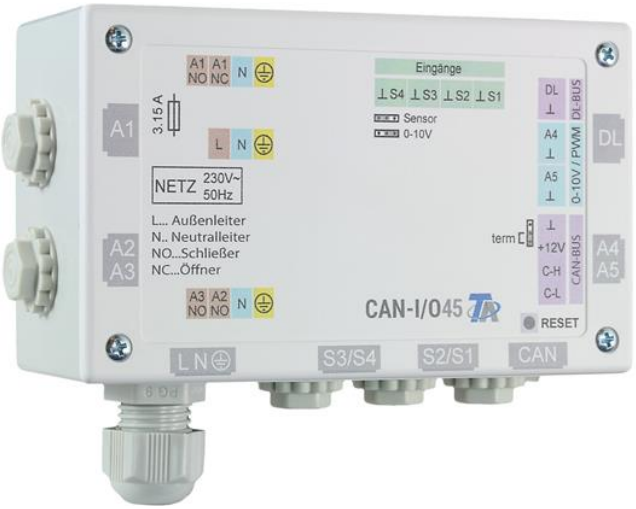
CAN-I/O 45

CAN-I/O Module 45



Programming:
General information

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Principles

The module can be used as an extension module for freely programmable controllers. Power is supplied via a controller or an external 12 V power supply unit. No more than two devices (CAN monitor, CAN-I/O module etc.) can be supplied with power with each controller. With three or more devices in the CAN network, an additional 12 V power supply unit is required.

The module is programmed using the TAPPS2 programming software, but can also be programmed via the UVR16x2 or CAN-MTx2.

All the function modules of the UVR16x2 controller are available. Up to 44 functions can be used in a single programming configuration.

The transfer of function data and updating of firmware is carried out via the C.M.I., from the UVR16x2 or CAN-MTx2.

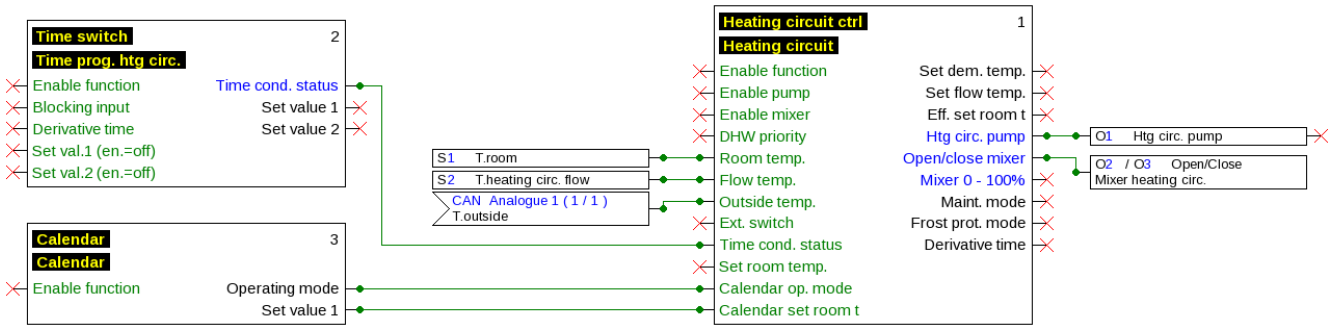
The module can be operated via a UVR16x2 controller, the CAN-MTx2 CAN monitor or the C.M.I. interface.

A separate firmware version is provided for each language.

This manual is designed as a guide to programming with the **TAPPS 2** programming software, while also providing important information about the elements that can be modified via the C.M.I. or the UVR16x2.

The tools and procedures for TAPPS2 that are required for the graphical creation of the module programming are explained in the TAPPS2 manual.

Example with TAPPS 2:



Planning basics

To ensure efficient programming, the following order must be observed:

1	A prerequisite for programming and defining parameters is an **accurate hydraulic scheme**.
2	Using that scheme, you **must** define **what should be controlled and how**.
3	Based on the required control functions, you must define the **sensor positions** and draw them on the scheme.
4	In the next step, all sensors and outputs are assigned the required **input and output numbers**. As all the sensor inputs and outputs have different characteristics, it is not possible to simply number them consecutively. The input and output numbers must therefore be assigned as instructed in this manual.
5	After that, the functions are selected and their parameters are programmed.

Designations

All elements can be designated by selecting a predefined designation from various designation groups or from the user defined designations.

You can also assign a number from 1 to 16 to every designation.

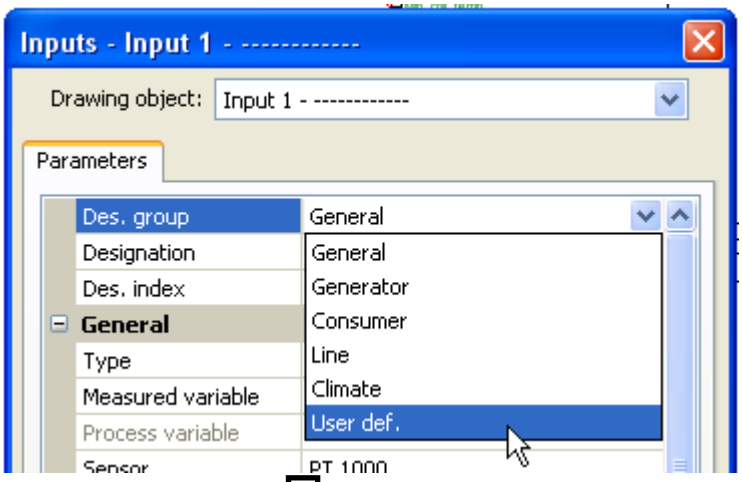
User defined designations

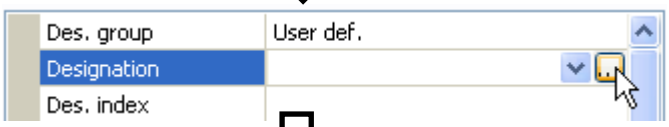
Up to 100 different designations can be defined by the user. The maximum number of characters per designation is **24**.

Designations defined previously are available for all elements (inputs, outputs, functions, fixed values, bus inputs and outputs).

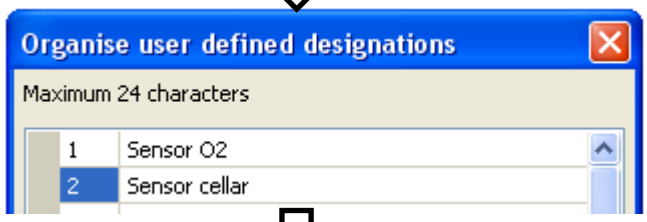
Example:

You want to assign a user defined designation to Input 1.

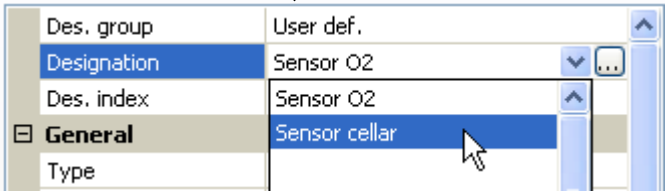




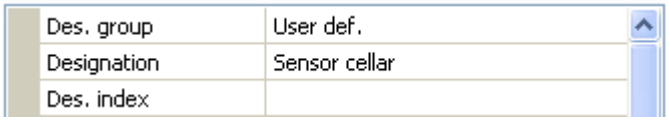
Click the field for creating the required designation.



Enter the designations, finish with "OK"



Select from the list of previously created user defined designations.



The required designation is displayed

Programming with TAPPS2

The following describes how to program the parameters for all elements using the TAPPS2 programming software.

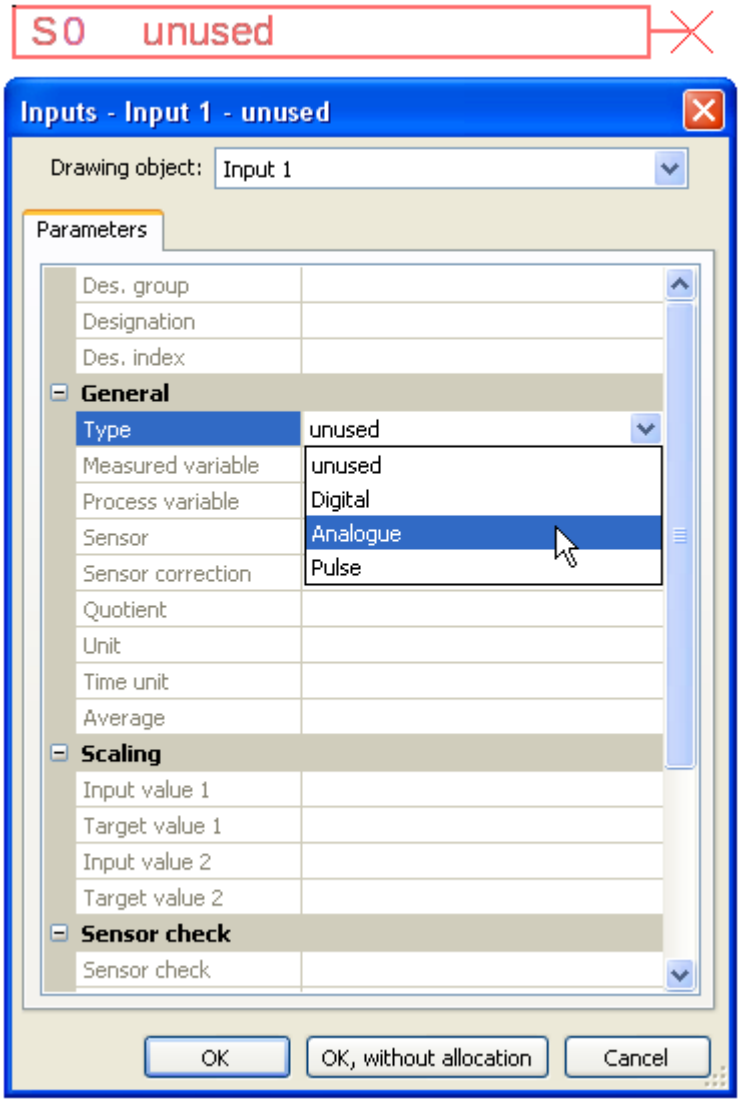
Inputs

The module has **4 inputs** for analogue signals (measurements), digital signals (ON/OFF) or pulses.

Programming the parameters

Sensor type and measured variable

Once the required input is selected, the sensor type can be defined.



3 types of input signal are available:

- **Digital**
- **Analogue**
- **Pulse**

Digital

Select the **measured variable**:

- **Off / On**
- **No / Yes**
- **Off / On (inverse)**
- **No / Yes (inverse)**

Analogue

Select the **measured variable**:

- **Temperature**
  Select the sensor type: **KTY** (**2 kΩ/25°C** = formerly Technische Alternative's standard type), **PT 1000** (= current standard type), room sensors: **RAS**, **RASPT**, **THEL** thermocouple, **KTY** (**1 kΩ/25°C**), **PT 100, PT 500, Ni1000**, **Ni1000 TK5000**
- **Solar radiation** (sensor type: **GBS01**)
- **Voltage**
- **Resistance**
- **Humidity** (sensor type: **RFS**)
- **Rain** (sensor type: **RES**)

The inputs 1-4 are normally capable of measuring a maximum voltage of 3.3 volts.

By repositioning the **jumpers** for inputs 3 and 4, these inputs can register a voltage of **0-10 V** (see installation instructions). When the jumper is set to "**0-10 V**", no other measured variables can be registered.

If this jumper is not set correctly, voltage greater than 3.3 V could result in damage to the input.

Also select the **process variable**
for the measured variables **Voltage** and **Resistance**:

- **dimensionless**
- **Dimensionless (.1)**
- **Performance factor**
- **Dimensionless (.5)**
- **Temperature °C**
- **Global radiation**
- **CO_2 content (ppm)**
- **Percent**
- **Absolute humidity**
- **Pressure bar, mbar, Pascal**
- **Litre**
- **Cubic metre**
- **Flow rate (l/min, l/h, l/d, m³/min, m³/h, m³/d)**
- **Output**
- **Voltage**
- **Amperage mA**
- **Amperage A**
- **Resistance**
- **Speed km/h**
- **Speed m/s**
- **Degree (angle)**

Then you must use scaling to define the value range.

Example Voltage/Global radiation:

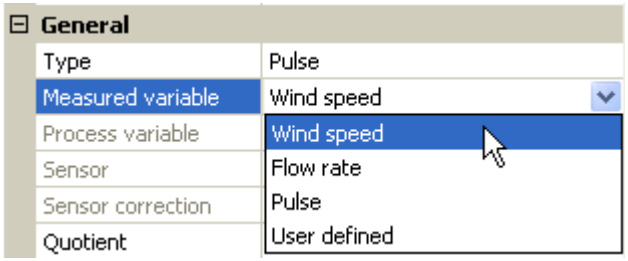
Scaling	
Input value 1	0,00 V
Target value 1	0 W/m²
Input value 2	3,00 V
Target value 2	1500 W/m²

0.00 V equates to 0 W/m², 3.00 V yields 1500 W/m².

Pulse input

Inputs can capture pulses with **max. 10 Hz** and a pulse duration of at least **50 ms**.

Select the measured variable



Wind speed

A quotient must be entered for the "**Wind speed**" measured variable. This is the signal frequency at **1 km/h**.

Example: The **WIS01** wind sensor issues one pulse (=1 Hz) per second at a wind speed of 20 km/h. Therefore the frequency at 1 km/h equals 0.05 Hz.

Quotient	0,05 Hz

Setting range: 0.01 – 1.00 Hz

Flow rate

A quotient must be entered for the "**Flow rate**" measured variable. This is the flow rate in litres per pulse.

Quotient	0,5 l/imp

Setting range: 0.1 – 100.0 l/pulse

Pulse

This measured variable is used as the input variable for the "**Meter/Counter**" function, as a pulse counter with "Pulses" as its unit.

User defined

For the "**User defined**" measured variable, both the quotient **and** the unit must be entered.

Quotient	0,50000 l/imp
Unit	l
Time unit	/h

Setting range for quotient: 0.00001 – 1000.00000 units/pulse (5 decimal places)

Units: l, kW, km, m, mm, m³.

For l, mm and m³ the unit of time must be selected as well. For km and m the units of time are predefined and cannot be changed.

Example: For the "Energy meter" function, the unit "kW" can be used. In the example above, 0.00125 kWh/pulse was selected, which equates to 800 pulses /kWh.

Quotient	0,00125 kWh/imp
Unit	kW
Time unit	

Designation

Enter the input designation by selecting a predefined designation from various designation groups or from the user defined designations.

Sensor type Analogue / Temperature:

- **General**
- **Generator**
- **Consumer**
- **Line**
- **Climate**
- **User** (user defined designations)

You can also assign a number from 1 to 16 to every designation.

Sensor correction

The option of sensor correction is available for the measured variables Temperature, Solar radiation, Humidity and Rain. The corrected value is utilised for all calculations and displays.

Example: Pt1000 temperature sensor

General	
Type	Analogue
Measured variable	Temperature
Process variable	
Sensor	PT 1000
Sensor correction	0,2 K

Average

Average	1,0 sec

This setting refers to the average of the measurements **over time**.

Averaging over 0.3 seconds leads to extremely rapid reactions on the part of the display and the unit. However, this can be expected to cause fluctuations of the value.

A large average value leads to inertia and is only recommended for sensors for the heat meter.

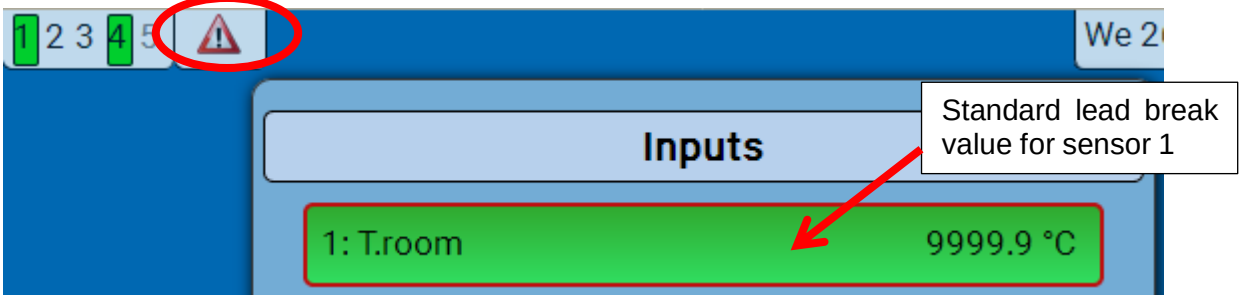
For simple measuring tasks, around 1 - 3 seconds should be selected. For hygienic domestic hot water heating with the ultra-fast sensor, 0.3 - 0.5 seconds should be selected.

Sensor check for analogue sensors

Sensor check	
Sensor check	Yes
Short circuit threshold	Standard
Threshold value	
Short circuit value	Standard
Output value	
Lead break threshold	Standard
Threshold value	
Lead break value	Standard
Output value	

When "**Sensor check**" is active (setting: "**Yes**"), a short circuit or a lead break will **automatically** generate an error message: A **warning symbol** is displayed in the upper status line, and the faulty sensor is shown with a red border around it in the "**Inputs**" menu.

Example:



Sensor error

When "**Sensor check**" is active, **Sensor error** is available as an input variable for functions: status "**No**" for a sensor that is working correctly and "**Yes**" for a defect (short circuit or lead break). This allows the controller to react to the failure of a sensor, for example.

In System values / General, a sensor error for **all** inputs is available.

If the **Standard** thresholds are selected, a short circuit will be indicated if the value falls below the lower **measurement limit** and a lead break will be indicated if the value exceeds the upper **measurement limit**.

The **Standard** values for temperature sensors are -9999.9 °C for a short circuit and 9999.9 °C for a lead break. Those values are utilised in the internal calculations in the event of an error.

By selecting the thresholds and values appropriately, a fixed value can be specified for the controller in the event of sensor failure, in order to allow a function to continue operating in emergency mode.

Example: If the temperature value falls below the threshold of 0 °C (= "Threshold value"), a value of 0.0 °C (= "Output value") is issued and displayed for that sensor (fixed hysteresis: 1.0 °C). At the same time the "Sensor error" status is set to "**Yes**".

Sensor check	
Sensor check	Yes
Short circuit threshold	User def.
Threshold value	0,0 °C
Short circuit value	User def.
Output value	20,0 °C

If the sensor falls below 0 °C, 20 °C will consequently be displayed as the measurement value, and at the same time a sensor error will be displayed (with a red border).

The short circuit threshold must be defined below the lead break threshold.

Programming with TAPPS2 / Inputs

In the case of **voltage measurements** on inputs (max. 3,3V), note that the internal resistance of the **voltage source** must not exceed 100 Ω otherwise the accuracy will be less than that specified in the technical data.

Voltage measurement 0-10 V of inputs 3 and 4 with jumper set: The module's input impedance is 10 kΩ. Make sure that the voltage never exceeds 10.5 V as this would have an extremely negative effect on the other inputs.

Resistance measurement: If the process variable is set to "Dimensionless", measurement is only possible up to 30 kΩ. If the process variable is set to "Resistance" and the resistances being measured are >15 kΩ, the averaging time should be increased as the values will fluctuate slightly.

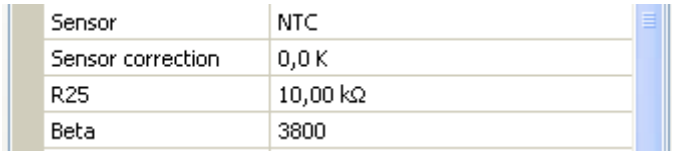
Resistance table for various sensor types

Temp. [°C]	**0**	**10**	**20**	**25**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
PT1000 [Ω]	1000	1039	1078	1097	1117	1155	1194	1232	1271	1309	1347	1385
KTY (2kΩ) [Ω]	1630	1772	1922	2000	2080	2245	2417	2597	2785	2980	3182	3392
KTY (1kΩ) [Ω]	815	886	961	1000	1040	1122	1209	1299	1392	1490	1591	1696
PT100 [Ω]	100	104	108	110	112	116	119	123	127	131	135	139
PT500 [Ω]	500	520	539	549	558	578	597	616	635	654	674	693
Ni1000 [Ω]	1000	1056	1112	1141	1171	1230	1291	1353	1417	1483	1549	1618
Ni1000 [Ω] TK5000	1000	1045	1091	1114	1138	1186	1235	1285	1337	1390	1444	1500

The standard type used by Technische Alternative is **PT1000**.

PT100, PT500: As these sensors are more susceptible to external interference, their sensor leads must be **screened** and the **Average time** should be increased. Nevertheless the accuracy specified in the technical data for PT1000 sensors **cannot be guaranteed**.

NTC sensors



For evaluating the NTC sensors, the R25 value and the beta value must be specified.

The nominal resistance R25 is always based on 25 °C.

The beta value refers to the characteristic of an NTC sensor in relation to 2 resistance values.

Beta is a material constant and can be calculated from the manufacturer's resistance table using the following formula:

$$B = \frac{\ln \frac{R1_{(NT)}}{R2_{(HT)}}}{\frac{1}{T1_{(NT)}} - \frac{1}{T2_{(HT)}}}$$

As the beta value is not a constant over the total temperature curve, the anticipated limits of the measuring range must be determined (e.g. for a cylinder sensor from +10 °C to +100 °C or for an outside sensor from -20 °C to +40 °C).

All temperatures in the formula must be given as **absolute temperatures in K** (Kelvin) (e.g. +20 °C = 273.15 K + 20 K = 293.15 K)

In	Natural logarithm
$R1_{(NT)}$	Resistance at the minimum temperature of the temperature range
$R2_{(HT)}$	Resistance at the maximum temperature of the temperature range
$T1_{(NT)}$	Minimum temperature of the temperature range
$T2_{(HAT)}$	Maximum temperature of the temperature range

Outputs

The module has **5 outputs.**

The following different output types exist, although they are not available for selection for all outputs:

- **Switching output**
- **Output pair**
- **0 - 10 V**
- **PWM**

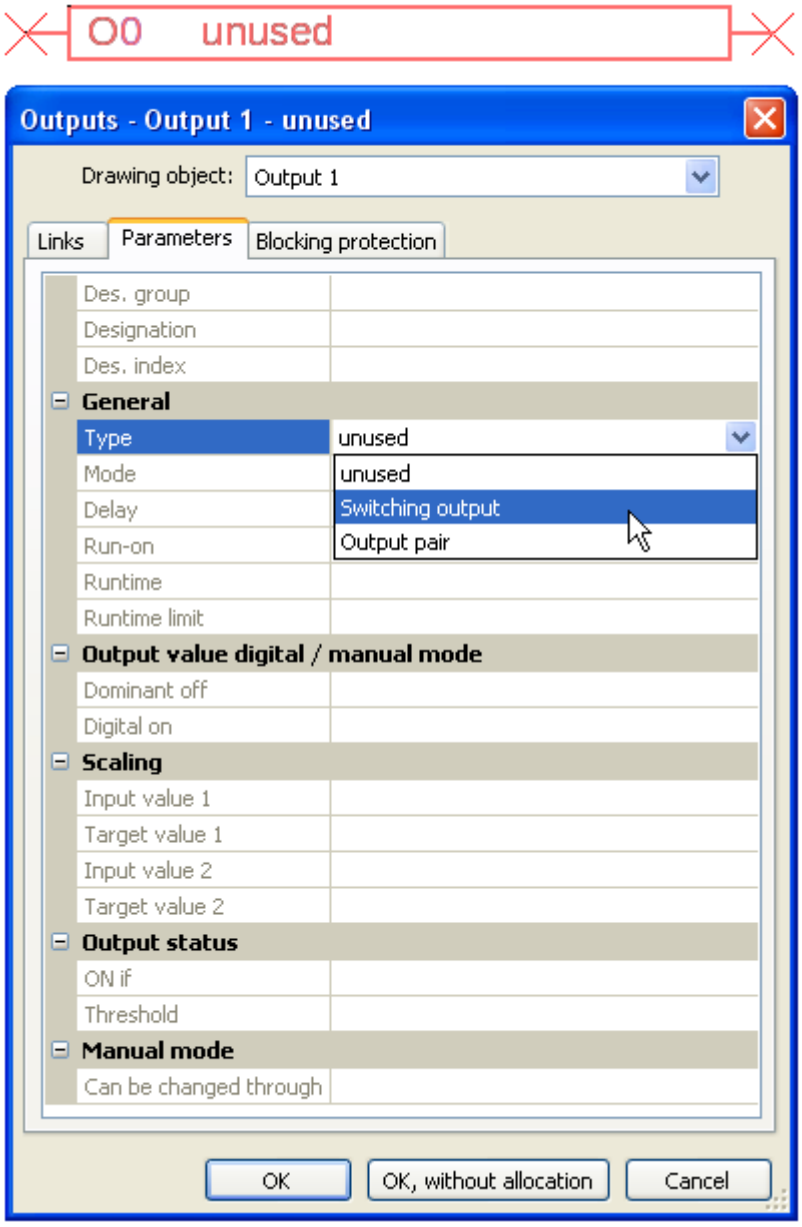
Outputs 1-3 can be programmed as switching outputs.

Outputs 2/3 and **4/5** can be programmed as output pairs.

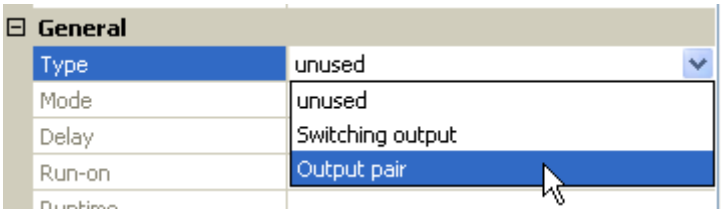
Outputs 4 and 5 are primarily intended as 0-10 V or PWM outputs for speed control of pumps or modulation of heat generators.
However, with the aid of additional auxiliary relays (e.g. HIREL16x2), these outputs can also be used as switching outputs or output pairs.

Programming the parameters

Once the required output is selected, the output type can be defined.

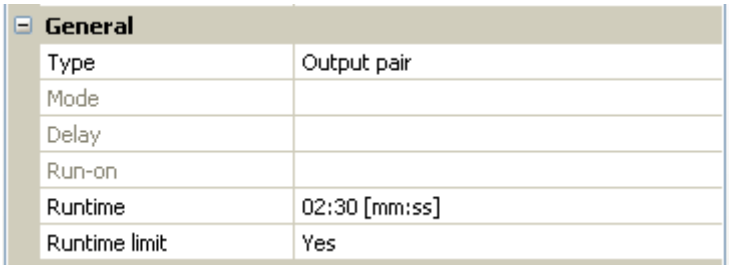


Output pairs



The **outputs 2/3 and 4/5** can be used as single switching outputs or as an **output pair** together with the following **switching output** (e.g. to control a mixer drive). An additional auxiliary relay is required if output pair **4/5** is used.

Runtime



The mixer runtime must be entered for every **output pair**.

If a mixer runtime of 0 is entered, the output pair will not be utilised.

Runtime limit

When the runtime limit is **active**, output pair control is terminated if the remaining runtime of 20 minutes has counted down to 0. The remaining runtime is reloaded if the output pair is switched to manual mode, is switched by a message (to dominant ON or OFF), changes its direction of control, or if enabling is switched from OFF to ON.

If the runtime limit is **deactivated**, the remaining runtime only counts down to 10 seconds and output pair control is not terminated.

Output pairs are shown in the status line with a "**+**" symbol between the output numbers.

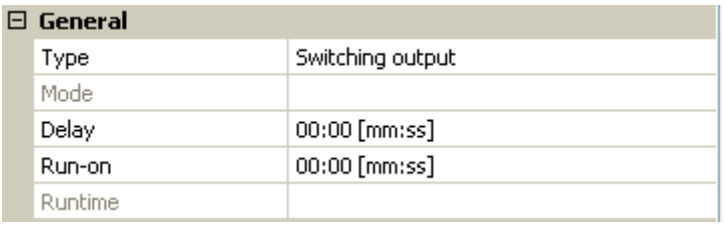
Example: Outputs **2+3** have been programmed as output pairs

If two different functions act on the two outputs in the output pair simultaneously, the output with the lower number ("OPEN" command) will be activated.

Exception: the "**Message**" function – if the simultaneous command comes from this function, the output with the higher number ("CLOSE" command) will be activated.

All switching outputs

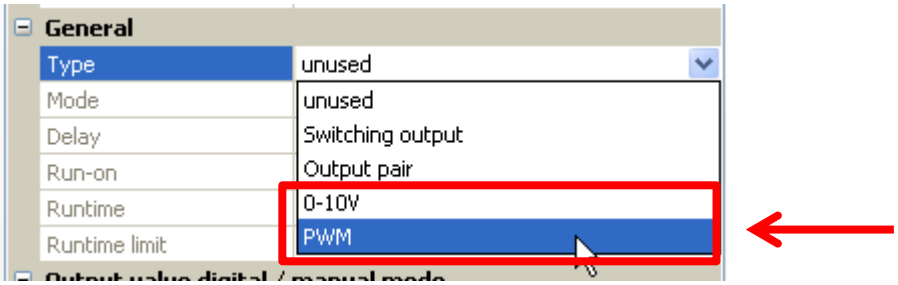
A start delay and a run-on time can be defined for all **switching** outputs.



All outputs

Manual mode can be restricted to certain **user groups** (User, Technician, Expert) for all outputs.

Outputs 4 and 5 as analogue outputs



These **outputs 4 and 5** provide a voltage between 0 and 10 V, e.g. for output-dependent control of burners (burner modulation) or speed control of electronic pumps.

The output can be issued either as a voltage (**0 – 10 V**) or as a **PWM** signal.

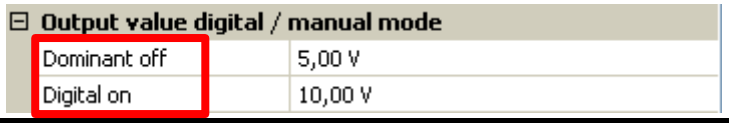
They can be controlled by the PID function, or by other functions. The "**Scaling**" provides the option of matching the **analogue value** of the source (with or without decimal place) to the control range of the device being controlled.

In **PWM** (pulse width modulation) mode, a square wave signal is created with a voltage level of about **10 V** and a frequency of **1 kHz** with a variable duty factor (0 - 100 %).

If multiple functions (analogue values) act simultaneously on one analogue output, the higher value is output.

For cases where an analogue output is activated by a **digital command**, an output voltage of 0.00 V and 10.00 V (or 0.0 % – 100.0 % for PWM) can be defined. Digital commands are **dominant** over links with an analogue value.

The activation of the analogue output via "**Dominant off**" and "**Digital on**" is possible by means of the following digital signals:



Example: **Dominant off**: Output value 5.00 V	**Example**: **Digital on**: Output value 10.00 V
Dominant off (from messages)	Dominant on (from messages)
Manual Off	Manual On
	Digital on
	Anti-blocking protection

Output status of the analogue outputs

Output status	
ON if	Act. > threshold
Threshold	Act. > threshold
Manual mode	Act. < threshold

For the **output status** you can define whether the **ON** status should be issued above or below an adjustable **threshold**.

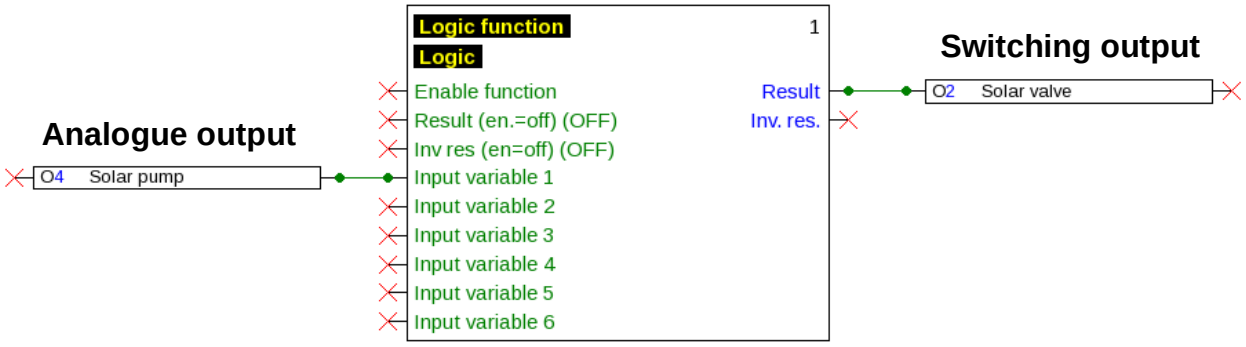
Example: If the analogue output is over 3.00 V, the output status switches from OFF to ON.

Output status	
ON if	Act. > threshold
Threshold	3,00 V

Depending on the technical attributes of the pump being controlled, it may thus be possible to set the output status to be ON only when the pump is actually running.

If you want an analogue output to be switched **together with** a switching output, it can only be done by means of appropriate programming.

Example: As soon as the output status of the analogue output switches to ON, that ON command is forwarded to the switching output via the logic function.



Examples of different scalings

Correcting variable of PID function: Mode 0-10 V, correcting variable 0 should correspond to 0 V, correcting variable 100 should correspond to 10 V:

Scaling	
Input value 1	0
Target value 1	0,00 V
Input value 2	100
Target value 2	10,00 V

Temperature value, e.g. from an analogue function: Mode PWM, the temperature 0 °C should correspond to 0 %, 100.0 °C should correspond to 100 %:

Scaling	
Input value 1	0
Target value 1	0,0 %
Input value 2	1000
Target value 2	100,0 %

The temperature is transferred in 1/10 °C **without the decimal point**.

Burner output, e.g. from the functions DHW demand or Maintenance: Mode 0-10 V, burner output of 0.0 % should correspond to 0 V, 100.0 % should correspond to 10 V:

Scaling	
Input value 1	0
Target value 1	0,00 V
Input value 2	1000
Target value 2	10,00 V

The percentage is transferred in 1/10 % **without the decimal point**.

Designation

Enter the output designation by selecting a predefined designation from various designation groups or from the user defined designations.

- **General**
- **Climate**
- **User** (user defined designations)

You can also assign a number from 1 to 16 to every designation.

Overview of outputs

	Switching output N/O relay	Switching output N/O + N/C relay	Output pair for mixer, etc.	0-10V or PWM
Output 1		x		
2	x		x	
3	x		x	
4	x		x	x
5	x		x	x

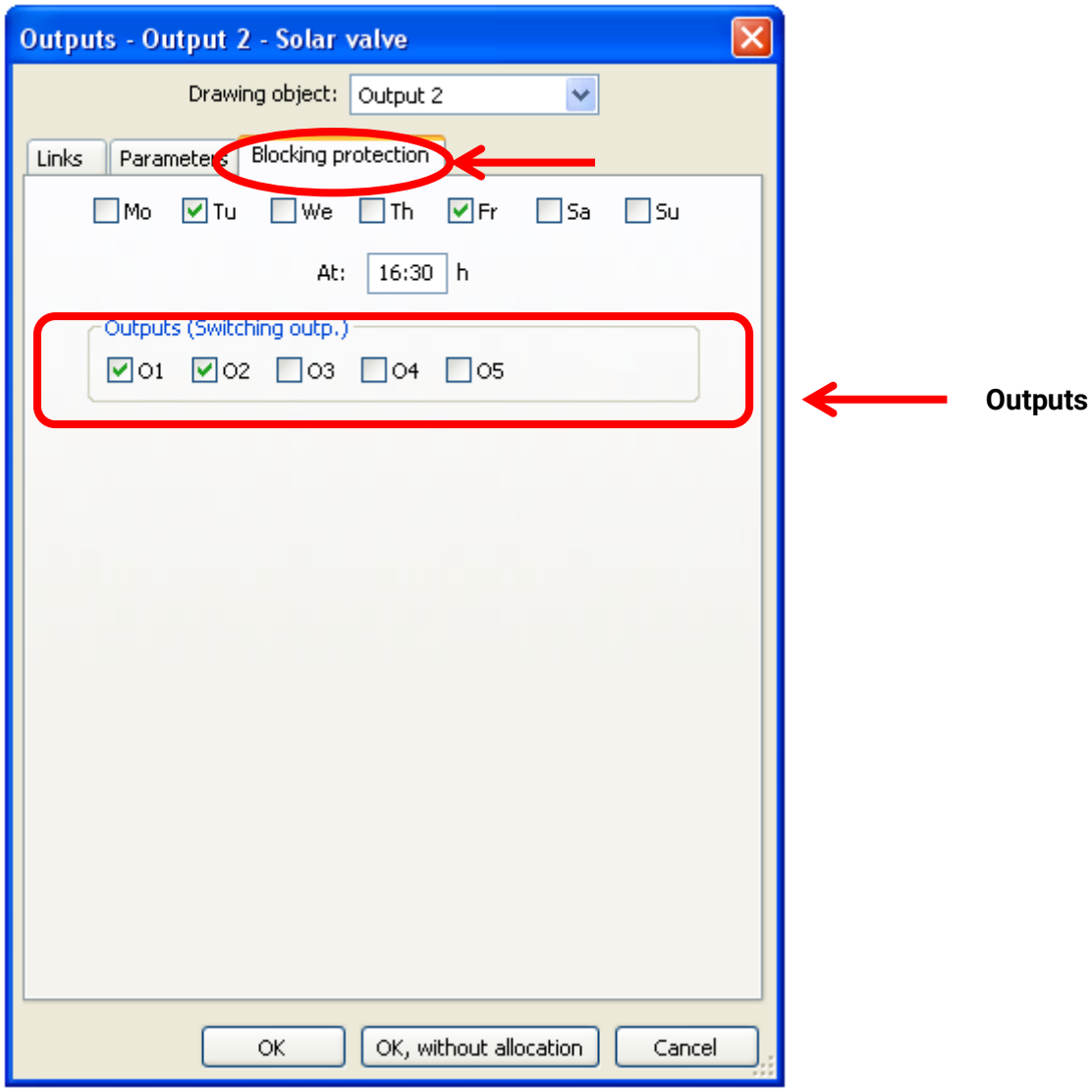
Switching outputs 4 - 5 or output pairs are only possible with additional relay

Blocking protection

Circulating pumps which do not run for a long period (e.g. heating circuit pump during the summer) often encounter start-up problems as a result of corrosion. This problem can be avoided by starting the pump periodically for 30 seconds.

The **blocking protection** for all outputs can be defined in every output menu. You can specify a time and all the outputs that are to receive blocking protection.

Example:



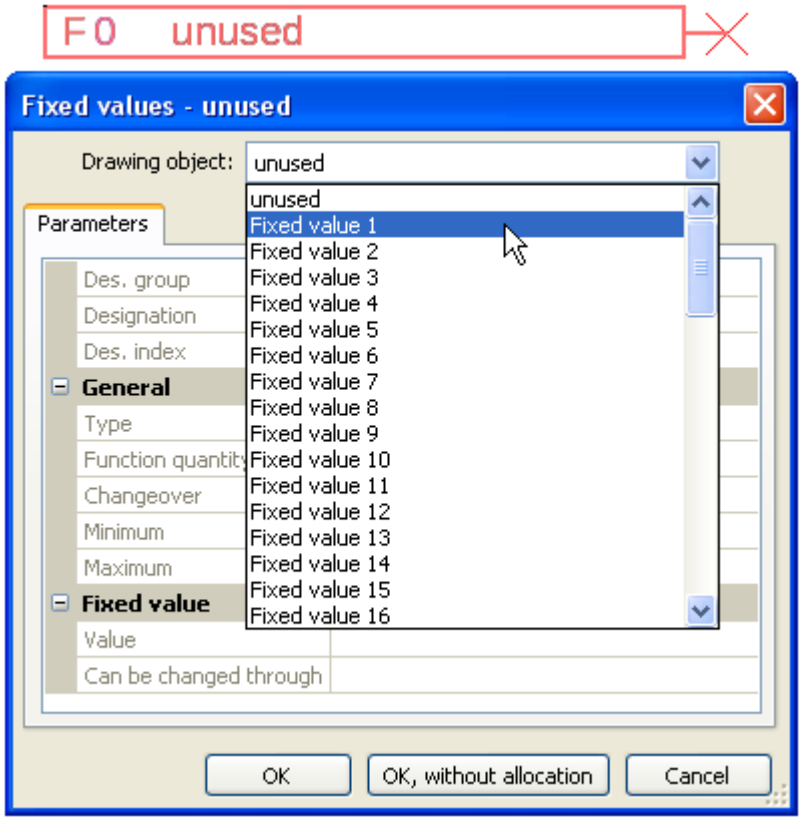
In this example, the pumps 1 and 2 will be run for 30 seconds on Tuesday and Friday at 16:30 h if the output has not been active since the module was started or since blocking protection was last initiated.

The module does not switch on all the outputs at the same time, but instead begins with one output, switches after 30 seconds to the next, and so on.

Fixed values

In this menu you can define up to **64 fixed values**, which can be used as input variables for functions, for example.

Example:



Fixed value type

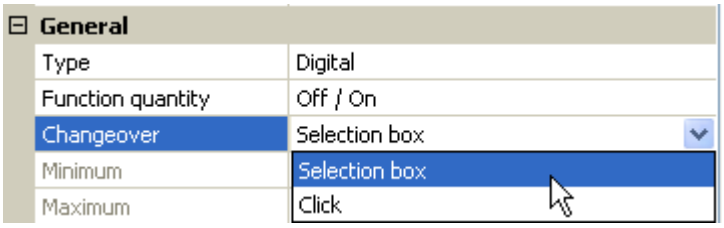
Once the required fixed value is selected, the fixed value type can be defined.

- **Digital**
- **Analogue**
- **Pulse**

Digital

Select the **measured variable**:

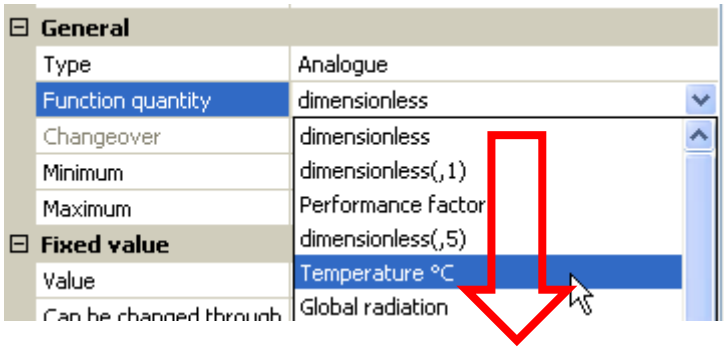
- **Off / On**
- **No / Yes**

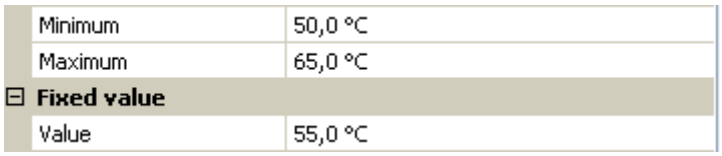


Select whether the status can be changed via a selection box or simply by a click.

Analogue

Select from a wide range of units and dimensions



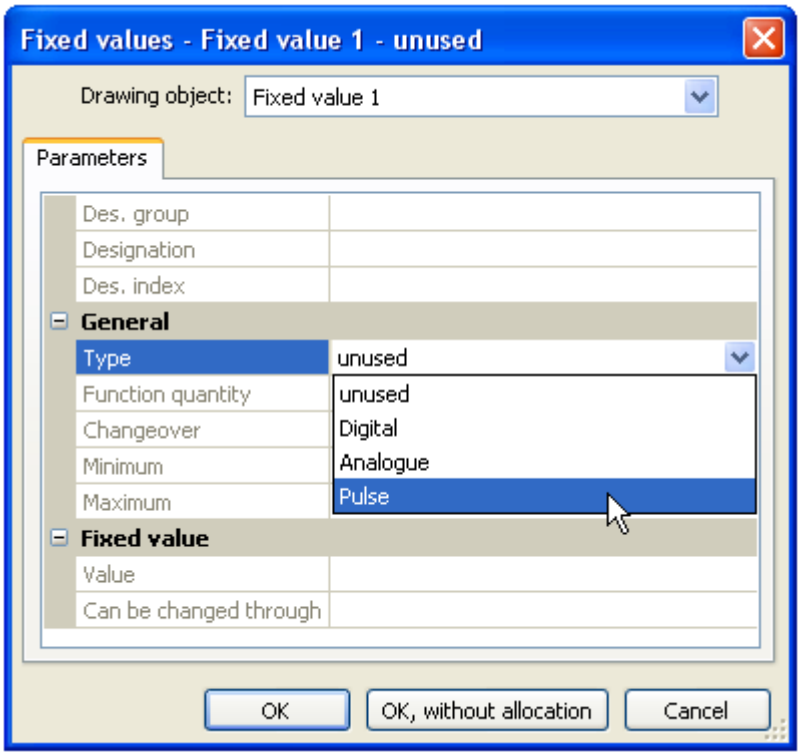


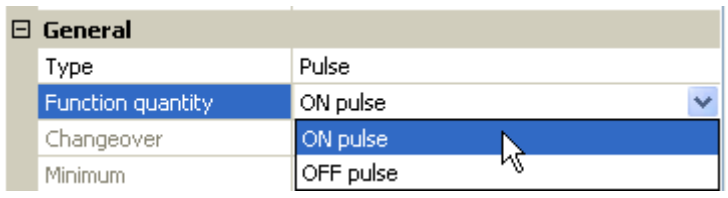
After assigning the **designation**, you must define the permitted limits and the current fixed value. The value can be adjusted in the menu within those limits.

Pulse

A fixed value of this type allows short **pulses** to be generated by tapping it in the menu.

Example:





Select the **function quantity**: When activated, either an ON pulse (from OFF to ON) or an OFF pulse (from ON to OFF) will be generated, depending on the selection made here.

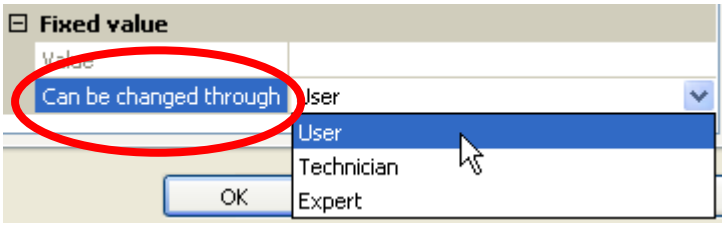
Designation

Enter the fixed value designation by selecting a predefined designation or one of the user defined designations.

You can also assign a number from 1 to 16 to every designation.

Restriction of change authority

For **all** fixed values, you can set the user level from which the fixed value can be changed:



CAN bus

The CAN network allows communication between CAN bus devices. When analogue or digital values are sent via CAN **outputs**, other CAN bus devices can utilise those values as CAN **inputs**.

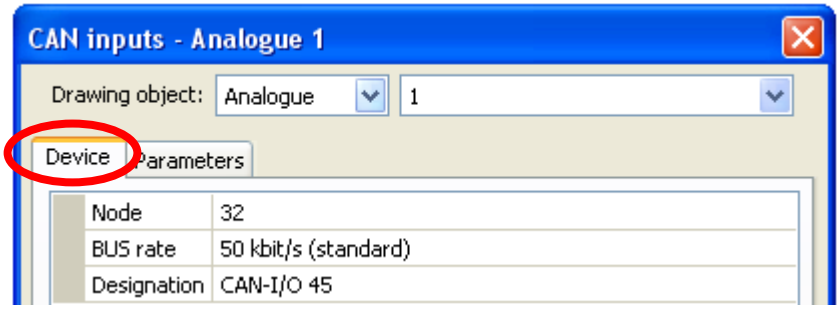
Up to 62 CAN bus devices can be operated in one network.

Every CAN bus device must be given its own node number in the network.

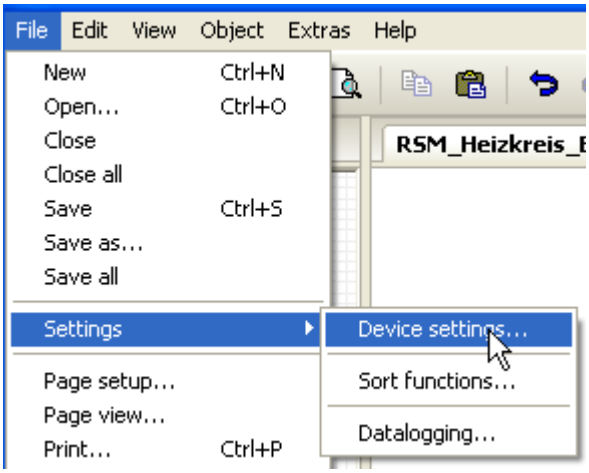
The **cable topology** of a CAN bus network is described in the installation instructions.

If a CAN input or CAN output is inserted into the drawing, the controller settings can be defined for the first time. These settings then apply to all other CAN elements as well.

CAN settings for the module



These settings can also be entered in the menu "File / Settings / Device settings...":



Node

Define a **unique** CAN node number for the device (setting range: 1 – 62). The factory-set node number of the module is 32.

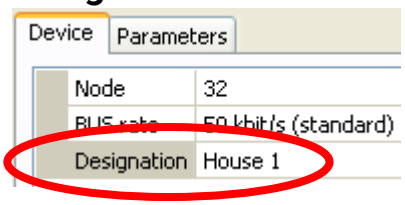
Bus rate

The standard bus rate of the CAN network is **50 kbit/s** (50 kBd), which is specified for most CAN bus devices.

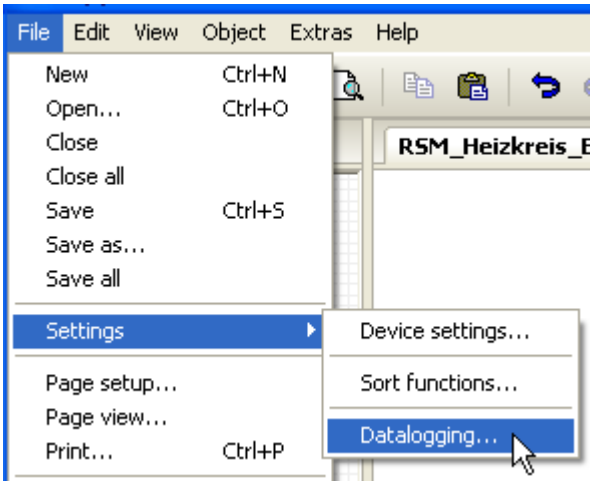
> **Important:** **All** devices in the CAN bus network must have the **same** transfer rate in order to be able to communicate with each other.

The bus rate can be set to between 5 and 500 kbit/s, with lower bus rates allowing longer cable networks (see installation instructions).

Designation



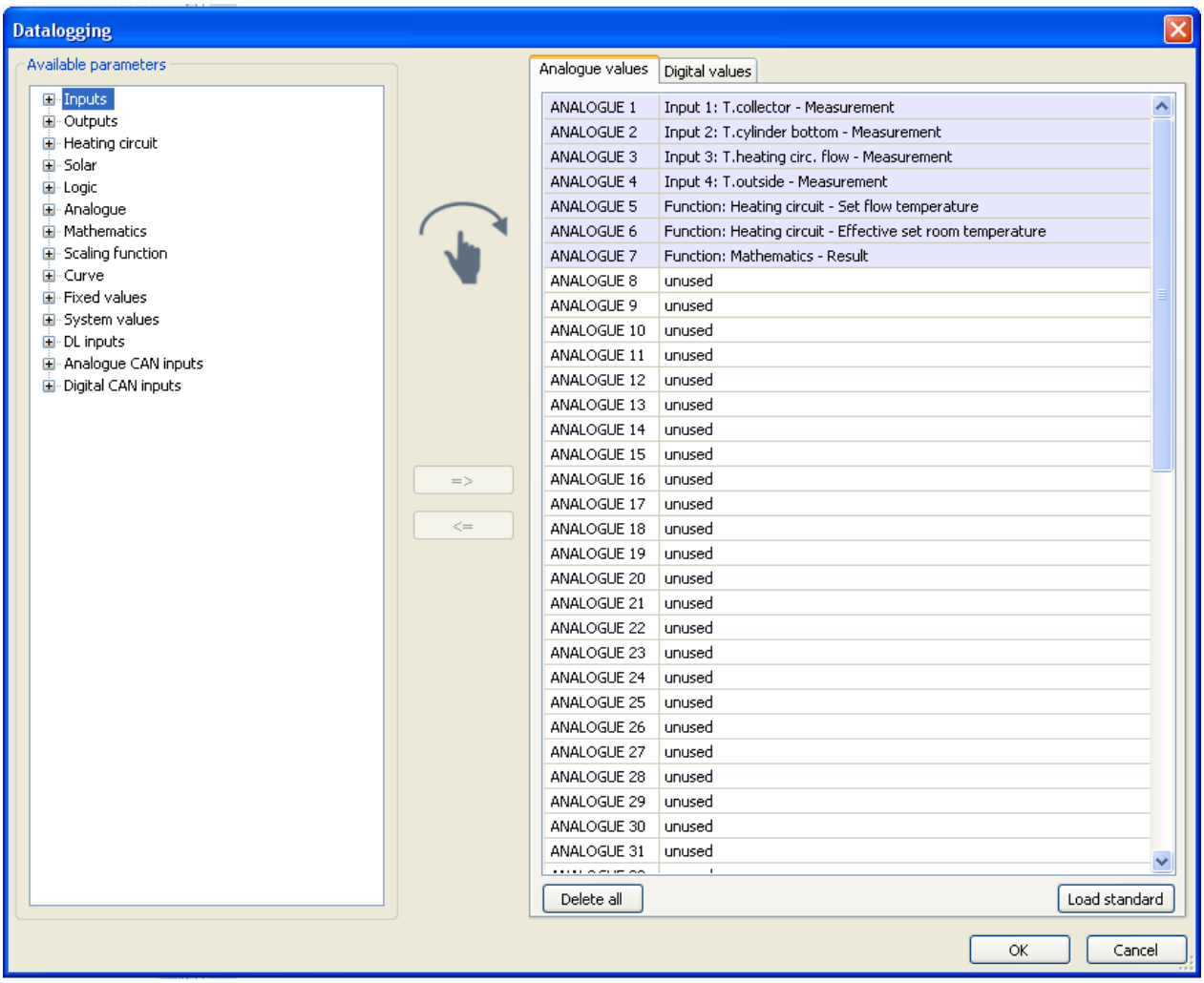
Every module can be given its own designation.



Datalogging

This menu is used to define the parameters for CAN datalogging of analogue and digital values.

Example: TAPPS2 predefines the programmed inputs and outputs by default. This default setting can be changed or expanded.



CAN datalogging requires at least version 1.25 on the C.M.I. datalogger and a Winsol version of at least 2.06.

CAN datalogging is only possible with the C.M.I. datalogger. The data to be logged can be freely selected. There is no constant data output. When requested by a C.M.I., the module saves the current values to a logging buffer and locks it to prevent it from being overwritten (if requests are received from another C.M.I.) until the data is read out and the logging buffer has been enabled again.

The settings required on the C.M.I. for datalogging via CAN bus are described in the C.M.I.'s online help.

Each CAN-I/O45 can issue a maximum of 64 digital and 64 analogue values that are defined in the menu "**CAN bus/datalogging**" of the CAN-I/O45.

The sources for the logged values can be inputs, outputs, function output variables, fixed values, system values, and DL and CAN bus inputs.

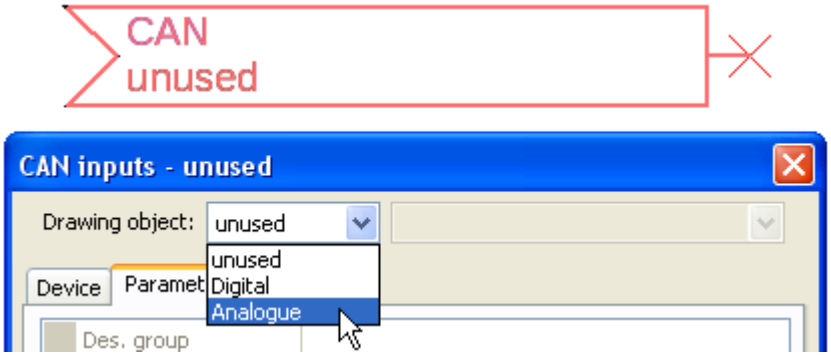
Note: Digital inputs must be defined within the range of **digital** values.

All counter functions (energy meters, heat meters, counters)

Any number of counter functions (but a maximum of 64 analogue values) can be logged. Like all other analogue values, the counter values to be logged are entered into the "Analogue datalogging" list.

CAN analogue inputs

Up to 64 CAN analogue inputs can be programmed. They are defined by specifying the **transmission** node number and the number of the **transmission** node's CAN output.



Node number

After the node number of the **transmission node** is entered, the other settings can be specified. The number of a CAN analogue output is taken from the device with that node number and applied here.

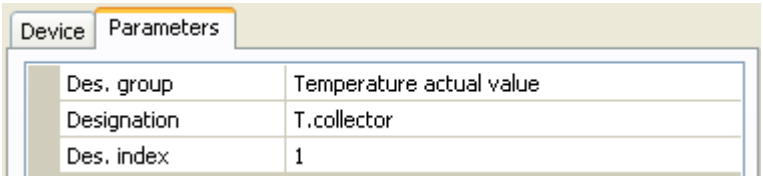
Example: On CAN analogue **input** 1, the output number applied is that of CAN analogue **output** 1 **from** the device with node number 1.

General	
Node number	1
Output number	1

Designation

Every CAN input can be given its own designation. The designation can be selected from various designation groups or can be user defined, as for the other controller inputs.

Example:



CAN bus timeout

Define the timeout time for the CAN input (minimum value: 5 minutes).

General	
Node number	1
Output number	1
CAN BUS timeout	00:20 [hh:mm]

As long as the information continues to be read from the CAN bus, the **network error** for the CAN input will be "**No**".

If the value has not been updated for longer than the set timeout the **network error** changes from "**No**" to "**Yes**". You can then define whether the controller should issue the last value transmitted or a definable substitute value (only when the measured variable is set to **User def.**).

The **network error** can be selected as the source of a function input variable, which allows the controller to react appropriately to a failure of the CAN bus or transmission node.

In **System values** / General, a network error for **all** CAN inputs is available.

Unit

If "Measured variable" is set to "**Automatic**", the unit of measurement specified by the transmission node will be applied in the controller.

Unit	
Measured variable	Automatic

If you select "**User def.**", you can select a **unit** of your own, a **sensor correction** and, if **sensor check** is active, a monitoring function.

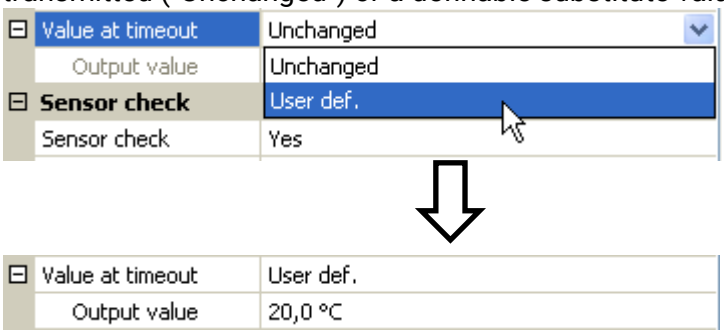
Unit	
Measured variable	User def.
Unit	Temperature °C
Sensor correction	0,0 K

Every CAN input is assigned its own unit, which can differ from the unit used by the transmission node. A range of units is available to choose from.

Sensor correction: The value of the CAN input can be corrected by applying a fixed value.

Value at timeout

If the timeout time is exceeded, you can define here whether the controller should issue the last value transmitted ("Unchanged") or a definable substitute value.



Value at timeout	User def.
Output value	20,0 °C

Sensor check

If you set "Sensor check" to "**Yes**", the **sensor error** of the sensor supplying the CAN input is available as an input variable for a function.

Sensor check	
Sensor check	Yes

Sensor error

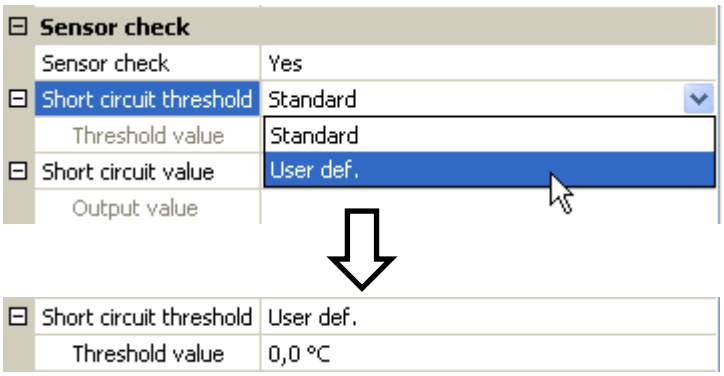
This setting is only displayed if **sensor check is active and** "Measured variable" is set to "**User def.**".

When "**Sensor check**" is active, the **sensor error** of a CAN input is available as an input variable for functions: status "**No**" for a sensor that is working correctly and "**Yes**" for a defect (short circuit or lead break). This allows the controller to react to the failure of a sensor, for example.

Sensor check	
Sensor check	Yes
Short circuit threshold	Standard
Threshold value	
Short circuit value	Standard
Output value	
Lead break threshold	Standard
Threshold value	
Lead break value	Standard
Output value	

If the **Standard** thresholds are selected, a short circuit will be indicated if the value falls below the **measurement limit** and a lead break will be indicated if the value exceeds the **measurement limit**.

The **Standard** values for temperature sensors are -9999.9 °C for a short circuit and 9999.9 °C for a lead break. Those values are utilised in the internal calculations in the event of an error.



By selecting suitable thresholds and values for short circuit and lead break, a fixed value can be specified for the module in the event of sensor failure at the transmission node, to allow a function to continue operating in emergency mode (fixed hysteresis: 1.0 °C).

The short circuit threshold must be defined below the lead break threshold.

In **System values** / General, a sensor error for **all** inputs, CAN inputs and DL inputs is available.

CAN digital inputs

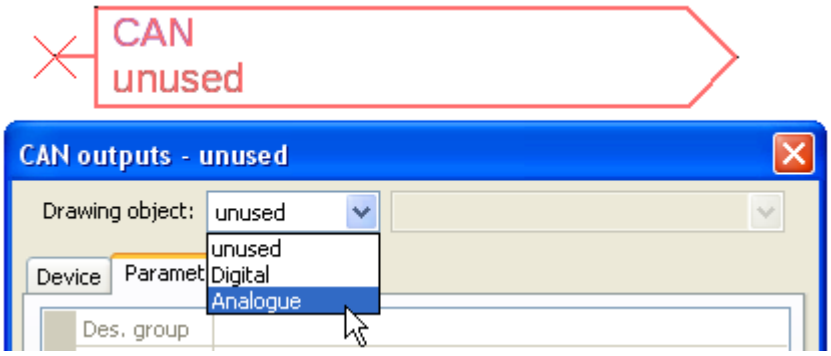
Up to 64 CAN digital inputs can be programmed. They are defined by specifying the **transmission** node number and the number of the **transmission** node's CAN output.

Their parameters are programmed in almost exactly the same way as for the CAN analogue inputs.

Under **Measured variable / User def.** the **Display** for the CAN digital input can be changed from **Off / On** to **No / Yes** and you can define whether the controller should issue the last status transmitted ("Unchanged") or a definable substitute status when the timeout time is exceeded.

CAN analogue outputs

Up to 32 CAN analogue outputs can be programmed. They are defined by specifying the **source** in the controller.



Link to the source in the module which supplies the value for the CAN output.

- **Inputs**
- **Outputs**
- **Functions**
- **Fixed values**
- **System values**
- **DL bus**

Example: Source Input 3

Input variable	
Source type	Input
Source	3: T.outside
Variable	Measurement

Designation

Every CAN analogue output can be given its own designation. The designation can be selected from various designation groups or can be user defined, as for the inputs.

Example:

Des. group	Temperature actual value
Designation	T.outside
Des. index	

Transmission condition

Example:

Transmission condition	
If change >	10
Blocking time	00:10 [mm:ss]
Interval time	5 min

If change > 10	A new transmission will be made if the current value has changed by more than the quantity specified (1.0 K in this example) compared to the last transmitted value. In the module, the unit of the source is applied together with the corresponding decimal place. (minimum setting: 1)
Blocking time 00:10 [mm:ss]	If the value changes by more than 1.0 K within 10 seconds of the last transmission, the value is nevertheless only transmitted again after 10 seconds. (minimum setting: 1 sec.)
Interval time 5 min	The value is transmitted every 5 minutes even if it has not changed by more than 1.0 K since the last transmission. (minimum setting: 1 minute)

CAN digital outputs

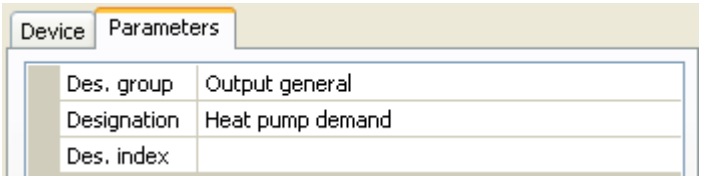
Up to 32 CAN digital outputs can be programmed. They are defined by specifying the **source** in the module.

Their parameters are programmed in exactly the same way as for the CAN analogue outputs except for the transmission conditions.

Designation

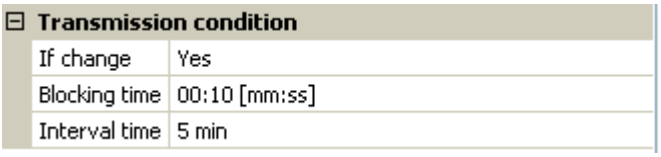
Every CAN digital output can be given its own designation. The designation can be selected from various designation groups or can be user defined, as for the inputs.

Example:



Transmission condition

Example:



If change Yes/No	Transmission of the value if a status change occurs
Blocking time 00:10 [mm:ss]	If the value changes within 10 seconds of the last transmission, the value is nevertheless only transmitted again after 10 seconds (minimum setting: 1 sec.).
Interval time 5 min	The value is transmitted every 5 minutes even if it has not changed since the last transmission (minimum setting: 1 minute).

DL bus

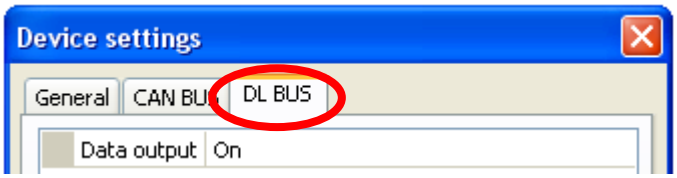
The DL bus acts as a bus cable for various sensors and/or for datalogging by C.M.I. or DLOGG.

The DL bus is a bidirectional data link and is only compatible with products from Technische Alternative. The DL bus network operates independently of the CAN bus network.

This menu contains all of the information and settings needed to set up a DL bus network.

The **cable topology** of a DL bus network is described in the controller's installation instructions.

DL settings



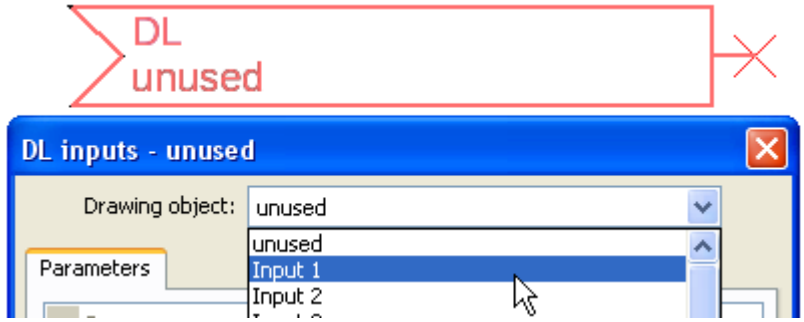
In the menu File / Settings / Device settings / DL BUS, you can activate or deactivate the data **output** for **datalogging** via the DL bus and for display on the **RAS-PLUS** room sensor. The C.M.I. can be used for **DL datalogging**. Only the input and output values and the 2 heat meters are included in the data output; the values of the network inputs are not included.

DL input

Sensor values from DL bus sensors are transferred via a DL input.

Up to 32 DL inputs can be programmed.

Example: Programming the parameters of DL input 1



Select: Analogue or digital

General	
Type	Analogue
Address	1
Index	1

DL bus address and DL bus index

Every DL sensor must have its own **DL bus address**. Setting the address of a DL sensor is described in the sensor's datasheet.

Most DL sensors can measure various different values (e.g. flow rate and temperatures). Every value measured must be given its own **index** number. The applicable index number can be found in the DL sensor's datasheet.

Designation

Every DL input can be given its own designation. The designation can be selected from various designation groups or can be user defined, as for the other controller inputs.

Example:

Parameter

Des. group	Temperature actual value
Designation	T.solar flow
Des. index	

DL bus timeout

As long as the information continues to be read from the DL bus, the **network error** for the DL input will be "**No**".

If the controller scans the DL sensor value three times and no value is transmitted, the **network error** changes from "**No**" to "**Yes**". You can then define whether the controller should issue the last value transmitted or a definable substitute value (only when the measured variable is set to **User def.**).

The **network error** can also be selected as the source of a function input variable, which allows the controller to react appropriately to a failure of the DL bus or DL sensor.

In System values / General, a network error for **all** DL inputs is available.

Unit

If "Measured variable" is set to "**Automatic**", the unit of measurement specified by the DL sensor will be applied in the controller.

Unit	
Measured variable	Automatic

If you select "**User def.**", you can select a **unit** of your own, a **sensor correction** and, if **sensor check** is active, a monitoring function.

Unit	
Measured variable	User def.
Unit	Temperature °C
Sensor correction	0,0 K

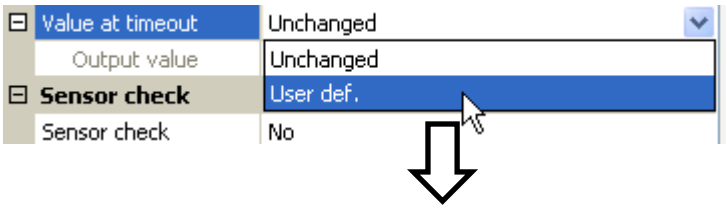
Every DL input is assigned a **unit**, which can differ from the unit used by the DL sensor. A wide range of units is available to choose from.

Sensor correction: The value of the DL input can be corrected by applying a fixed differential value.

Value at timeout

This setting is only displayed if "Measured variable" is set to "**User def.**".

If a timeout is set, you can define here whether the controller should issue the last value transmitted ("Unchanged") or a definable substitute value.



Value at timeout	User def.
Output value	20,0 °C

Sensor check

If you set "Sensor check" to "**Yes**", the **sensor error** of the sensor supplying the DL input is available as an input variable for a function.

Sensor check	
Sensor check	Yes

Sensor error

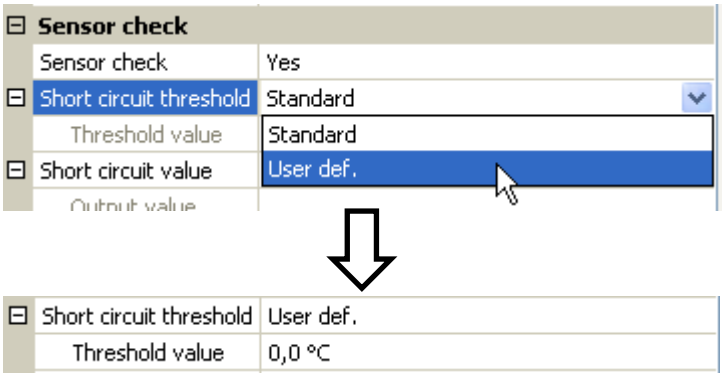
This setting is only displayed if **sensor check is active** and "Measured variable" is set to "**User def.**".

When "**Sensor check**" is active, the **sensor error** of a DL input is available as an input variable for functions: status "**No**" for a sensor that is working correctly and "**Yes**" for a defect (short circuit or lead break). This allows the controller to react to the failure of a sensor, for example.

Sensor check	
Sensor check	Yes
Short circuit threshold	Standard
Threshold value	
Short circuit value	Standard
Output value	
Lead break threshold	Standard
Threshold value	
Lead break value	Standard
Output value	

If the **Standard** thresholds are selected, a short circuit will be indicated if the value falls below the **measurement limit** and a lead break will be indicated if the value exceeds the **measurement limit**.

The **Standard** values for temperature sensors are -9999.9 °C for a short circuit and 9999.9 °C for a lead break. Those values are utilised in the internal calculations in the event of an error.



By selecting suitable thresholds and values for short circuit and lead break, a fixed value can be specified for the module in the event of sensor failure, to allow a function to continue operating in emergency mode (fixed hysteresis: 1.0 °C).

The short circuit threshold must be defined below the lead break threshold.

In System values / General, a sensor error for **all** inputs, CAN inputs and DL inputs is available.

DL digital inputs

The DL bus is configured for the transfer of digital values as well as analogue. However, there is not yet any use for this at present.

The parameters are programmed in almost exactly the same way as for the DL analogue inputs.

Under **Measured variable / User def.** the **Display** for the DL digital input can be changed to **No / Yes**.

Bus load of DL sensors

A 2-pole cable provides **both** the power supply and the signal transfer for DL sensors. An additional power supply by means of an external power supply unit (such as with the CAN bus) is not possible.

As the DL sensors have a relatively high power demand, the "**bus load**" must be considered:

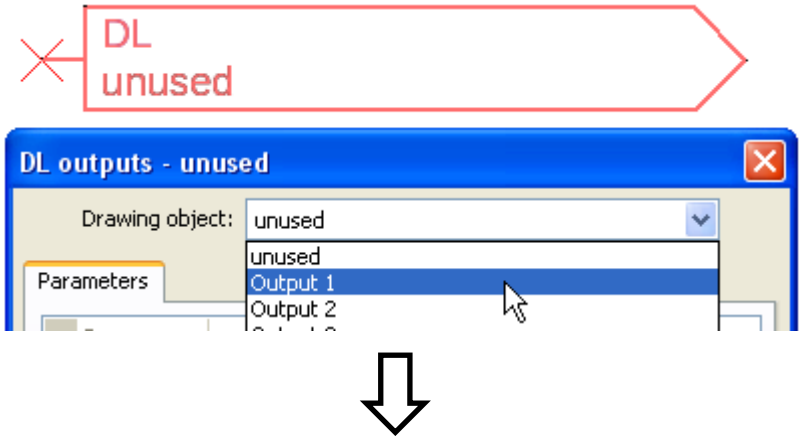
The module supplies **100 %** of the bus load. The bus loads of the DL sensors are listed in the technical data of each DL sensor.

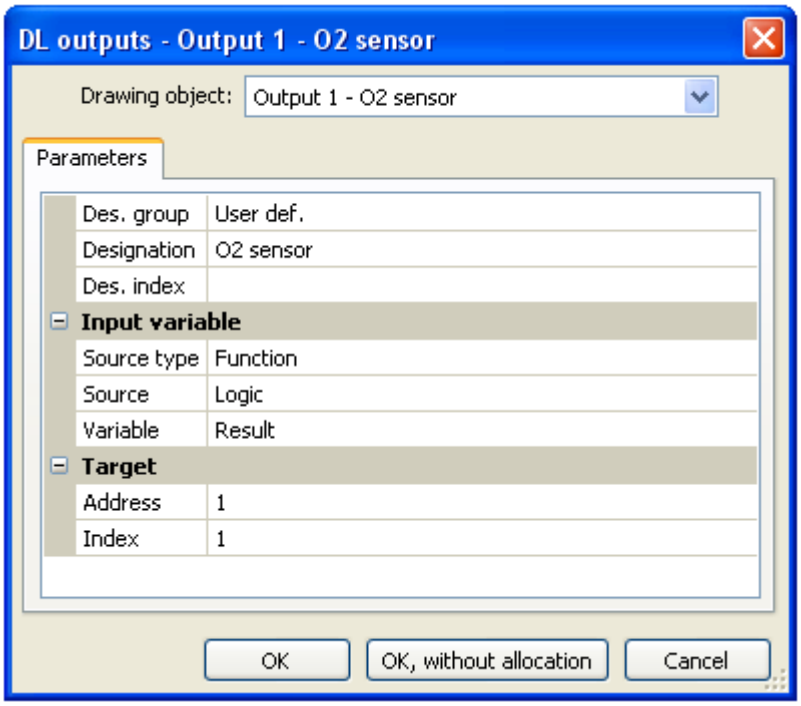
Example: The DL sensor FTS4-50DL has a bus load of **25 %**. Consequently, up to four FTS4-50DL sensors can be connected to the DL bus.

DL output

Analogue and digital values can be transmitted to the DL bus network via a DL output. For example, a **digital command** to activate an O2-DL O_2 sensor can be output.

Example: Programming the parameters of DL output 1





Entering the designation

Specify the source in the controller which supplies the value for the DL output.

- **Inputs**
- **Outputs**
- **Functions**
- **Fixed values**
- **System values**
- **CAN bus analogue**
- **CAN bus digital**

Specify the destination address of the DL sensor to be activated.

For the activation of the O_2 sensor, the index has no effect and can be ignored.

System values

The following system values can be selected as the **source** for function input variables and CAN and DL outputs:

- **General**
- **Time**
- **Date**
- **Sun**

General system values

When programmed accordingly, these system values allow monitoring of the controller system.

- **Controller start**
- **Sensor error inputs**
- **Sensor error CAN**
- **Sensor error DL**
- **Network error CAN**
- **Network error DL**

Controller start generates a 20 second pulse 40 seconds after the device is switched on or reset, and is used for monitoring the controller starts (e.g. after power failures) in the datalogging feature. The interval time in datalogging should be set to 10 seconds for these starts.

The **sensor errors** and **network errors** are global digital values (No/Yes) which are not connected to the error status of a specific sensor or network input.
If any one of the sensors or network inputs has an error, the status of the corresponding group changes from **No** to **Yes**.

Time system values

- **Second** (seconds of the current time)
- **Minute** (minutes of the current time)
- **Hour** (hour of the current time)
- **Second pulse**
- **Minute pulse**
- **Hour pulse**
- **Summertime** (digital value OFF/ON)
- **Time** (hh:mm)

Date system values

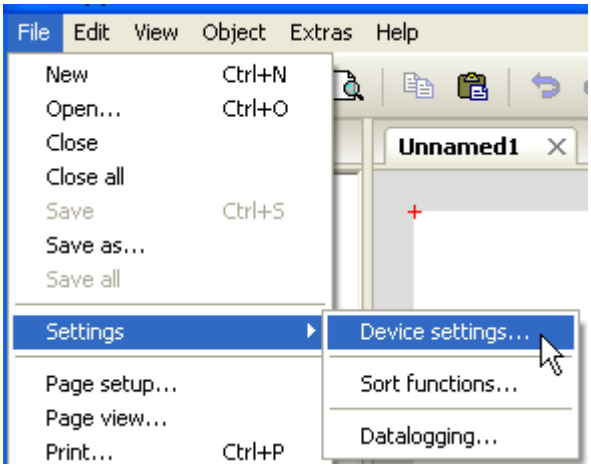
- **Day**
- **Month**
- **Year** (without the century)
- **Day of the week** (starting with Monday)
- **Calendar week**
- **Day of the year**
- **Day pulse**
- **Month pulse**
- **Year pulse**
- **Week pulse**

The pulse values generate a single pulse per time unit.

Sun system values

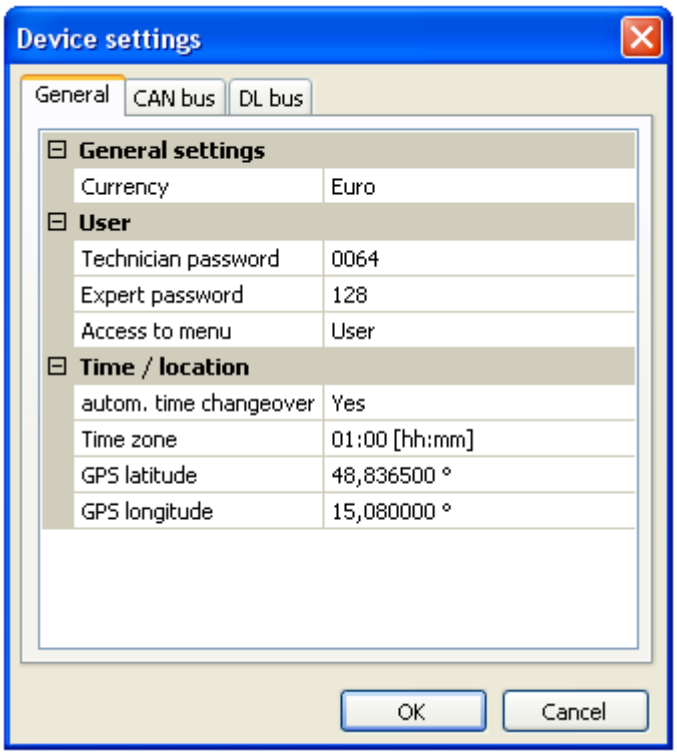
- **Sunrise** (time)
- **Sunset** (time)
- **Minutes until sunrise** (on the same day, does not go beyond midnight)
- **Minutes since sunrise**
- **Minutes until sunset**
- **Minutes since sunset** (on the same day, does not go beyond midnight)
- **Solar altitude** (see Shading function)
- **Direction of the sun** (see Shading function)
- **Solar altitude > 0°** (digital value ON/OFF)

Device settings



This menu allows global settings to be made for the module, the CAN bus and the DL bus.

General



Currency

Select the currency for yield metering

Technician / Expert password

Entry of the passwords for this programming

Access to menu

Definition of the user levels from which access to the **main menu** is permitted.

If only **technicians** or **experts** are permitted to access the menu, then the relevant **password** must be entered when selecting the main menu from the start page of the function overview.

Time / Location

- **Automatic time change** – If "**Yes**", the time will switch over automatically to summertime according to the specifications of the European Union.
- **Time zone** – 01:00 means the time zone "**UTC + 1 hour**". **UTC** stands for "Universal Time Coordinated", also known as GMT (= Greenwich Mean Time).
- **GPS latitude** – Geographical latitude according to GPS (= global positioning system)
- **GPS longitude** – Geographical longitude according to GPS

The values for geographical latitude and longitude are used to determine the location-specific solar data. That data can be used in functions (e.g. shading function).

The factory default settings for the GPS data are for the location of Technische Alternative in Amaliendorf, Austria.

CAN / DL bus

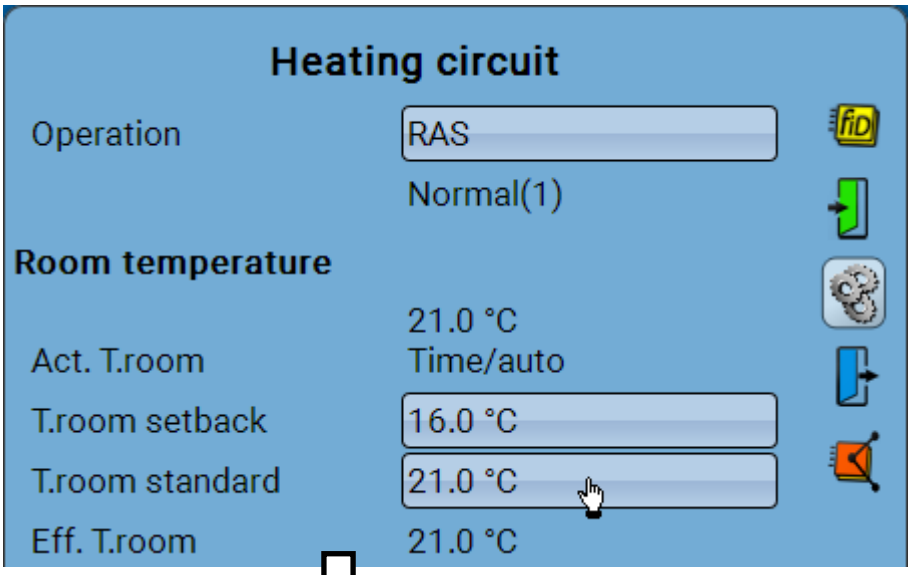
These settings are described in the CAN bus and DL bus chapters.

C.M.I. menu

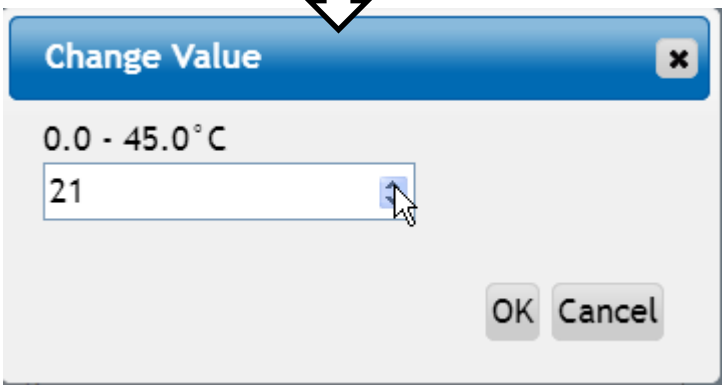
Changing set values

Example:

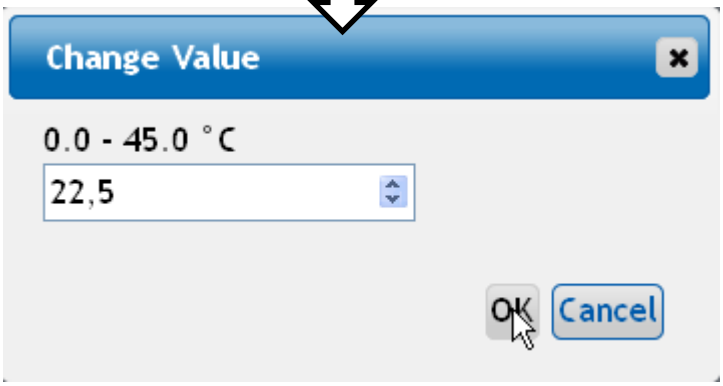
Changing the "T.room standard" value of the heating circuit function



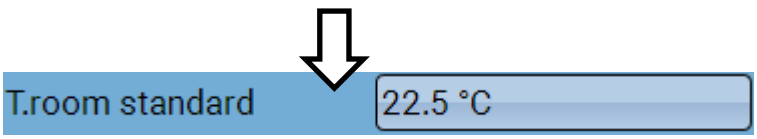
When the required field is clicked, a dropdown list appears:



The current value is shown (example: 21.0 °C). The set value can be changed by clicking the UP or DOWN arrow. It is also possible to highlight the value and overwrite it with the required value (example: 22.5 °C):



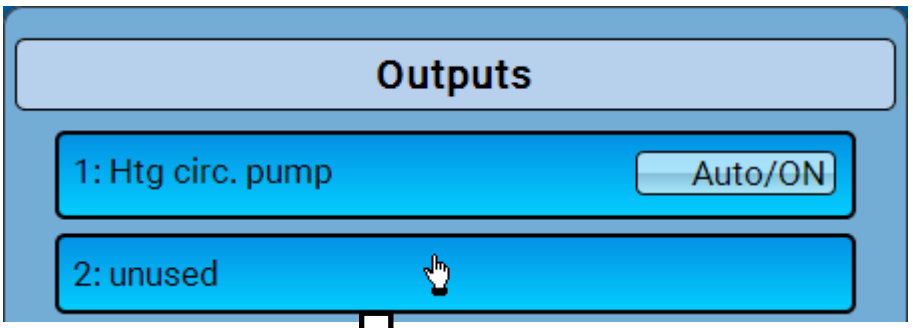
Finish with "OK" and the value will be applied in the module:

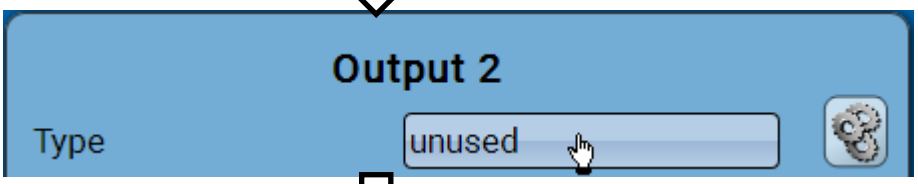


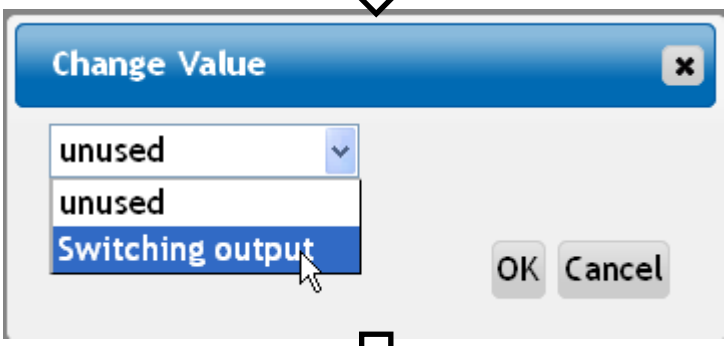
Creating new elements

Of inputs or outputs, fixed values, functions, messages, CAN or DL bus

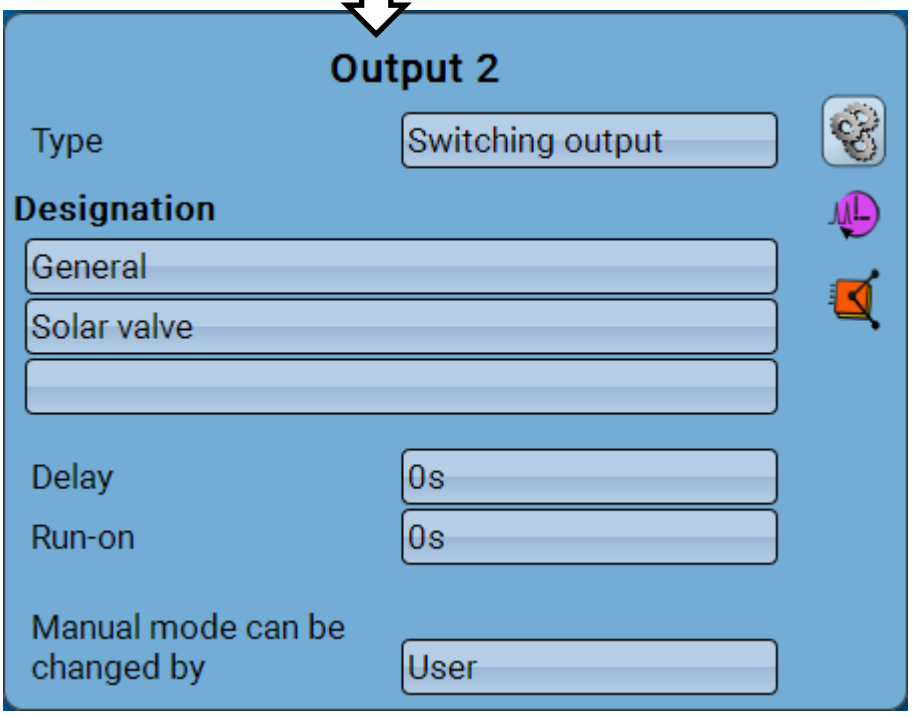
Example: Using a previously unused output to create a switching output:







After making your selection, finish with "OK".



You can then enter a designation and make other settings

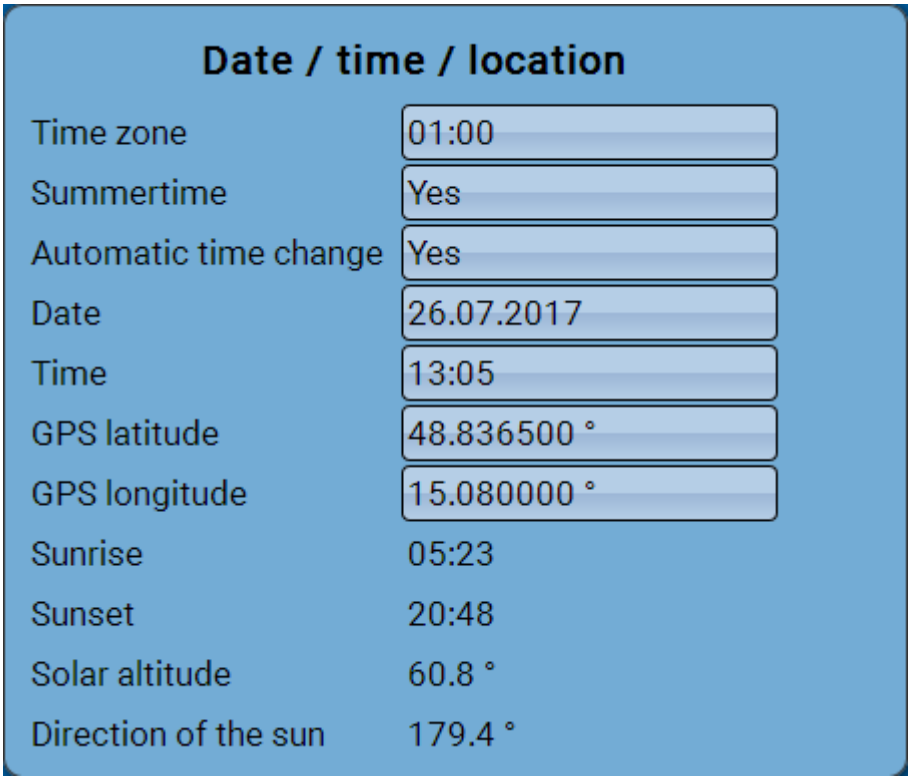
Date / time / location

The "**Date**" and "**Time**" are shown in the status line at top right.

As the module does not have its own clock function, the time and date are taken from network node 1 and cannot be changed in the module. A CAN bus device which has its own clock function must therefore have the node number 1 (UVR16x2, UVR1611, RSM610, C.M.I.).

Tapping that status field takes you to the menu for the date, time and location details.

Display example:



The date and time are taken from CAN node 1. Changes made to the date and time in this menu will therefore not be applied permanently.

C.M.I. menu / Date / time / location

The system value parameters are displayed first.

- **Time zone** – Specifies the time zone relative to UTC (= "Universal Time Coordinated", also known as GMT (= Greenwich Mean Time)). In the example, the time zone is set to "UTC + 01:00".
- **Summertime** – "**Yes**" if summertime is active.
- **Automatic time change** – If "**Yes**", the time will switch over automatically to summertime according to the specifications of the European Union.
- **Date** – The current date (dd.mm.yy).
- **Time** – The current time
- **GPS latitude** – Geographical latitude according to GPS (= global positioning system)
- **GPS longitude** – Geographical longitude according to GPS

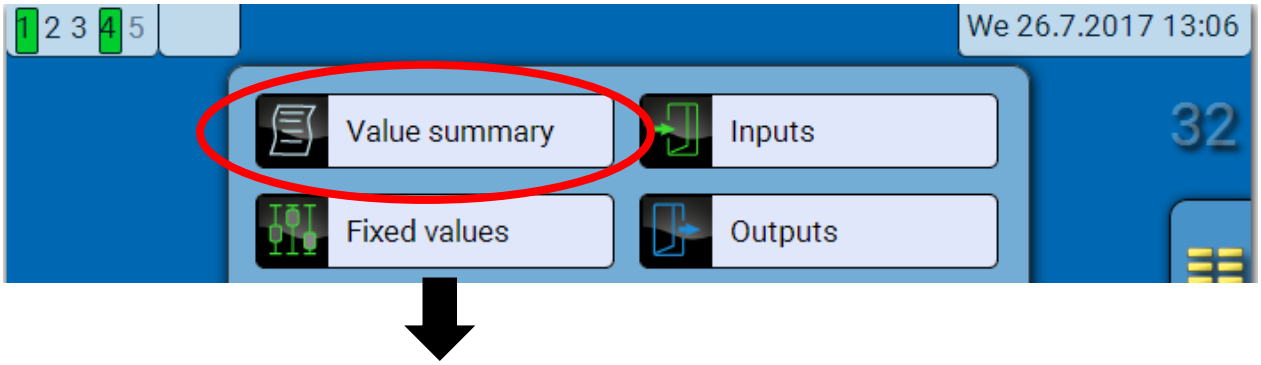
The values for geographical latitude and longitude are used to determine the location-specific solar data. That data can be used in functions (e.g. shading function).

The factory default settings for the GPS data are for the location of Technische Alternative in Amaliendorf, Austria.

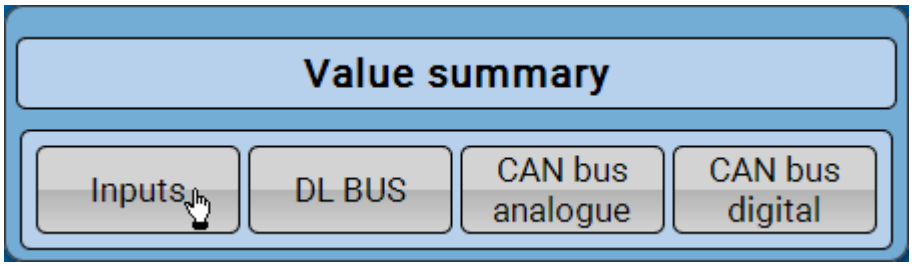
- **Sunrise –** Time
- **Sunset –** Time
- **Solar altitude** – Specified in ° as measured from the geometric horizon (0°), zenith = 90°
- **Direction of the sun** – Specified in ° as measured from the north (0°)
  North = 0°
  East = 90°
  South = 180°
  West = 270°

Value summary

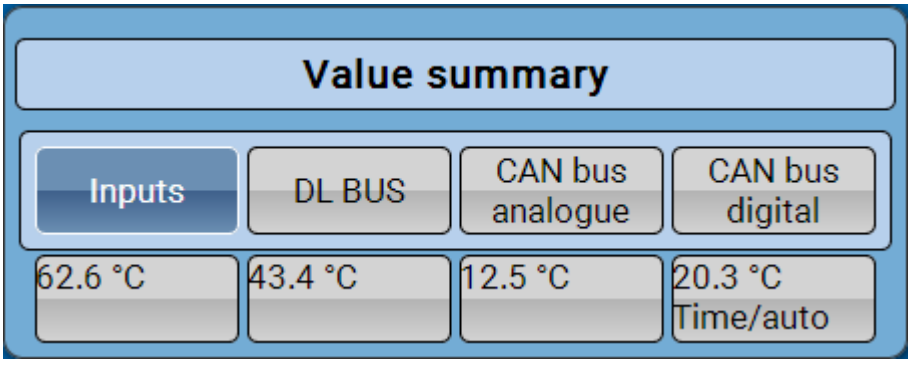
This menu item shows the current values for **inputs** 1 –6, the **DL inputs** and the analogue and digital **CAN inputs**.



The various values are displayed by selecting the group required.



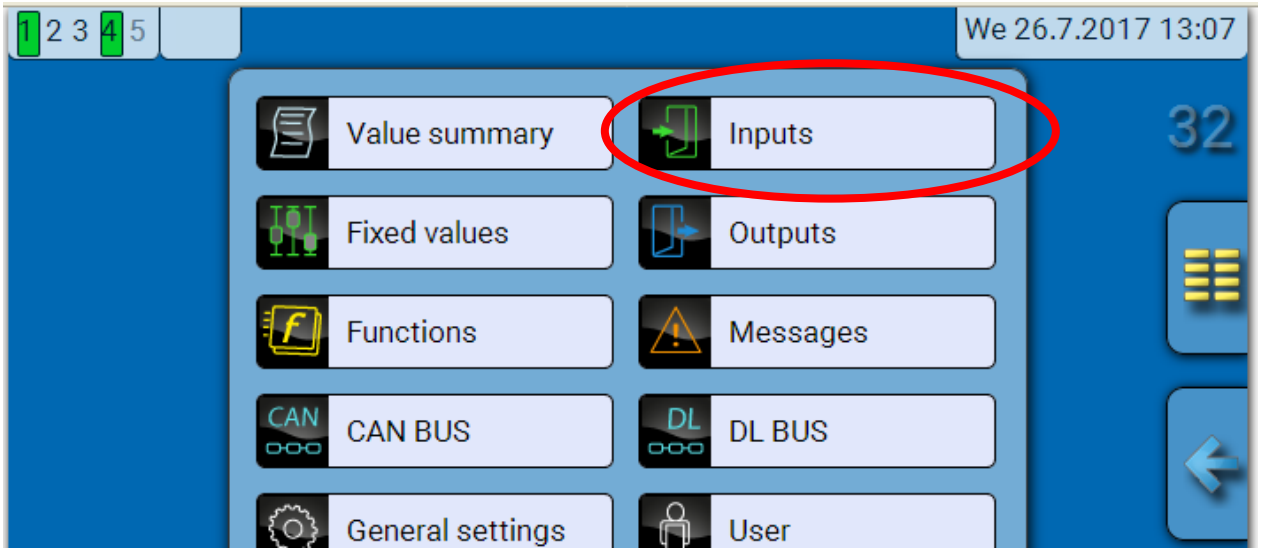
Example: Inputs



Inputs

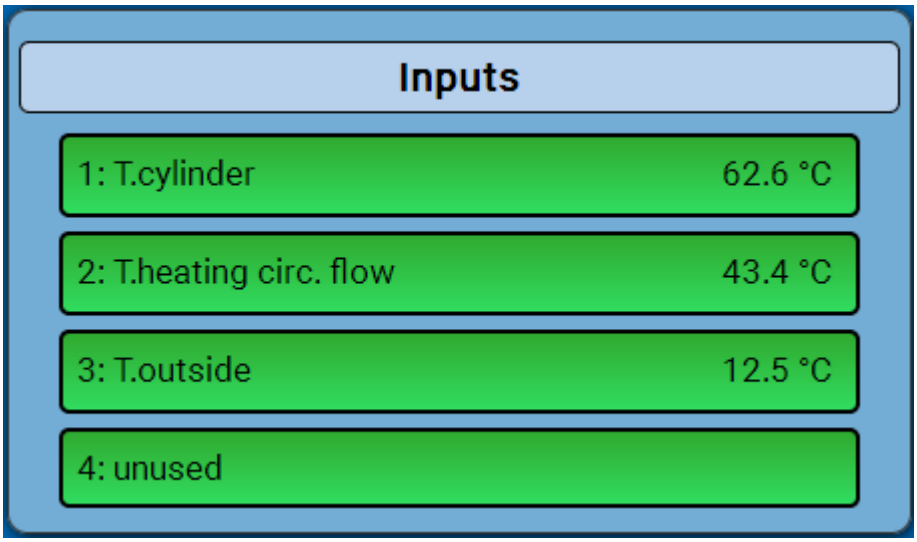
The **method** for programming parameters via the C.M.I. is always the same, so only one example is described here: the programming of parameters for the inputs.

The module has **4 inputs** for analogue signals (measurements), digital signals (ON/OFF) or pulses.



When this item is selected in the main menu, the inputs are displayed together with their designation and their current measurement or status.

Example of a programmed system; input 4 is still unused:

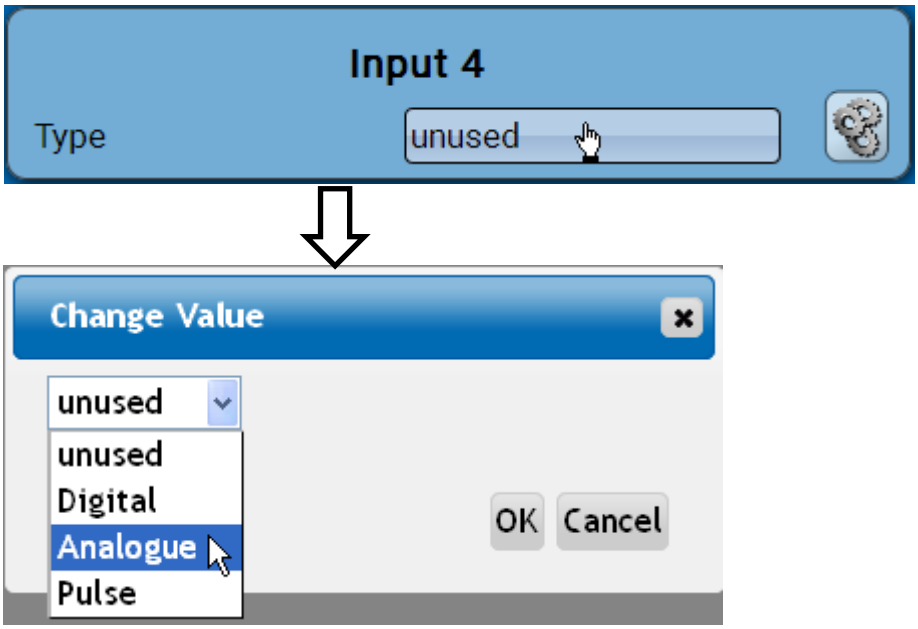


Programming the parameters

Sensor type, measured variable and process variable

Once the required input is selected, the sensor type can be defined.

First, you must specify the basic type of input signal.



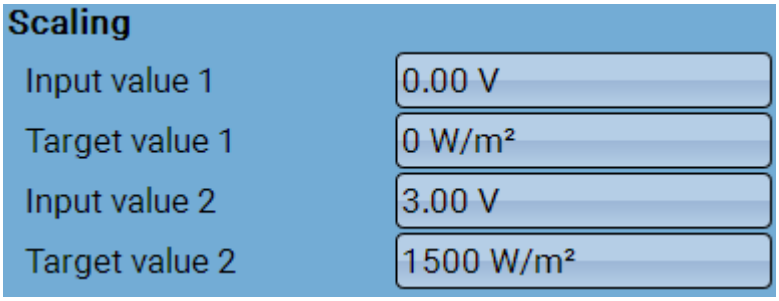
Then select the **measured variable.** For the measured variable "**Temperature**", you must also define the **sensor type**.

For the measured variables **Voltage** and **Resistance**, select the process variable:

- **Dimensionless**
- **Dimensionless (.1)**
- **Performance factor**
- **Dimensionless (.5)**
- **Temperature °C**
- **Global radiation**
- **CO_2 content (ppm)**
- **Percent**
- **Absolute humidity**
- **Pressure bar, mbar, Pascal**
- **Litre**
- **Cubic metre**
- **Flow rate (l/min, l/h, l/d, m³/min, m³/h, m³/d)**
- **Output**
- **Voltage**
- **Amperage mA**
- **Amperage A**
- **Resistance**
- **Speed km/h**
- **Speed m/s**
- **Degree (angle)**

Then you must use scaling to define the value range.

Example Voltage/Global radiation:

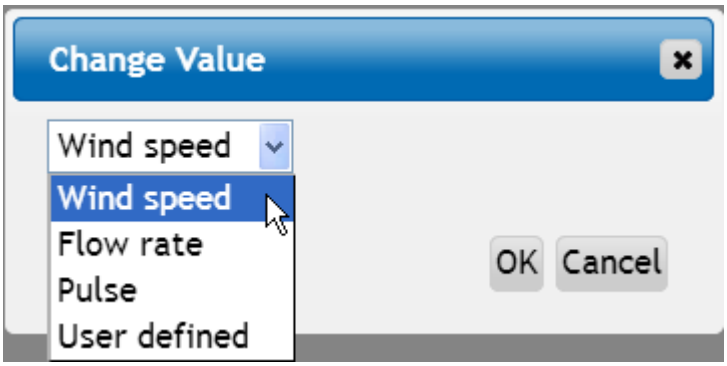


0.00 V equates to 0 W/m², 3.00V yields 1500 W/m².

Pulse input

Inputs can capture pulses with **max. 10 Hz** and a pulse duration of at least **50 ms**.

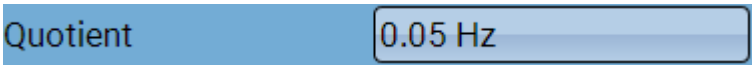
Select the measured variable



Wind speed

A quotient must be entered for the "**Wind speed**" measured variable. This is the signal frequency at **1 km/h**.

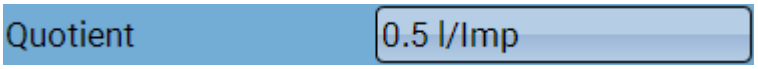
Example: The **WIS01** wind sensor issues one pulse (=1Hz) per second at a wind speed of 20 km/h. Therefore the frequency at 1 km/h equals 0.05Hz.



Setting range: 0.01 – 1.00 Hz

Flow rate

A quotient must be entered for the "**Flow rate**" measured variable. This is the flow rate in litres per pulse.



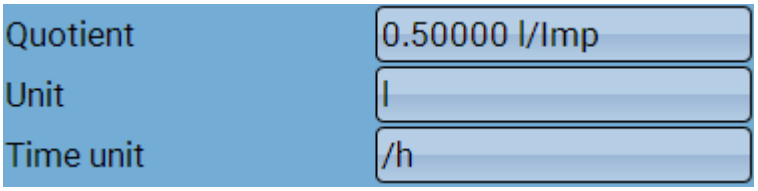
Setting range: 0.1 – 100.0 l/pulse

Pulse

This measured variable is used as the input variable for the "**Meter/Counter**" function, as a pulse counter with "Pulses" as its unit.

User defined

For the "**User defined**" measured variable, both the quotient **and** the unit must be entered.

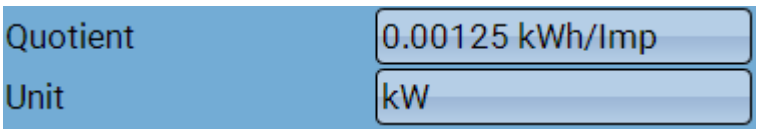


Setting range for quotient: 0.00001 – 1000.00000 units/pulse (5 decimal places)

Units: l, kW, km, m, mm, m³.

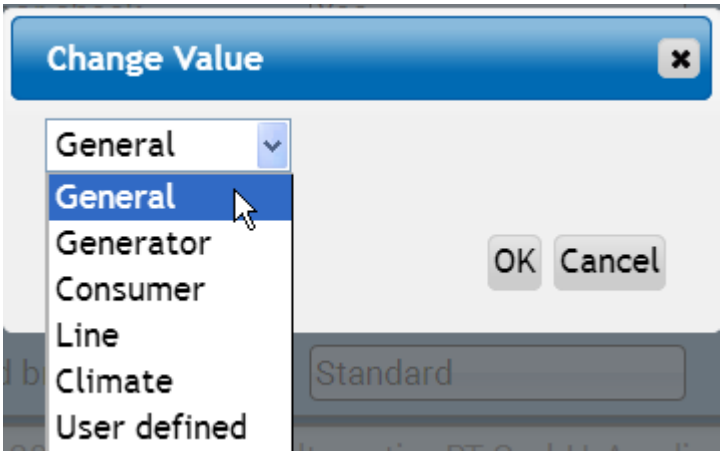
For l, mm and m³ the unit of time must be selected as well. For km and m the units of time are predefined and cannot be changed.

Example: For the "Energy meter" function, the unit "kW" can be used. In the example above, 0.00125 kWh/pulse was selected, which equates to 800 pulses /kWh.



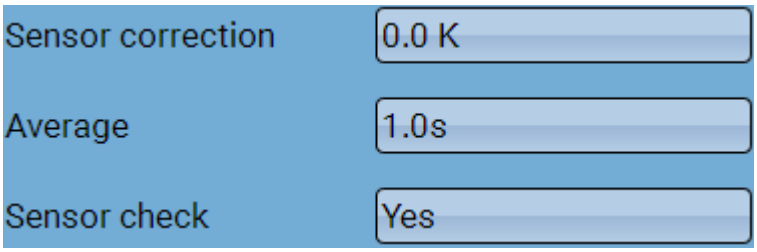
Designation

Enter the input designation by selecting a predefined designation from various designation groups or from the user defined designations.



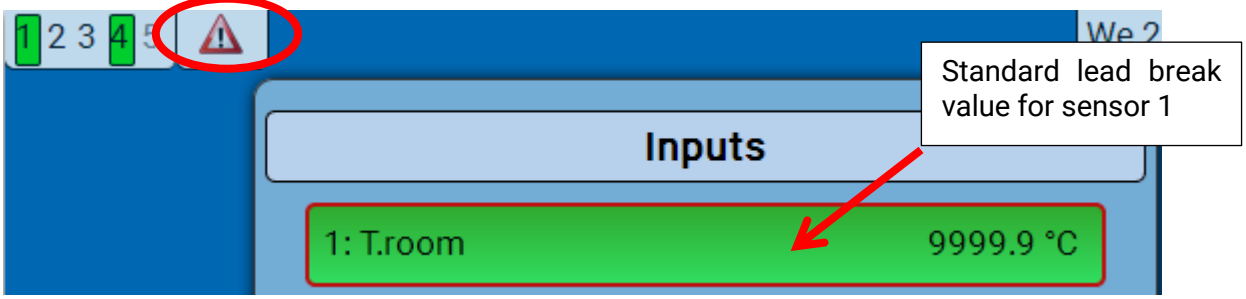
You can also assign a number from 1 to 16 to every designation.

Sensor correction, average, Sensor check (for analogue sensors)



When "**Sensor check**" is active (setting: "**Yes**"), a short circuit or a lead break will **automatically** generate an error message: A **warning symbol** is displayed in the upper status line, and the defective sensor is shown with a red border around it in the "**Inputs**" menu.

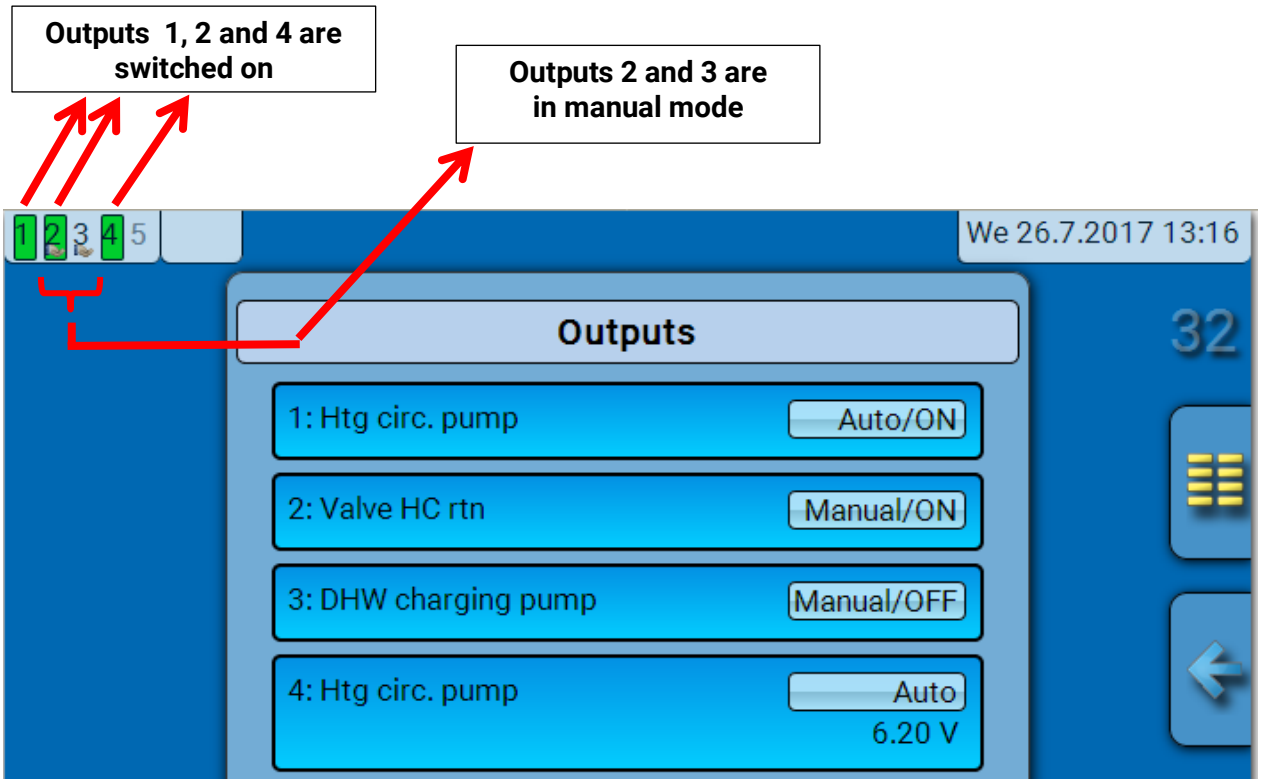
Example:



Outputs

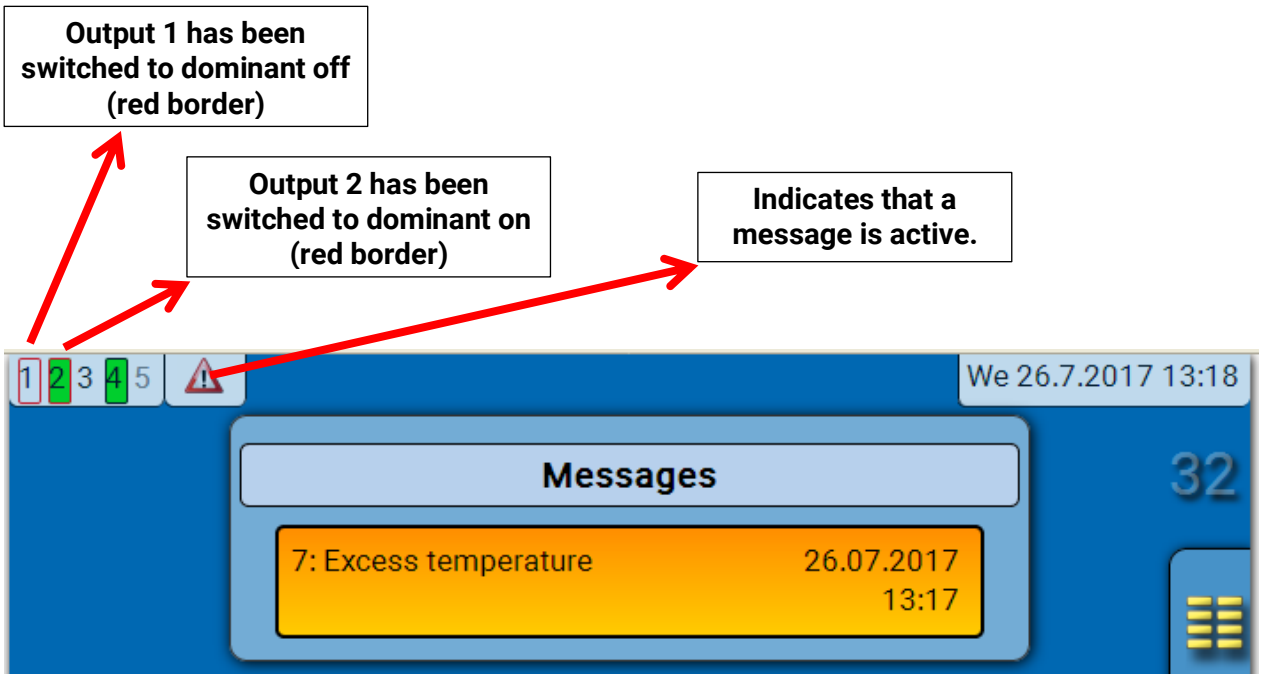
Display of output status

Example of a system already programmed:



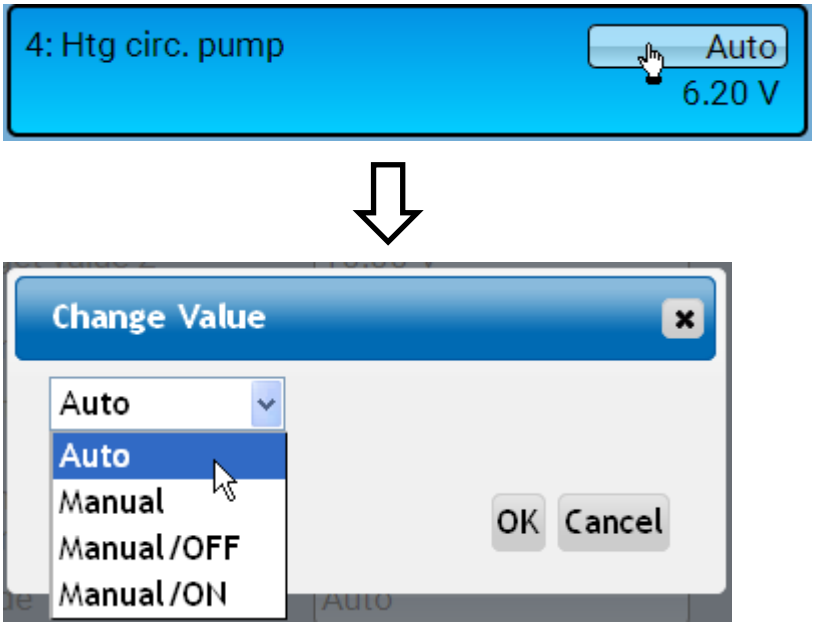
The **switched-on** outputs are highlighted in **green**.
Outputs in **manual mode** are marked with a **hand symbol** under the output number.

Example: Outputs switched dominant (by the "Message" function):



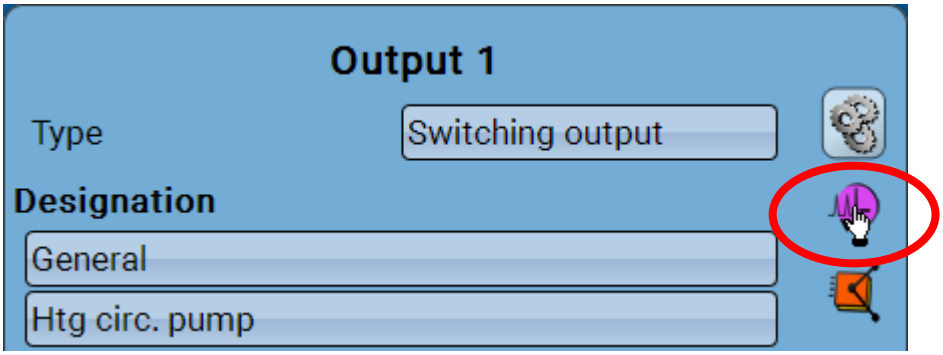
Display of analogue outputs

The C.M.I menu display shows the operating status and output value of the analogue output.



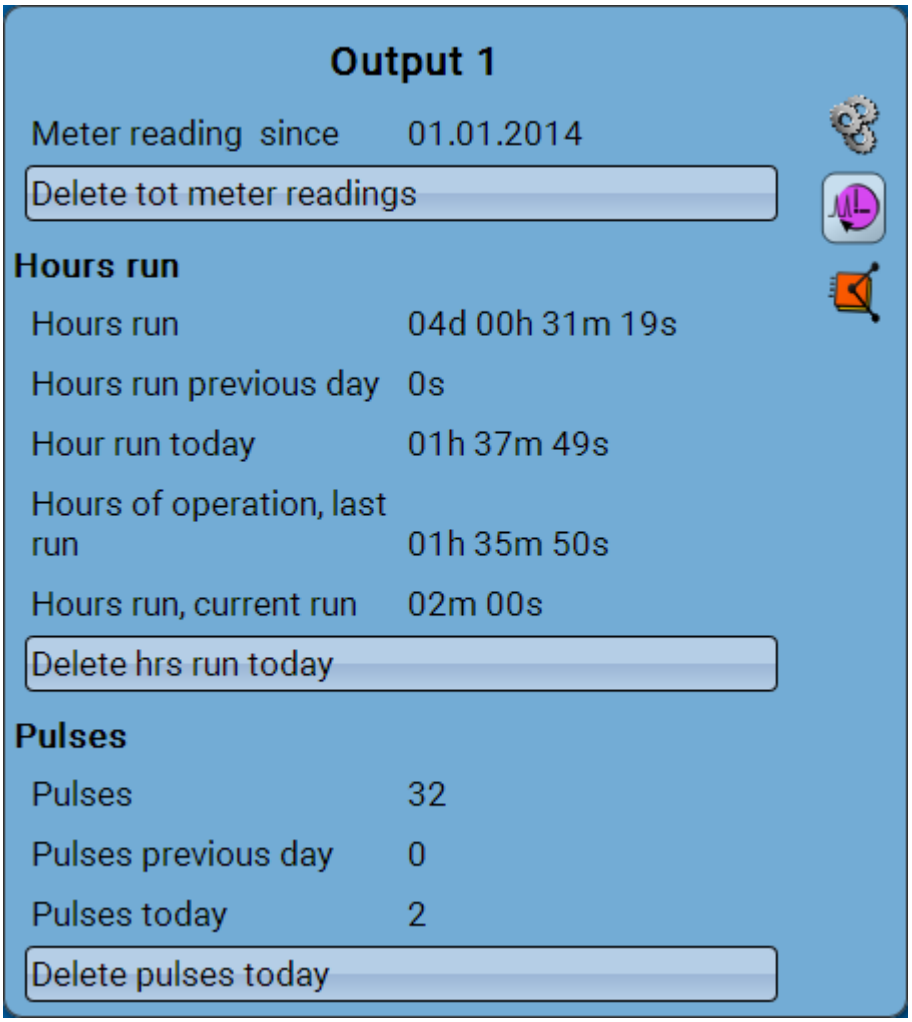
- **Auto**: Output issued according to the source and scaling
- **Manual**: Adjustable value
- **Manual/OFF**: Output issued according to "Dominant off" setting
- **Manual/ON**: Output issued according to "Digital on" setting

Output meter



Selecting this icon allows you to see the hours run and pulses (times switched on) **for every output**.

Example: For output 1, the meter reading since 01/01/2014 can be viewed.



The meter shows the total hours run, the hours run the previous day and today, and the previous runtime and the current runtime.

Below the hours run, the pulses (how many times

The meter shows the total number of pulses (times switched on), the number of pulses on the previous day and the number today.

- **CAUTION:** The meter readings are saved to the internal memory every hour. Therefore, in the event of a power failure, no more than 1 hour of metering can be lost.
- When loading function data, you will be asked whether you want to apply the saved meter readings.

Deleting meter/counter readings

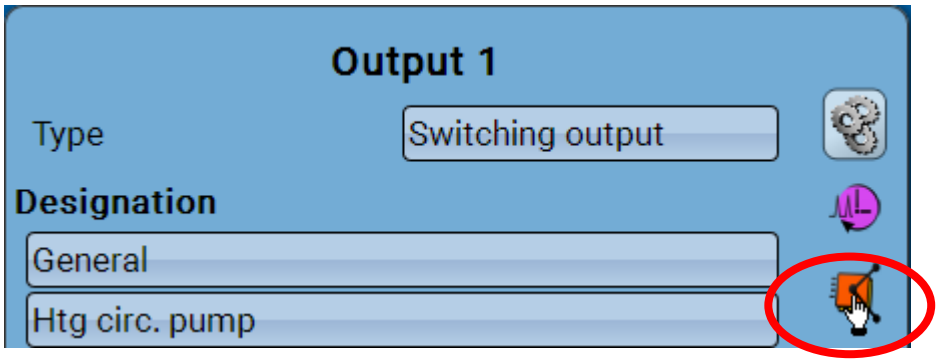
Deleting total meter/counter readings

If you click the button, you will be asked whether you want to delete the **total** readings and the "**Previous day**" readings for the hours run meter **and** the pulse counter. The "**Today**" and "**Last run**" and "**Current run**" readings will not be deleted.

Deleting hours run or pulses today

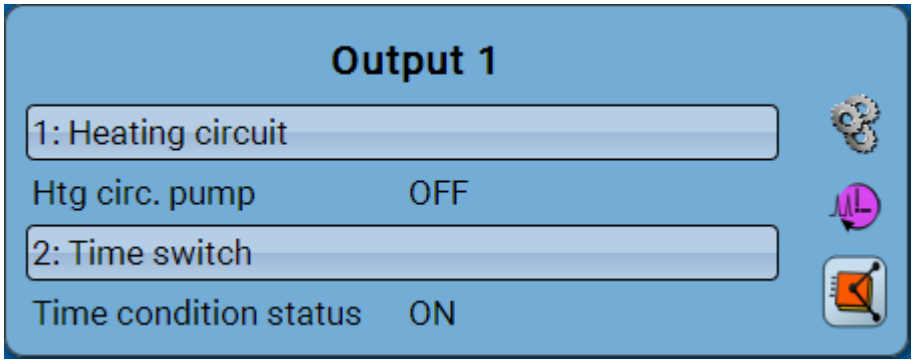
If you click the button, you will be asked whether you want to delete the hours run or pulses counted **today**. This will **not** delete the hours run for "**Last run**" and "**Current run**"

Display of links 



When you select this icon, the output's links to the functions will be displayed.

Example:



In this example, output 1 is controlled by two functions, and it has just been switched on by function 2 (Time switch).

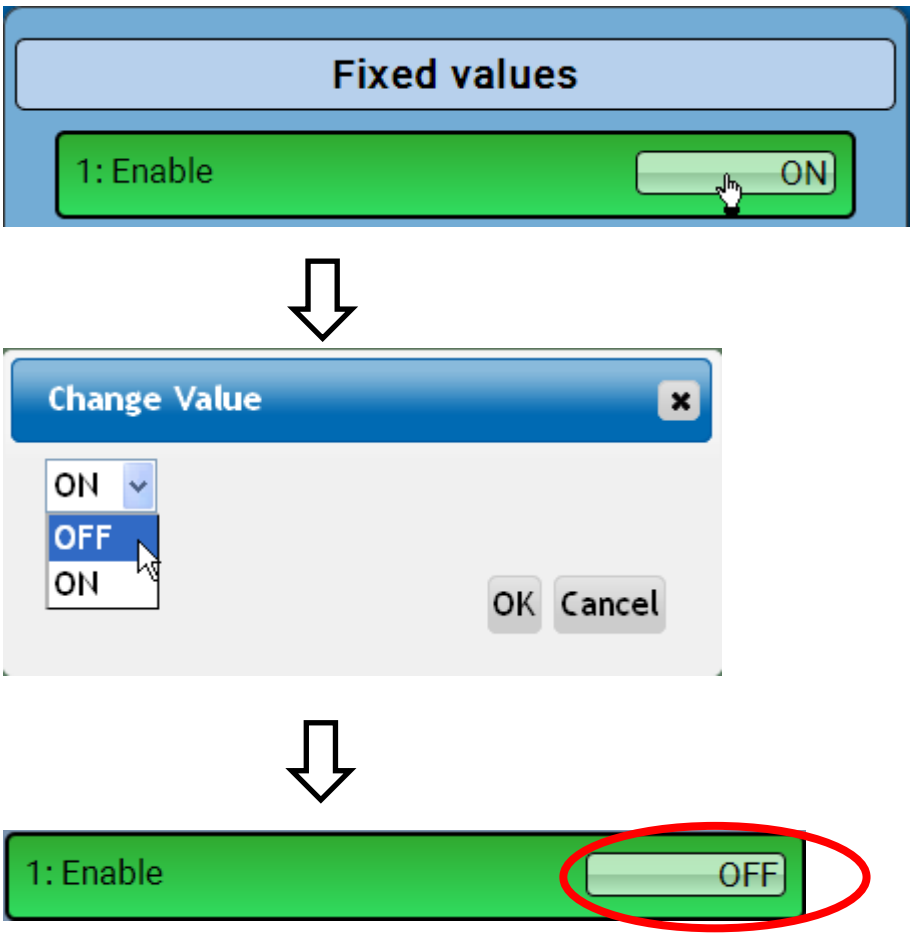
Tapping a function takes you **directly** to the programming of the parameters for that function.

Fixed values

Changing a digital fixed value

Tapping a button with a **light background** allows you to change the fixed value.

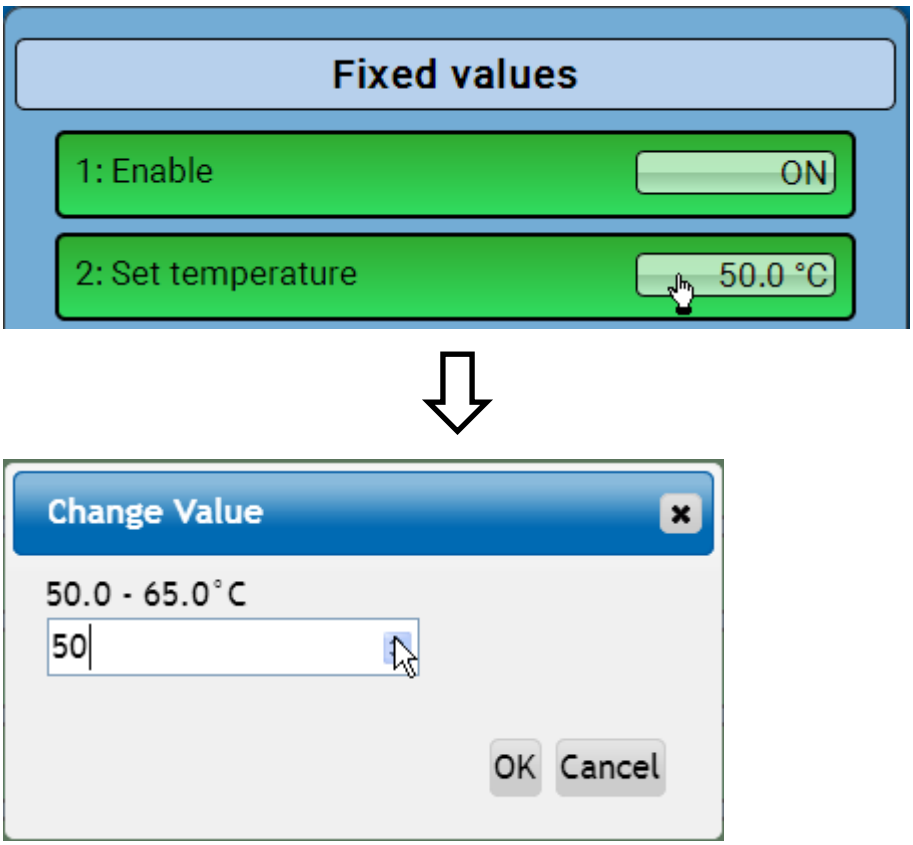
Example: Changeover from **ON** to **OFF** via a selection box



Changing an analogue fixed value

Tapping a button with a **light background** allows you to change the fixed value.

Example:

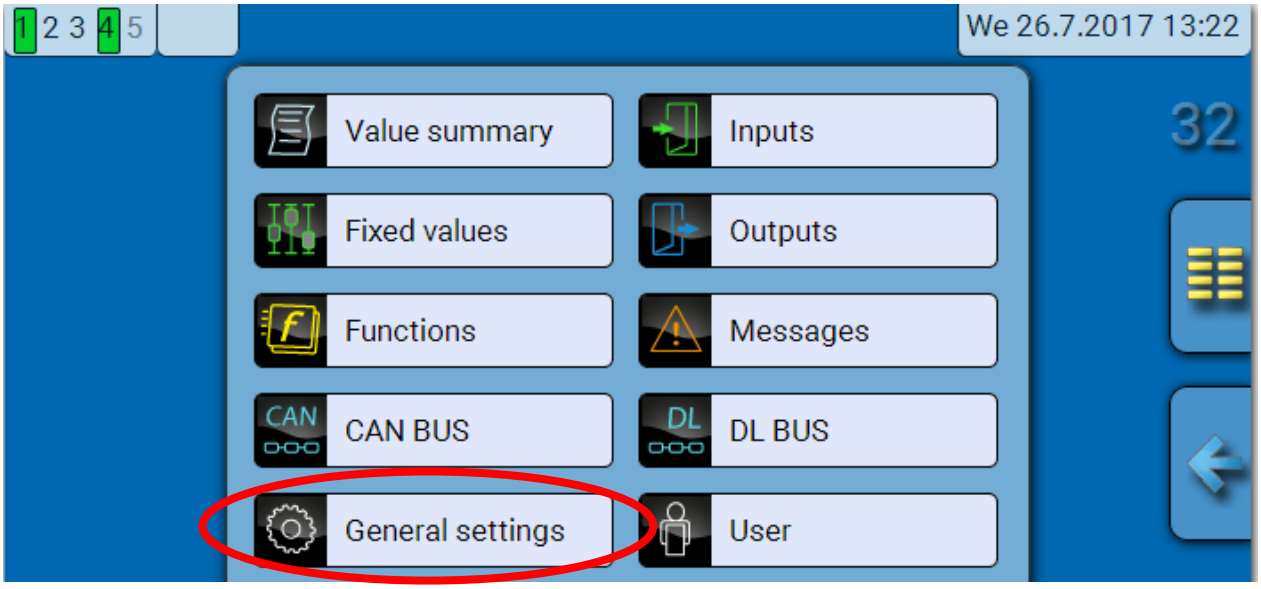


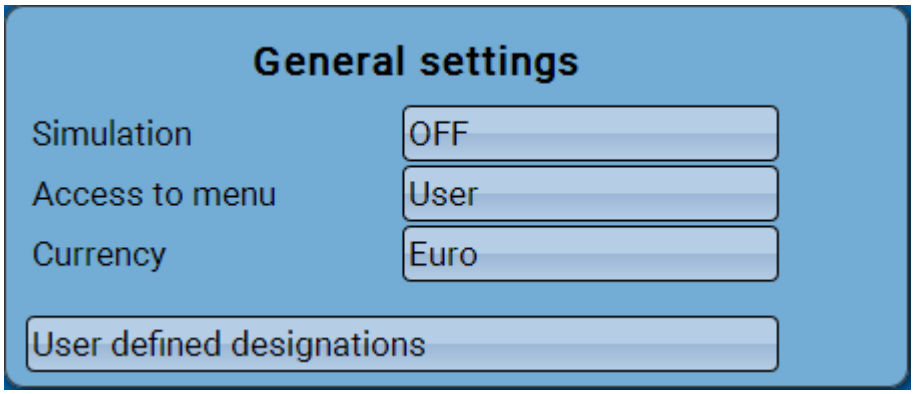
The current value is displayed at first (example: 50°C). Clicking the Up- or down-arrow-keys changes the value. It's also possible to select the value and typing the new desired value over it.

Activating a pulse fixed value

Tapping a button with a **light background** allows you to change the fixed value.

General settings





This menu is only accessible for the "Technician" or the "Expert".

This menu allows settings to be made which then take effect for all other menus and displays.

Simulation - Option of activating the simulation mode (only possible in Expert mode):

- No averaging of the outside temperature in heating circuit control.
- All temperature inputs are measured as PT1000 sensors, even if a different sensor type is defined.
- The RAS features of room sensors are ignored.

Select from: **OFF**
Analogue – Simulation with the EWS16x2 development set
CAN SIM board – Simulation with SIM-BOARD-USB-UVR16x2 for simulation in a system

The simulation mode is ended automatically when you exit the Expert level.

Access to menu - Definition of the user levels from which access to the **main menu** is permitted.
If only **technicians** or **experts** are permitted to access the menu, then the relevant **password** must be entered when selecting the main menu.

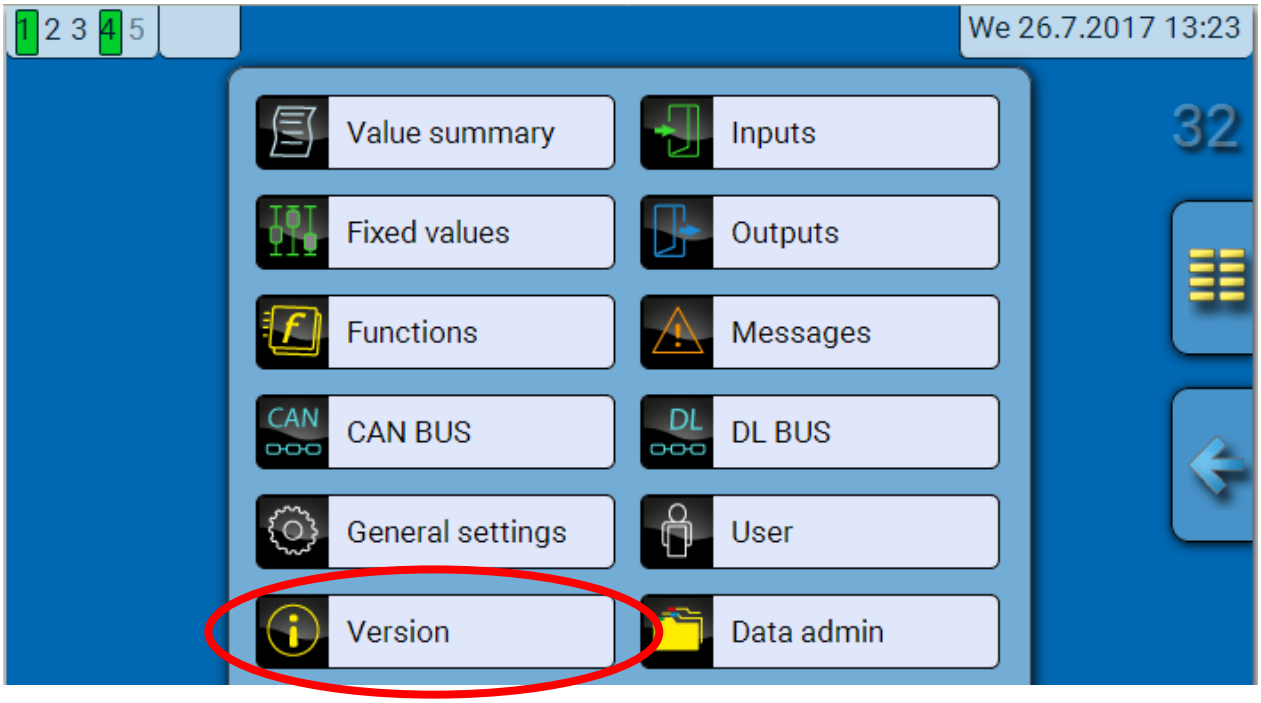
Currency – Select the currency for yield metering

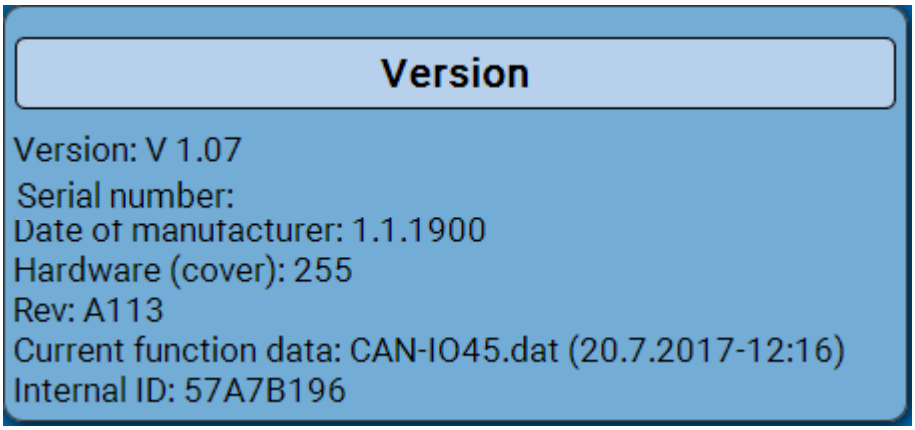
User defined designations - All elements can be designated by selecting a predefined designation from various designation groups or from the user defined designations.

Up to 100 different designations can be defined by the user. The maximum number of characters per designation is **24**.

Version and serial number

This menu item displays the operating system version (firmware), the serial number and internal production data.



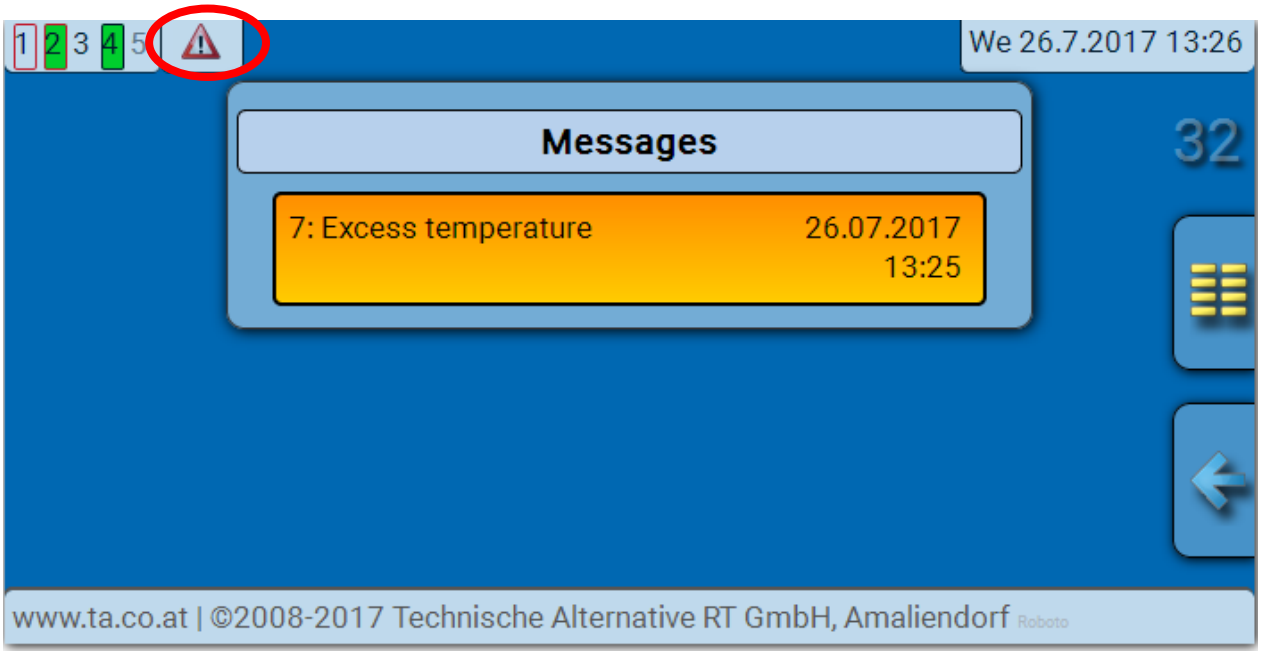


The serial number is also visible on the module's rating plate.

Messages

This C.M.I. menu displays activated messages.

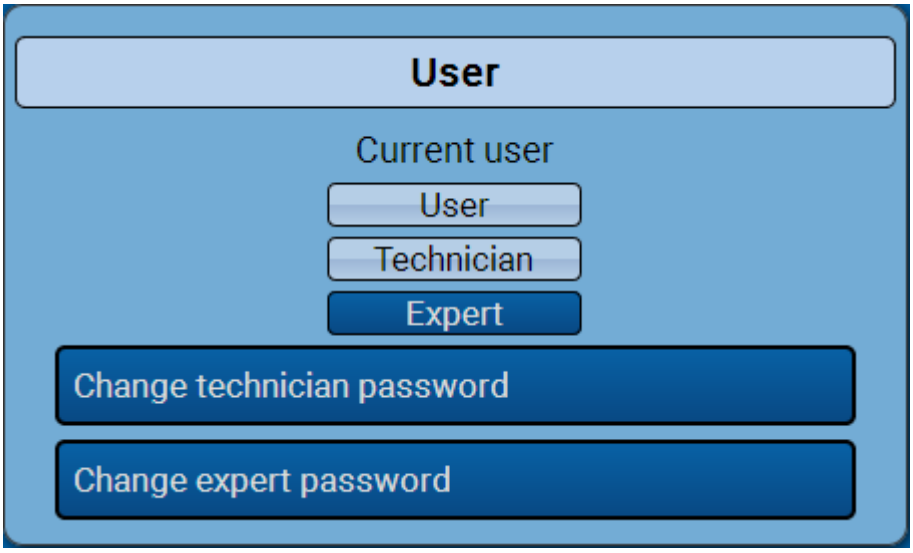
Example: Message 7 is active.



If there is at least one active message, a warning symbol will appear in the upper status line.

More detailed information about the messages is provided in the manual **Programming / Part 2: Functions, Message chapter**".

User



Current user

When entering the menu of the module, the user is in the **User level**.

To enter the Technician or Expert level a **password** must be entered, which can be set by the programmer.

After function data has been loaded, the module returns to the User level and adopts the programmed passwords.

Following a controller start, the module is always in the User level.

The password is set in the TAPPS2 program and can be modified by accessing the Expert level via UVR16x2 or CAN-MTx2.

List of permitted actions

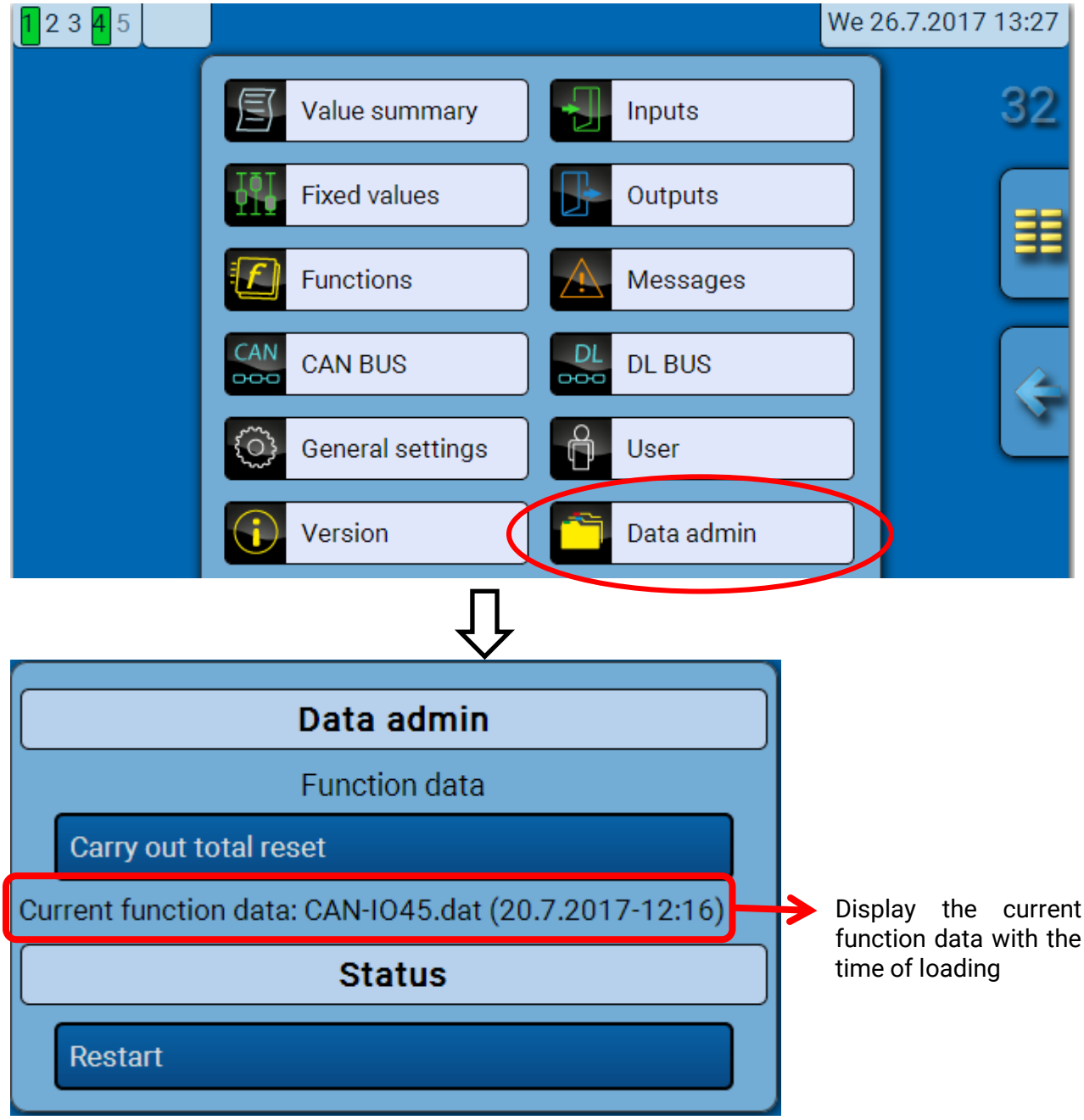
User	Displays and permitted actions
User	• **Function overview** with options for control • **Access to main menu** only if enabled for "**User**" in the "General settings" • **Summary of values** • **Inputs**: display only, no access to the parameters • **Outputs**: changes to the output status of the outputs enabled for User, display of hours run, no access to the parameters • **Fixed values**: changes to the value or status of the fixed values enabled for User, no access to the parameters • **Functions**: display of the **function status**, no access to the parameters • **Messages**: display of active messages • **CAN and DL bus**: no access to the parameters • **General settings**: no access • **User**: change of user (with password entry) • **System values**: display of System values
Technician	**All of the above plus**: • **Access to main menu** only if enabled for **Technician** or **User** in the "General settings" • Changes to the parameters for **inputs** (except for type and measured variable), no creation of new ones • Changes to the parameters for **outputs** (except for type; status only if enabled for User or Technician), no creation of new ones • Changes to the parameters for **fixed values** (except for type and measured variable; value and status only if enabled for User or Technician), no creation of new ones • **General settings**: Changes to **user defined designations** and creation of new ones, selecting the currency • **Functions**: changes to user defined input variables and parameters • All settings in the **CAN** and **DL bus** menus • **Data administration** actions
Expert	**All** actions and **all** displays are accessible.

Automatic changeover

Normally, the module automatically switches back to **user mode** 30 minutes **after login** as an expert or technician.

Data administration

C.M.I. menu Data administration



Total reset

A total reset can only be carried out from the Technician or Expert level and requires confirmation when prompted.

A **total reset** deletes the function modules, the parameter settings of all inputs and outputs, bus inputs and outputs, fixed values and system values. The settings for the CAN node number and the CAN bus rate are retained.

After tapping the screen, you will be asked to confirm that you want a total reset to be carried out.

Restart

At the end of the "Data admin" menu, there is an option to restart the controller following a confirmation prompt, without disconnecting the controller from the network.

Loading function data or updating firmware via C.M.I.

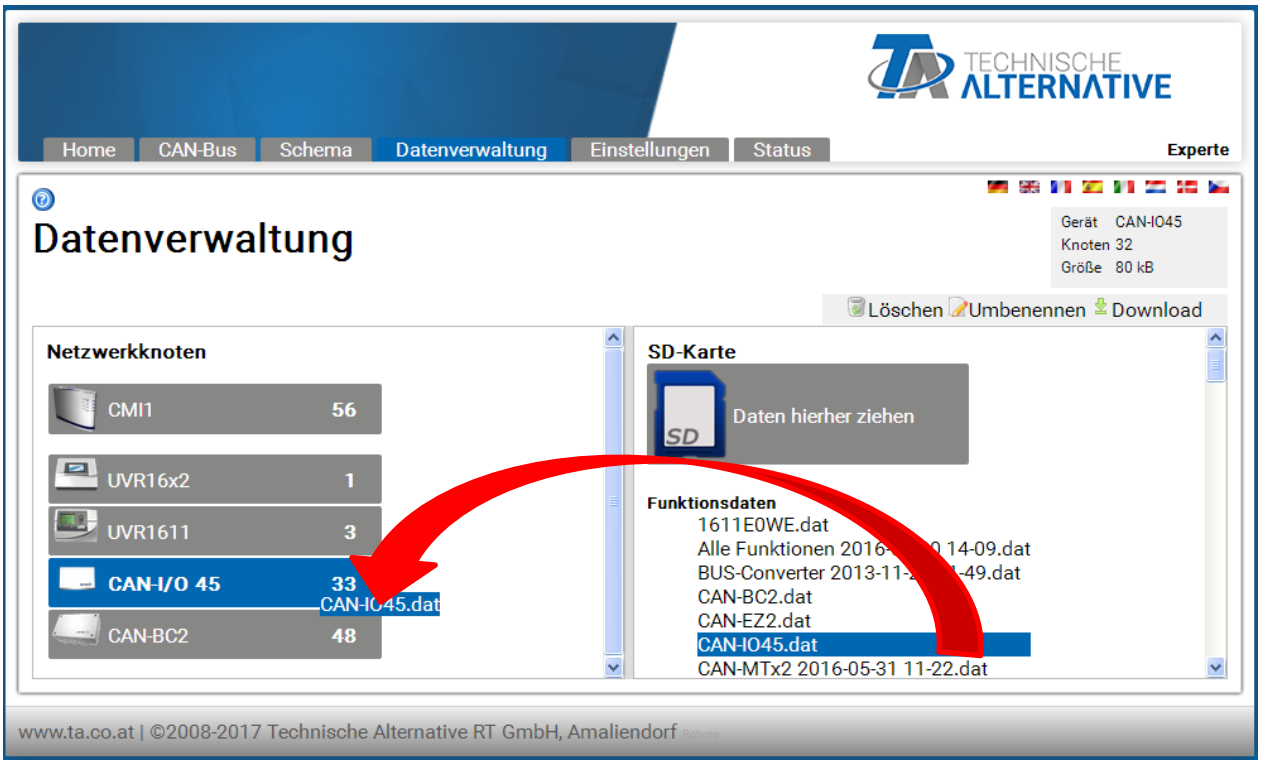
In the **Data admin** C.M.I. menu, function data can be loaded or saved and the firmware (the operating system) can be loaded onto the module.

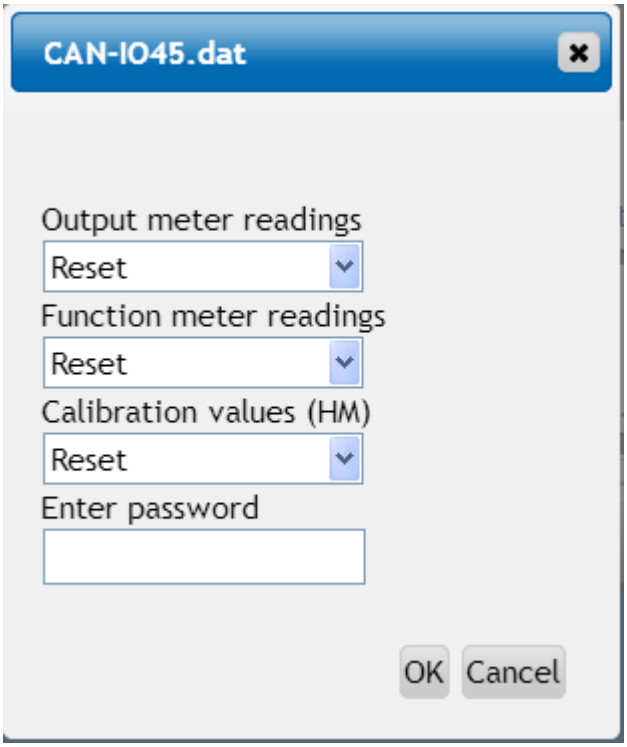
A separate operating system version is required for each language. Consequently, unlike the UVR16x2 controller, the module does not have a menu for language selection.

The required file must first be loaded onto the SD card of the C.M.I. The file is subsequently transferred onto the module.

You can perform these actions by simply dragging the files while holding down the left mouse button ("**drag & drop**").

Example: Loading function data from the SD card onto the module

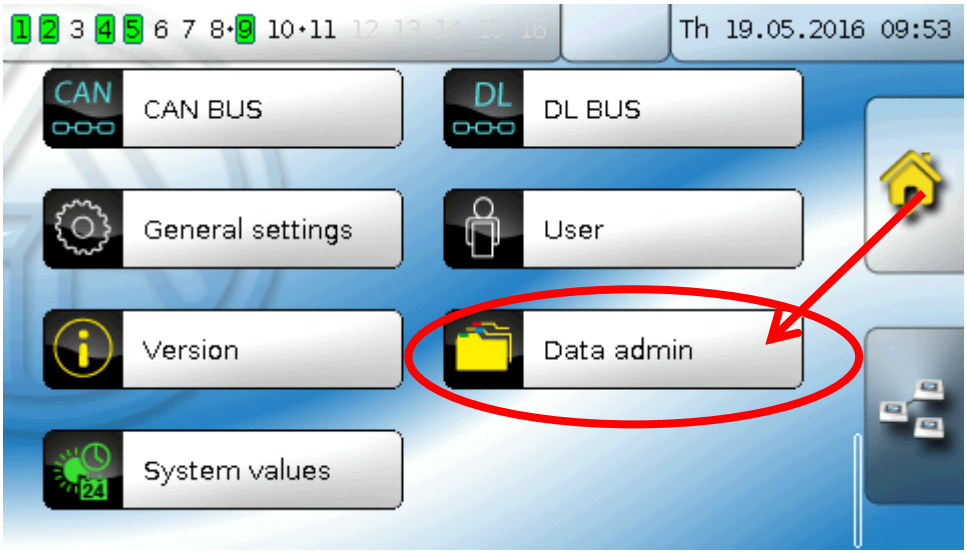


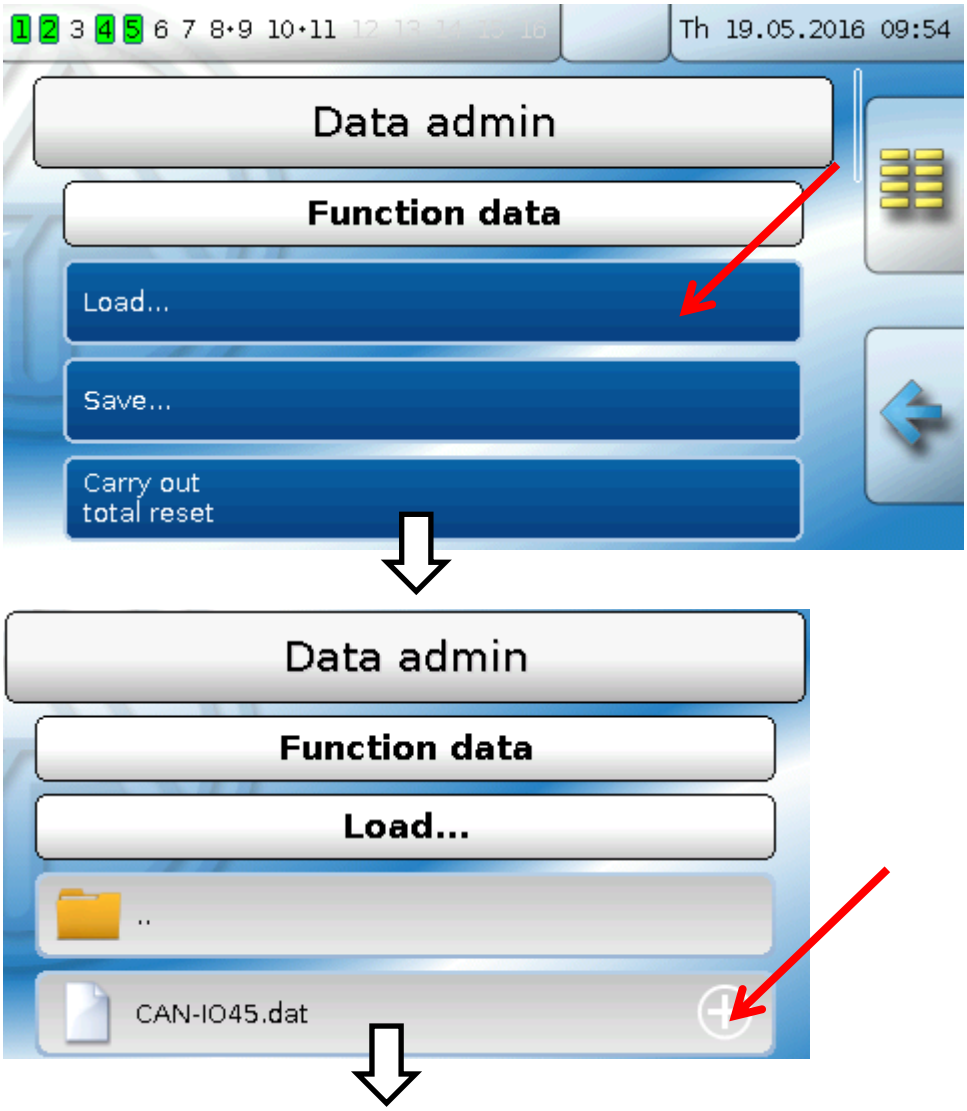


Before the start of the data transfer, you will be asked to provide meter readings and the **expert** or **technician password**.

Loading function data or updating firmware via UVR16x2 or CAN-MTx2

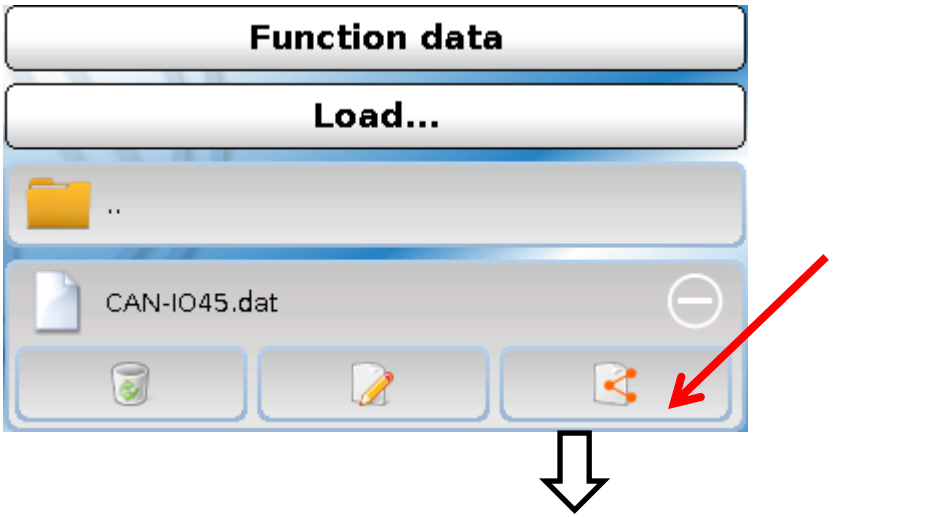
The data transfer can only be carried out in the technician or expert level, in the **data admin** menu.

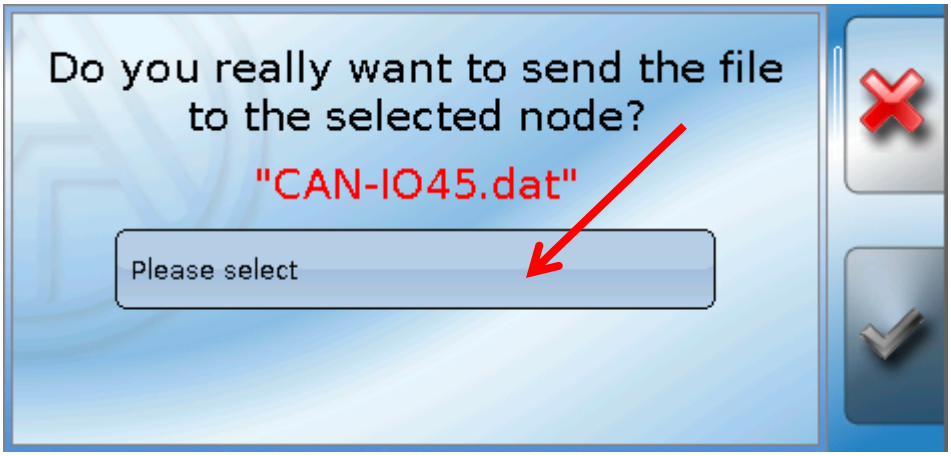




In order to send the file to the module, tap the plus icon. A number of options will appear for selection.

Data administration





Select the **node number** and then tap  .

Tapping  cancels the action.

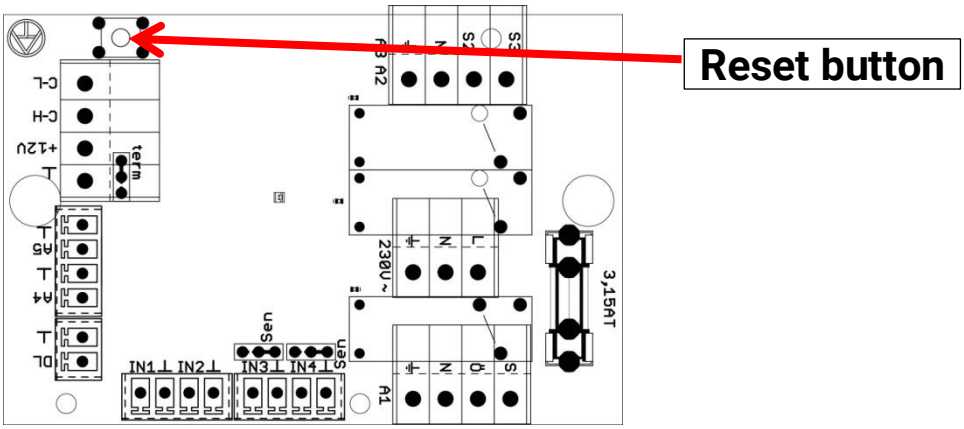
The data transfer is only possible after a technician or expert password has been entered for the target device.

Reset

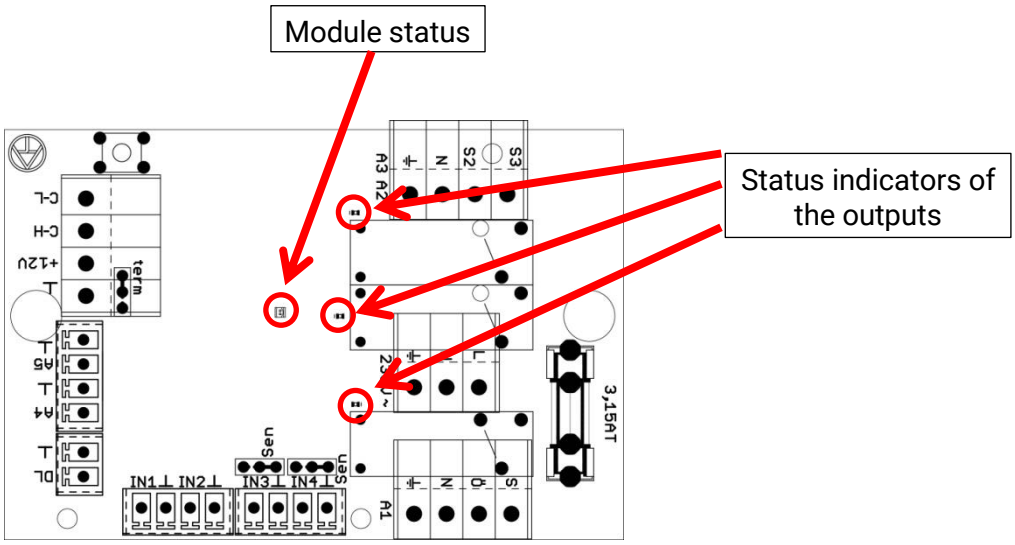
Pressing the reset button **briefly** will restart the module (= reset).

Total reset: Holding the button pressed down **for a long time** causes the status LED to start flashing **quickly**. The button must be held down until the quick flashing changes to slow flashing.

A **total reset** deletes all function modules, the parameter settings of all inputs and outputs, bus inputs and outputs, fixed values, system values and the CAN bus settings.



LED status indicators



Status indicators at module start

Indicator light	Explanation
Steady red light	The controller is booting up (= start routine after switching on, resetting or updating) **or**
Steady orange light	Hardware is initialising after booting up
Flashing green light	After hardware initialisation, the controller waits about 30 seconds to receive all the information necessary for a function (sensor values, network inputs)
Steady green light	Normal operation of the controller

Technical data CAN-I/O 45

All inputs	Temperature sensors of type PT1000, KTY (2 kΩ/25 °C), KTY (1 kΩ/25 °C), PT100, PT500, Ni1000, Ni1000TK5000 and room sensors RAS or RASPT, radiation sensor GBS01, thermocouple THEL, humidity sensor RFS, rain sensor RES01, pulses **max. 10 Hz** (e.g. for flow rate transducer VSG), voltage **up to 3.3 V DC**, resistance (1-100 kΩ), and as a digital input
Inputs 3, 4	Auxiliary voltage (0-10 V DC) (note jumper position)
Outputs 1	Relay output, with N/O contact
Output 2 - 3	Relay output, with NO contact
Outputs 4 - 5	Analogue outputs 0-10 V (max. 20 mA) or PWM (10 V/1 kHz), or expansion option as switching outputs with auxiliary relay modules
Max. bus load (DL bus)	100 %
CAN bus	Standard data rate 50 kbit/s, adjustable from 5 to 500 kbit/s
Differential temperatures	With separate start and stop differential
Threshold values	With separate start and stop differential or fixed hysteresis
Temperature measuring range	PT100, PT500, PT1000: -200 °C to +850 °C with a resolution of 0.1 K All other temperature sensors: -49.9 °C to +249.9 °C with a resolution of 0.1 K
Temperature accuracy	Typ. 0.4 K, max. ±1 K within a range of 0 - 100 °C **for PT1000 sensors**
Resistance accuracy	max. 1,6% at 100kΩ (measured variable: Resistance, process variable: Resistance)
Voltage accuracy	Typ.1 %, max. 5 % of maximum input measuring range
Output 0-10V accuracy	Max. -2% to +6%
Max. breaking capacity	Relay outputs 230V / 3A each
Fuse	Relay outputs are fused jointly with 3.15 A (delay)
IP rating	IP40
Protection class	II – double insulated ⧈
Permissible ambient temperature	+5 to +45 °C

Subject to technical modifications

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