SMART**CONTROL** | ECS

Energy Management System

3-349-424-03
2/3.10

1   Range of Applications

Diverse Data Collector and Data Messenger

Performance features of Gossen Metrawatt's SmartControl:
SmartControl renders energy consumption immediately measurable in a detailed fashion, and thus makes it 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

Gossen Metrawatt's SmartControl is an **inexpensive, user-friendly, easy to integrate data logging system**, and thus fulfills all prerequisites for quickly establishing efficient, sustainable, widespread energy management for buildings and properties.

Amongst other quantities, Gossen Metrawatt's 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
- M-Bus protocol, ModBus

One of the system's important advantages is its ability to access all relevant data at any time – quickly and conveniently. For example, an integrated display allows for visualization of the building's energy consumption in Gossen Metrawatt's SmartControl, and any defects, above average consumption levels and irregularities are identified immediately.

We would be happy to place ourselves at your disposal if you would like to make actual energy consumption more transparent in the future, and optimize it as well.

Information regarding all facets of GMC-I Messtechnik GmbH, as well as other industry information, is available at:

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2   Gossen Metrawatt SmartControl

2.1   Important Notes

Please keep these instructions in a safe place and make them accessible to new users, or hand them over to the new owner in the event of a change of ownership. These instructions must always be available, must be adhered to during installation, operation and maintenance, and must be provided to the installation technician for his or her perusal.
All other instructions, including those contained in the installation instructions and the wiring diagram, must also be adhered to.

Our manuals are prepared with care, examined and continuously updated.
Errors and omissions are excepted.
No liability can be assumed for faulty information.
Gossen-Metrawatt reserves the right to implement technical improvements to the function and/or the design of software and hardware products, and to revise manuals at any time without notice.

> **The SmartControl may only be installed
> by trained, authorized personnel.**

In particular, all VDE regulations, as well as other connection regulations and stipulations, must be complied with.

Electrostatic charging must be avoided. For this reason, avoid touching the PCB and provide for electrostatic discharging of personnel and tools before beginning work. Do not install during a thunderstorm.

Correct polarity must be assured when making connections, and ground terminals must be properly connected.
Do not supply power to any other devices directly from the mains power terminals.
Unused terminals may not be utilized for other connections.

The devices are not intended for use in explosion-proof zones.

Make sure that all sources of electrical power have been disconnected before conducting work on the system's electrical section.

Please note that the system does not function during configuration, i.e. the relays do not work.

> **No guarantee can be made regarding the
> achievement of specified accuracies.
> The complexity of conditions which prevail depending
> upon local circumstances make it impossible to specify
> any general guarantee stipulations.**

The SmartControl is not approved for use as a life support device in safety relevant systems or other vitally important equipment.

Examples: fire alarms, reactor monitoring, medical devices, aircraft

It is the responsibility of the user to install suitable safety and protective devices in all areas of application.

We make explicit reference to the fact that hardware and software designations are, as a rule, protected by the brand name, trade mark and patent rights of the respective manufacturers.

All of the devices may only be operated in accordance with the instructions, and within the stipulated range of specifications. For example, overvoltage, excessive temperature, moisture inside the housing – even for short periods of time – as well as careless handling and operating errors render the guarantee null and void.

The devices must be tested for correct functioning after all installation and connection work has been completed.
Inspection is also required in order to assure that all screws have been securely tightened. Furthermore, insulation testing must be conducted in accordance with VDE. Do not expose components which are not voltage-proof to high voltages during testing.

Wherever possible, low-voltage cables must not be laid parallel to heavy-current conductors, adequate clearance to heavy-current conductors should be maintained and ferrite beads should be attached to both cable ends.

If any of the devices demonstrates a defect, please contact your dealer or Gossen Metrawatt. No repairs may be carried out by the customer.

Our devices are guaranteed for a period of 24 months beginning on the date of purchase. If defects due to production errors should become apparent within this period of time, the device shall be repaired or replaced by ourselves free of charge. All other claims for the compensation of damages are excluded.
Return devices must be dispatched to us via the least expensive postal service. Unauthorized modification of the device immediately renders the guarantee null and void.

We assume no liability for any further damages, or for consequential damages.
In general, liability is limited to the purchase price of our products.

The information provided in this brochure includes general descriptions and performance features only, which do not always apply to the application in actual practice, or which may change as the result of further development of the products. The desired performance features are only binding if they have been explicitly agreed upon contractually.

2.2 Scope of Delivery

The following is included in the scope of delivery:

1 Gossen Metrawatt SmartControl
1 User's manual
1 Set of installation instructions
1 Wiring diagram

1 Ethernet crossover patch cable (approx. 3 m.)
1 Gossen Metrawatt screwdriver
1 CD

Depending upon selected device options:
Cables and antennas

2.3   SmartControl Components

SmartControl Standard:

SC/S Basic Device Compact Housing	
Housing	Steel sheet metal, approx. 225 x 210 x 70 mm (W x H x D)
Power consumption *	Approx. 2.5 W
Control keys	Two function keys: F1 and Reset (in device)
Display	LCD connection available as option
Operating conditions	5 to 50° C, no condensation

SmartControl IP 65:

Gossen Metrawatt's SmartControl is supplied in a control cabinet which fulfills the IP 65 standard. A lockable control cabinet is available as an option, but not with IP 65 protection. Gossen Metrawatt's SmartControl [*see figure 5*] consists of a single PCB system [*see figure 6*], a power pack, a circuit breaker and various attachable components. In addition to this, options (e.g. M-Bus) can be secured to the integrated mounting rails or inserted into available slots on the PCB (e.g. socket modules or memory expansions). The housing is furnished with Pg connectors at the bottom (1 ea. M25, 4 ea. M16).

SC/IP 65 Basic Device, 12 or 24 V IP 65 Control Cabinet Variant	
Housing	Steel sheet metal, 380 x 380 x 210 mm (W x H x D)
Weight	Approx. 10 kg
Protection	IP 65 when correctly mounted
Power consumption *	Approx. 2.5 W
Power Supply	230 V ~
Built-in power pack	Input: 100 to 240V~, 50/60 Hz
	Output: 24 V=
Additional 24 V= power pack	Optional, e.g. for sensors
Operating conditions	5 to 50° C, no condensation

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* Actual power consumption depends upon power pack efficiency, as well as any other connected sensors and devices.

Not suitable for explosive or corrosive atmospheres.
Conductive contamination, loose small parts and moisture may not be allowed to penetrate the control cabinet.

Storage: 5 to 50° C, no condensation, dry, frost-free, dust-free

Power Pack:

Gossen Metrawatt's SmartControl is supplied with electrical power from the integrated, primary switched-mode power supply, which complies with the following performance data:

Input: 100 to 240V~, 50/60 Hz
Output: 24 V=

An optional 24 V= power pack can be integrated into the Gossen Metrawatt SmartControl IP 65 for simultaneously supplying multiple external sensors, for example, with electrical power.

LED Display:

Various LED displays are included on the PCB. The DIAG and COM displays can be found here [*see figure 6, item* (18)*, and refer to the section entitled "Diagnosis / Status Display LEDs"*].

DIAG LED:	Blinks green (status: OK)
COM LED:	Blinks green to indicate data transfer
8 LEDs for the digital inputs:	Blink red to indicate input signal
1 LED for 3.3 V supply power:	Lights up red
1 LED for 5 V supply power:	Lights up red
1 LED for each switching output,	
K1 and K2:	Light up green when relay contact is closed

2.4 Overview of Connection Options

Figure 1

Compact flash card (optional)

Ethernet: 10/100 MBit — 8

Compact flash card (optional) — 9

Numerical keypad: 16 keys, LCD-display: 4 x 20 char. (optional) — 10

RS 485 Bus: i.e. ModBus — 11

Socket*: Phone or ISDN — 12

* Module socket: analogue modem/ GSM/Bluetooth/ISDN (optional) — 13

RS 232: FIELD 2 — 7

RS 232: FIELD 1 — 6

RS 232: M-Bus protocol via external level converter — 5

8 Analogue inputs: 0-10V, 0-20 mA — 4

2 Relay outputs — 3

8 Temperature inputs (PT 1000) — 2

8 Inputs pulse/ status/tariff — 1

POWER

DIAG

SMARTCONTROL ECS energy control system

GOSSEN METRAWATT

2.5   Installation

2.5.1   Installation Location

Close proximity to water, sources of heat, direct sunlight, radiators, devices which generate electromagnetic fields, transmitters, high frequency sources, radiation emitting devices, locations which are exposed to excessive vibration or shock
must be **avoided**.
Ambient temperature should lie within a range of +5 to +50° C.
Recommended installation height: at least 50 cm, and not more than 150 cm from the floor to the bottom edge of the cabinet.
The wall to which the device is mounted must be flat, dry and sturdy.
Before drilling holes, make sure that there are no cables, pipes or other lines which have been laid inside the wall in close proximity to the intended installation position.

2.5.2   Mounting the SmartControl IP 65

The standard version of the IP 65 housing has the following dimensions:
approx. 380 x 380 x 210 mm (W x H x D).
The 4 holes in the housing are used to mount the box. Remove the right-hand cable duct cover in order to expose all four mounting holes.

Figure 2

The box must be securely mounted with 4 suitable screws and anchors, depending upon substrate and material.

Box Mounting Hole Diameter: Approx. 8.2 mm
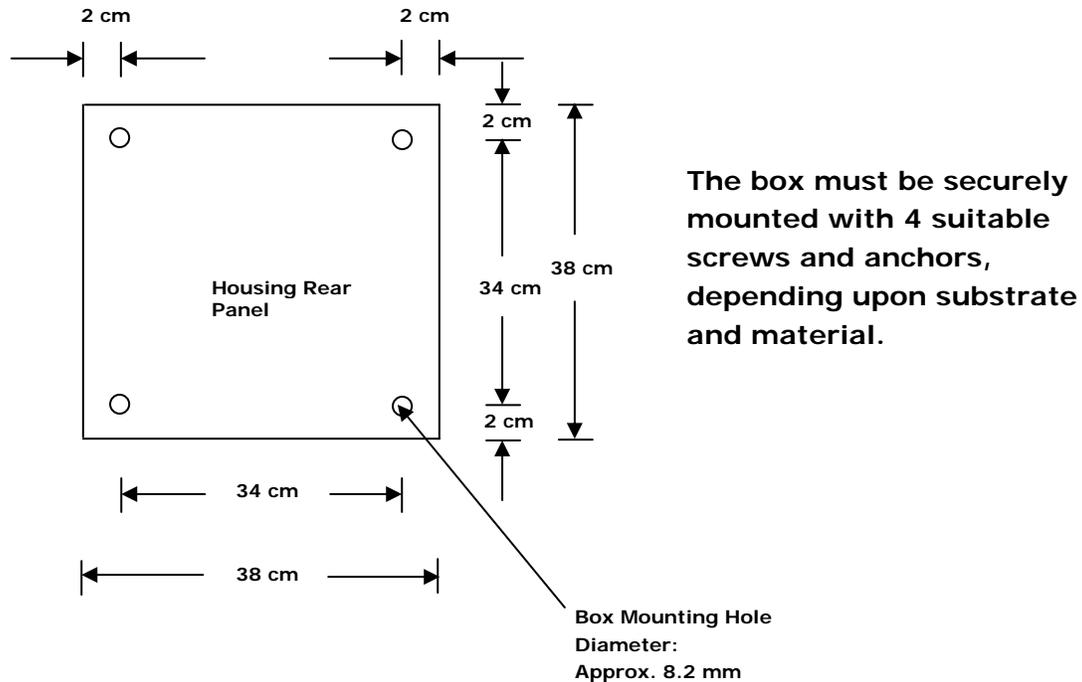
Please check housing dimensions in the case of special variants.

2.5.3 Mounting the SmartControl Standard

The housing has the following dimensions:
approx. 225 x 210 x 70 mm (W x H x D).
The 3 holes in the housing are used to mount the SmartControl. Remove the 4 housing screws and lift off the housing cover in order to expose the mounting holes.

Top Housing Screw

Top Housing Screw

11.3 cm   11.3 cm

2.6 cm

The box must be securely mounted with 3 suitable screws and anchors, depending upon substrate and material.

Bottom Housing

Housing Rear Panel

16 cm   21 cm

2.4 cm

3.3 cm   3.3 cm

16 cm

22.6 cm

Box Mounting Hole Diameter: Approx. 5 mm
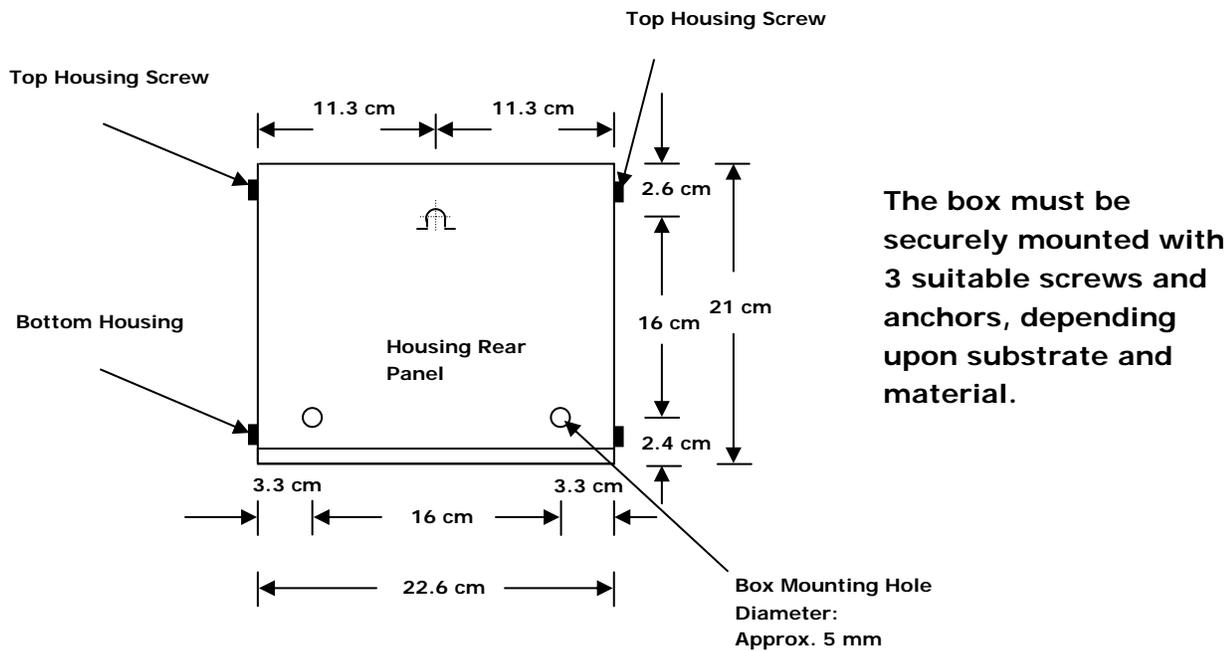
The top mounting hole is laid out as a slot, and the thickness of the housing wall is approximately 1 mm.

The SmartControl Standard is shipped with 4 installed housing screws. Only the two screws at the bottom need to be loosened for mounting, because the opening in the housing top is only intended for the LED cable with version 1.x, and for the fiber-optic cable with version 2.x. The top screws may not be loosened for this reason.

The housing top can be tipped up after removing the two underline bottom screws with the included tool (stiff wire, approx. 25 cm long), in order to work on the installed SmartControl.

Remove the bottom two screws and tip up the housing top to this end. Now insert one end of the tool into the threaded drill hole at either side of the SmartControl for the bottom housing screws in the SmartControl base plate – from the outside. Insert the other end of the tool into the drill hole for the bottom screw in the housing top after it has been tipped up.

2.5.4   Cable Inlets, SmartControl IP 65

Figure 3
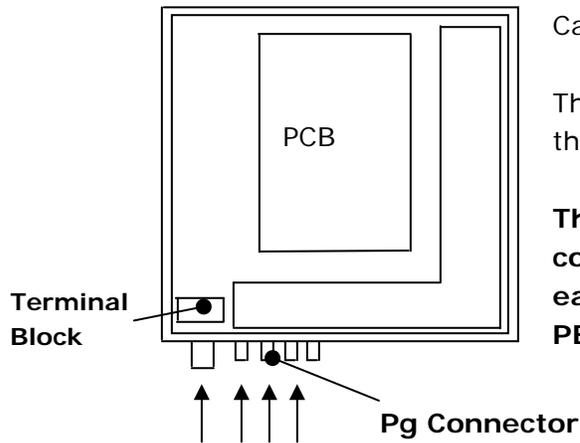
Cables must be <u>tension-free</u>.

The cables must be lead in from the bottom. It must be assured that the cables are long enough to reach the connector terminals.

The power supply cable may have no more than 3 conductors with a maximum cross-section of 1.5 square mm each, and must be connected to the 230 V terminal block: PE, N and L1.

Terminal Block

Pg Connector

F1	N	PE	L1

Terminal Block

2.5.5   Low-Current Leads
a) SmartControl IP 65

Figure 4
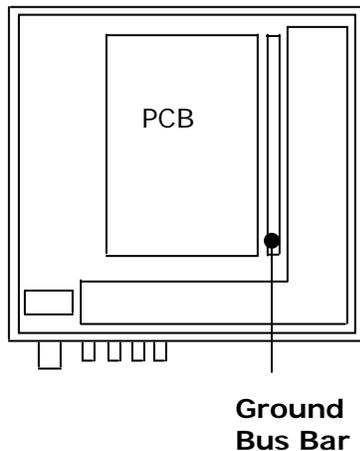
The shields of all shielded cables must be connected to a ground bus bar by means of shield terminals assuring large surface-area connection.
Identify all inserted cables with the respective cable number in accordance with the wiring diagram in a readily legible fashion using cable ties.
Secure the cables firmly, with cable ties if necessary.
See the connection overview below regarding connection options. Be sure to observe additional notes included in the operating instructions as well.
Retighten all screws and fasteners after installation has been completed.

Ground Bus Bar

Tighten the threaded cable glands to the specified tightening torque. The housing must be water-proof. If applicable, the included connectors must be replaced with suitable ones, and unused connectors must be replaced with blanking plugs. It must be assured that only standardized materials which are suitable for the IP 65 standard, and which seal the openings appropriately, are utilized.

b) SmartControl Standard
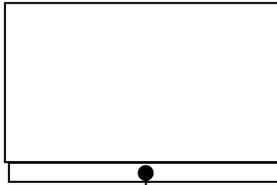
Ground Bus Bar

The shields of all shielded cables must be connected to a ground bus bar by means of shield terminals assuring large surface-area connection. Connect the ground bus bar to the building's equipotential bonding. Identify all cables with the respective cable number in accordance with the wiring diagram in a readily legible fashion using cable ties. Secure the cables firmly, with cable ties if necessary. See the connection overview below regarding connection options. Be sure to observe additional notes included in the operating instructions as well.

c) All SmartControl Variants

Retighten all screws and fasteners after installation has been completed.

Insulation testing must be executed in accordance with VDE. Do not expose components which are not voltage-proof to high voltages during testing.

Green connector plugs for the various inputs (analog, temperature, digital) are located on the PCB. Wires with cross-sections of up to 1.5 square mm can be connected.

2.6   Component Views

2.6.1   Housing Layout, IP 65

Figure 5 (schematic)

2.6.2   PCB Connections

Figure 6
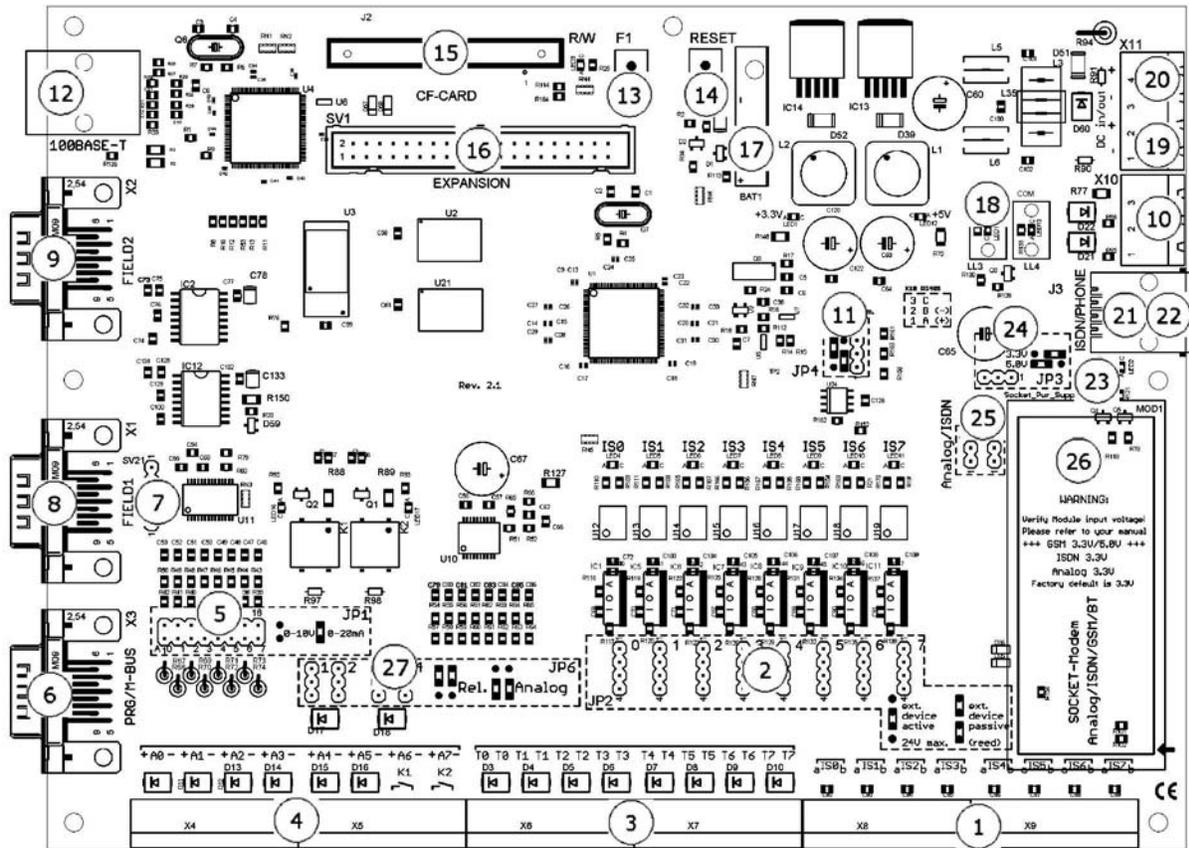
(1)	8 digital inputs: pulse/status, tariff	(15)	Option: compact flash card
(2)	Jumper: digital inputs (active/passive signal)	(16)	Option: LCD/keypad
(3)	8 temperature inputs: Pt 1000	(17)	Battery for real-time clock
(4)	6 analog inputs, 2 relay outputs or 2 additional analog inputs	(18)	LED: DIAG / COM
(5)	Jumper: analog measurement (0 to 10 V / 0 to 20 mA)	(19)	Input: 12 to 24 V DC supply power
(6)	Interface: M-Bus*/PRG (RS 232) (* via level converter)	(20)	Output: 12 to 24 V DC supply power
(7)	Jumper: PRG firmware	(21)	Connection: analog telephone line
(8)	Interface: FIELD 1 (RS 232)	(22)	Connection: ISDN telephone line
(9)	Interface: FIELD 2 (RS 232)	(23)	LED: GSM/DCD/TX/RX
(10)	Interface: FIELDBUS (RS 485)	(24)	Jumper: socket supply (3.5 V / 5.5 V)
(11)	Jumper: RS 485 termination	(25)	Jumper: analog or ISDN telephone output utilized
(12)	Interface: TCP/IP (10/100 MBit)	(26)	Module socket: analog/ISDN/GSM/ Bluetooth
(13)	Key: F1	(27)	Jumper: use A6/A7 as analog input or as K1/K2 relay output
(14)	Key: reset		

2.7 Inputs

2.7.1 Analog Inputs

The 6 analog inputs, A0 through A5 (terminals 1 through 12) [*see wiring diagram and item* (4) *in figure 6*], are intended for the connection of measuring transducers (e.g. pressure sensor, atmospheric humidity etc.) with **0 to 10 V** or **0 to 20 mA** output signals. Depending upon the jumper setting, terminals 13 through 16 can be used either as analog inputs A6 and A7, **or** as relay outputs K1 and K2:
Jumper series JP6 [*see item* (27) *in figure 6*] determines whether an analog input or a relay output will be used. These jumpers are set to the relay output operating mode at the factory(jumpers are included in the scope of delivery).
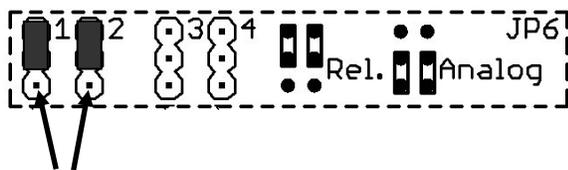
Jumper plugged onto relay output (default)

Relay Output	
Relay	1 NO contact, 1 A
Nominal voltage	60 V=/~, no inductive loads

Analog Measurement	
Measuring range	0 to 10 V, 0 to 20 mA
Internal resistance	Voltage measurement: 200 kΩ
	Current measurement: 249 Ω
Accuracy	better than ± 0.02 V
Calibration	± 0.005 V at 10 V
Frequency	Max. 1 Hz
A-D converter resolution	12 bit

The signal type or operating mode is determined with **jumper series JP1** [*see item* (5) *in figure 6*]. These jumpers are assigned to the respective analog input (from left to right: A0 to A7), and are set to the voltage measurement operating mode (0 to 10 V) at the factory (blue jumper included in scope of delivery). In order to measure a current signal (0 to 20 mA), the blue jumper which corresponds to the analog input must be inserted **in accordance with the following schematic diagram**:

The connector plugs are designated, and must be connected, as shown below (polarity as specified):

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

+ =

+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
Analog Input A0		Analog Input A1		Analog Input A2		Analog Input A3		Analog Input A4		Analog Input A5		Analog Input A6		Analog Input A7	
												or ⟋ — Relay Output K1 (jumper 6)		**or** ⟋ — Relay Output K2 (jumper 6)	
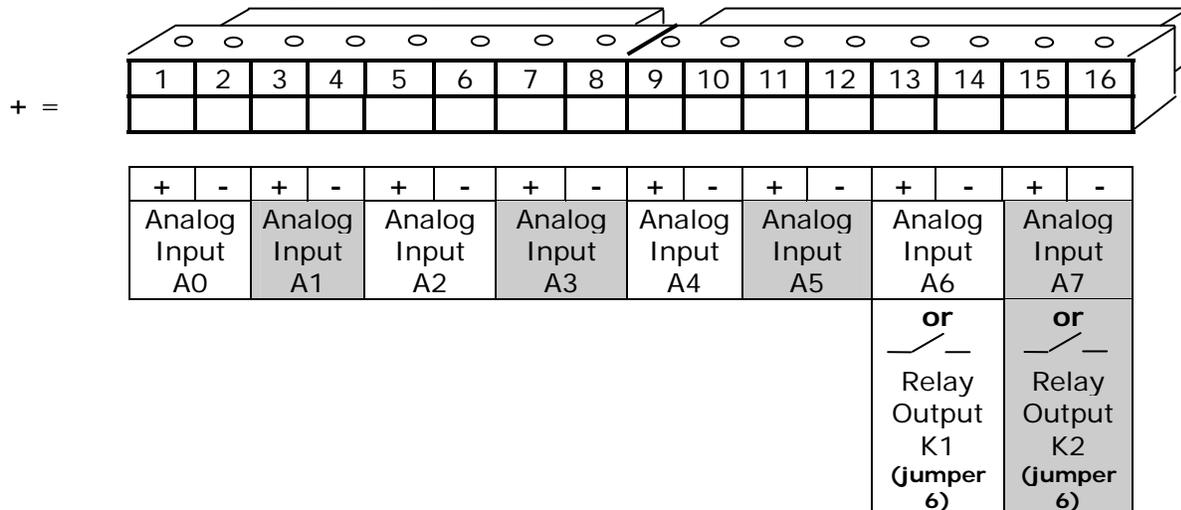
     Measuring signal

- =   All eight inputs have a common ground which also functions as the negative terminal. They are not electrically isolated.

The following points must be observed in order to achieve high measuring accuracy:
- Use shielded cables only. If possible, connect the shield to a separate ground contact (available with Gossen Metrawatt SmartControl/IP65).
- Keep cables as short as possible.
- Large cable cross-sections, at least 0.5 square mm (recommended: 0.75 square mm)
- Ferrite beads attached to both cable ends
- **If at all possible, do not lay cables parallel to heavy current conductors!**

In addition to this, if an input is used for 0 to 20 mA measurement, the corresponding input must be set to current measurement with the help of SmartControl Manager software [*see details in the section entitled "SmartControl Manager"*].

<div style="border:2px solid red; text-align:center">

All temperature and analog inputs must be safeguarded with suppressor diodes against over and undervoltages,which may occur, for example, in the event of distant lightening or due to electrostatic discharge, as well as due to defective third party devices.

Ideal overvoltage protection (lightning protection) can only be assured by means of lightning protection for the entire system laid out in accordance with applicable standards.

</div>

Connection example, <u>voltage</u> measurement at analog input 0:

Jumper Setting

Open

JP1   16
          ● 0-10V ▯ 0-20mA
A ₀

```
...
2  )─  -
1  )─  +
```

Voltage source   0 to 10 V
                  0 to 5 V   } Measuring range adjustable
                  0 to 1 V   with software
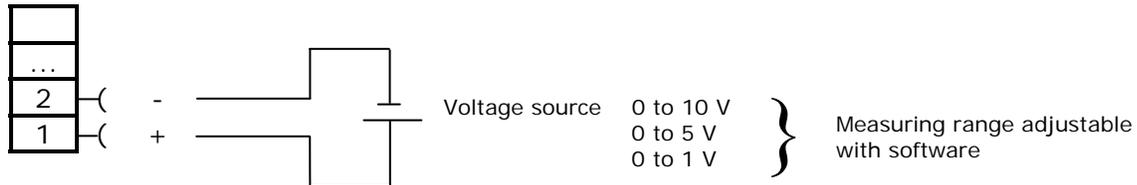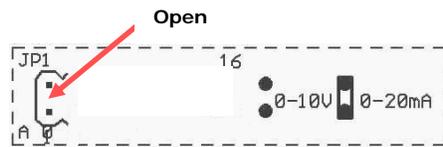
Connection example, <u>current</u> measurement at analog input 0:

Jumper Setting

Inserted

JP1   16
          ● 0-10V ▮ 0-20mA
A ₀

```
...
2  )─  -
1  )─  +
```

Current source   0 to 20 mA
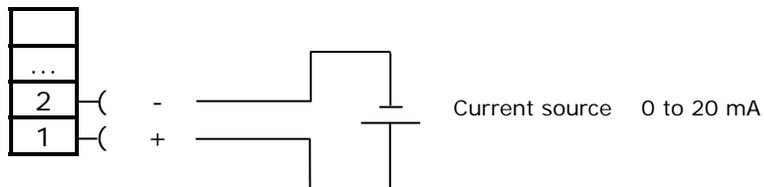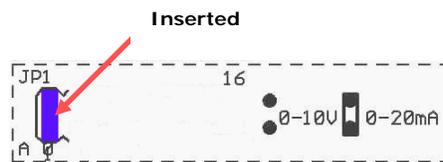
2.7.2   Temperature Inputs

The 8 temperature inputs, T0 through T7, terminals 17 through 32 [*see item* ③ *in figure 6, and the wiring diagram*], are intended for direct operation of eight Pt1000 platinum temperature sensors with 2-wire connection.

Temperature, Platinum 1000	
Measuring rnge	-0 to +170° C
Accuracy	Better than ± 0.5° C (depending upon DIN class)
Calibration	At the factory at 0° C and 100° C ± 0.05° C
A-D converter resolution	12 bit

Information regarding accuracy classes for platinum temperature sensors:	Class A: $dT = \pm(0.15° \text{ C} + 0.002 \cdot T)$ Class B: $dT = \pm(0.30° \text{ C} + 0.005 \cdot T)$ Class 1/3 B: $dT = \pm 1/3\ (0.30° \text{ C} + 0.005 \cdot T)$

The connector plugs are designated, and must be connected, as shown below (polarity is arbitrary):
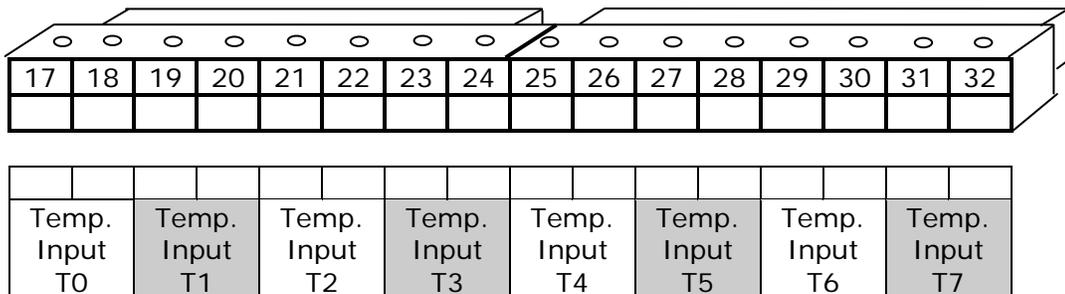
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

Temp. Input T0	Temp. Input T1	Temp. Input T2	Temp. Input T3	Temp. Input T4	Temp. Input T5	Temp. Input T6	Temp. Input T7

The following points must be observed in order to achieve high measuring accuracy:
- Use shielded cables only. If possible, connect the shield to a separate ground contact (available with Gossen Metrawatt SmartControl/IP65).
- Keep cables as short as possible.
- Large cable cross-sections, at least 0.5 square mm (recommended: 0.75 square mm)
- Ferrite beads attached to both cable ends
- If the last two conditions cannot be fulfilled, cable length and wire cross-section can be adapted with the software.
- If greater accuracy is required, class 1/3 B sensors can be used.
- **If at all possible, do not lay cables parallel to heavy current conductors!**

Example of connection to temperature input 1:
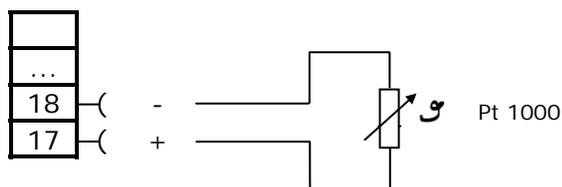
2.7.3 Digital Inputs

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

The 8 digital inputs include IS0 through IS7, terminals 33 through 48, [*see item* ① *in figure 6, and the wiring diagram*].
Either passive (e.g. reed contacts) or active pulse sources can be connected.
Examples of both types include electrical, gas and water meters, as well as door and window contacts and the like.
All digital inputs are preconfigured for **passive** switching contacts at the factory.
All of the red jumpers located on the PCB must be replugged for **active** pulse sources [*see item* ② *in figure 6*]. Active pulses indicate current and voltage values. They are electrically isolated by an optocoupler on the SmartControl.

Digital Inputs	
Passive reed contact load capacity	12 mA / typical input voltage: 12 or 24 V=
Active signals	Min. 12 mA, max. 24 V
Edge slope	Any
Filter (debouncing)	Digital (5 ms)
Pulse sequence	At least 10 / 10 ms (0/1)
Frequency	Max. 100 Hz
Detection method	Interrupt
Maximum cable length	200 m
Storage of meter readings	Every 15 minutes
Maximum meter reading	9999 9999.9999 99
Smallest resolution	0.000001
Units	M-Bus protocol
Inputs which can be setup as pulse inputs	8
Inputs which can be setup as status inputs	8
Inputs which can be setup as tariff inputs	3 (IS1, IS3 and IS5)
Input which can be setup as synchronization input	1 (IS7)
Optical pulse display	LED on the PCB

The signal type or operating mode is set with jumper series **JP2** [*see item* (2) *in figure 6*], which determines electrical configuration. These jumpers (red jumpers included in scope of delivery) are assigned to the respective digital inputs (from left to right: IS0 to IS7), and are set to the passive operating mode at the factory. In order to measure an active signal (active operating mode), the red jumpers which correspond to the respective digital input must be inserted as follows in accordance with the schematic shown below**:**

<u>Correct polarity must be assured</u>!	
Jumper Setting "active"	**Jumper Setting "passive"**
Terminal **a** = pulse input / status **+**	Terminal **a** = contact **−** / GND
Terminal **b** = pulse input / status **−**	Terminal **b** = contact **+** / open collector
Connection of, for example, pulse generators with their own 12 to 24 V= power supply / output signal and a load capacity of at least 15 mA	Connection of, for example, pulse generators with reed contact and a minimum contact / open collector load capacity of 15m A
* * * Electrical isolation * * *	**GND/earth connected to each other * * * <u>No electrical isolation</u> * * ***

Polarity is determined by the jumper setting. Polarity must be correct!

33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48

a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b
Digital Input IS0		Digital Input IS1		Digital Input IS2		Digital Input IS3		Digital Input IS4		Digital Input IS5		Digital Input IS6		Digital Input IS7	
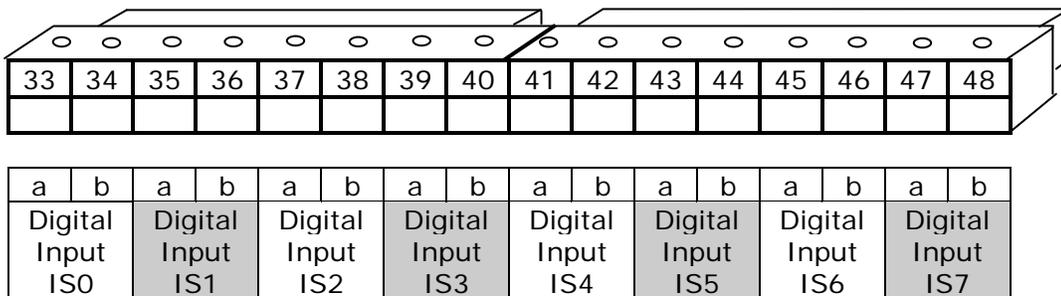
If a digital input is used as a <u>status input</u> (e.g. door contact, burner on-time etc.), SmartControl Manager software must be correspondingly configured in order to assure that every change to the input signal is recorded [*see section entitled "SmartControl Manager"*].

It is also possible to record tariff data, for example high tariff (HT) and secondary tariff (ST). There are three tariff inputs: IS1, IS3 and IS5. They specify whether or not the respectively previous inputs, namely IS0, IS2 and IS4, are allocated to HT or ST. For example, tariff input IS1 specifies whether pulses from IS0 will be allocated to HT or ST.

Inputs	IS0	IS1	IS2	IS3	IS4	IS5	IS6	IS7
Pulse	X	X	X	X	X	X	X	X
Status	X	X	X	X	X	X	X	X
Tariff		X		X		X		
Synchronizing								X

These tariff and synchronizing inputs are configured with SmartControl Manager software [*see section entitled "SmartControl Manager"*].

The following points must be observed in order to achieve high measuring accuracy:
- Use shielded cables only. If possible, connect the shield to a separate ground contact (available with Gossen Metrawatt SmartControl/IP65).
- Keep cables as short as possible.
- Large cable cross-sections, at least 0.5 square mm (recommended: 0.75 square mm)
- Ferrite beads attached to both cable ends
- **If at all possible, do not lay cables parallel to heavy current conductors!**
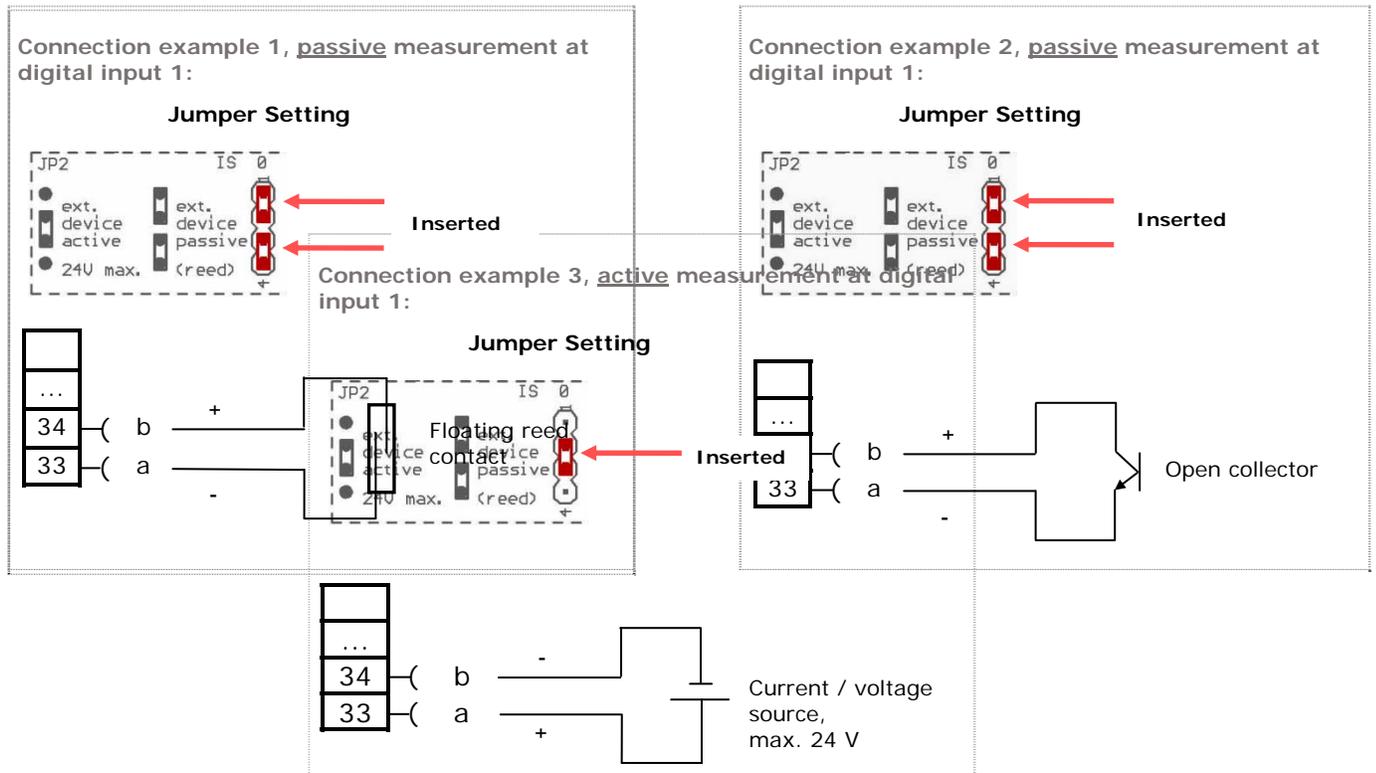
2.8   Example, Broken Cable Detection (Namur)

Connection example, Namur / broken cable detection, for passive pulse sources only (no internal voltage)

A SmartControl digital input, in this example 33/34, is set to the passive operating mode with the help of jumpers. An analog input, in this example 1/2, is set to the voltage measuring mode for 0 to 10 V with the help of jumpers.
A 15 kΩ resistor is installed at the pulse generator, and 1.5 and 1 kΩ resistors are installed at the SmartControl.
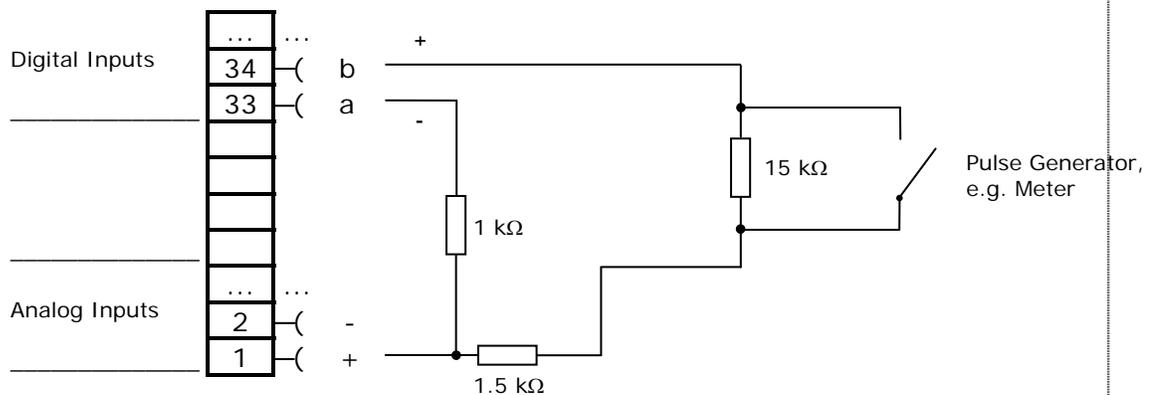
Mode of operation: As usual, the digital input acquires data from the meter.
The analog input is configured in the SmartControl Manager as a 0 to 10 V voltage input. As soon as the measured voltage falls below 0.2 V, this is indicated as a broken sensor.
See details regarding programming in the section entitled "*SmartControl Manager*".
The alarm limit (set here to 0.2 V) and the resistor values must be adapted to the system.
Limitations: Long cables can only be used under certain circumstances with this circuit layout, and must thus be carefully configured.

Connection example 2, Namur / broken cable detection, for devices with Namur output (for passive pulse sources only (no internal voltage)

A SmartControl digital input, in this example 33/34, is set to the passive operating mode with the help of jumpers. An analog input, in this example 1/2, is set to the voltage measuring mode for 0 to 10 V with the help of jumpers.
A 1 kΩ resistor is installed at the SmartControl. If a SmartControl with 12 V power pack is used, a 0.47 kΩ resistor must be installed.
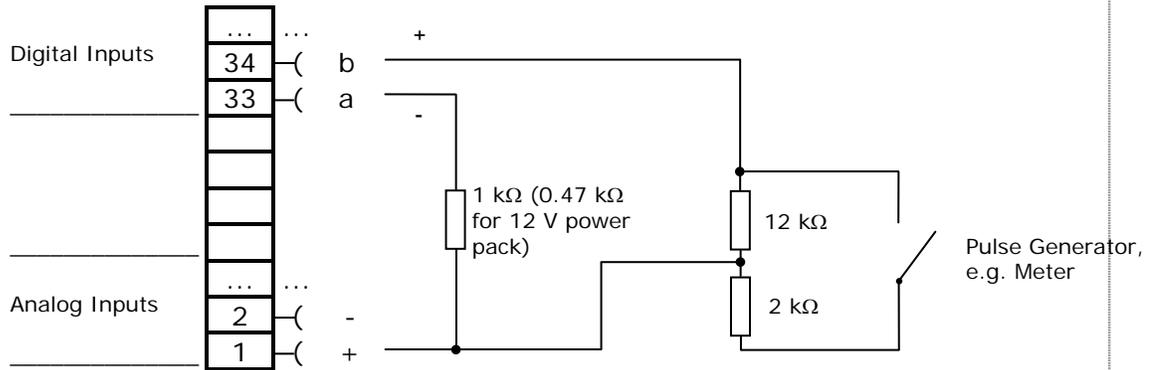
Mode of operation: same as above.

See details regarding programming in the section entitled "*SmartControl Manager*".

The alarm limit and the resistor values must be adapted to the system!

A SmartControl with 24 V power pack is recommended (higher measuring voltage).
Limitations: Long cables can only be used under certain circumstances with this circuit layout, and must thus be carefully configured.

2.9 Interfaces

The Gossen Metrawatt SmartControl is equipped with three serial interfaces, an RS 485 interface and an Ethernet interface, which are used as follows:

2.9.1 RS 232 Serial Interface, <u>M-Bus Protocol</u>

This interface [*see item* ⑥ *in figure 6*] is intended for use with the M-Bus protocol.

An M-Bus level converter with RS 232 interface is required in order to read out M-Bus compatible devices in accordance with EN1434-3. Up to 480 devices can be addressed (via corresponding M-Bus level converters with serial interface and booster).

At this time, up to 480 devices can be addressed by the ennovatis SmartControl (via corresponding M-Bus level converters with serial interface and booster). Maximum cable lengths for M-Bus networks must also be adhered to.
We recommend limiting the size of M-Bus networks to 250 devices per SmartControl (interference, management, operating reliability etc.).

<u>Prerequisite</u>: M-Bus protocol EN1434-3, unlimited read-out interval (e.g. every 15 minutes), devices preprogrammed at the factory with unique primary addresses.

The baud rate can be set individually for each meter to either 300, 2400 or 9600 baud.
Primary or secondary readout (selection) is possible.
For further characteristics [*refer to the "Options" and "M-Bus" sections*].

2.9.2 RS 232 Serial Interfaces (FIELD1 and Field 2)

Serial interfaces [*see item* ⑦ *and* ⑧ *in figure 6*].

2.9.3 RS 485 Interface

(firmware upon request)

Distances of up to 1.2 km can be spanned with the fieldbus interface [*see item* ⑩ *in figure 6*], terminals A (+), B (-), C (equipotential bonding. **Do not use a ground!**).
The terminal assignments are printed on the SmartControl PCB at X10.

The RS 485 bus must be correctly terminated with one or two resistors at the ends. No termination is required for shorter distances (less than 10 meters).
Termination must be carefully implemented for larger installations: Under no circumstances may bus voltage drop to below 0.3 V! Under normal circunmstances this termination can be selected directly on the PCB with the green JP4 jumper [*see item* ⑪ *in figure 6*] (220 Ohm).
In extreme cases, lower ohmic values may be required (must be correctly laid out by an expert).

<u>Attention</u>: The **RS 485** and the **FIELD 1** interfaces [*see item* ⑦ *in figure 6*] are wired in parallel. Simultaneous use of both interfaces depends upon the protocol.

2.9.4　　Ethernet Interface

The integrated Ethernet interface [*see item* (12) *in figure 6*] works with the usual TCP/IP protocol at 10/100 MBit per second. The Gossen Metrawatt SmartControl can be read out, and its parameters can be configured, via this interface.

The TCP/IP address can either be retrieved from a DHCP server or statically assigned.

<u>Static addresses are absolutely essential</u> for the creation of a SmartControl network with several devices which are required to communicate with each other (data / measured value exchange)!

A public IP address is required for readout via the Internet, and port 2083 must be open or routed to the SmartControl (firewall). Internet access must be set up with a flat rate (permanent connection). Required hardware includes a DSL modem and a router. In the case of a non-static public IP address, the router must support DynamicDNS service. As a rule, DynDNS is available on the Internet free of charge.

Use of a VPN channel (virtual private network) must be made available via separate hardware.

2.10　　Socket Modules (or socket modems)
(optionally available, not included in scope of delivery)

2.10.1　　Applicable to All Modules

Before beginning any work, disconnect the entire system from all sources of electrical power (refer to section 2.16, "Shutting Down and Restarting SmartControl", to this end)!
Electrostatic charging must be avoided. Provide for electrostatic discharging of personnel and tools before beginning work.

An optionally available module can be plugged into the socket module slot [*see item* (26) *in figure 6*].
An extra power pack and serial connector cable, as required with external modems, are unnecessary. A combination connector socket for analog connections and ISDN are included on the Gossen Metrawatt SmartControl [*see items* (21) *and* (22) *in figure 6*]. The antenna must be mounted at a suitable location for Bluetooth and GSM (GPRS).

The operating voltage of the module is determined by jumper series JP3 (Socket_PWR_Supply) [*see item* (24) *in figure 6*].

The default setting is 3.3 V, which is correct for operation with analog modems and ISDN modules. Before inserting the module, make sure that the right voltage has been selected

with the jumpers for the module to be inserted. If this is not the case, insert jumper JP3 such that the correct voltage is available.

Module Type	Voltage to be Selected
Analog modem	3.3 V
ISDN	3.3 V
Bluetooth	3.3 V
GSM, 3.3 V version	**3.3 V**
GSM, 5 V version	**5.0 V**

The GSM modules can be easily differentiated visually:

GSM, **3.3 V** version   GSM, **5 V** version
Altec 7020   UNGSM

**If the supply voltage setting is incorrect, the
module may malfunction, or it may be damaged.**

If a previously inserted module needs to be removed, pull it out carefully. Grip the module at the left and right-hand sides with both hands underneath the PCB, and pull it out slowly and carefully. The module must not be tilted during removal.

Caution: Never insert a module when the system is switched on!
Unpack the new module and make sure that all of the pins are straight. The module is inserted into the slot provided to this end [*see item* (26) *in figure 6*].

Jack A (at the socket) serves as a point of orientation <u>on the PCB</u> (see arrow below, <u>a white marking</u> is located in close proximity to the jack for easier locating).

Figure 10
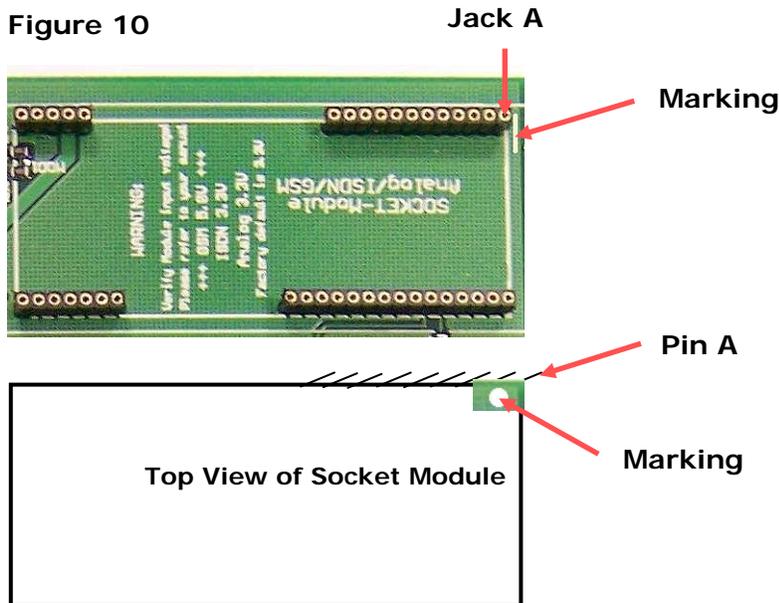
The right-hand pin (see arrow) at the corner of the module identified with a <u>white dot</u> (pin A) serves as a point of orientation <u>on the module</u>.
Carefully insert the module. Pin A on the module must be inserted into jack A at the <u>socket</u>.
Make sure that all of the other pins are also inserted into their corresponding jacks. Depending upon the type of module, some of the pins in the middle portion of the module might not be connected, i.e. the sockets are far away.

Grasp the module at the sides of the PCB with both hands and push it into the socket carefully and evenly, avoiding any tilting. Make sure that none of the pins are at the sides of the sockets, which would cause them to bend during insertion.

Failsafe Initialization

If no connections are established from outside over the period of one day (last 25 hours), the integrated modem is reset via an internal reset line.

2.10.2 Analog Modem Modules

See instructions included in section 2.10.1 as well.

For SC and IP 65: Feed the RJ11 plug at the end of the modem's connector cable into the box via one of the cable glands. Lay the cable into the cable duct in the box. For all SC versions: Insert the plug into the connector jack (RJ11) for **analog** connection (PHONE) on the PCB [*see item* (21) *in figure 6*].

Plug the other end of the cable into a TAE-N telephone socket.

<u>An analog connection with TAE-N socket must be available at the SmartControl.</u>
<u>Analog private branch extensions are possible.</u>

Jumper JP5 [*see item* (25) *in figure 6*] is used to configure the RJ45 connector jack to analog operation. Make sure that the jumper configuration is correct before initial start-up.

The number of rings before the modem answers a call can be selected with the SmartControl Manager. It is advisable to enter a 1.
<u>Caution: If no setting is entered, or if the number of rings is set to 0, the analog modem does not answer</u>!

A reset must then be executed in order to assure that the new setting is transferred to the modem (see section 11, "*Shutting Down and Restarting the SmartControl*" to this end). After restarting, make sure that the communication LEDs between the RJ45 jack and the modem [*see figure 9 in section 2.12*] blink briefly several times.

2.10.3   ISDN Modules

See instructions included in section 2.10.1 as well.

<u>The prerequisite for operation with this module is an RJ45 ISDN
connection socket on an ISDN-S0 bus.</u>

For SC and IP 65: Feed the RJ45 plug at the end of the connector cable to the module via one of the cable glands (Pg). Lay the cable into the cable duct in the box. For all SC versions: Insert the plug into the connector jack for **ISDN** connection (RJ45) on the PCB [*see item* (22) *in figure 6*].

Jumper JP5 [*see item* (25) *in figure 6*] is used to configure the RJ45 connector jack to ISDN operation. Make sure that the jumper configuration is correct before initial start-up.

Plug the other end of the cable into an ISDN telephone socket (RJ45).

<u>An unused digital number must be available.</u>
<u>If no number is programmed, the module answers all</u>
<u>incoming digital calls (X.75 protocol only). As a rule,</u>
<u>ISDN telephones do not respond (ring).</u>

Wiring of the ISDN connection must comply with ISDN specifications. These include: **terminating resistor** in the last IAE socket, max. cable length depending upon utilized installation cable and the number of connected devices.

If applicable, use an ISDN tester in order to check your ISDN connection.

2.10.4 Bluetooth Modules

The Bluetooth module is inserted at the factory as standard equipment. Please check the condition of the module and make sure that module accessories are complete (module, adapter cable including cable gland, antenna).

See instructions included in section 2.10.1 as well.
<u>The prerequisite for establishing connections with this
module is a Bluetooth compatible PC or notebook.</u>
The included adapter cable (approx. 25 cm) connects the module to the antenna. The adapter cable is furnished with an MMCX/FME mounting plug. The MMCX plug is connected to the module. The FME plug serves to connect the antenna, and is used as a housing feed-through at the same time. A drill hole with a diameter of 11 mm is only required for the SmartControl IP 65.
An antenna must be additionally installed to the Bluetooth module. The antenna is used to establish connections to Bluetooth compatible devices. The included antenna (cable length of approx. 300 cm) is connected to the FME plug (adapter cable) by means of the FME socket.
<u>Positioning of the antenna has a significant
influence on transmission speed.</u>

The Bluetooth module allows for wireless connection to a Bluetooth compatible PC or notebook inside of a building.

Please note that the Bluetooth module has a limited transmission range (class 1: 100 meters with unobstructed view). The Bluetooth compatible PC or notebook must also comply with class 1 (i.e. 100 meter range). Walls, windows and doors reduce transmission range considerably.

Connection is established from the Bluetooth compatible PC or notebook to the SmartControl via a "virtual COM port" (see section 3, "Software", in the SmartControl operating instructions).

- Install the Bluetooth stick to the PC and test it for correct functioning.

<u>After</u> initial start-up of the SmartControl [*see section 2.14 ff*]:

- After switching the SmartControl on, wait for approximately 30 seconds until connection has been established.
- Look for Bluetooth devices under Bluetooth Neighborhood in the Explorer.
- Establish connection with the SmartControl at: found device -> Bluetooth Socket Smartbox.
- A new icon appears in the task bar: . Double click the icon if the dialog box for entering your PIN does not appear automatically.
- The PIN code is set to "**default**" at the factory. Enter "default" here. As a rule, the PIN code is saved by the PC so that it only has to be entered once.
- Check the serial COM connection. You can specify the desired COM port manually depending upon the driver version.
- Enter the port number to the COM setting in the SmartControl Manager. Make sure that the COM number if less than or equal to 16. It is not currently possible to enter higher port numbers.

Further instructions regarding Bluetooth:

1　The Bluetooth serial connection is now ready to communicate with the SmartControl. You **won't** need to make **any further settings** in the future.
2　As a rule, **connection and disconnection are automatic** when an application initializes the serial port.
3　Experience has shown that with some drivers the Bluetooth software assigns various COM ports.
4　Enter a **password to the SmartControl Manager**. This increases security for the prevention of unauthorized data access and changes to the SmartControl configuration. Although serial connections can still be established, no other commands can then be executed in the SmartControl.
5　We supply class 1 Bluetooth modems and USB sticks only. They have a **range of at least 100 meters** with unobstructed view.
6　**Tip:** If you're using a mobile laptop with integrated Bluetooth adapter, deactivate the adapter and use our class 1 USB sticks. You'll avoid a great deal of frustration, irritation and lost time.
7　**Never** operate the SmartControl without an antenna if a Bluetooth modem has been installed!

2.10.5   GSM Modules

See instructions included in section 2.10.1 as well.

IMPORTANT:

> A valid PIN must be entered with the help of the SmartControl Manager **before** installation and initial start-up [*see section entitled "SmartControl Manager"*]!
>
> If an incorrect PIN is entered, or none at all, the SIM card is disabled automatically after initialization has been attempted three times!

For this reason, the GSM module is not inserted at the factory as standard equipment. Please check the condition of the module and make sure that module accessories are complete (module, adapter cable including cable gland, antenna).

Prerequisites for operation with this module include a
contract with a network service provider and an enabled SIM card.
The installation site must also be checked for good reception.

The SIM card furnished by the network service provider must be inserted into the GSM module **before** the module is installed. The module is then inserted into the slot provided to this end and securely plugged in.

The included adapter cable (approx. 50 cm) connects the module to the antenna. The adapter cable is furnished with an MMS/FME mounting plug. The MMS plug is connected to the module. The FME plug serves to connect the antenna, and is used as a housing feed-through at the same time. A drill hole with a diameter of 11 mm is required for the SmartControl IP 65 to this end.

The included antenna (cable length of approx. 300 cm) is connected to the FME plug (adapter cable) by means of the FME socket.
Please refer to the included data sheet for exact technical details.

Positioning of the antenna has a significant
influence on reception quality.

The following points must be observed in order to assure good reception:
- Install the antenna in close proximity to openings to the outdoor environment.
- If possible, install the antenna above the highest point of local terrain.
- Install the antenna above components which might function as a shield, e.g. reinforced concrete ceilings.
- A booster is required for long cable lengths (> 7 m), because attenuation due to the antenna cable is otherwise too great.

Never operate the SmartControl without an antenna if a GSM module is used!

2.11 Options

Overview

Various function modules can be integrated into the firmware depending upon the task at hand. The additional modules included with the SmartControl are displayed in the "Options" field on the information page in the SmartControl Manager with the help of abbreviations. The abbreviations have the following meanings:

Firmware Options	
Abbreviation	**Description**
LO	LON
MA	**Firmware for M-Bus analyzer**
MB	**M-Bus function**
MP	**Firmware for serial modem port via TCP/IP** - A modem module included in SmartControl is made accessible via the TCP/IP network with this firmware.
MR	**Firmware for M-Bus router function** - Transforms the SmartControl into an M-Bus router - TheSmartControl is installed between, for example, the building management system and the M-Bus level converter. - Two RS 232 ports on the SmartControl are used for incoming and outgoing lines. - Allows for read-out and remote querying of the M-Bus - Access to the M-Bus is maintained for the building management system, which has precedence.
AA	**RS 485 fieldbus acquisition package** - Fieldbus (ASCII protocol, reading)
MO	**RS 485 ModBus acquisition package** - Read Modbus RTU
CN	**Controller** - Writing for bus systems: - Modbus and ASCII
PS	**Peak load single (peak load optimization)** **- For simple systems and single devices**
PC	**Peak load complex** **- Peak load optimization for complex systems (upon request)**

2.11.1   M-Bus

For larger objects it is possible to address and read out M-Bus compatible meters and terminal devices in accordance with EN1434-3 via an optionally available M-Bus level converter with serial interface. In this case, the level converter is connected to Gossen Metrawatt's SmartControl via the M-Bus interface [*see item* (6) *in figure 6*] with a serial cable.
Level converters are available for 3, 20, 30, 60 or 250 devices.

⇒ You now have an M-Bus data logger with nearly unlimited communications options.

⇒ If the optional flash card is installed, SmartControl memory capacity is expanded as well, e.g. for large networks, short readout cycles and infrequent or no remote readout.

⇒ The usually required M-Bus pulse converters for meters which are not M-Bus compatible are unnecessary for up to 8 pulse counters.
They can be attached <u>directly</u> to the Gossen Metrawatt SmartControl.

⇒ Eight PT 1000 temperature sensors can be directly attached to each Gossen Metrawatt SmartControl, etc.

Up to 480 M-Bus compatible terminal devices can be addressed by the Gossen Metrawatt SmartControl via appropriate M-Bus repeaters. However, we recommend limiting the size of M-Bus networks to 250 devices per SmartControl (interference, management, operating reliability etc.).

In the case of very large networks, several Gossen Metrawatt SmartControls can be installed and connected via network.

Primary addressing (1 … 250), as well as secondary addressing with address, manufacturer, medium and version, is possible for individual M-Bus devices. Beyond this, the baud rate can be separately configured for each terminal device. The included PC software (SmartControl Manager) is used to find and adjust readout parameters (see section entitled "SmartControl Manager", M-Bus).

<u>Important</u>:
Before buying new M-Bus compatible meters,
makes sure they are usable for energy management:

⇒ **Protocol: EN1434-3**
⇒ **Unlimited readout interval (e.g. every 15 minutes)**
⇒ **Meters and other M-Bus devices should be**
   preprogrammed at the factory with unique
   addresses.

Further information is available at http://www.gossenmetrawatt.com and http://www.m-bus.com.

2.11.2   Relay Outputs

Further relay outputs in addition to relays K1 and K2, which are included on the PCBs, can be implemented with the help of RS 485 fieldbus modules.
Refer to the section entitled "Fieldbus Modules" with regard to connection and programming.

The following applies to relays K1 and K2, as well as to RS 485 modules:

Before beginning any work, disconnect the entire system from all sources of electrical power.
Electrostatic charging must be avoided. Provide for electrostatic discharging of personnel and tools before beginning work.

2.11.3   Compact Flash Card

Gossen Metrawatt's SmartControl is equipped with internal flash memory with 2 MBytes of capacity as a standard feature, to which data are saved even in the event of power failure. Internal memory can be expanded with the compact flash card, e.g. for:
- Large networks
- Short readout cycle for M-Bus meters
- Infrequent or no data transmission
- Data security
- For automatic saving of current configuration and programming

SmartControl can adress cards with a capacity of up to 2 GB.

<u>Attention:</u>
We cannot guarantee that CF cards not purchased from ourselves will function in the SmartControl. The SmartControl only detects and reads cards which support the "True IDE Mode".
Cards offered by ourselves are tested for correct functioning with the SmartControl, and are shipped pre-formatted.

Pre-configuration is executed by means of software with the SmartControl Manager (*refer to the section entitled "SmartControl Manager" for further details*), and by means of hardware with a compact card reader which has been connected to the PC. Maximum memory capacity is 2 GB.

The preconfigured cared is inserted into the flash card slot [*see item* (15) *in figure 6*] with the contacts facing the PCB.
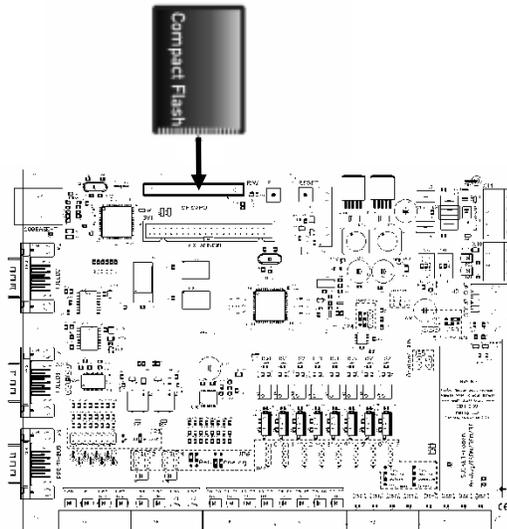
Refer to the section entitled *"Shutting Down and Restarting"* regarding how to save recorded data to RAM.

After the card has been inserted, the SmartControl must be restarted by pressing the reset key [*see item* (13) *in figure 6*].
The flash card is then automatically detected by the SmartControl, and data is stored to it **parallel** to internal flash memory. The compact flash card is also organized as a **ring buffer**.
The current user program is also saved to the compact flash card each time the SmartControl is started and each time reprogramming takes place. This is required for subsequent readout of the card at a PC.

2.11.4 Saving Configurations and Programs to a Compact Flash Card

As of firmware version 2.0.15, configurations and programs are saved automatically to the installed CF card.

Please note that these data must be available in their entirety from the CF card in order to successfully restore configuration data.
The configuration data are written to the CF card each time one of the following events occurs:

- Each time configuration data are written
- Each time a program is started
- Each time the system is started

Use the following procedure to restore a backup to a new SmartControl:
If applicable, create a backup of the programs and **delete all data and programs from the new SmartControl**.
Switch the device off, and then back on again, and make sure that no more commands are listed in the programs index card! This is a prerequisite for a successful restore operation.

Insert the CF card with the backup.
Restart the device.
Data are restored automatically.
The SmartControl then executes a reset automatically, which indicates that various settings have been read in which require a reset.
Check to make sure that the restore operation was successful.

Please not that the restore function only works as of firmware version 2.0.15.

After the backup has been successfully restored, it might not be possible to establish direct connection with the SmartControl via TCP/IP using a network connection with network switches, or it might only be possible after a given period of time.
This can be remedied by resetting the respective switches, or by waiting until the switches have learned the new MAC.

2.11.5   Serial Modem Port via TCP/IP

A SmartControl can be transformed into a "Smart Modem Box" with this firmware option. It's not always possible to connect a GSM modem, an analog modem or an ISDN modem directly to a PC. The "Smart Modem Box" makes the integrated modem module available to all via the TCP/IP network.

Advantages in comparison with conventional RS 232 to Ethernet converters:

Automatic detection and initialization of the installed modem
For GSM: automatic start-up and PIN setting
Monitoring of the modem and automatic re-initialization in the event of a recognized malfunction
Client IP report with connection start and ending times accurate to the second. The first thirty transmitted characters are recorded as well. As a rule, these include the phone number (can be used for billing connections).
All of the functions included with SmartControl are retained, but dial-up via modem is no longer possible for the effected SmartControl itself.

2.11.6   Fieldbus Modules via RS 485 Bus

This section describes connection and configuration, as well as the readout and setting (writing) of values. Please refer directly to the manufacturer's instructions for use in the case of special tasks.

Physical Connection
The RS 485 interface included on the SmartControl is used to connect a fieldbus module to the SmartControl. The RS 485 plug has three contacts: A, B and C. Wiring is always looped through 1-to-1 from module to module. Observe the following:

Smart Control	Module 1 with External Power Supply	Module 2 with Supply Power from the SmartControl	Module n with External Power Supply
A	Data +	Data +	Data +
B	Data -	Data -	Data -
C	C	---	C
V +	--	V +	--
V -	--	V -	--

Caution:

Do **not** use terminal C (data ground) if the modules are supplied with power from the SmartControl! This terminal is used exclusively to compensate for extraneous voltages from other devices. It is thus not suitable for supplying power to the devices!

Power Supply

Supply power for the modules may lie within a range of 10 to 30 V. Power consumption depends upon module type and manufacturer, and usually lies within a range of 1 to 2 W per module.

Data Cabling / Network Termination

If at all possible, use a shielded, twisted data cable for data transmission
(e.g. type "RD-Y(ST)Y" or "JE-Y(ST)Y …. Bd").

Each network must be terminated on both ends with a 100 to 250 Ω resistor. If the SmartControl is located at one of the ends of the bus, the terminal resistor in the SmartControl can be used (jumper on the PCB). Resistors will otherwise be required in order to terminate the bus.

In the case of special requirements, for example a very large number of devices, very long cables and high transmission speeds, terminal resistors must be balanced with an oscilloscope.

Transmission Speeds

The default transmission speed of 9600 baud, to which the devices are set, is adequate for most applications, as well as for long transmission distances.

The data blocks, which as a rule amount to only a few bytes, are transmitted within just a few milliseconds when a transmission speed of 9600 baud is used.

2.11.7   Functions and Protocols Available Upon Request

Fieldbus protocols available upon request:
BACnet
1-Wire
LON interface
IEC 1107
ZigBee

2.12　Diagnosis / Status LEDs

2.12.1　Position of the LEDs

Figure 9

2.12.2 LED Codes

Description, Status LED 14:

Blinking: short: . (dot), long: - (dash),
Pause: short pause: _ , long pause: __ (underline)

Normal operation:	-_-_-_-_-	
General error:	. . . .	Fast, short blinking
Onboard flash (2 MB) defective:	.-__.-__.-__	Short, long and long pause
Compact flash error:	..__..__.. __	Short, short and long pause
Missing RTS/CTS jumper or JP5 not inserted:	.__-__.__-	Short, long pause, long, long pause, …
Password deleted:	-.__-.__-.__	Long, short, long pause
Deleting flash memory:	....	Very short blinking (flickering)
Maintenance mode (as of firmware version 1.1.34):	._.__._.__._	Short blink, short pause, short blink and long pause

2.13 Reset / F1 Key

[*See item* (13) *in figure 1*] **and [item** (14) **in** *figure 1*]**.**

For resetting or accessing special functions.

2.14 Calculating Memory Range and Data Transmission Time

The flash memory on the PCB has a capacity of 1993 kByte (= 2,040,832 bytes) for the storage of measurement data. Remaining memory capacity is used for the user program.

Memory range depends upon:
- The type of signals to be saved
- The interval at which signals are read out

Signal Type	Memory Occupancy per Value
Input terminals 1 through 48	
Status value	11 bytes
Analog value and temperature	14 bytes
Measured value, meter reading	18 bytes
M-Bus	
Depends, for example, upon M-Bus device	60 bytes

Range (in days) with 1993 kByte of onboard memory	Memory range in days with interval of:				
	Readout every **5** minutes	Readout every **10** minutes	Readout every **15** minutes	Readout every **30** minutes	Readout every **60** minutes
Input terminals 1 - 48:					
1 status, 2 temperature and 2 meter signals = 69 byte	94	188	283	566	1133
2 status, 4 temperature and 4 meter signals = 138 byte	47	94	141	283	566
5 status, 10 temperature, and 10 meter signals = 345 byte	18	37	56	113	226
External data, "M-Bus"					
3 M-Bus meters with 60 bytes	39	78	118	236	472
3 M-Bus meters with 60 bytes and 10 M-Bus devices with 160 bytes	3	7	12	23	47

Example: 10 M-Bus meters with 60 bytes, readout every 15 minutes (corresponds to 4 x 24 = 96 readouts per day).
Data volume per day: 10 x 60 bytes x 96 readouts per day = 57600 bytes per day.
Memory range in days: 2,040,832 bytes / 57600 bytes per day = 35.4 days.

Transmission time depends upon:
- Transmission speed
- The amount of data to be transmitted

Example: System with 5 status, 10 temperature and 10 meter signals, data logging interval: 5 minutes

Amount of data to be transmitted with **daily remote readout:**
Data logged 288 times per day x bytes = 108,000 bytes. 108,000 bytes / 1024 = 105.47 kByte.

Actual data transmission speeds depend upon the utilized connection and may deviate greatly depending upon the respective installation, for which reason sample values are used for calculation. Time required for establishing a connection and disconnection is not, for example, taken into consideration.

Transmission time with analog modem: approx. 15 seconds *
Average data transmission speed, for example 7 kByte/s **

Transmission time with ISDN: approx. 18 seconds
Average data transmission speed, for example 6 kByte/s

Transmission time with GSM: approx. 1 minute 45 seconds
Average data transmission speed, for example 1 kByte/s

Transmission time with network connection: approx. 3 seconds
Average data transmission speed, for example 35 kByte/s

*   Attention: It may take 30 seconds or more for an analog modem to establish a connection!
**   Analog modems are capable of compressing data before transmission (V42bis, V90bis, …), thus allowing for higher transmission speeds than those achieved with, for example, ISDN. With analog private branch extensions, transmission speed typically drops to approximately 3.5 kByte/s.

2.15　Initial Start-Up

Make sure that all cables (power supply, data channels, communication lines) are connected. After the circuit breaker is switched on, the green DIAG LED [*see item* ⑱ *in figure*] must blink after initialization.

In order to start data recording, the SmartControl must be configured and the individual channels/commands must be entered.

2.16　Configuration

The SmartControl is configured with SmartControl Manager software (refer to section 3, "*SmartControl Manager*" regarding comprehensive functions).
The SmartControl must be connected to the PC for initial configuration.
This connection can be established by means of the **Ethernet interface**, or with the optional **analog modem** or **ISDN module**.

1　Connection via Ethernet interface [*see item* ⑫ *in figure 6*]**:**
A **crossover patch cable** must be used for the connection between the SmartControl and the PC.
Each SmartControl has the following static IP address as a default setting: 192.168.130.190.
There are two possibilities for data exchange:

- either IP address 192.168.130.XXX and subnet mask 255.255.255.0 are selected at the PC or notebook (XXX being a number between 1 and 254 **but not** 190)

- or the TCP/IP address at the SmartControl is changed. The procedure is described in detail beginning with the section entitled "*SmartControl Manager, Setting Up Projects, Buildings and SmartControls*".

2　Configuration via analog modem or ISDN: A PC with a phone jack and an analog modem or an ISDN card must be used.
Please note: The ISDN module in the SmartControl cannot be queried by an analog modem without additional hardware.

Start Gossen Metrawatt SmartControl Manager software, and then establish connection and configure the SmartControl as described beginning in the section entitled "*SmartControl Manager, Setting Up Projects, Buildings and SmartControls*".

2.17   Shutting Down and Restarting the SmartControl

Maintenance Mode:
Approximately once every 15 minutes, the 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. Press and hold the F1 key for 5 seconds to this end.
The blinking pattern at DIAG LED 17 changes. The SmartControl can now be shut down or restarted by pressing the reset key. If no further action is taken after pressing the F1 key, the SmartControl resumes normal operation after 60 seconds.
Information regarding the current firmware version can be displayed in the SmartControl Manager by accessing "Info" in the "Configuration" tab.
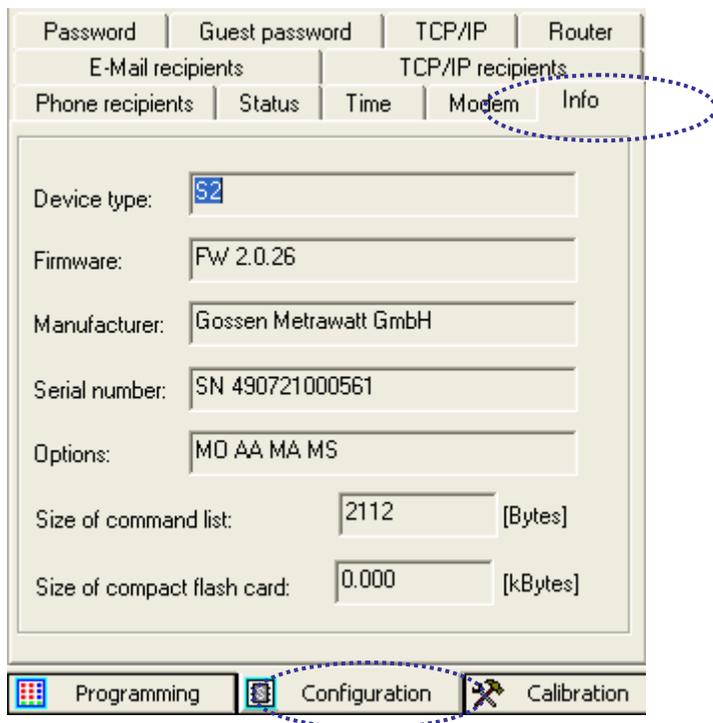
2.18   Deleting the Password

1   Press and hold the F1 key [*see item* (13) *in figure 6*].
2   Briefly press the reset key [*see item* (14) *in figure 6*].
3   Release the F1 key.
4   Wait until the DIAG LED goes out [*see item* (18) *in figure 6*].
5   Press and hold the F1 key (max. 5 seconds) until the DIAG LED starts blinking.

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2.19   Resetting Smartbox to default values

1   Press and hold the F1 key [*see item* (13) *in figure 6*].
2   Briefly press the reset key (don't release the F1 key) [*see item* (14) *in figure 6*].
3   Release the F1 key after two seconds.
4   Wait until Diag LED starts flashing fast.
5   Press and hold the F1 key for five seconds.
Now the Diag LED will start flashing. After a few seconds, the Smartbox will reset to default values.

Please note:
all saved values and settings are erased.

Default values means:
-    no password,
-    standard network settings: IP address 192.168.130.190
-    no parameters and
-    no program

2.20   Firmware Update

New functions are also implemented via the firmware. A firmware update must be executed in order to be able to use these new functions.
Complete instructions for updating the firmware are included in the firmware data files.
These are available from the download area at www.gossenmetrawatt.com.

Special firmware versions are available upon request e.g. for:
•   M-Bus router function
•   Serial modem port via TCP/IP

2.21 Real-Time Clock Battery

The battery on the PCB is a type CR2032 3V lithium button cell.

We recommend replacing the battery once every two years if the device is stored (not used) for long periods of time.
If the device is used continuously, it is advisable to replace the battery every 5 years.

Black: reference lines
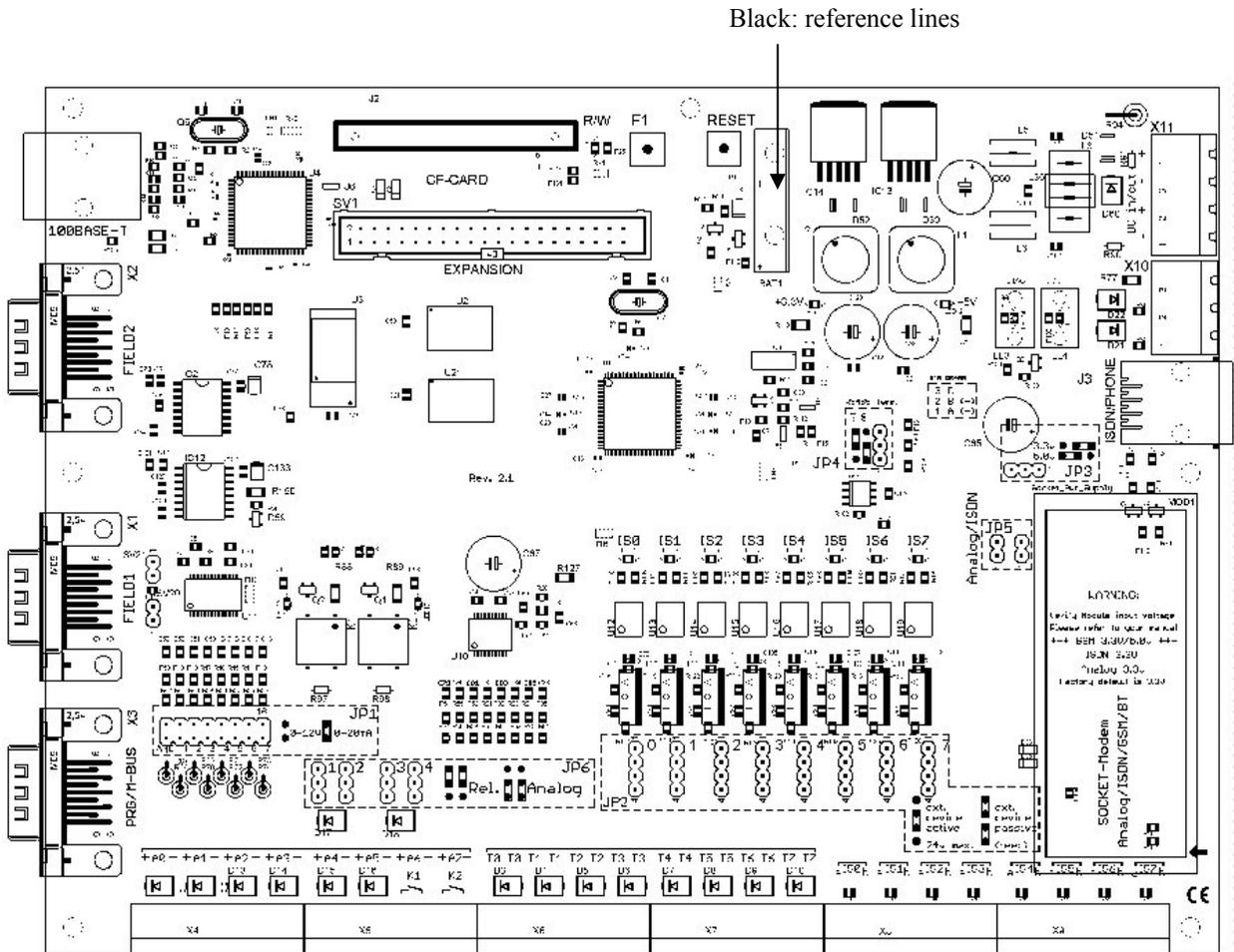
2.22   Technical Data

SC/S Basic Device Compact Housing	
Housing	Steel sheet metal, approx. 226 x 210 x 70 mm (W x H x D)
Power consumption*	< 2.5 W
Mains power	12 V= via external power pack
Control keys	Two function keys: F1 and reset in the housing
Display	LCD connection available as option
Operating conditions	5 to 50° C, no condensation

SC / IP 65 Basic Device, 12 or 24 V= IP 65 Control Cabinet Variant	
Housing	Steel sheet metal, 380 x 380 x 210 mm (W x H x D)
Weight	Approx. 10 kg
Protection	IP 65 when correctly mounted
Power consumption*	< 2.5 W
Mains power	230 V ~
Built-in power pack	Input: 100 to 240V~, 50/60 Hz
	Output: 12 or 24 V=
24 V= power pack	Optional, e.g. for external 24 V devices
Operating conditions	5 to 50° C, no condensation

* Actual power consumption depends upon power pack efficiency, as well as any other connected sensors and devices.

Inputs	
Max. 8 Analog Inputs	e.g. for connecting measuring transducers (pressure sensors, humidity etc.)
Measuring range	0 to 1 V, 0 to 5 V, 0 to 10 V or 0 to 20 mA
Internal Resistance	Voltage measurement: 200 kΩ Current measurement: 249 Ω
Accuracy	Better than ± 0.02 V
Calibration	± 0.005 V at 10 V
Electrical Isolation	Common ground, no electrical isolation. No connection to frame ground. The SmartControl may be subjected to external voltage for this reason.
Frequency	Max. 1 Hz
Suppressor diodes for voltage peaks	Yes
A-D converter resolution	12 bit
Relay	2 normally open, 1 A, photo MOS
Nominal voltage	60 V
8 Temperature Inputs	Pt 1000 platinum temperature sensors with 2-wire connection
Measuring range	–50 to +170° C
Accuracy	Better than ± 0.5° C (depending upon DIN class)
Calibration	At the factory at 0° C and 100° C ± 0.05° C
A-D converter resolution	12 bit
Suppressor diodes for voltage peaks	Yes
Connection option	Suitable housings available for indoor use, outdoor temperature and sensors for attachment to a pipe
8 Digital Inputs	Either passive (e.g. reed contacts) or active pulse sources can be connected.
Passive reed-contact load capacity	12 mA / typical input voltage: 12 or 24 V=

Active signals	Min. 12 mA, max. 24 V
Electrical Isolation	Active operating mode: electrically isolated
	Passive operating mode: not electrically isolated
Edge slope	Any
Filter (debouncing)	Digital (5 ms)
Pulse sequence	Max. 10 / 10 ms (0/1)
Frequency	Max. 100 Hz
Maximum cable length	200 m
Storage of meter readings	Every 15 minutes
Maximum meter reading	9999 9999.9999 99
Smallest resolution	0.0000 01
Units	M-Bus protocol
Inputs which can be setup as pulse inputs	8, e.g. meter with pulse input
Inputs which can be setup as status inputs	8, e.g. door contact
Inputs which can be setup as tariff inputs	3 (IS1, IS3 and IS5), the respective upstream inputs (IS0, IS2, IS4) are counted.
Input which can be used as a synchronizing input	1 (IS7), the clock is synchronized to the next quarter hour.
Optical pulse display	LED on the PCB

PCB / CPU	
Internal memory	2 MByte flash ring buffer
Maximum number of commands (field, M-Bus, timer, calculations etc.)	Approx. 480
Watchdog	Yes
Real-time clock	Yes
Ring buffer	Yes
Selective memory readout	Yes (time-span)
Password protection	Yes (admin/guest)
Mean value generation for data reduction	Yes
Calculations	Yes
Timer	Yes (time of week or day)
Heat load meter/ Cooling load meter	Required for metering: volumetric flow meter with pulse output for heating and cooling circuits, as well as the respective inlet and return temperatures
TCP/IP	Static and/or dynamic addressing, NetBIOS, ping
Storage rules	Cyclical, dynamic or based on conditions
Status signals	Yes
Pulses	Yes, 5 / 10 / 10 (debouncing / pulse duration / pause)
Time server	Yes
e-mail	Yes
SMS	Yes

Interfaces:

**Three RS 232, one RS 485,
one Ethernet**

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RS 232 serial interface	Protocol: M-Bus or uploading of firmware updates. An M-Bus level converter with RS 232 interface is required in order to read out M-Bus compatible devices in accordance with EN1434-3. Up to 480 devices can be addressed, baud rate can be set to 300, 2400 or 9600 baud, primary or secondary readout (selection). Prerequisite: M-Bus protocol EN1434-3, unlimited readout interval (e.g. every 15 minutes), devices preprogrammed at the factory with unique addresses.
RS 232 serial interface (FIELD 1)	Actuation of various fieldbus devices which are not equipped with an RS 485 interface, e.g. 1-Wire. Additional interface converters may be required to this end. Fieldbus interface, distances of up to 1.2 km, connection of up to 250 additional Gossen Metrawatt SmartControls, as well as ModBus compatible meters. FIELD 1 and the RS 485 interface are parallel wired. Simultaneous use of both interfaces depends upon the protocol.
RS 232 serial interface (FIELD 2)	Connector pin assignments upon request
Ethernet interface	Layout / parameters configuration of the SmartControl directly via TCP/IP at 10/100 MBit/s. TCP/IP address via DHCP server or static. A public IP address is required for readout via the Internet, and port 2083 must be open or routed to SmartControl (firewall). Internet access must be set up with a flat rate (permanent connection). Required hardware includes a DSL modem and a router. In the case of a non-static public IP address, the router must support DynamicDNS service. As a rule, DynDNS is available on the Internet free of charge. Use of a VPN channel (virtual private network) must be made available via separate hardware.
RS 485 interface	Bus termination: internal, 120 Ω, can be disconnected with jumper
Socket Module Options	**1 free slot for:**
Gossen Metrawatt analog modem module	Modem for connecting the SmartControl to an analog telephone system. An analog connection must be available, analog private branch extensions are possible.
Gossen Metrawatt ISDN module	Module for connecting the SmartControl to an ISDN telephone system. The prerequisite for operation with this module is an RJ45 ISDN connection socket on an ISDN-S0 bus.
Gossen Metrawatt GSM module	Module for connecting the SmartControl to a GSM network. The prerequisites for operation with this module include a contract with a network service provider and an enabled SIM card. The installation site must also be checked for good reception.
Gossen Metrawatt Bluetooth module	For wireless connection inside a building to a Bluetooth compatible PC (class 1: range of up to 100 m with unobstructed view).

3 SmartControl Manager

3.1 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:

- Windows NT 4.0 (SP 6a + RPC security patch), Windows 2000 or XP
- Pentium 300 MHz, 256 MB RAM
- Administrative authority
- At least 500 Mbyte of available hard disk capacity for acquired measurement data

Notes concerning installation:

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

- <u>TCP/IP</u>: All required interfaces included with the operating system

- <u>ISDN</u>: CAPI interface (included with your ISDN card)

- <u>Analog modem</u>: Please remove all modem drivers. The SmartControl Manager communicates with all commercially available interfaces and initializes them directly via the serial interface. It is advisable to deactivate all modems which have already been installed and are detected by the operating system.

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 start the installation program by double clicking the **SCM** 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 inserts appropriate menu items (*Start -> Programs -> Gossen Metrawatt*).
5 Start the SmartControl Manager.

3.2   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.

3.3   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**
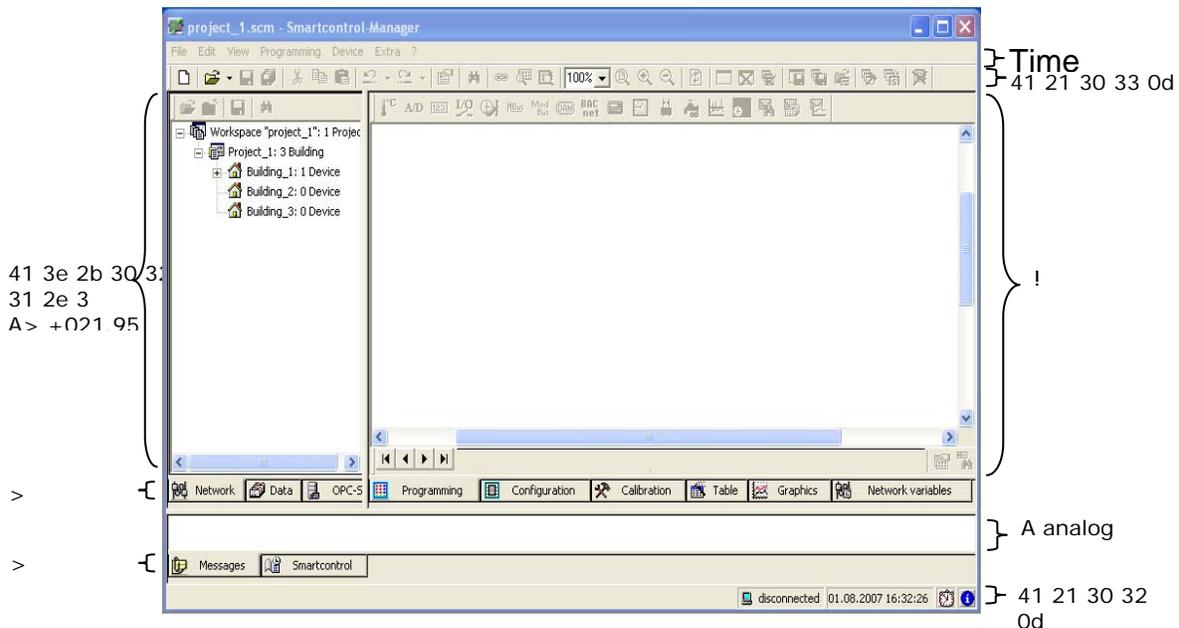
Various pull-down menus are available in the menu bar depending upon the main window, the active document or the drawing.

The Menu Bar

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 (help, information etc.)

The Toolbars

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 upon which element has been activated in the scenario browser, upon the selected element, and whether or not, for example, a connection has been established with a SmartControl:

New project or workspace, open a workspace and save
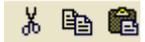
Cut, copy, paste

Undo or repeat last action

Display program attributes. Only available in the "Programming" tab. A new window appears which display the program attributes.

Search: Not active until a building has been selected. In this way, SmartControls can be searched for by means of broadcast via TCP/IP connection.

Search for devices

No.	Name	DHCP	Domain	DNS-Server	Alternative IP	Standard gateway	Subnet mask	Up to date IP	Up to date gateway	Up to date subnet r
1	44 21 37				192.168.130.191		255.255.255.0	192.168.130.191	0.0.0.0	255.255.255.0
2					192.168.130.122	192.168.130.254	255.255.255.0	192.168.130.122	192.168.130.254	255.255.255.0
3	46 30 30				192.168.130.97		255.255.255.0	192.168.130.97	0.0.0.0	255.255.255.0
4	30 30 0d				192.168.130.121		255.255.255.0	192.168.130.121	0.0.0.0	255.255.255.0
5	DI7E000				192.168.130.102	192.168.130.254	255.255.255.0	192.168.130.102	192.168.130.254	255.255.255.0

Search   Accept   End

Found devices 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.

Establish or interrupt connection to the SmartControl. Not active until a SmartControl has been selected in the scenario browser.

Reads 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.

100% ⊕ ⊕ ⊖

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

Various zoom factors can be entered directly with the dropdown list (**100%**), zooming can

be increased one step with the ⊕ button or reduced one step with the ⊖ button, and the

zoom factor can be reset to 100% with the ⊕ button.

Refresh data from the SmartControl. Not active until connection has been established to a SmartControl.

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

Save program / read program from file.

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

Online help

The Status Line

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

Wizard

If this button is available, it can be use to access the help function, for example in order to establish a connection. A new window appears.

The 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:
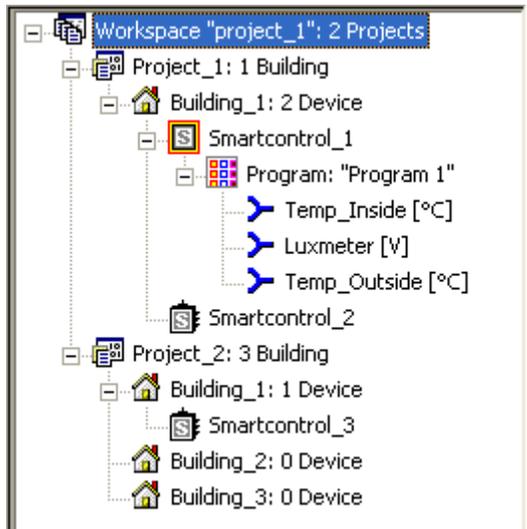
Workspace consisting of, for example:

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

All objects offer attributes and methods which can be accessed via a **context menu (right-hand mouse key)**. For example, attributes can be displayed, or various functions are displayed.
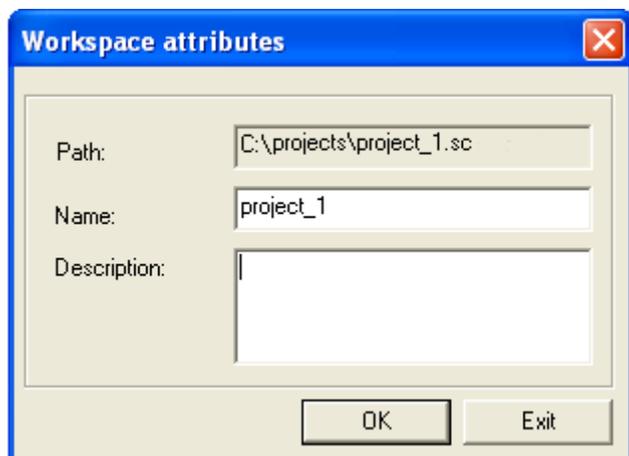
For example, information regarding the element selected in the scenario browser is displayed in the "Attributes" box shown above. This information can be modified and supplemented.

Network Toolbar

 - Close workspace, new building, delete building, new device, delete device and find device

"Find device" is active when a building is 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 TCP/IP addresses of devices which have been found are displayed.

Red: mean power from currently active MP

Data Toolbar

Read in measurement data, delete read in data, read in network variables, read in global variables, tabular display, graphic display

OPC Server Toolbar

New network, add networks from workspace, import OPC server structure, export OPC server structure, find network, OPC server status, start OPC server, exit, update configuration

The 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
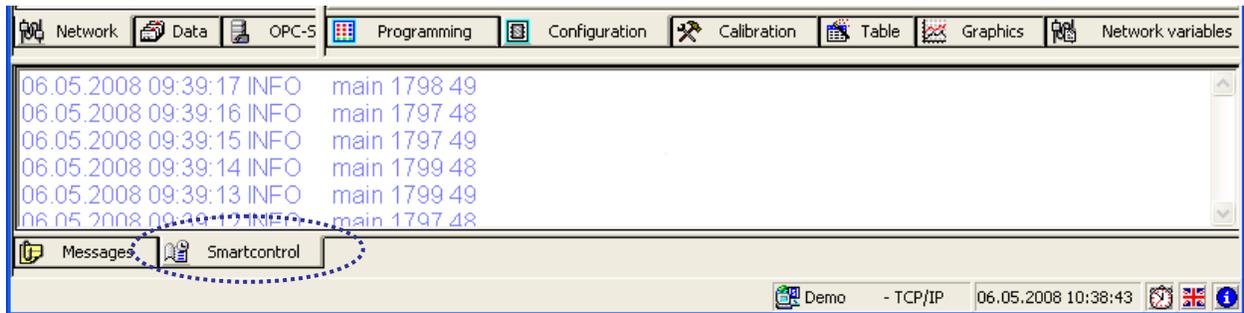
Messages regarding operations being executed by the SmartControl appear continuously in this window. This is above all helpful when you need to know exactly how the SmartControl responds to certain circumstances.

The display 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: i.e. decimal point instead of decimal comma.

Example: Enter the number 3.33 instead of 3,33 for the calculator command.

3.4 Entering Projects, Buildings and Devices with the Application Wizard
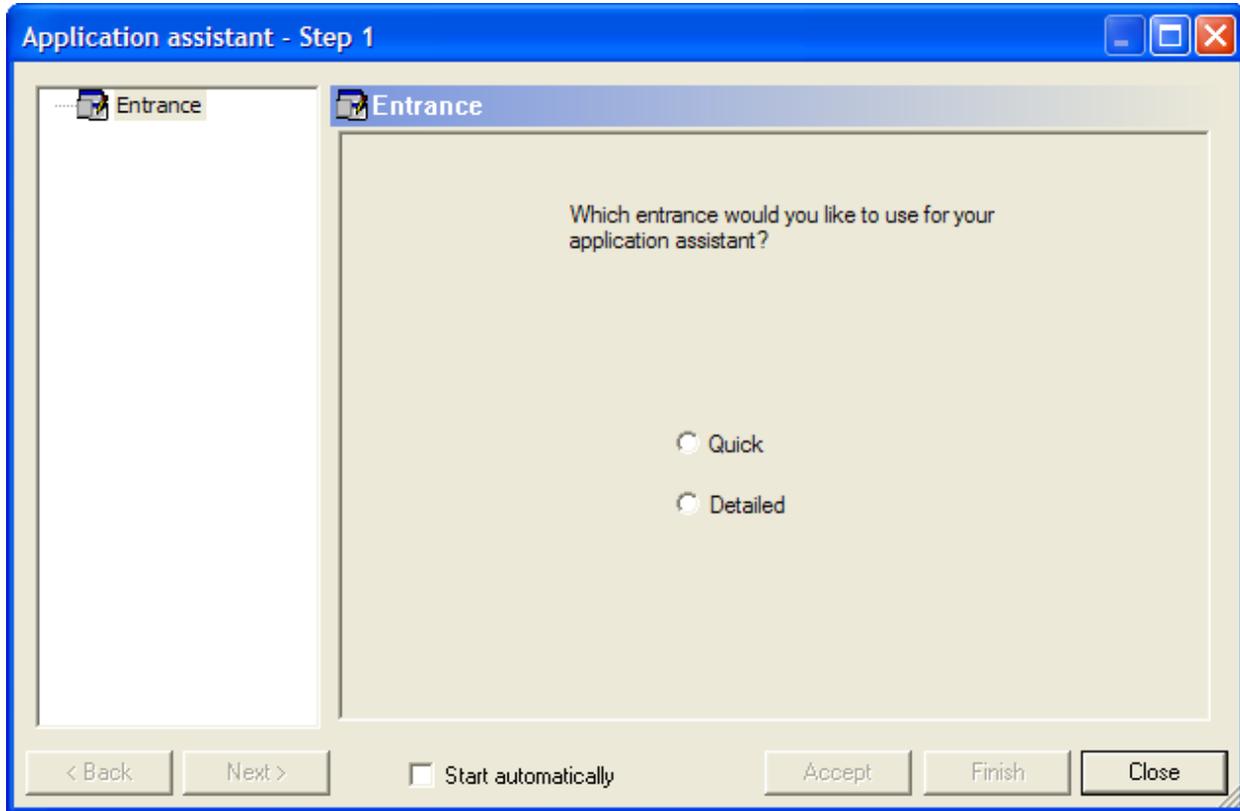
After clicking "**Application Wizard**" in the "**File**" menu, a dialog box appears which guides you step by step to a finished workspace including project, buildings etc. Each entry is activated by clicking the "**Accept**" button. A comprehensive procedure can be used, or only the most essential entries can be made by selecting "**Quick**", thus shortening the procedure. Further entries can be added later. All of the necessary steps are self-explanatory, and are outlined further in the following section.

3.5 Entering Projects, Buildings and Devices without the Application Wizard

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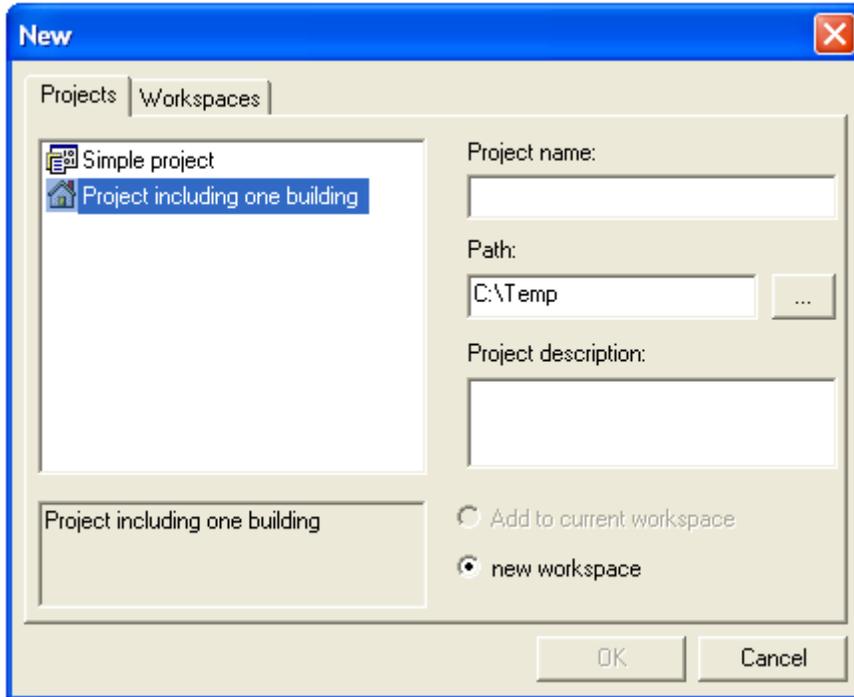
Enter a clear-cut project name. The project path can be entered either directly, or can be selected after clicking the ... button.

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 is 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.
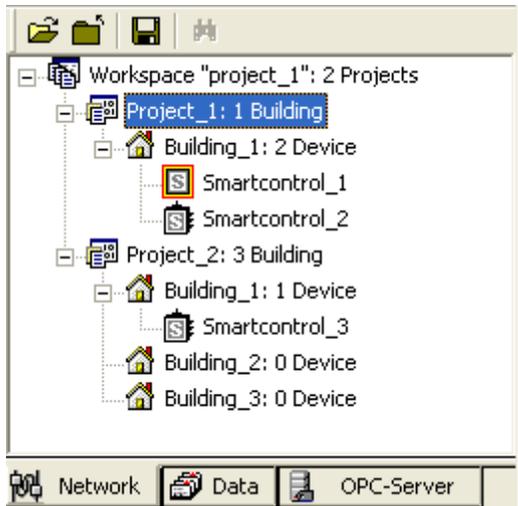
After clicking a project with the right-hand mouse key, new buildings can be added, projects and buildings can be deleted, and attributes can be viewed.
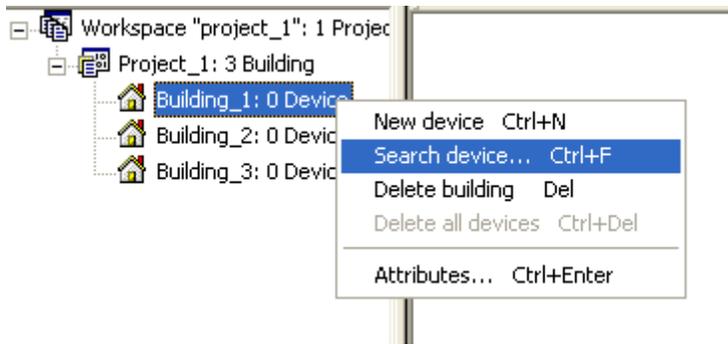
After clicking a building with the right-hand mouse key, a new SmartControl can be added to the building -> "New device".

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.

No.	Name	DHCP	Domain	DNS-Server	Alternative IP	Standard gateway	Subnet mask	Up to date IP	Up to date gateway	Up to date subnet r
1	?-Logics				192.168.130.191		255.255.255.0	192.168.130.191	0.0.0.0	255.255.255.0
2					192.168.130.122	192.168.130.254	255.255.255.0	192.168.130.122	192.168.130.254	255.255.255.0
3					192.168.130.97		255.255.255.0	192.168.130.97	0.0.0.0	255.255.255.0
4					192.168.130.121		255.255.255.0	192.168.130.121	0.0.0.0	255.255.255.0
5					192.168.130.102	192.168.130.254	255.255.255.0	192.168.130.102	192.168.130.254	255.255.255.0

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.
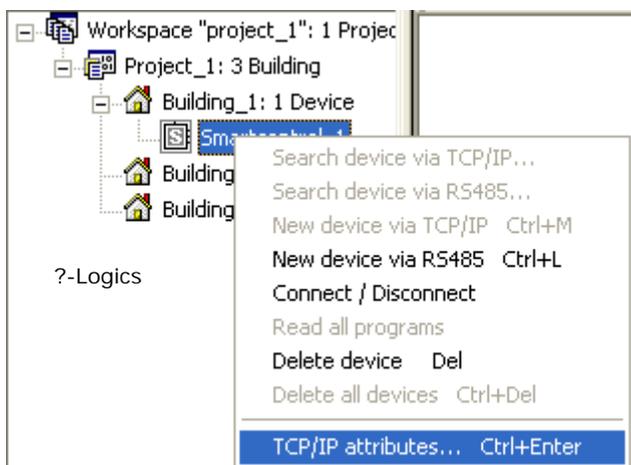
If the connection is to be established via a network, and if the interconnected PC or laptop is listed in another network as 192.168.130.XXX, the SmartControl's network address can be changed. Click the SmartControl with the right-hand mouse key to this end, and select "TCP/IP attributes".

TCP/IP attributes

Name:	Demo
Domain:	
DNS-Server:	
Alternative IP:	192.168.130.100
Subnet mask:	255.255.255.0
Standard gateway:	192.168.130.10
DHCP:	☐

Up to date network configuration

IP address:	192.168.130.93
Subnet mask:	255.255.255.0
Gateway:	192.168.130.10
MAC:	00 50 C2 71 9F 40

[Help]   [Accept]   [Exit]
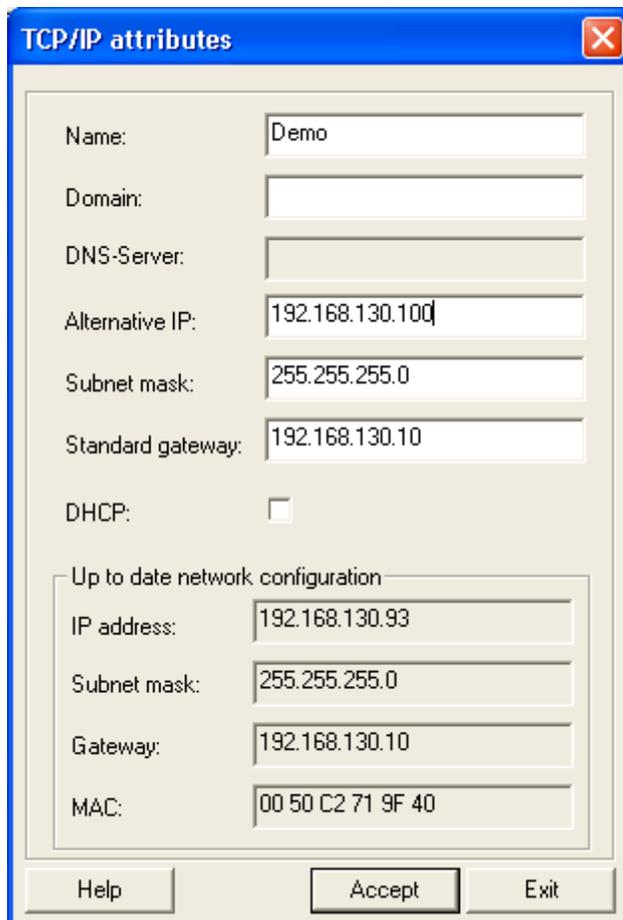
Now ascertain your PC´s own IP address and subnet mask (for example with the ipconfig command), enter it to a DOS console (run -> cmd for Windows 2000 and XP -> ipconfig) and adapt the SmartControl's IP address accordingly: enter a new IP address (free IP within the network, other than your PC´s own IP address) and the same subnet mask. Specify a gateway and a DHCP server if applicable.

Now click the "**Accept**" button.

The TCP/IP data are activated automatically.

Any existing connections are reset by the SmartControl.

The following window appears after double clicking a SmartControl:
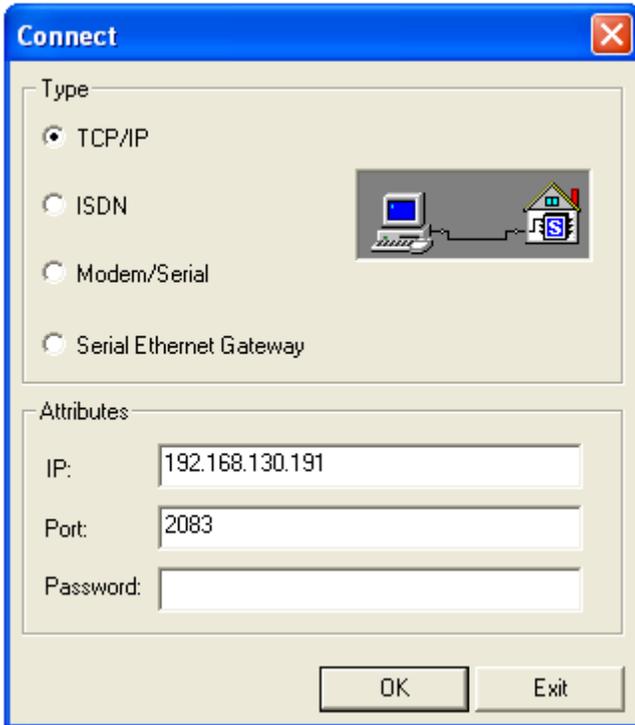
A selection must be made as to whether connection will be established via TCP/IP, ISDN, a modem / serial cable or a serial gateway.
Refer to the section entitled "*Configuration*" regarding additional prerequisites for establishing a connection.

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 a password.
If a modem is used the telephone number must also be entered.
If necessary, the standard modem initialization must be adapted.

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

3.6　　　　The Configuration Tab

Password

A password prompt can be set up here for connection via TCP/IP or modem. The password is encrypted before it is transmitted.

Guest Password

A password for guest access can be specified here for connection via TCP/IP or modem. In the case of guest access, the configuration and the programs can be read. However, no changes can be saved to memory.

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 data to the SmartControl.

Router

An entry can be made here specifying whether or not the SmartControl is permitted to communicate with other devices via RS 485. If this is the case, SmartControl acts as a slave. Port, transmission speed and parity can be specified.
Note: Functionality is firmware dependent.

e-mail Recipients

Three 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.
Numerous recipients, separated by semicola, can be entered per line.

TCP/IP Destinations

| Password | Guest password | TCP/IP | Router | E-Mail recipients | TCP/IP recipients | Phone |

TCP/IP 1: 192.168.130.191   Port: 10   Name: **Ziel1**

TCP/IP 2:   Port: 0   Name:

TCP/IP 3:   Port: 0   Name:

Read   Accept

A destination for the transmission of messages can be entered in this tab.

Phone Recipients

Number 1:	No. of Recipient 1	Name:	Recipient 1
Number 2:	No. of Recipient 2	Name:	Recipient 2
Number 3:	No. of Recipient 3	Name:	Recipient 3
SMS gateway:	Gateway if SMS via ISDN	Protocol:	UCP

Read   Help   Accept

Help phone recipients

Please note: not all phone companys support sending SMS via fixed line networks. Please refer to your local phone companies for information.

Current SMSC (provider) and protocols in Germany:

Gateway	Protocol	Provider	Phone number blocks
090032669005	UCP	AnnyWay	only for clients of accom, ARCOR, DOKOM, EWE TEL, HeLi NET, NetCologne, osnatel and T-COM
0193010	UCP	T-COM	only for clients of T-COM

Please adhere to the format of phone numbers for SMS:

For sending SMS via GSM modems, the country code has to be added without leading zero(s): i.e. 49xxx for Germany.

For sending SMS via fixed line networks, the country code may be added with leading zero(s): i.e. 0049xxx for Germany.

End

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 fixed network.

Configuring Error Messages for Status Relays

How long which error messages will be indicated at which relays can be configured in the "**Status**" tab.

Explanation of error types:

Hardware error:
The device is defective and must be replaced. For example, this error may occur in the event that fatal errors have been reported to an internal controller (e.g. A-D converter, flash memory, network etc.) during reading and writing operations.

General error:
General errors occur, for example, when a connection is interrupted, a bus device no longer responds, or when an invalid command is received.

Field device errors:
The relay is activated whenever field device errors are indicated in the protocol.
This means that although communication with the device is still possible, the device is reporting an internal or external error.

Warnings:
These are non-critical error messages which have little or no effect on performance. They include, for example, attempts to log in with an incorrect password or issue non-existing commands.

If you plan to use the relays for other applications, don't activate any of the checkboxes.

Time

Time is read out of the SmartControl after clicking the "Device time" button.

SmartControl clock time can be synchronized with PC time by clicking the appropriate button.

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 after clicking the "Accept" button.

<u>Please note</u>: Not all time servers support this protocol.

It may be necessary to enter a gateway to the TCP/IP attributes, in order to be able to access the time server via the Internet.
Time Server (protocol RFC 868)

As of firmware version 2.0.22, current time can be queried from the SmartControl via the RFC 868 protocol. Use this option in order to execute simultaneous read-out at different locations within a local network.
A possible 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. Synchronized clock time is transmitted to the other SmartControls via time server.
In order to transmit clock time to the other SmartControls, enter exactly one SNTP sever with the IP address of the "master" to the "Time" configuration page for the clients. If you enter more than one server (including perhaps one or more from the Internet), the internal, actually correct server might be rejected due to a deviating measurement period.

Important:

Be absolutely sure that clock times are not set from different sources. This could result in measurement periods which are too long or short at the point in time of time correction. Data are rendered useless in this case.
For this reason it's 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 MBus 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 (may effect all), they may be read and saved with a considerable time offset.
If no errors occur at the M-Bus meters (repeated unsuccessful read-out results in 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.

3   As an alternative, you can of course also use server software which automatically corrects the recorded time offsets.

Time Correction

Correction: Correct the number of seconds entered to "Deviation per Day" every day. This value is calculated by the box automatically.
Allow the SmartControl to run for at least two days without time correction to this end. Automatic calculation is otherwise not executed.
As an alternative, time correction can be calculated "manually", for example by the SmartControl Manager, and entered manually.

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!

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.

3.7 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 sensors

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 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 degree, this can be compensated for by entering an offset of "-1".

A-D Converter

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

 The measuring range can be changed.
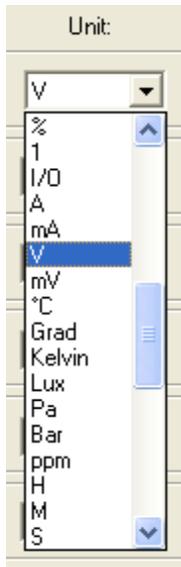
The unit of measure for the quantity to be measured can be specified.
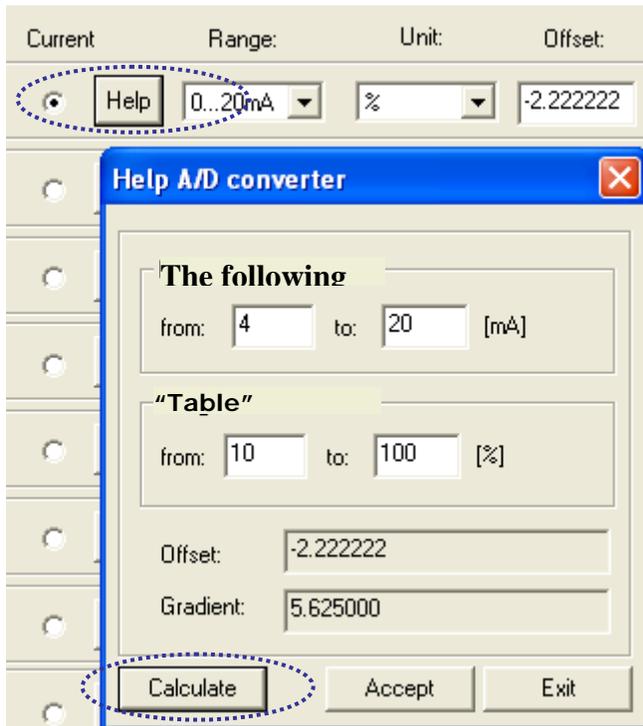
With the help of an offset and a gradient, the measured analog signal can be <u>directly</u> converted into the measured unit of measure.
The dialog box shown above appears after clicking the "Help" button.

Example: Humidity sensor with 4 to 20 mA current output for 10 to 100% humidity.
Offset and gradient are ascertained after clicking the "Calculate" button.
The calculated values can now be activated by clicking the "Accept" button.

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.
A window appears which can be used to calculate the meter factor after clicking the "Help" button.

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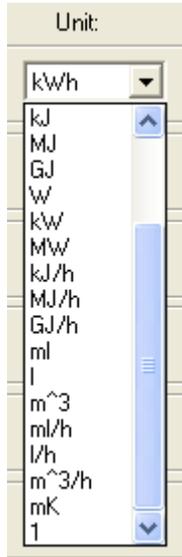
The **Unit** of measure must be specified. **Status signals** can also be processed (e.g. door contact, burner on-time etc.).

If applicable, the current meter reading can be entered.

Tariff data, for example high tariff (HT) and secondary tariff (ST) can be processed as well. 3 tariff inputs can be set up: IS1, IS3 and IS5. If they have been defined as tariff inputs, they determine whether or not 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. In this case, tariff input IS1 specifies whether pulses from IS0 will be allocated to HT or ST.
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 low 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 relay is closed, and a logic high signal is also applied to IS1, IS3 or IS5. The meter is thus switched from HT meter with IS0, IS2 or IS4 to 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 synchronized to the next quarter hour.

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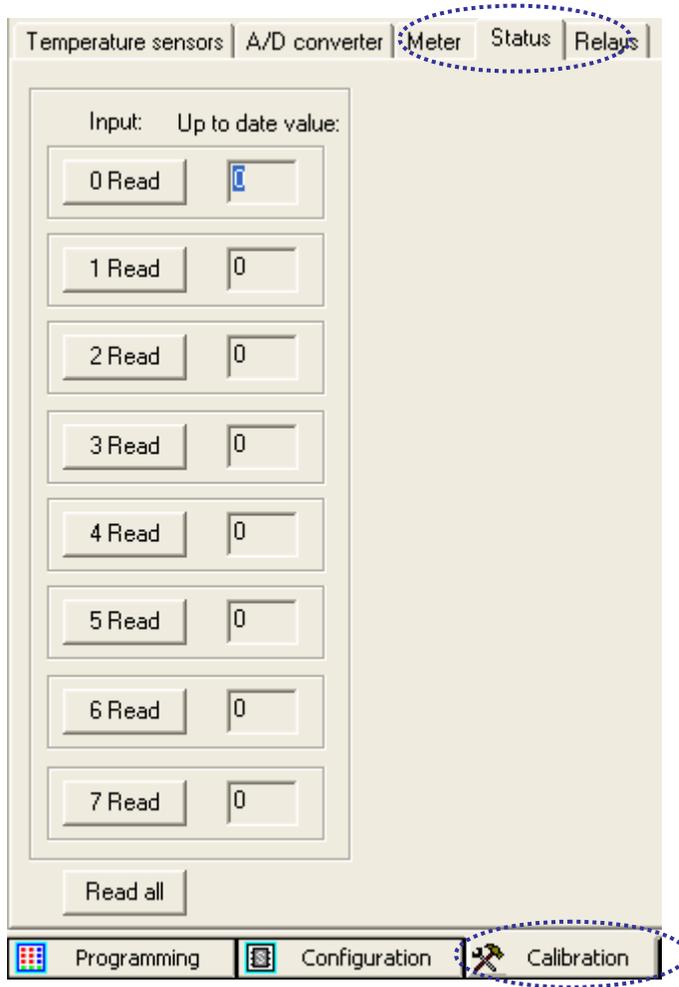
The current status of the digital inputs is displayed here as either 0 or 1.

Relay Start Status
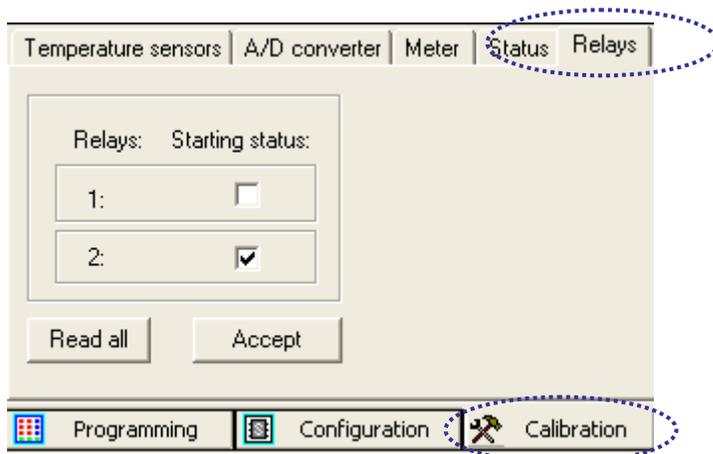
The status of the on-board relays after the SmartControl is started can be set here.
The status is updated immediately after clicking the "Accept" button.

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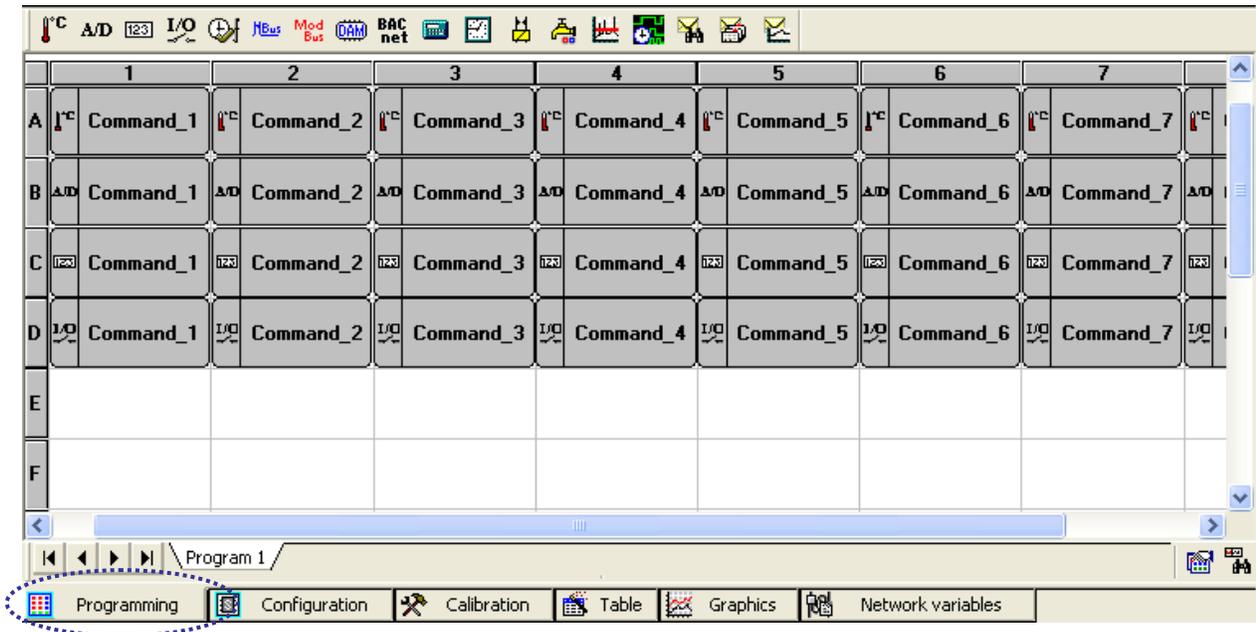
The names of the current programs appear above the **Programming** tab. Up to 16 programs can be added, and programs can be deleted or renamed after clicking the program with the right-hand mouse key, or by clicking the appropriate button in the toolbar.
Programs can be saved to and read from a data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

A **command** can be added after clicking the white area with the right-hand mouse key

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.
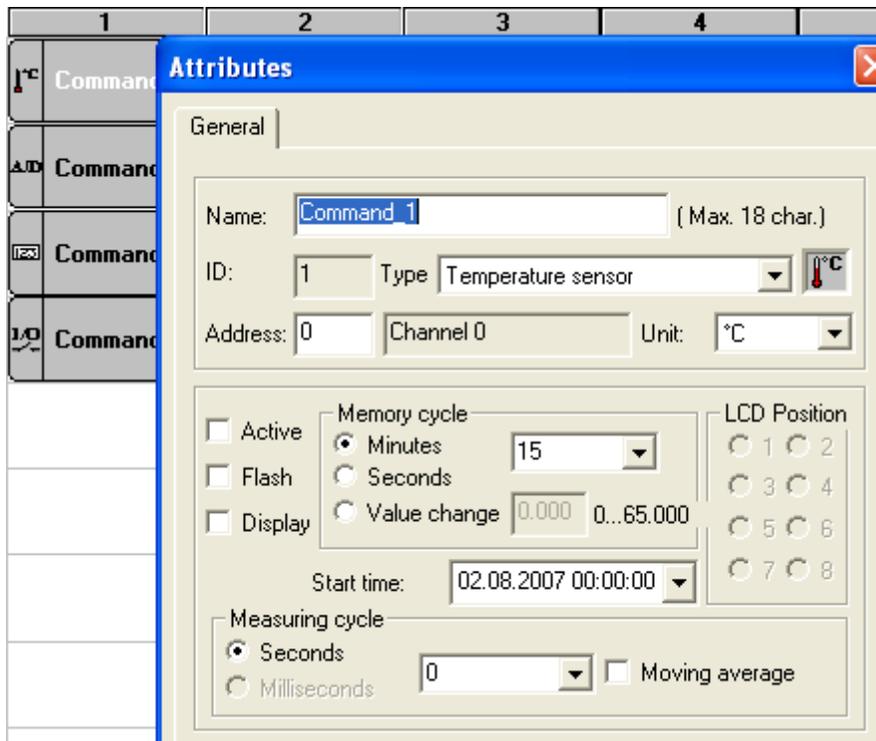
It's advisable to enter a clear-cut designation as a **name**. The name can have a length of up to 18 characters.

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.

If **display** is selected, a position within a range of 1 to 8 can be selected at the optional LCD.

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.

The **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 time-span. 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 as well.

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

Priorities
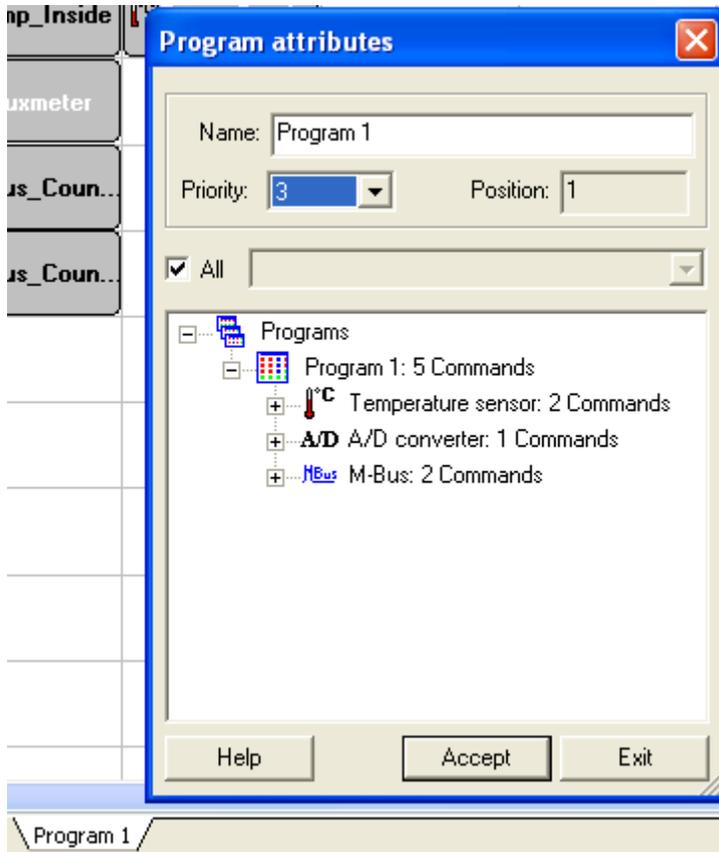
As of firmware version 1.4.12, it is possible to assign different priorities to various programs. In this way, important commands can be executed with preference. This function can be accessed by clicking the program tab with the right-hand mouse key (in this case program 1).
In particular, control procedures 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:
<u>Priority 0</u>:
All commands are executed immediately, and in order.
This is the standard procedure and is used as long as nothing to the contrary has been specified.
<u>Priorities 1 through 5</u>:
All commands are executed immediately, and in order, in accordance with their priorities. Programs with priority 1 are executed first.
<u>Priorities 6 through 10</u>:
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 Characteristics in Tabular View

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

As of version 1.7.0.1, all programs can be converted with uninterrupted IDs.
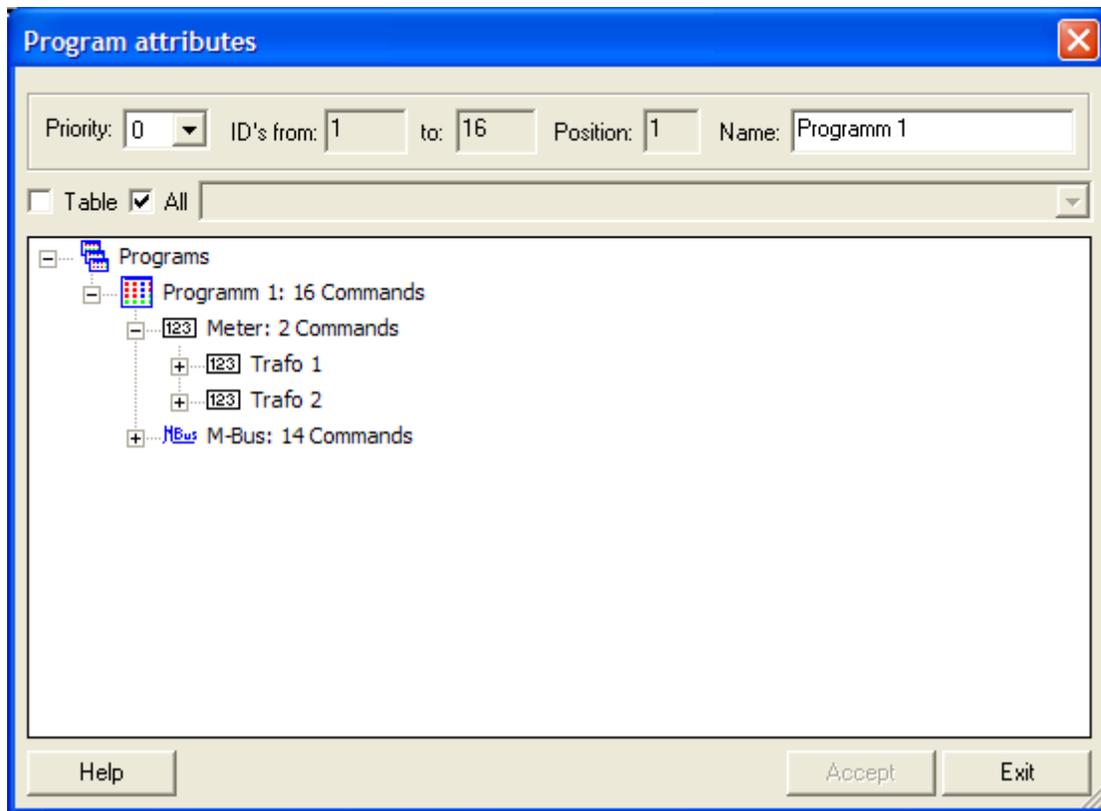
Find Program Commands
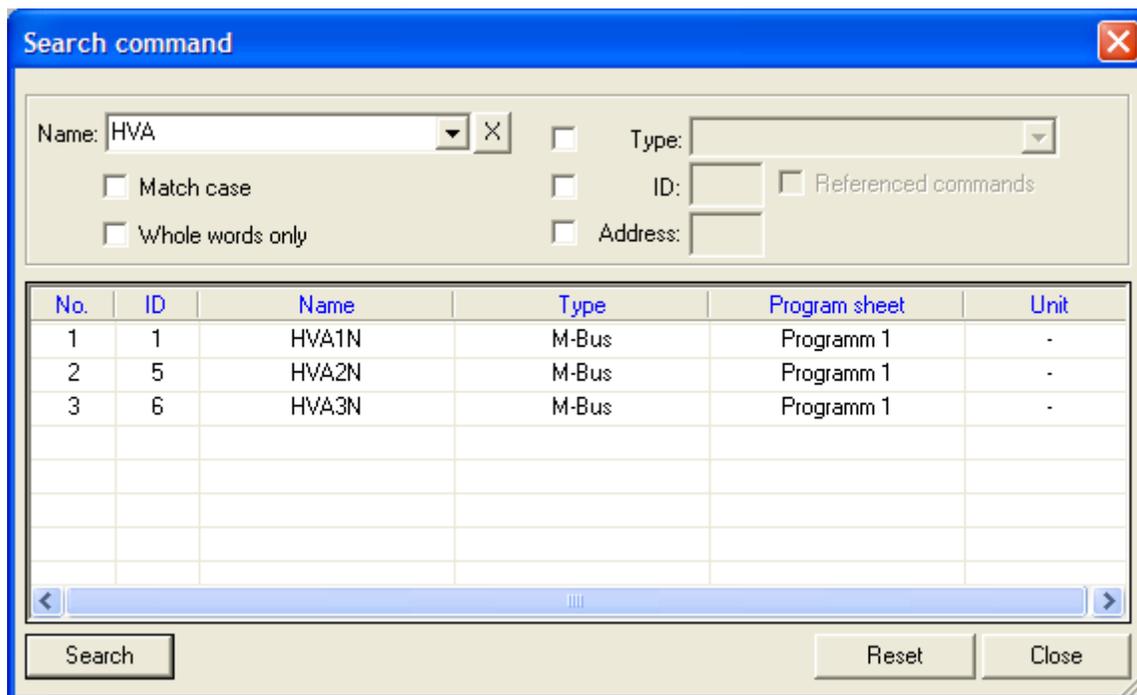
As of version 1.7.2.0, all referenced commands can be searched for any given ID.
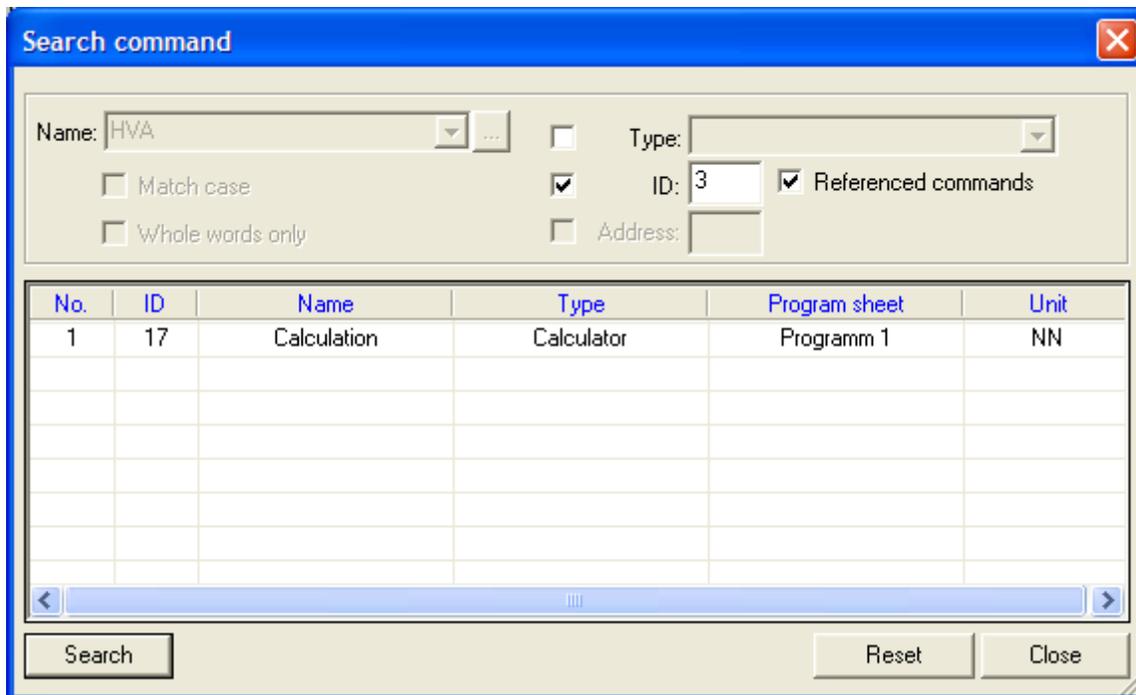
Transmitting Programs to the SmartControl and Starting Them

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 the 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 thereafter (approx. 2 seconds with TCP/IP, approx. one minute with GSM).

M-Bus Command Type

The M-Bus ("Meter-Bus") is a new European standard for remote reading of heatmeters and it is also usable for all other types of consumption meters as well as for 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 interface 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 done by the manufacturer of the respective device, or with the software intended for this purpose.

Procedure:

M-Bus commands can be generated automatically in a file after clicking the "Generate M-Bus Commands" function in the "Extras" menu.

Manual procedure for individual commands:
Select M-Bus command type in the program.

Manual entry at the bottom next to M-Bus command type:

In the case of **primary** readout, the **address** and the **baud rate** must be entered.

In the case of **secondary** readout, entry fields are also available for the following data: "**Prod.by**" (= Manufacturer), "**Version**" and "**Media**".

The following can be entered:
   Address: "secondary" M-Bus ID for the data point
   Prod. by: 3 character manufacturer designation (M-Bus compliant)
   Version: additional manufacturer-specific selection (hexadecimal). Leave this field empty, or enter "FF".

Media: additional selection of a medium. Leave this field empty as well, or use the selection menu.

Port: interface selection. The standard serial M-Bus interface at the SmartControl is the default setting.

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.

M-Bus frame analyzer:

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 in the M-Bus command to this end.
The M-Bus data are then broken down and the corresponding values are accessible via the network variables list.

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" M-Bus read-out with this command, for example in order to enter new settings to the devices from a remote location via the SmartControl Manager.

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 used data).
Set field "CI" to "send data" (parameterization).
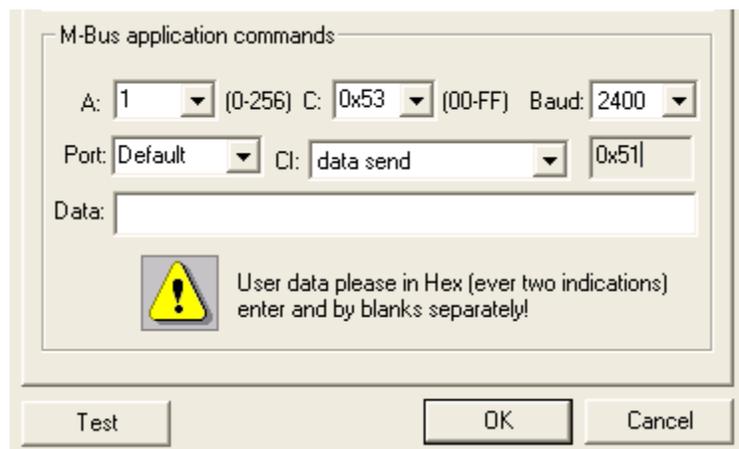
Then write the following character string, separated by blanks, to the "Data" field:

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.

=> Clear-cut documentation and identification of the meters with their primary addresses will help you to avoid faulty installation.

Calculator Command Type

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 back and forth, for example from "Value" to "Reference".

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.
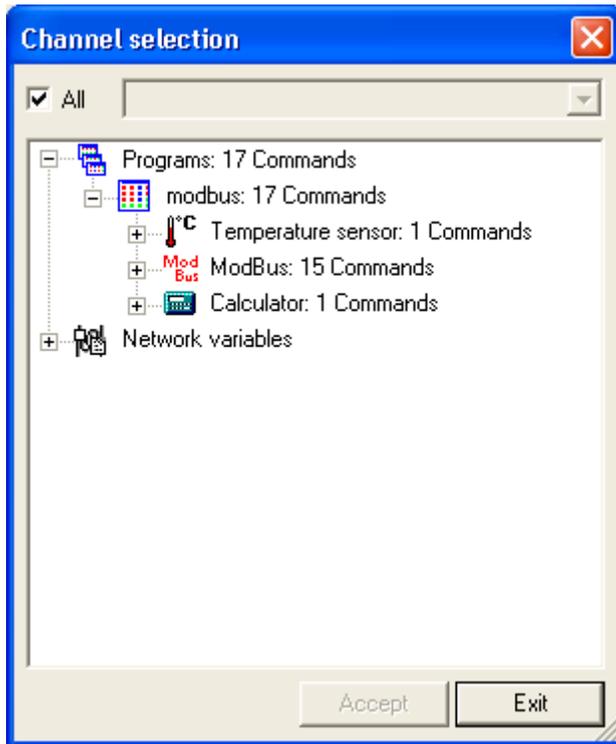
In the above example, temperature 1 is read in as a reference, and comparison takes place to determine whether or not temperature is greater then 22. And thus the command reads out 1 as soon as temperature exceeds 25°, and otherwise 0. This function can be tested with the "Test" button.

Up to 40 command lines are possible per program 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. The "Flash" checkbox is not activated in this case.

Timer Program Command Type

Date-specific calender 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 trigger range can be selected here.
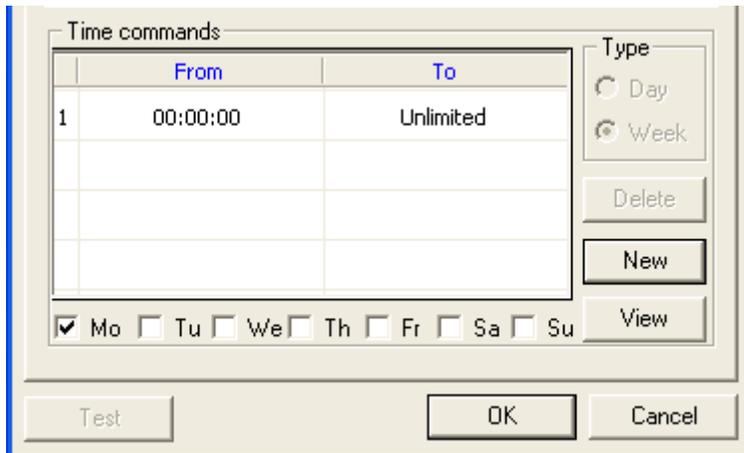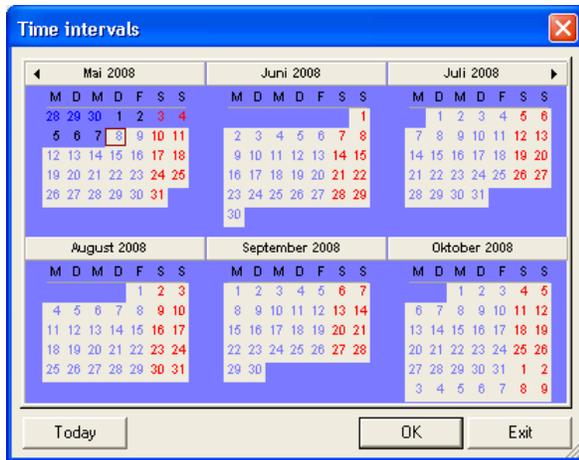
Weekdays can be entered under "Week", on which switching takes place at certain times each week.
A day window appears after clicking the "View" button. The switching time can be changed here.
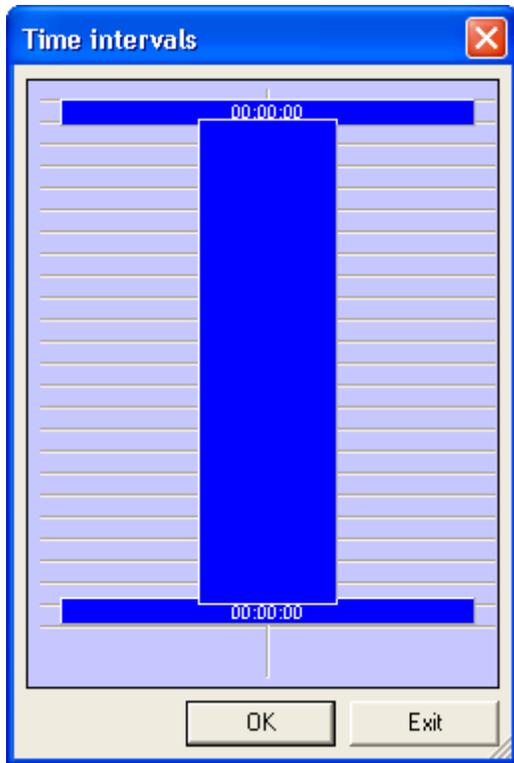
The command can be checked by clicking the "Test" button.

Multifunction Timer Command Type

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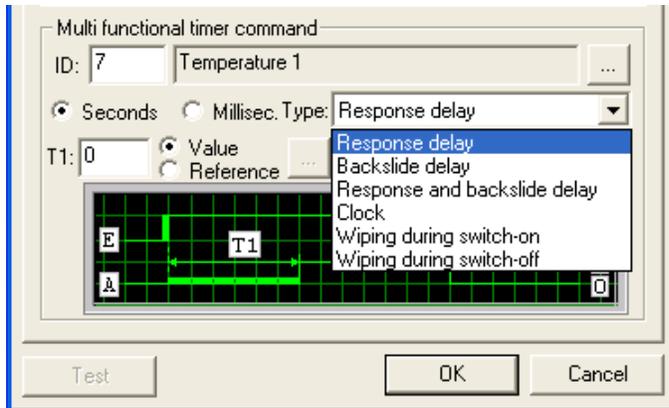
On-delay: delayed switch-on
Off-delay: delayed switch-off
Clock: pulse as output signal
Making pulse contact: immediate switch-on, delayed switch-off
Breaking pulse contact: immediate switch-off, delayed switch-on

A channel is specified which functions as an input signal, e.g. for on-delay. In the image above calculator "T > 60".
After clicking "…", a window appears in which a program command can be selected.
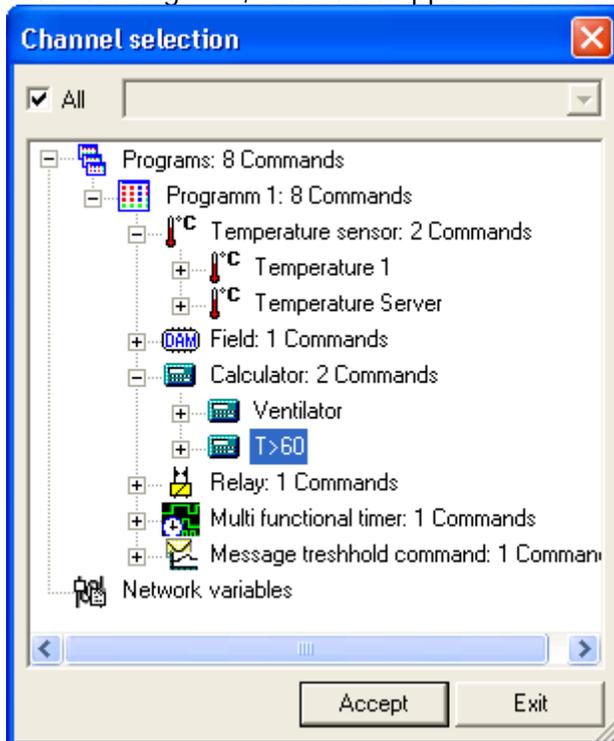
T1 has various functions depending on command type. Time can be selected in seconds or milliseconds. With the response delay command type, T1 is the response delay duration. T2 is time from switch on to switch off.

In the above example:
As soon as calculator "T > 60" reads out a 1 signal, and the condition for "T > 60" is thus fulfilled, the input of the multifunction relay receives a 1 signal.

Delay time entered at T1 (on-delay) is then started.
After delay time has expired, 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 > 60" switches to 0.
If calculator "T > 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

A heat/cold quantity calculator can be set up with this command.

Prerequisites: A flow meter with pulse input and a temperature sensor for inlet 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 inlet/return temperature sensor is entered to
"Inlet/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.

No.	Flow in	Unit	Cp (water)/Flow power
1	Liter	W	4190
2	Liter	kW	4.19
3	Liter	MW	0.00419
4	m^3	W	4190000
5	m^3	kW	4190
6	m^3	MW	4.19
7	Liter	l/s	1
8	Liter	m^3/s	0.001

Heat capacity / power factor

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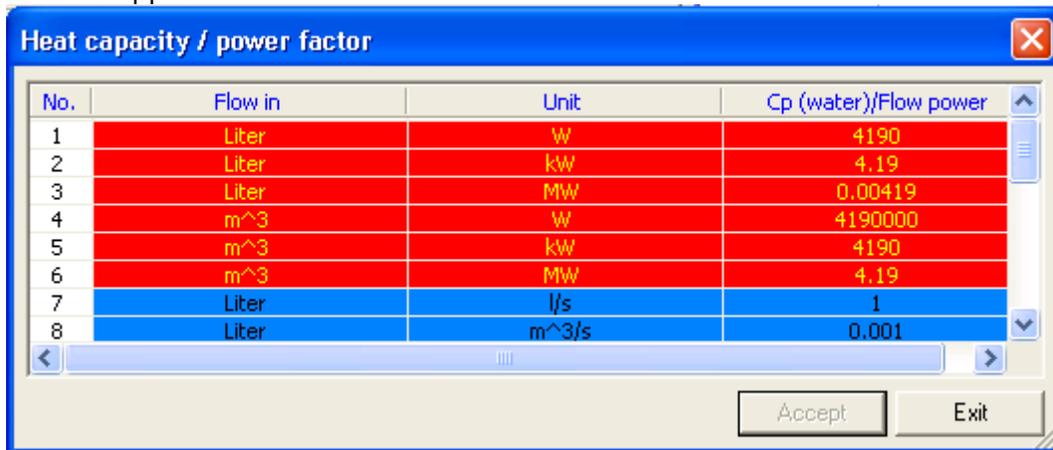
The corresponding line can be selected depending upon the flow meter's unit of measure and the desired output unit of measure.

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.

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 are 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.

This command can be used, for example, to determine how long a machine, a boiler, a pump etc. has run per hour, per quarter hour or per day, 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. Addresses 0 or 1 are interpreted as an 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 (assuming the upper threshold has been activated), the relay is switched back to 0.
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.

Example:
Due to inversion, relay output 1 is set to 1, unless: the signal from the luxmeter with ID 2 is between 3.8 and 9.3.

Example: The luxmeter reads out 4 as a signal, which is greater than 3.8, and the relay output is switched from 1 to 0 (green range in screenshot above).

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 peak load optimization! This must be taken into separate consideration in each individual case, and the prevailing conditions must be taken into account.

With regard to installation, also observe the user's manuals and installation instructions.

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:

- 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 billing periods are identical with those of the energy supplier.

Memory Cycle / Start:

Specifies the **billing period** and must be set to 15 minutes for electrical power and 60 minutes for gas. Optimization is not **started** until **after** a new billing 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 billing period.

Priority:

The priority determines as of which point in time this relay may be switched off during the billing period The billing 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 billing 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 billing 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 **billing 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 can be 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 is 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 (cubic meters) 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 or Measuring Period (MP):

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 (MP), 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 quite inaccurate. In this case it is advisable to activate the **"moving average"**.

How it works:

A new maximum targeted power value is calculated for each measuring cycle based upon the already "consumed" quantity allotment (shown in the diagram below as a thick black dashed line from the end of measuring period 3 to the end of the billing 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 billing period
+ mean power from the currently active billing period
+ averaged power from the preceding measuring period
+ power from the just elapsed measuring period (not shown in the diagram)
÷ 4

Example:

Blue: momentary power ascertained at end of MP

Red: mean power from currently active MP

Green: current mean value based on red and blue lines, "moving average" (schematic)

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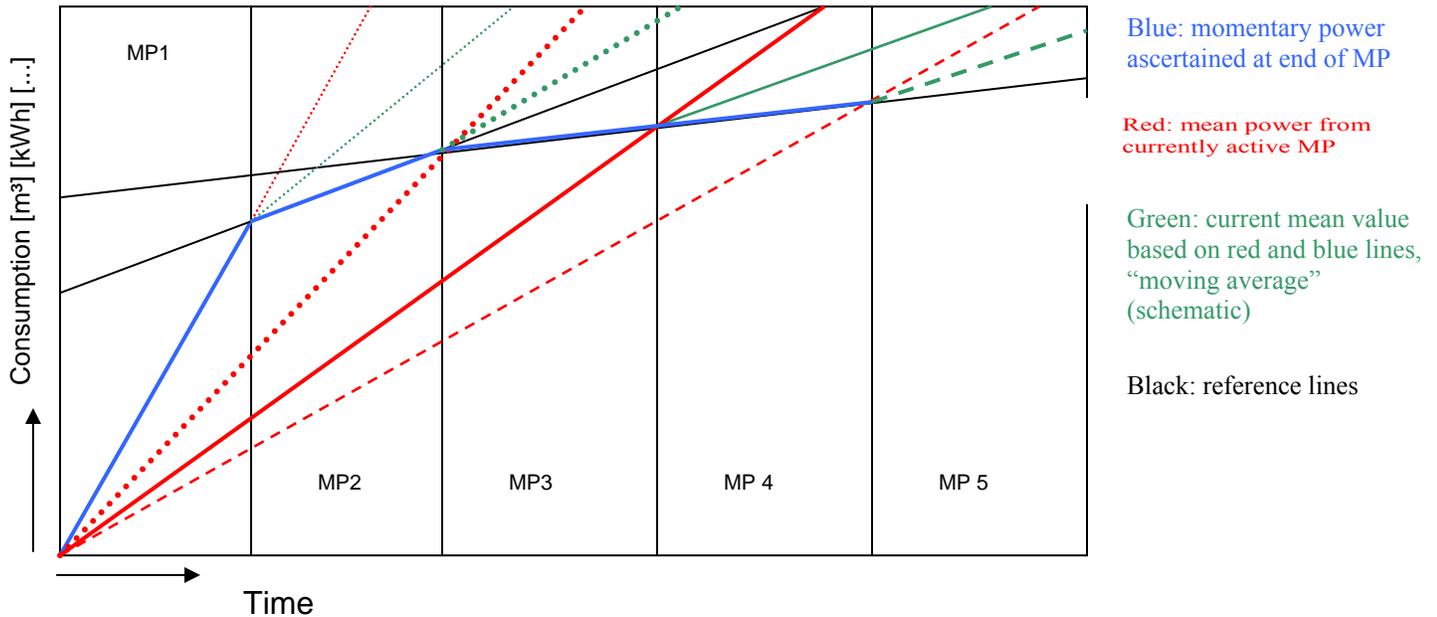
Figure 1: Diagram Demonstrating Function of the Moving Average Value (simplified)

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

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

Actually 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 below maximum power until the transition to MP 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 billing 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 billing period
+ power from the just elapsed measuring period
÷ 2

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 during 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!

Recoding (flash ring buffer):

It is 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 billing 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 cycle, 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** to 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 this assured in the event of changing circumstances.

Message Threshold, E-Mail Command Type

Prerequisite for e-mails:

- **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.
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.

- Enter the destination phone numbers in the "Configuration" which can be accessed after clicking "E-Mail Recipients":
- 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. This must be the same as the mailbox owner's address for some e-mail service providers.

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
%#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, SMS Command Type

Prerequisites:

- SmartControl with **ISDN** module and the recipient's service provider: Telekom, Arcor or DoKom, <u>or</u>
- 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".

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The following must be observed:

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

- For **SMS via GSM:** Please note that destination phone numbers for SMS services begin with the applicable country codes:
  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 **fixed network**, 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.

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

-> Acknowledge by clicking the "Accept" button.

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.

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

Field Command Type

Prerequisites:

- **Fieldbus module connected to the RS 485 bus**

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 a free 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
    value range
    06 -> 9600 baud
     00 -> readout in °C
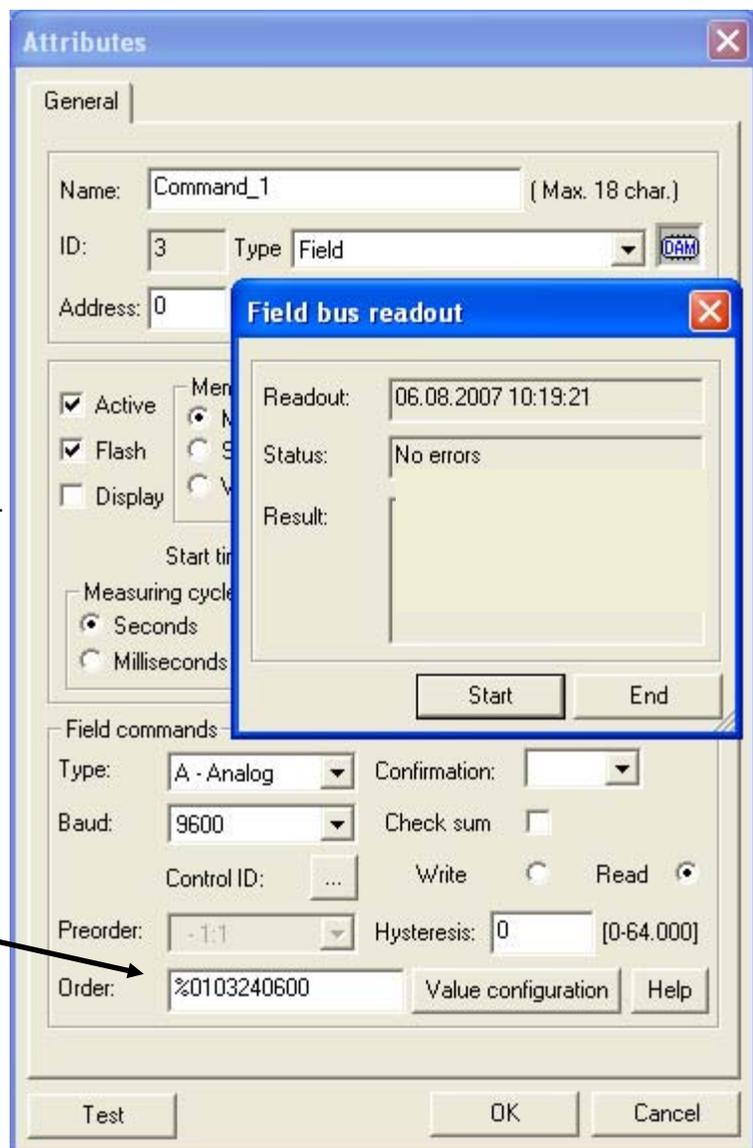
Activate the SmartControl Manager monitor as well (activate the right-hand tab in the bottom window). Incorrectly entered commands can be detected more quickly here.

Important: Do **not** leave the 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 to be read out:

All three channels are read out at the same time with the command: "#03A".

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 the "value configuration" button.

Attributes

General

Name: Command_1 (Max. 18 char.)

ID: 3 Type Field [OAM]

Address: 0

Field bus readout

Readout: 06.08.2007 10:22:14

Status: No errors

Result:

Start End

☑ Active
☑ Flash
☐ Display

Start ti
Measuring cycle
○ Seconds
○ Milliseconds

Field commands

Type: A - Analog ▼ Confirmation: ▼

Baud: 9600 ▼ Check sum ☐

Control ID: ... Write ○ Read ◉

Preorder: -1:1 ▼ Hysteresis: 0 [0-64.000]

Order: #03A Value configuration Help

Test OK Cancel

Field of values configuration

No.	Name	Unit	Offset	Factor
1	Temp_Level_1	°C	0.000	0.000
2	Temp_Level_2	°C	0.000	0.000
3	Temp_Level_3	°C	0.000	0.000

OK Cancel

The value can be changed after clicking the individual fields.
New values can be added after clicking the ● button, 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.

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

Example for heater temperature (Temp_Level_2):

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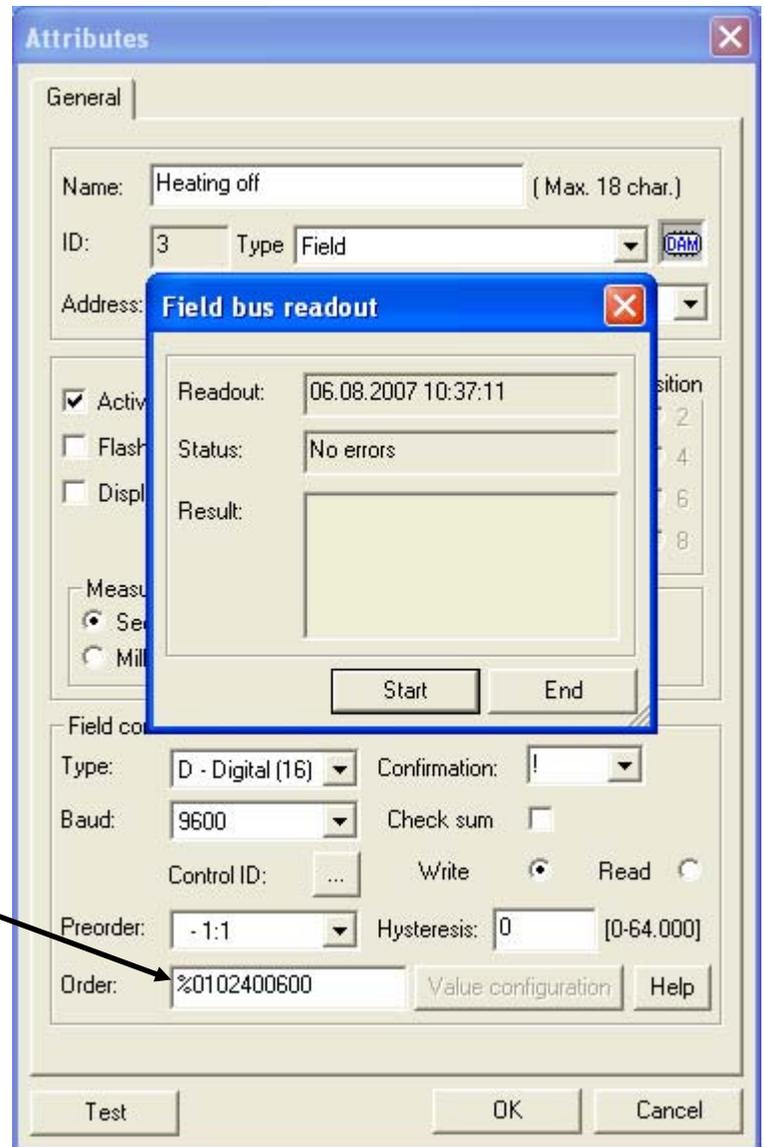
A module with 7 relay outputs (type xx67) serves as an example in this case.

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

Attributes

General

Name: Heating off   (Max. 18 char.)

ID: 3   Type Field   ▼ [DAM]

Address: 5   Channel Temp>65_Deg Unit: %   ▼

☑ Active

☐ Flash

☐ Display

Field bus readout

Readout: 06.08.2007 10:46:09

Status: No errors

Result:

St...

Measuring ...
○ Second...
○ Milliseco...
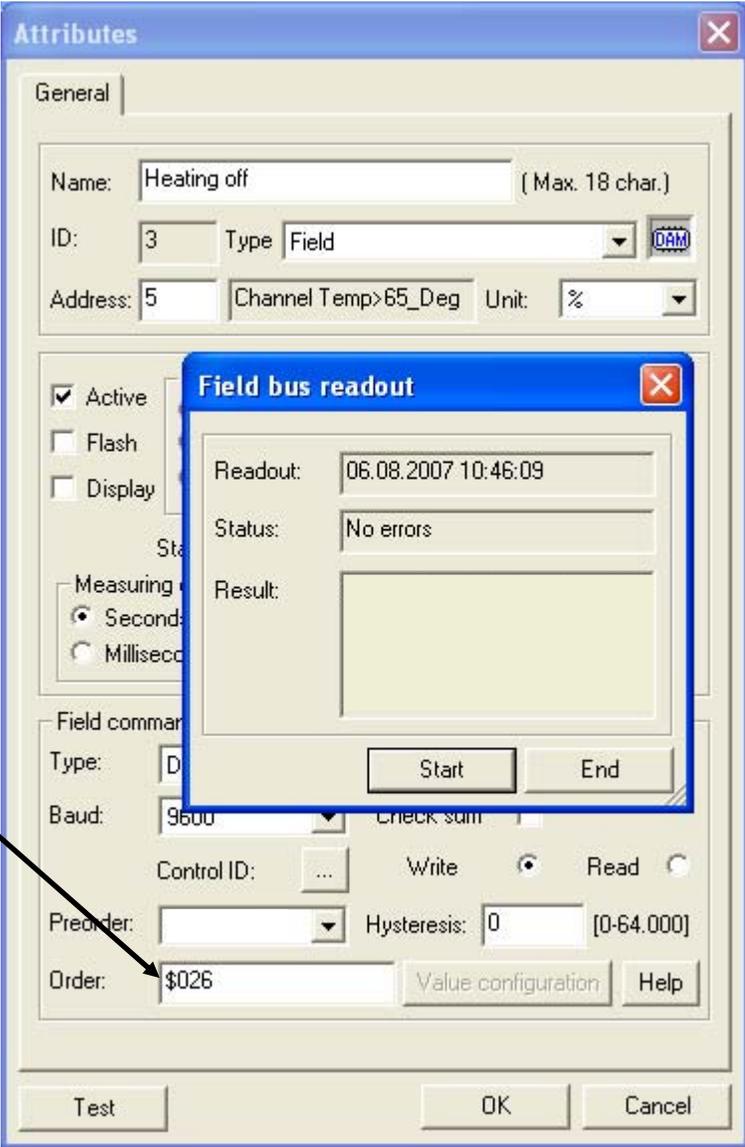
With the command $026

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.

Start   End

Field comman...

Type: D...

Baud: 9600   ▼   Check sum ☐

Control ID: ...   Write ⊙   Read ○

Preorder: ▼   Hysteresis: 0   [0-64.000]

Order: $026   Value configuration   Help

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

Test   OK   Cancel

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 computer or a relay command can be used for the logic. A relay command offers 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 4 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 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 always have a length of two characters.
        Shorter character strings are filled out with a 0.
X   Format in capital letter 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 to the right of 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 yes/no (0.5 < X < -0.5)
I   Integer (absolute number)
F   Floating point number
1:1   Value is used 1:1 for formatting, if the values of the application IDs can be prepared
        before use in the formatting.
Example 3:

No.	Function	Type	Value/Re...	Operator
1		Reference	7	> greater than
2	?	Value	22.000000	

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 #020A%02X command:
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.

Caution:
Heed the fieldbus during writing:
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 provided by the fieldbus while writing values are unusable for evaluations. Use the log function of the controlling command instead.
It is **not** possible to apply various groups, or more than one group, to a single module at the same time. Each write operation for a given 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.

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ModBus Command Type

Prerequisites:

- **Connection to one or more Modbus devices via the RS 485 interface at the SmartControl (fieldbus)** [*see item* ⑩ *in figure 6*]

- **SmartControl with installed Modbus firmware**
  (available upon request, instructions for flashing the firmware are 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 a code for the function, as well as the data to be transmitted and an error test field, are sent by the querying device (master). 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 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 "Parameter-Ind.".
11 The following window appears after clicking the "Value Configuration" button:
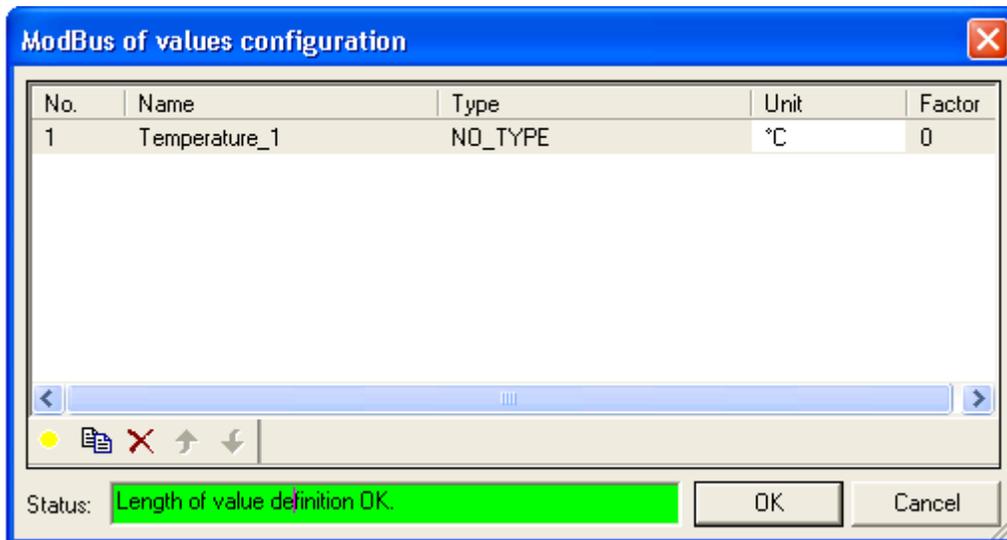
Data which are returned by the Modbus can be defined with the help of this dialog box.

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 no 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".

SBus Command Type

Prerequisites:

- **Connection to one or more SBus devices via the RS 485 interface at the SmartControl (fieldbus)** [*see item* ⑩ *in figure 6*]

- **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

PID controller:
A PID controller includes a P component, an I component and a D component.
P stands for proportional, I for integral and D for differential.
The control variable value calculated by the P component is proportional to system deviation.
The portion of the control variable value calculated by the I component increases continuously for the duration of system deviation and finally results in correction of system deviation.
Due to the I component, PID and PI controllers do not have any lasting system deviation.
In addition to the amount of system deviation and its duration, the rate at which deviation changes is also taken into consideration by the PID controller in calculating the control variable, which determines the differential component.
If system deviation occurs, this means that at the moment of occurrence system deviation also has a rate of change.

In contrast to PI controllers, PID controllers react immediately when system deviation occurs.
If the rate of change declines, the D component of the calculated control variable is also reduced.

Setpoint: ID of the setpoint
P factor: 0 to 100%
I factor: 0 to 100%
D factor: 0 to 100%
Delay: time constant (Tau)

SetMin: ID of the input which sets the setpoint to 100% (e.g. antifreeze)
The ID is, for example, the ID of the freeze guard. If the signal is 1, the control signal is set to 100%.

SetMax: ID of the input which sets the setpoint to 0% (e.g. fire, summer mode or no enabling for heat).

"SetpointMin" and "SetpointMax" specify control signal scaling.
0 … 100% = 0 … 10 V, 2 … 10 V, 0 … 20 mA, 4 … 20 mA

The ID of the actual value is entered to "Address".

The "Setpoint" can also be an address. In this way, for example, temperature reduction at night can be implemented with a computer.

If both signals are 0, the controller calculates the control signal, in which case the I component is correspondingly initialized at 0% or 100%.

All components (P, I and D), as well as the sum of all components, i.e. the control signal, are limited to a value of 0 to 100%. And thus the I component, which is critical in this case, does not approach infinity.

Examples:
A room temperature controller: P = 30%, I = 0.03%, D = 0%, delay = 60 s
This example is taken from actual practice. The 60 second delay allows the control signal, i.e. the system, to settle in a bit and doesn't have any negative effects on the targeted results.

Adaptation to the respective system must take place.
In addition to the actual value, the individual components and the resultant setpoint are also written to flash memory for a more accurate analysis.

Network Variables

"Network variables" are created automatically by the SmartControl for Modbus, fieldbus and M-Bus commands with defined values. A new virtual ID is assigned to them automatically, which is calculated as follows: [1]

Virtual ID = 10,000 + ID of the fieldbus command x 100 + numeric value
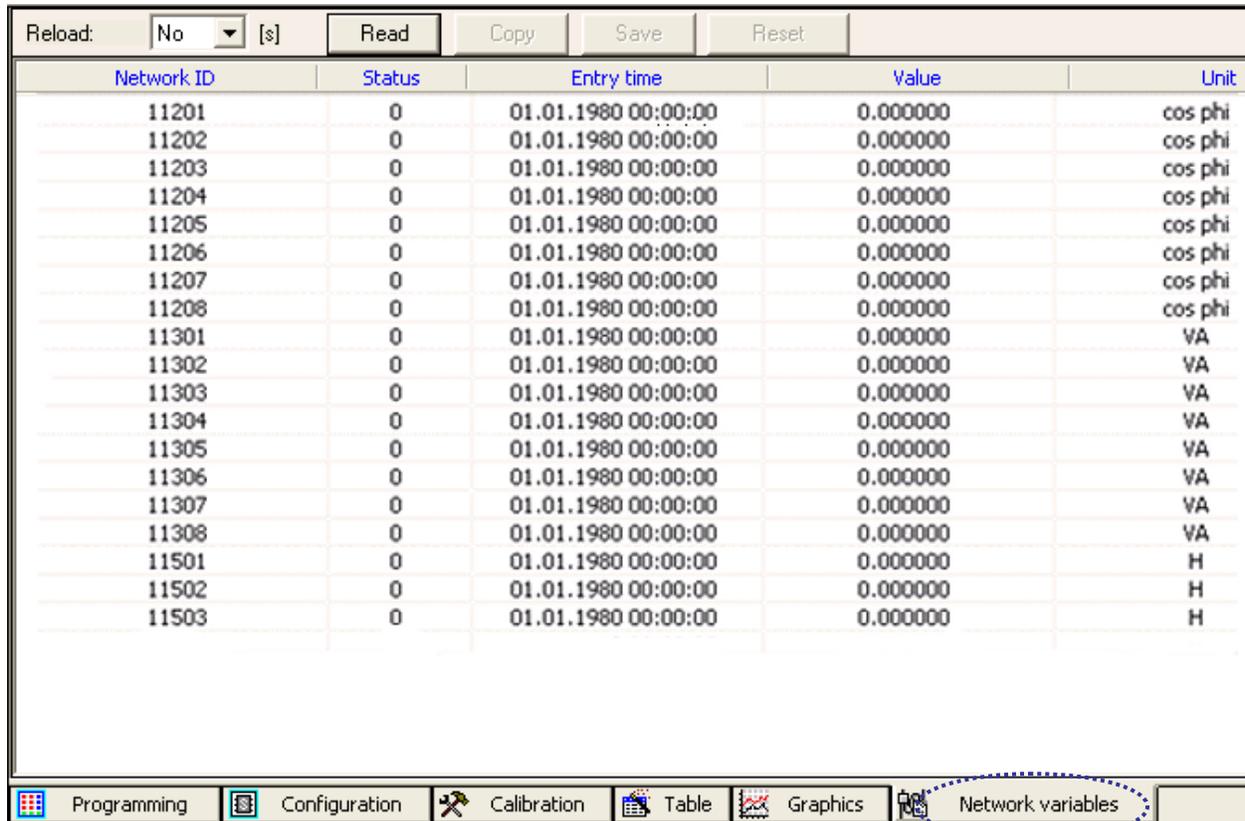
Network ID	Status	Entry time	Value	Unit
11201	0	01.01.1980 00:00:00	0.000000	cos phi
11202	0	01.01.1980 00:00:00	0.000000	cos phi
11203	0	01.01.1980 00:00:00	0.000000	cos phi
11204	0	01.01.1980 00:00:00	0.000000	cos phi
11205	0	01.01.1980 00:00:00	0.000000	cos phi
11206	0	01.01.1980 00:00:00	0.000000	cos phi
11207	0	01.01.1980 00:00:00	0.000000	cos phi
11208	0	01.01.1980 00:00:00	0.000000	cos phi
11301	0	01.01.1980 00:00:00	0.000000	VA
11302	0	01.01.1980 00:00:00	0.000000	VA
11303	0	01.01.1980 00:00:00	0.000000	VA
11304	0	01.01.1980 00:00:00	0.000000	VA
11305	0	01.01.1980 00:00:00	0.000000	VA
11306	0	01.01.1980 00:00:00	0.000000	VA
11307	0	01.01.1980 00:00:00	0.000000	VA
11308	0	01.01.1980 00:00:00	0.000000	VA
11501	0	01.01.1980 00:00:00	0.000000	H
11502	0	01.01.1980 00:00:00	0.000000	H
11503	0	01.01.1980 00:00:00	0.000000	H

Reload: No [s]   Read   Copy   Save   Reset

Programming | Configuration | Calibration | Table | Graphics | Network variables

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 processing from any command with referenceable input values.

---

[1] Option

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 open program.

Export Procedure

1   Select the desired commands and acknowledge by pressing the right mouse key.
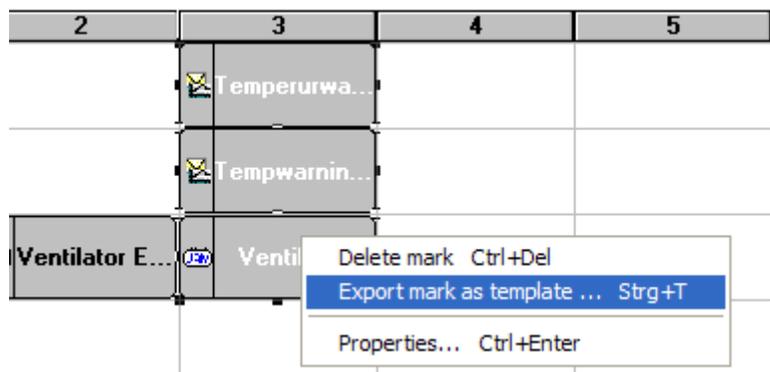
2   Click "Export selection as template".

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

Attributes commands template

Commands template_NN

No.	ID	Name	Type	Address	Unit	Attributes	External ID's
1	1	T-Server	Temperature sensor	1	°C	...	...
2	2	Temperurwarning	Message treshhold	1,2,3	I/O	...	OK
3	3	Tempwarning EM	Message treshhold	1	I/O	...	OK
4	4	Temperature > 28	Relay	5	I/O	...	OK
5	5	Ventilator E/A	Calculator	0	NN	...	OK
6	6	Ventilator	Field	5	NN	...	OK
7	7	ModuleReset	Field	0	NN	...	OK

⚠ Please describe the external ID's for all commands!   [OK] [Cancel]

4   After clicking "..." in the "External IDs" column, a window appears to which the necessary external IDs can be entered line by line. The "OK" button is enabled after the IDs have been entered for all lines.
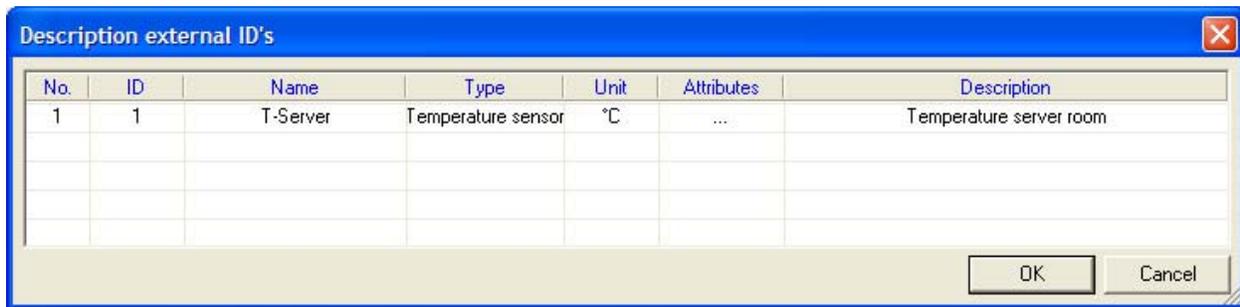
5   A file selection window appears after clicking the "OK" button. Select a directory path and a file name for the command template here.
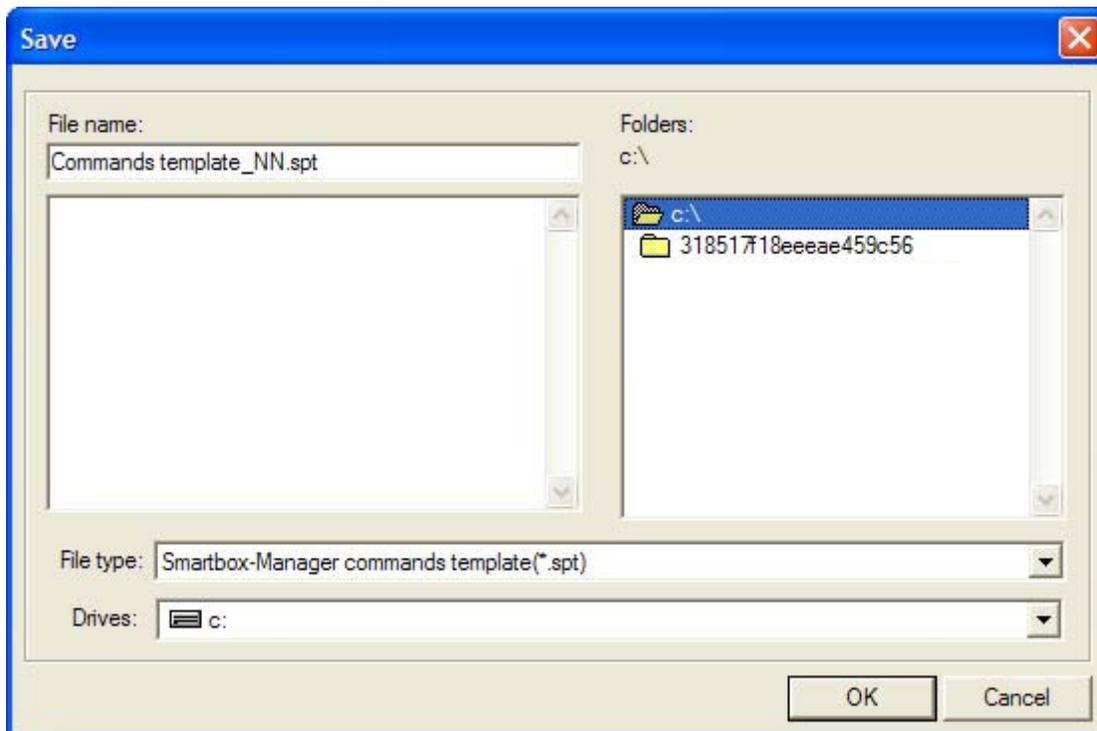
Import Procedure

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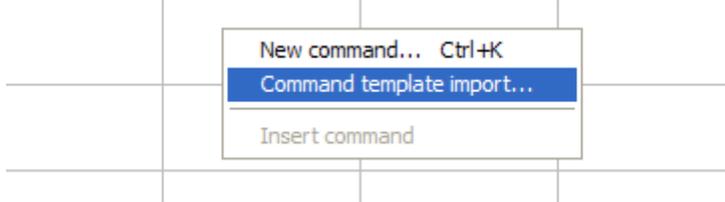
4   Select the command template to be imported in the file selection window which then appears. You can see how many commands are included in the template by clicking "Preview" at the bottom left during selection. This makes it possible to determine whether or not the programs to be imported will fit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

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

Attributes commands template

Commands template_NN

No.	ID	Name	Type	Address	Unit	Attributes	External ID's
1	8	T-Server	Temperature sensor		°C	...	...
2	9	Temperurwarning	Message treshhold	1,2,3	I/O	...	OK
3	10	Tempwarning EM	Message treshhold	1	I/O	...	OK
4	11	Temperature > 28	Relay	5	I/O	...	OK
5	12	Ventilator E/A	Calculator	0	NN	...	OK
6	13	Ventilator	Field	12	NN	...	OK
7	14	ModuleReset	Field	0	NN	...	OK

Please reference the external IDs for all commands!   OK   Cancel

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. A suitable data point is selected to this end in the now open "Reference External IDs" dialog box via the "Data Points" field. The configuration software offers suitable data points of the same type in this field. Addresses can be entered offline.
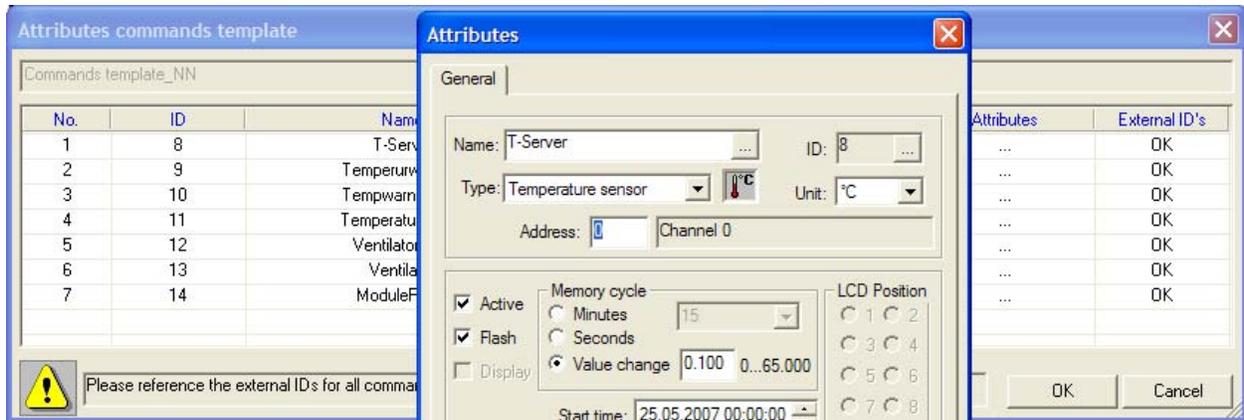
7   The "OK" button is once again enabled after all data points have been successfully allocated.

8   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:
Mbus: Data point, addresses, port, primary/secondary can be entered.
Mbus 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.

3.9 "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 Smart Control, 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

Reload: No ▼ [s]   Read   Copy   Save   Reset

No.	Name	ID	Status	Value
1	Year	65001	1	2010.000000
2	Month	65002	1	3.000000
3	Day	65003	1	17.000000
4	Hour	65004	1	13.000000
5	Minute	65005	1	23.000000
6	Second	65006	1	24.000000
7	Week day	65007	1	3.000000
8	Day minute	65008	1	803.000000
9	Error status_1	65011	1	0.000000
10	Error status_2	65012	1	0.000000
11		65020	0	
12		65021	0	
13		65022	0	
14		65023	0	
15		65024	0	
16		65025	0	
17		65026	0	

3.10 Timer Program / Special Days

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

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.

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 - Reads all entries to the connect device

The timer program table has the following columns:

ID – A number between 65020 and 65029 used a 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 -> a value of 1 to 13:00:00, switch-off time -> a value of 0)
M-S   **-** Day of the week
TD1-D9 – Special days

4 Reading in Data, Displaying Data as Graphics
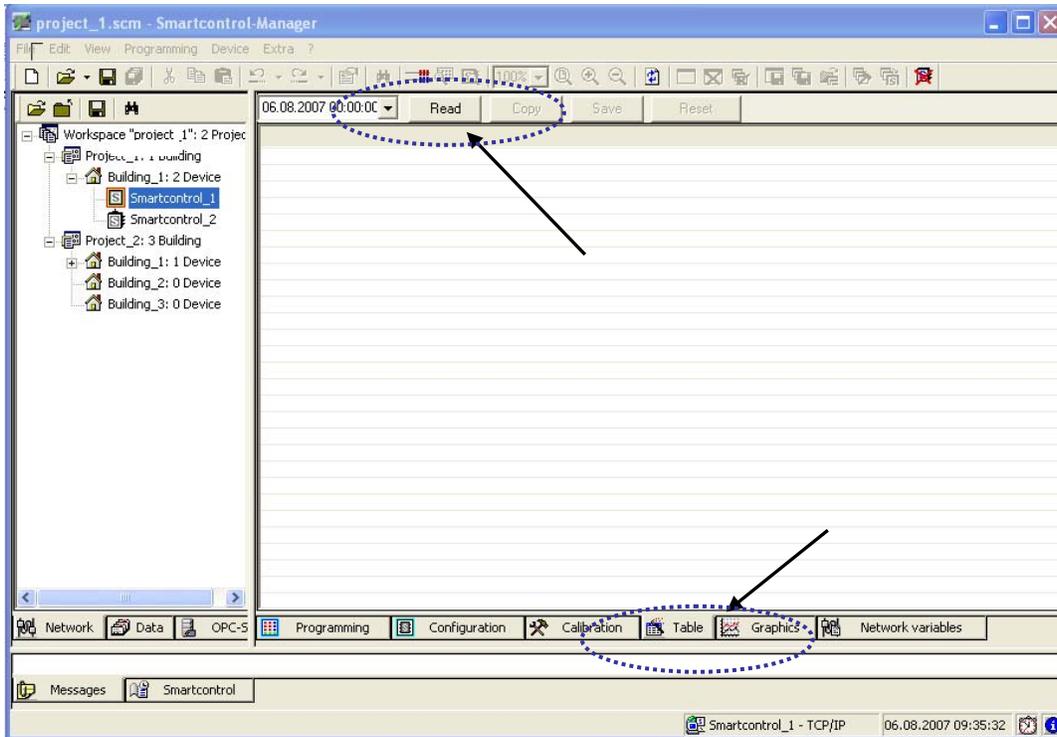
After connection to the SmartControl has been successfully established, select the "Table" tab, specify the desired readout time-span and click the "Read" button. Data which have been recorded to the SmartControl are now transmitted, which may take several minutes depending upon connection quality.
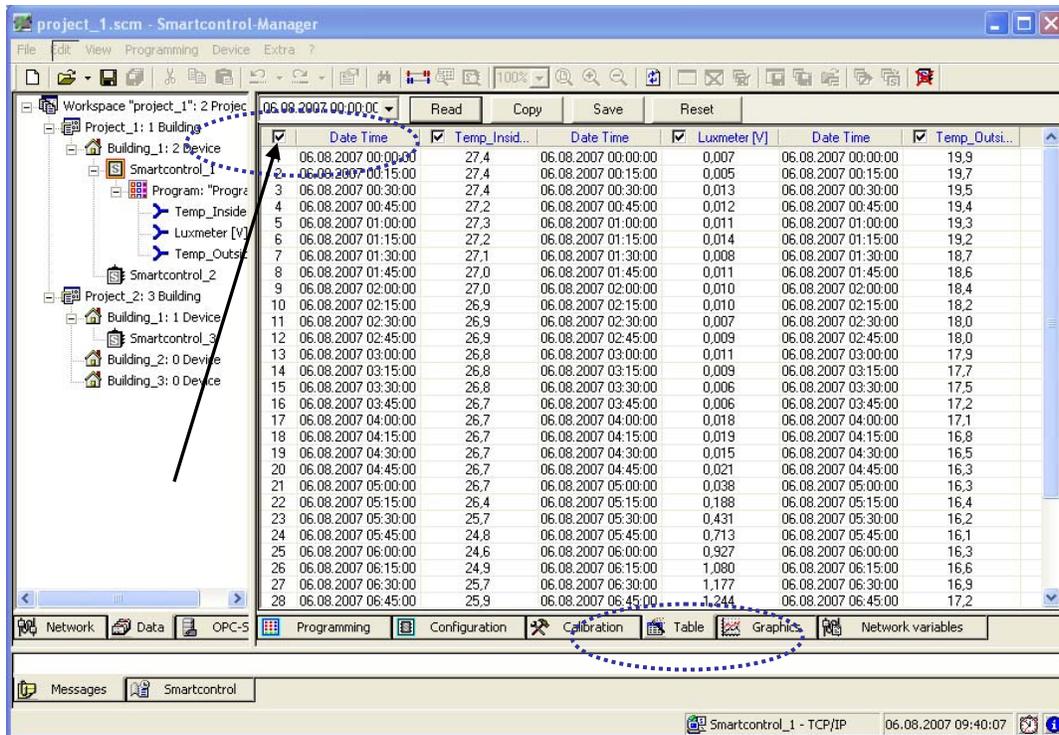
The data can now be copied, or exported as a data file which can be processed with the help of a spreadsheet program. Enter checkmarks next to the desired data points to this end, or enter checkmarks for all data points simultaneously as shown in the screenshot with the "Selection" function. The data 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 time-span, the "Reset" button must first be clicked.
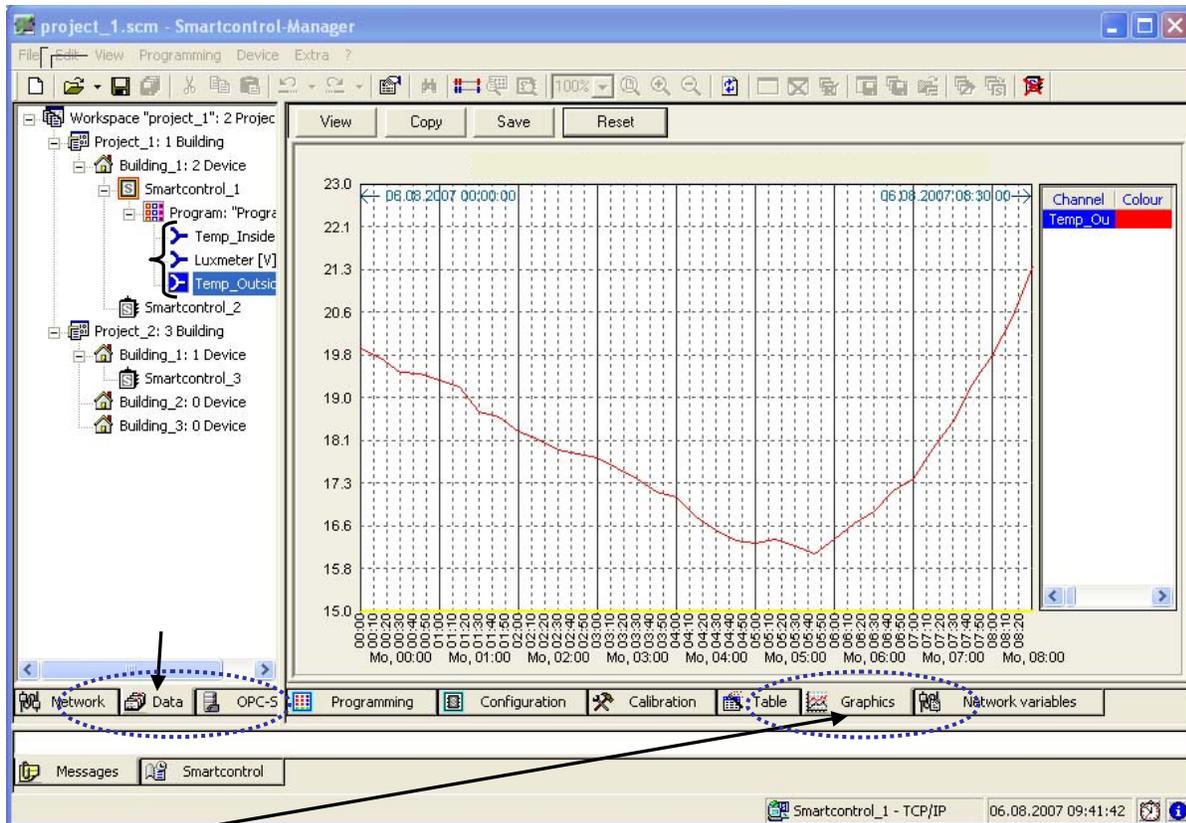
Click the "Graphics" tab.

After readout, channels are made available in the left-hand window under SmartControl. 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.

5   Options

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).

6 Repair and Replacement Parts Service DKD Calibration Center and Rental Instrument Service

If required please contact:

GMC-I Service GmbH
Service-Center
Thomas-Mann-Str. 20
90471 Nuremberg, Germany
Phone: +49 911 817718-0
Fax: +49 911 817718-253
e-mail: service@gossenmetrawatt.com

This address is only valid in Germany. Please contact our representatives or subsidiaries for service in other countries.

7 Product Support

If required please contact:

GMC-I Messtechnik GmbH
Product Support Hotline
Phone: +49 911 8602-500
Fax: +49 911 8602-340

e-mail support@gossenmetrawatt.com

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