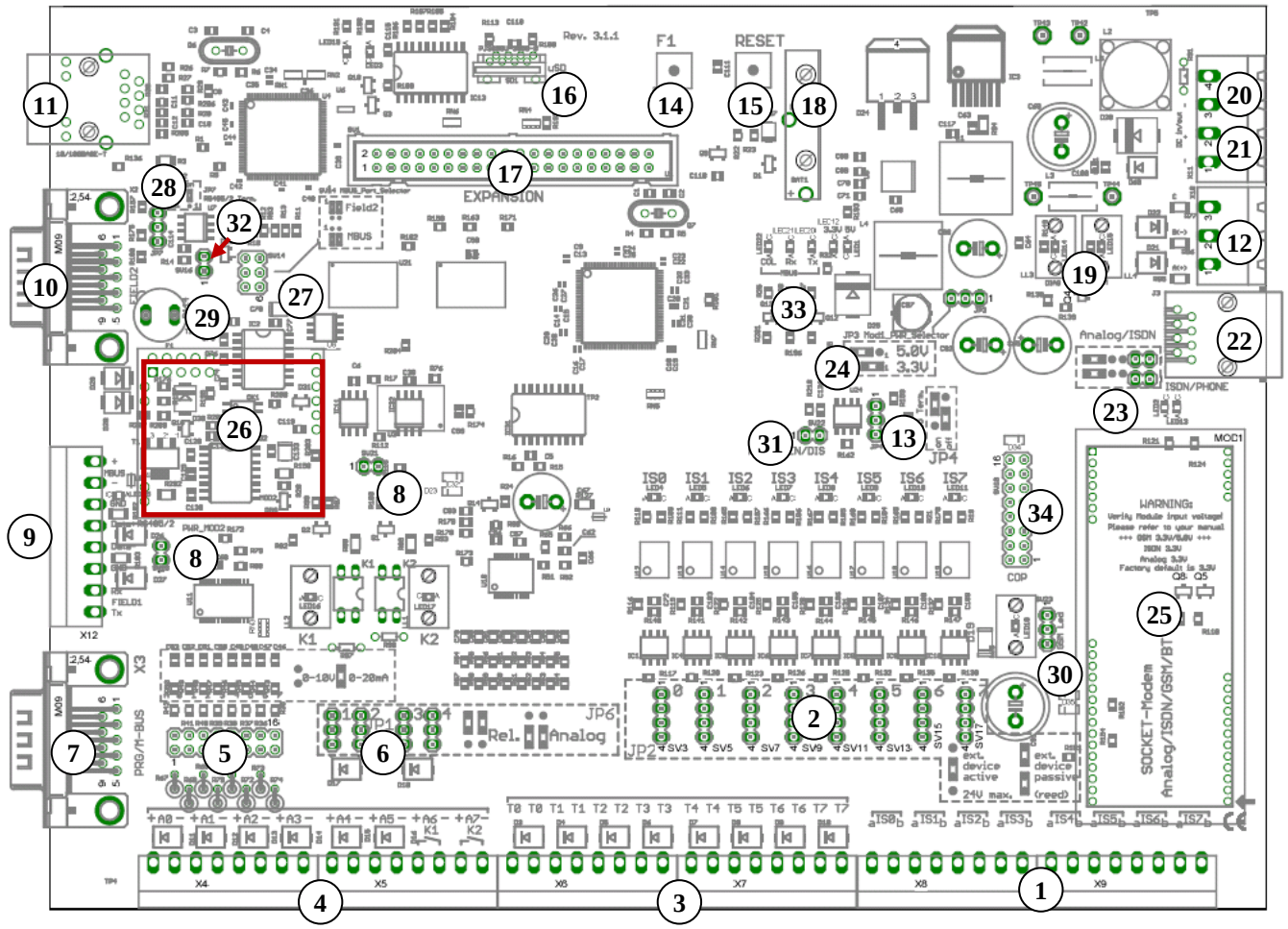
Problem during data logging

Determine whether or not the prerequisites for data logging have been fulfilled: active command in the program, test executed and saved to the SB.
Can the table be read in, are data available?
An M-Bus command is not recorded if the specified number of data points is incorrect.
Is or was SMARTCONTROL clock time in the future? If so, nothing is recorded.

Querying data via analog or GSM modem doesn't work

In the case of poor or impossible data transmission via GSM or analog modem, the size of the data block can be set to 1 in the "Extras" menu in the SMARTCONTROL Manager. The default value of 2 kB is reduced to 1 kB as a result. Data transmission takes longer, but valid data blocks will very probably be transmitted.

6. Connections Overview, Revision V3



(1) 8 digital inputs: pulse/status/tariff
(2) JP2: digital inputs (active/passive signal)
(3) 8 temperature inputs: Pt 1000
(4) 6 analog inputs + 2 relay outputs / analog inputs
(5) JP1: 0 to 10 V or 10 to 20 mA analog inputs
(6) JP6: A6/A7 as analog input or as K1/K2 relay output
(7) M-Bus via level converter / RS 232 programming
(8) System jumper
(9) Terminal strip (M-BUS,RS 485/2, Field1)
(10) Interface: Field2 (RS232), parallel to (9) RS485/2
(11) Interface: RJ45 Ethernet (10/100MBit), TCP/IP
(12) Interface: RS485/1 parallel to (9) Field1
(13) JP4: RS 485/1 termination
(14) Key: F1
(15) Key: reset
(16) microSD card slot
(17) Expansion port
(18) Battery for real-time clock (RTC)
(19) LED: DIAG/COM
(20) 12 to 24 V DC supply power input
(21) 12 to 24 V DC auxiliary power output
(22) Connection: analog cable / ISDN cable
(23) JP5: selection of analog/ISDN
(24) JP3: adjust voltage at socket module
(25) Module socket for analog/ISDN/GSM/Bluetooth
(26) Card slot for MBUS module (optional)
(27) SV14: MBUS port selector (MBUS/Field2)
(28) JP7: RS 485/2 termination
(29) Slot for fuse, MBUS module (250 mAT)
(30) SV23: GSM LED selection
(31) RS485/1 receive enable/disable
(32) RS485/2 receive enable/disable
(33) LED display, MBUS module (**col**lision/Rx/Tx)
(34) COP (reserved)

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90471 Nürnberg, Germany
Phone: +49 911 817718-0
Fax: +49 911 817718-253
e-mail: service@gossenmetrawatt.com
www.gmci-service.com

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