TECHNISCHE ALTERNATIVE

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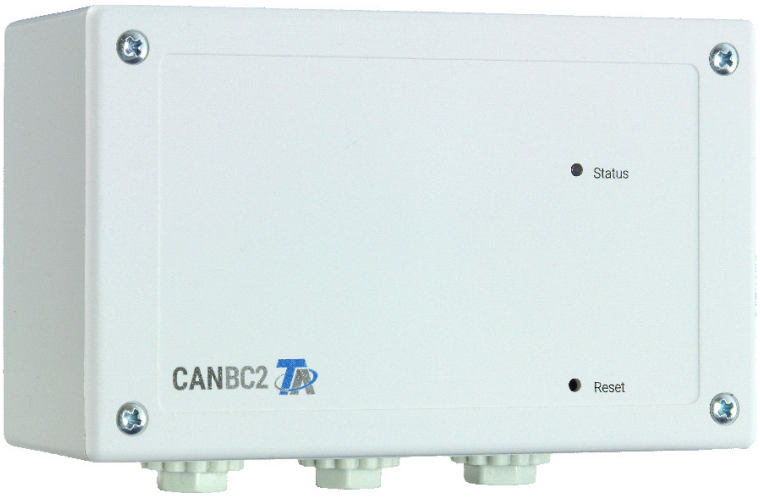
CAN-BC2

CAN-BUS CONVERTER



Installation instructions
Programming manual

Manual Version 1.21

English

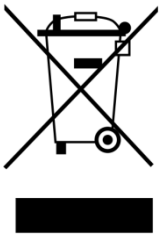
Table of contents

Disposal **5**
Standard delivery **5**
Installing and connecting the device **5**
Fixing dimensions and measurements **5**
Power supply **6**
CAN bus cable selection and network topology **6**
DL bus and M-Bus connections **9**
Data link for DL bus 9
Bus load of DL sensors 9
M-Bus cable 9
Principles **10**
Minimum system requirements **10**
Interfaces **10**
Potential-free CAN bus with increased interference resistance 10
M-Bus (measurement bus) 10
DL-Bus 11
Modules 11
KNX module MD-KNX 11
Modbus/M-Bus module 11
Programming with TAPPS2 . . . . . **12**
Designations **12**
User defined designations 12
Fixed values **13**
Fixed value type 13
Digital 13
Analogue 14
Pulse 14
Designation 14
Restriction of change authority 15
Functions **16**
Selecting a new function 16
Designation 16
Input variables 17
Parameters 19
Hystereses 20
Function quantities 22
Output variables 23
CAN bus **24**
CAN settings for the converter 24
Datalogging 25
CAN analogue inputs 27
Node number 27
Designation 27
CAN bus timeout 27
Unit 28
Value at timeout 28
Sensor check 29
Sensor error 29
CAN digital inputs 29
CAN analogue outputs 30
Designation 30
Transmission condition 30
CAN digital outputs 31
Designation 31

Table of contents

Transmission condition 31
DL bus 32
DL settings 32
DL input 32
DL bus address and DL bus index 32
Designation 32
DL bus timeout 33
Unit 33
Value at timeout 33
Sensor check 33
Sensor error 34
DL digital inputs 34
Bus load of DL sensors 34
DL output 35
M-Bus 36
Settings 36
M-Bus Eingang 37
General 38
Designation 38
Unit 39
Sensor check 39
Sensor error 39
System values 41
Device settings 42
General 42
Currency 42
Technician / Expert password 42
Access to menu 42
Time / location 43
Bus settings 43
C.M.I. Menü 44
Date / time / location 44
Value summary 46
Fixed values 47
Changing a digital fixed value 47
Changing an analogue fixed value 48
Activating a fixed pulse value 48
General settings 49
Version and serial number 50
Messages 51
User 52
Current user 52
List of permitted actions 53
Data administration 54
C.M.I. - Data administration menu 54
Total reset 54
Restart 54
Loading function data or updating firmware via C.M.I. 55
Loading function data or updating firmware via UVR16x2 or CAN-MTx2 56
Loading function data or firmware via UVR610 58
Reset 59
LED status indicators 59
Technical data 60

Disposal



•Devices no longer in use or beyond a state of repair must be disposed of in an environmentally responsible manner by an authorised collection point. They must never be treated as ordinary household waste.

•We can undertake the environmentally responsible disposal of devices sold by Technische Alternative upon request.

•Packaging material must be disposed of in an environmentally responsible manner.

•Incorrect disposal may result in considerable damage to the environment, as many of the materials used require professional handling.

Standard delivery

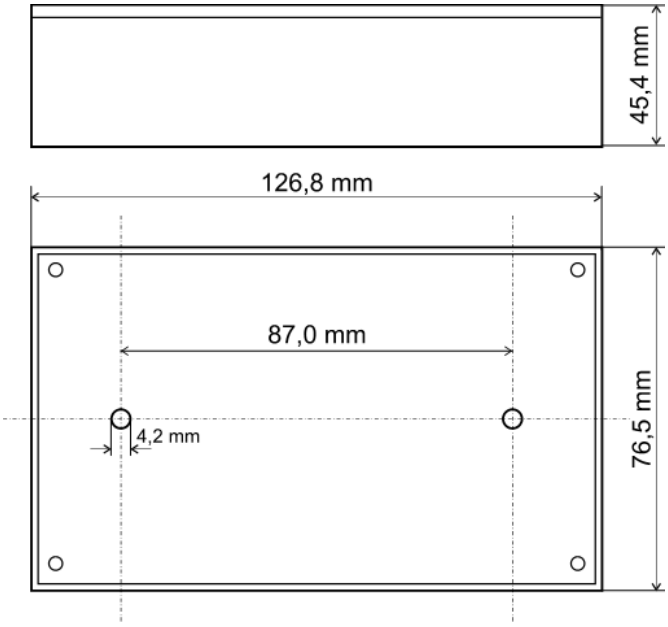
- CAN-BC2 CAN bus converter
- 2x terminal (4-pole)
- 2x terminal (2-pole)
- Plastic wall plugs
- Clamping plate screw
- Operating instructions

Installing and connecting the device

The CAN-BC2 is integrated into a distribution box or fitted to a level mounting surface in a dry room, in accordance with local regulations. It can be secured to a mounting surface through the 2 screw holes in the casing tray. Not designed for top-hat rail installation.

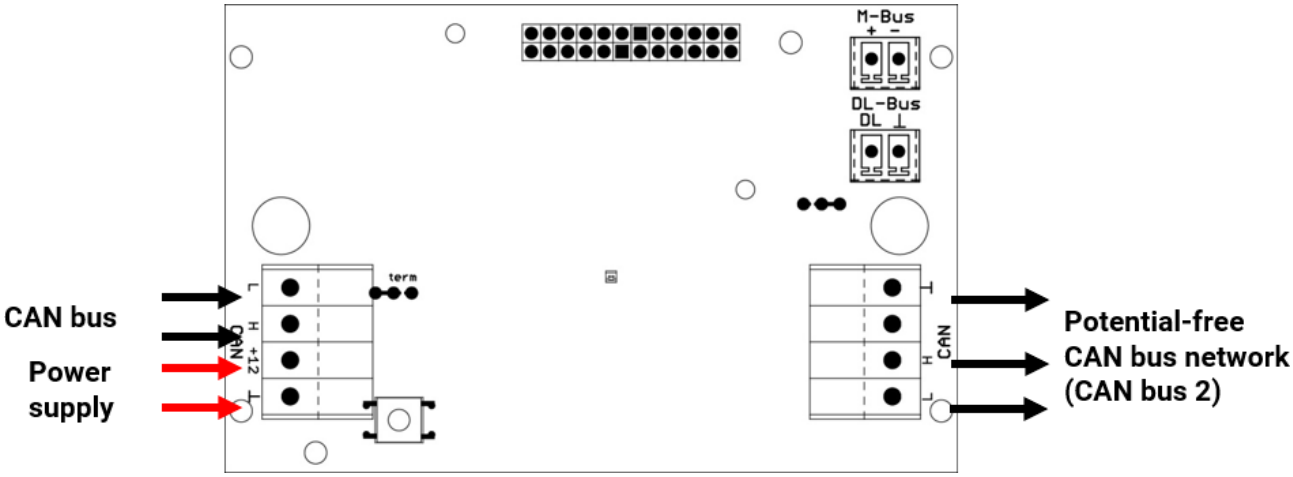
Unscrew the 4 screws on the front and lift the cover.

Fixing dimensions and measurements



Power supply

The bus converter requires a 12 V power supply provided by the CAN bus network. The supply comes **from one side** of the CAN bus network only, as the other side is potential-free, i.e. the 12 V power supply is **not looped through**.

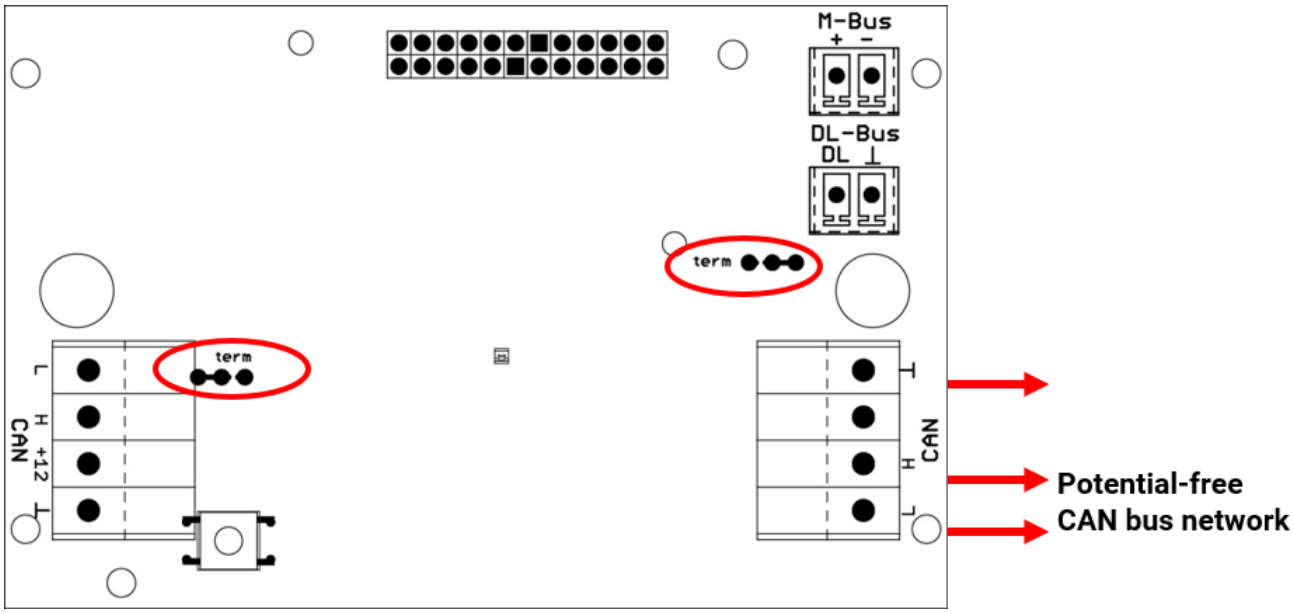


CAN bus cable selection and network topology

The principles of CAN bus cabling are described extensively in the manuals for the freely programmable controllers and **must** be observed.

This manual describes only certain features that are specific to this device.

Each CAN network must be provided with a 120 ohm bus terminator at the **first** and **last** network node (termination – with plug-in jumper). A CAN network therefore always has two terminators (one at each end). The potential-free separation by the bus converter requires a plug-in jumper to be set in accordance with the CAN network topology. This jumper is located on either side of the CAN bus.



Example: Network across several buildings with CAN bus converter CAN-BC2

Key to smybols:

… Device with its own power supply (UVR16x2, UVR1611K, UVR1611S, UVR1611E)

… Device is supplied by the bus (CAN I/O, CAN-MT, …)

… CAN bus converter (CAN-BC2)

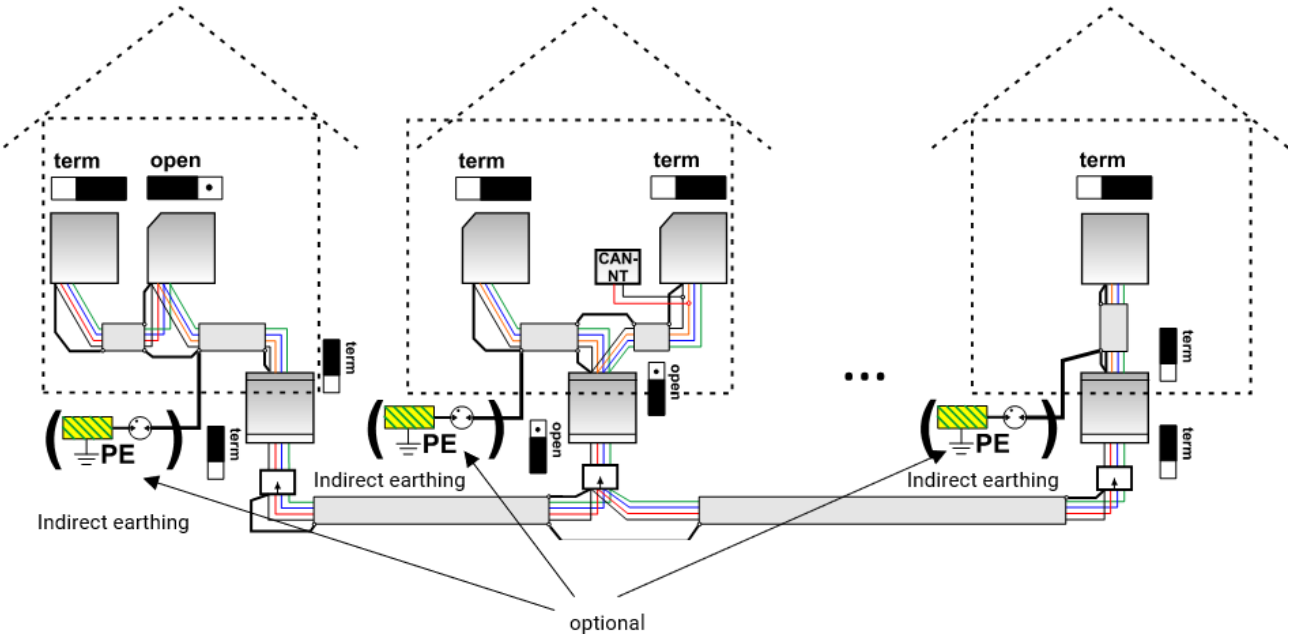
term … Terminated (end devices)

open … Open termination

… CAN bus surge arrester

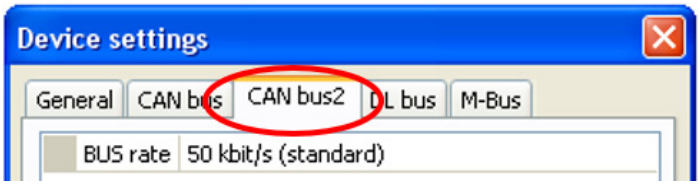
… Gas discharge arrester for indirect earthing

With CAN bus surge arresters: The screen of the **disconnected** network is connected to CAN bus earth (GND) for each bus converter. This screen must **not** be **directly** earthed.

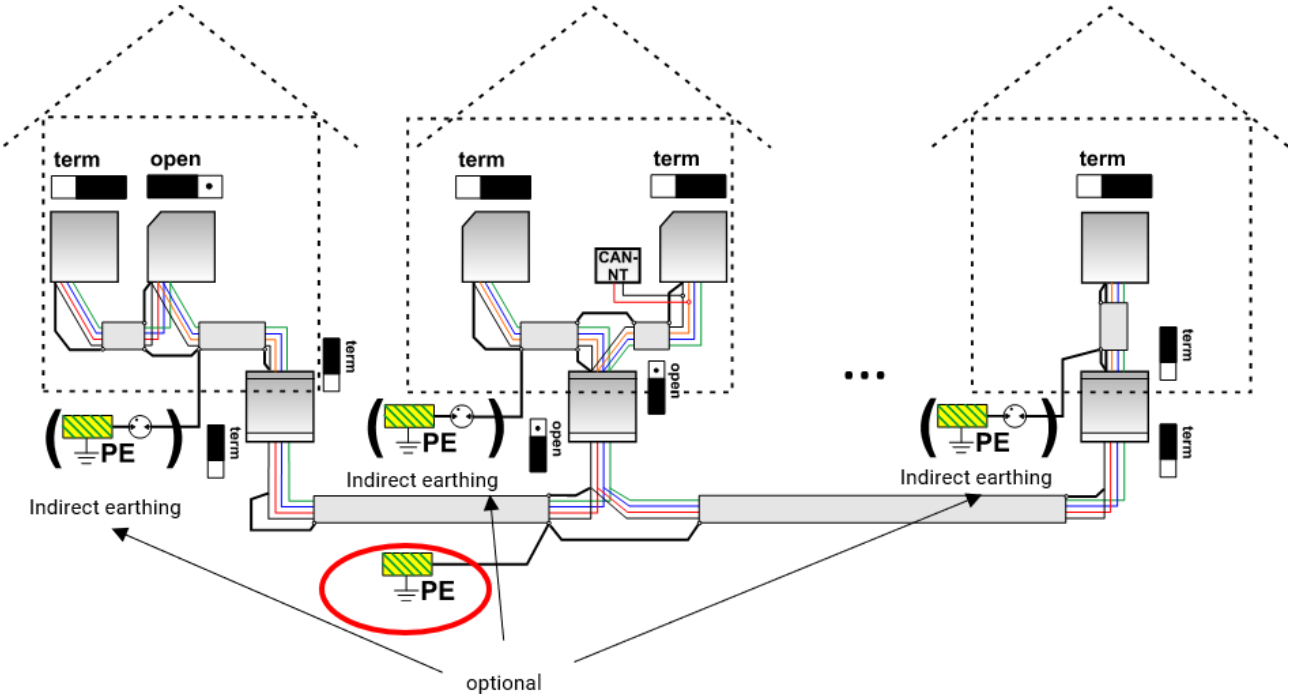


The CAN bus converter is similar to a repeater. It receives CAN bus signals and passes them on. Each cable run on either side of the CAN bus converter must therefore be viewed as an independent CAN bus network.

Max. cable length: Subject to bus rate set in the **disconnected** network (CAN bus 2)



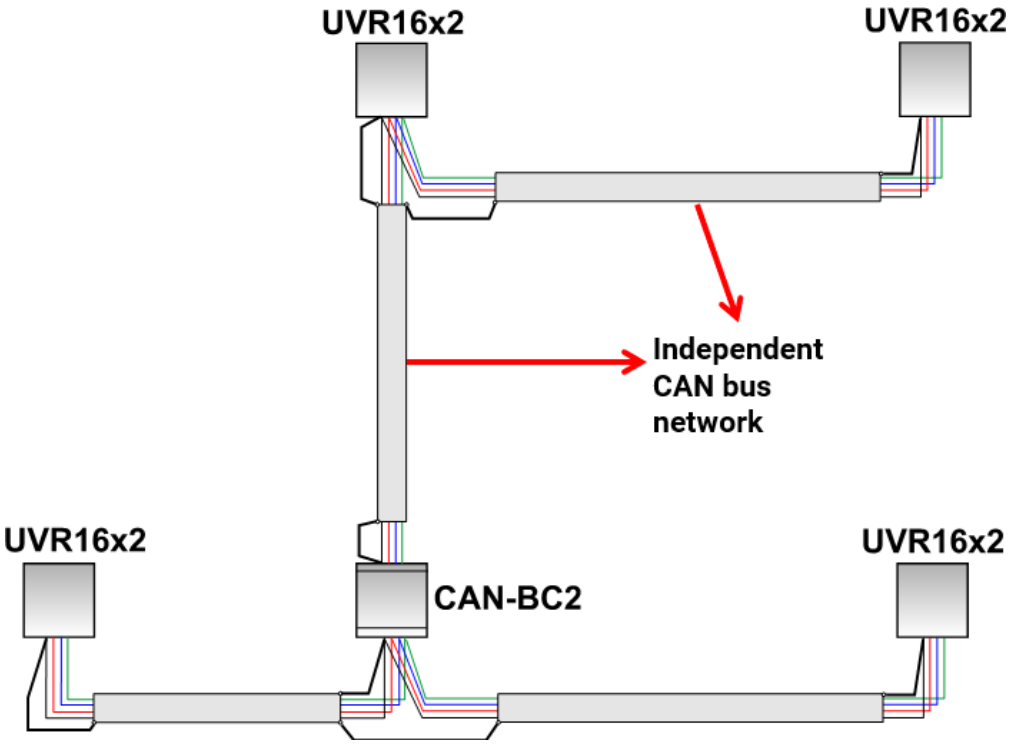
Without CAN bus surge arresters: This version only protects against potential differences **up to 1 kV** and cannot be considered to offer lightning protection. In this case, the cable screen must be earthed at a **single** point between the CAN bus converters, as close to the cable centre as possible. We recommend earthing the screen **indirectly** in the other buildings using a gas discharge arrester.



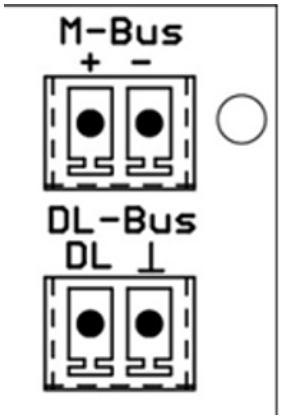
Branch cables

As a general principle, branch cables are **not** permitted in a CAN bus network.

The CAN bus converter is used to provide reliable **long** branch cables. This means the branch cable is disconnected from the other CAN bus network and can be viewed as an independent CAN bus network.



DL bus and M-Bus connections



The polarity of the **M-Bus** connection is reversible.

Data link for DL bus

The DL bus has 2 wires: **DL** and **GND** (sensor earth). The DL bus itself supplies the power supply for the DL bus sensors.

Cables can be routed with a star topology or in series (from one device to the next).

Any cable with a cross-section of 0.75 mm² up to 30 m in length can be used as a **data link**. For longer cables, we recommend the use of a screened cable.

Long cable conduits routed closely next to each other for mains and data links result in faults being induced into the data link from the mains. We therefore recommend a minimum clearance of 20 cm between two cable conduits or the use of screened cables.

Never run the data link together with a CAN bus cable or M-Bus cable in the same conduit.

Bus load of DL sensors

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

Take the "**bus load**" into consideration as sensors have a relatively high current demand:

The bus converter supplies the maximum bus load of **100 %.** The bus loads of the electronic sensors are listed in the technical data of the relevant sensors.

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

M-Bus cable

The M-Bus has 2 wires: **M-Bus** and **GND** (sensor earth). The power supply for reading data from M-Bus devices is provided by the bus converter.

Cables can be routed with a star topology or in series (from one device to the next). Ring topology is not permitted.

A two-wire screened cable is used as the **M-Bus cable** (e.g. telephone cable J-Y(ST)Y 2 x 2 x 0.8 mm). The maximum total cable length depends on the number of M-Bus devices connected and the cable cross-section.

Never run the M-Bus cable together with a CAN bus cable or DL bus cable in the same conduit.

Principles

The CAN bus converter makes additional **interfaces** available for all CAN bus devices.

Furthermore, all the **function modules** in the x2 range are available. These allow bus input values to be processed directly in the bus converter. The results of the functions can be transferred to other devices as network outputs, visualized or logged.

It is programmed using TAPPS2 software. The CAN-BC2 can be operated via the UVR16x2 controller, via CAN-MTx2 or via the C.M.I. interface.

Minimum system requirements

Programming:	TAPPS2 version **1.10**
Visualization:	TA-Designer version **1.17**
Access:	C.M.I. version **1.26.2**
	UVR16x2 version **V1.23**
	CAN-MTx2 version **V1.09**
Datalogging:	Winsol version **2.07**

Interfaces

Potential-free CAN bus with increased interference resistance

The CAN-BC2 is used for **remote connection** within a controller network or by network groups. This could be several groups of CAN bus connections and/or further remote CAN bus subscribers, for example in a heating system.

This interface is electrically **isolated** from the primary CAN bus via an **optical** transmission path.

We recommend using a bus converter at both ends of a long cable, so that no critical electronic parts are directly connected to the bus over the entire remote connection. The CAN-BC2 protects against potential differences of **up to 1 kV** and can therefore **not** be considered to offer voltage surge protection in the case of a lightning strike.

Note: Every CAN bus subscriber is identified with its own **CAN node number** from a total of 62 possible node numbers. When designing the network, bear in mind that a bus converter does **not** disconnect the networks **from a data point of view** and therefore does not increase the number of nodes available. As bus subscribers, **every single** converter is given its **own** node number. This individual number is identical for both CAN sides (primary and potential-free).

M-Bus (measurement bus)

The M-Bus is a master/slave system for reading data from energy and volume meters (electricity, heat, water, gas).

The CAN-BC2 is designed for up to 4 M-Bus "unit loads". Up to 4 M-Bus meters, each with 1 unit load, can therefore be connected. The bus converter (master) cyclically reads the values from the individual devices. The interval time is adjustable.

As a master, this bus converter is therefore suitable for the parallel connection of up to four M-Bus meters (slaves).

In total, a maximum of 32 M-Bus values can be read per bus converter. There must only be one master in the M-bus system.

DL-Bus

The DL bus was developed by Technische Alternative and is designed to read measurements from DL sensors.

It has just 2 wires: **DL** and **GND** (sensor earth). The DL bus itself supplies the power supply for the DL bus sensors.

Modules

The number of interfaces can be increased through the use of modules. Only **one** extension module can be used at a time in the CAN bus converter. These modules are described extensively in their own manuals.

KNX module MD-KNX

This module helps to make it possible to connect the CAN bus network to the KNX bus network. Up to 64 values can be exported to the KNX bus and 64 values can be imported from the KNX bus.

Modbus/M-Bus module

This module has a Modbus RTU 485 interface which can be configured as either master or slave. Up to 64 values can be exported to the Modbus and 64 values can be imported from the Modbus.

In addition, the module has an interface for reading data from a further four M-Bus meters. A further 32 M-Bus values can therefore be read.

Programming with TAPPS2

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

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.

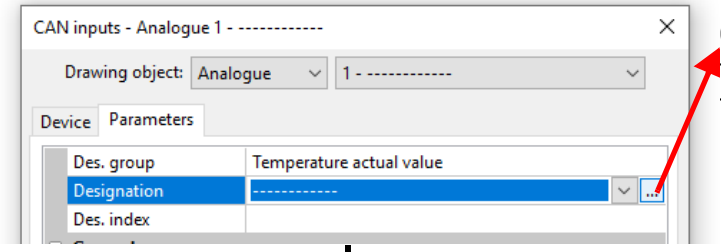
User defined designations

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

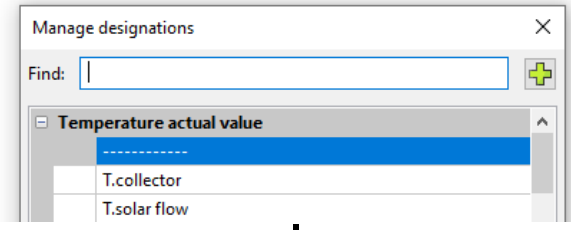
Designations defined previously are available for all elements (functions, fixed values, bus inputs and outputs).

Example:

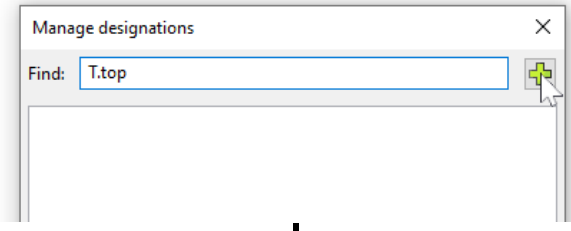
Example: You want to assign the user defined designation "T.top" to CAN input 1.



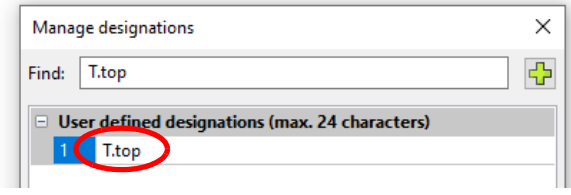
Clicking on this button calls up the window for managing and selecting all designations.



Firstly, the program's default designations are shown. The designations are divided into different groups. A search function makes it easier to find the right one. You only need to enter part of the term you are looking for.



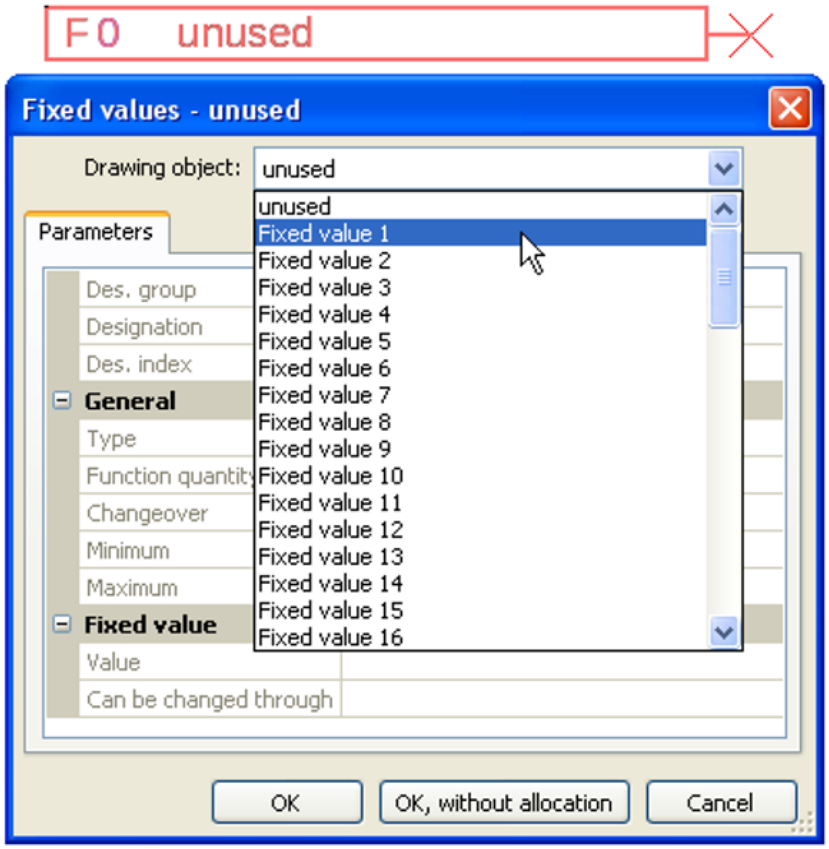
If the required designation is not found, clicking on the plus symbol immediately inserts the term as a user defined designation.



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

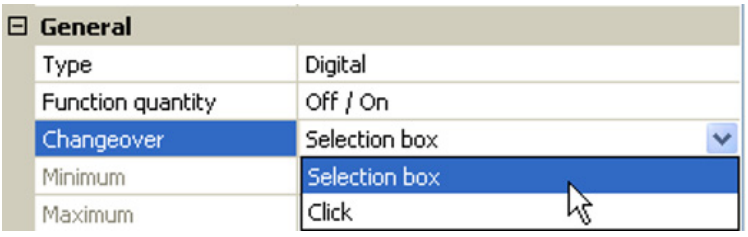
Once the required fixed value is selected, the fixed value type can be defined.

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

Digital

Select the **measured variable**:

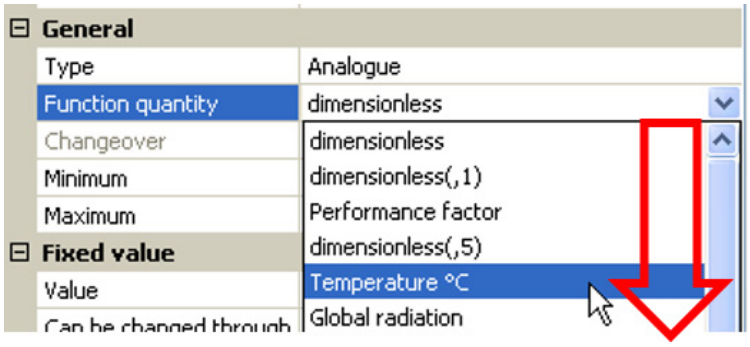
- **Off / On**
- **No / Yes**

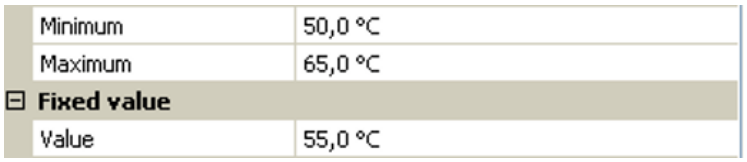


Select whether the status can be changed via a selection box or simply by a click.

Analogue

Select from a wide range of units and dimensions



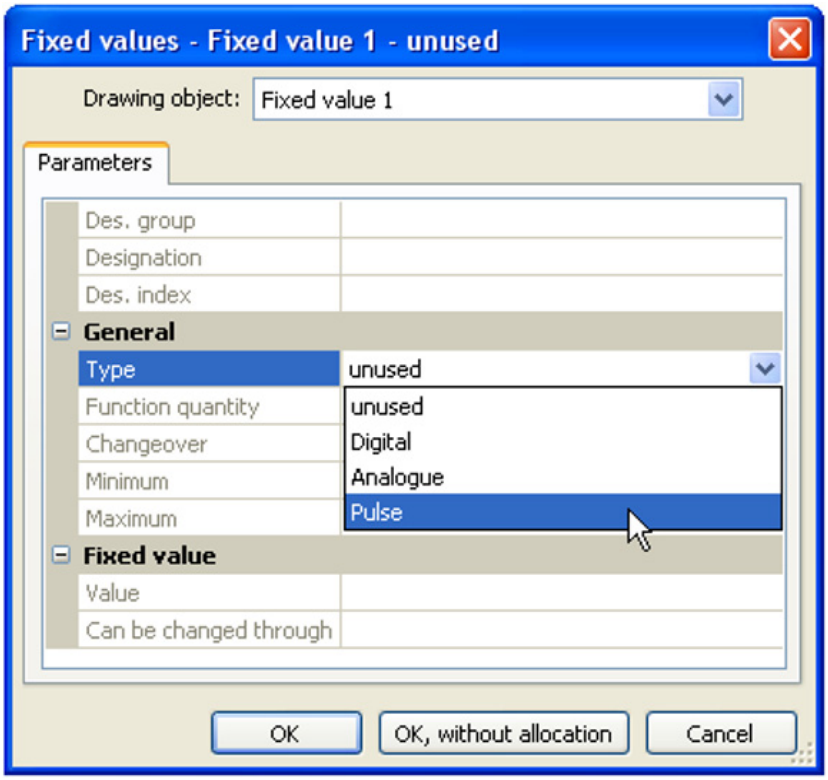


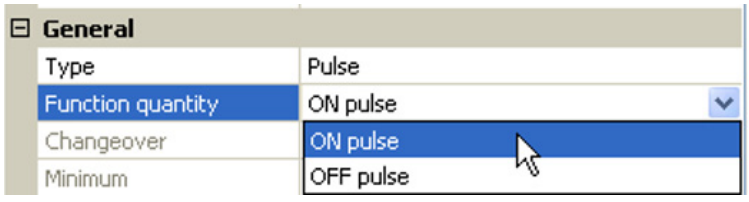
After assigning the **designation**, you must define the permitted limits and the current fixed value. The value can be adjusted in the menu within those limits.

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.

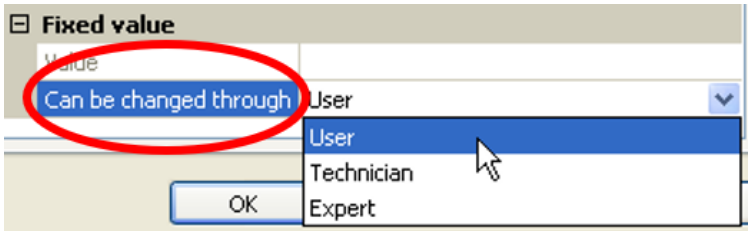
Designation

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:



Functions

You can choose from 43 different functions and create up to 22 functions. Functions can also be applied multiple times.

Input variables are assigned to every function. The input variables provide the function with all the data required for the internal decision.

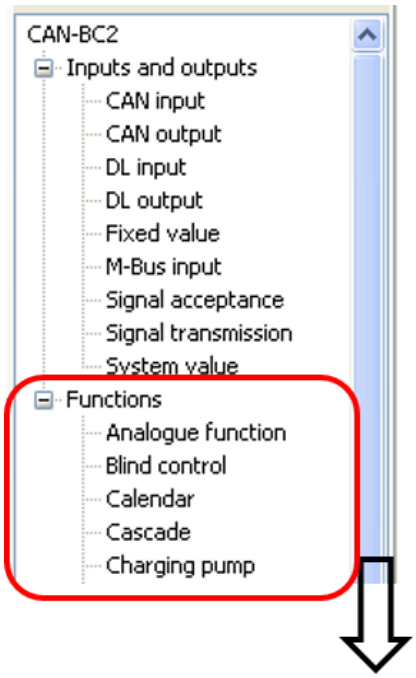
Each function can be activated or deactivated with "**Enable**".

Within each function, data and parameter settings are utilized in order to calculate the decisions and set values, which are then made available as output variables.

A function can therefore only perform tasks in the overall system when connected by its respective input and output variables to other parts of the system (other functions or the network).

The individual function modules are described in the UVR16x2, RSM610 and CAN-IO 45 manuals. This manual only provides general information on how to program functions.

Selecting a new function

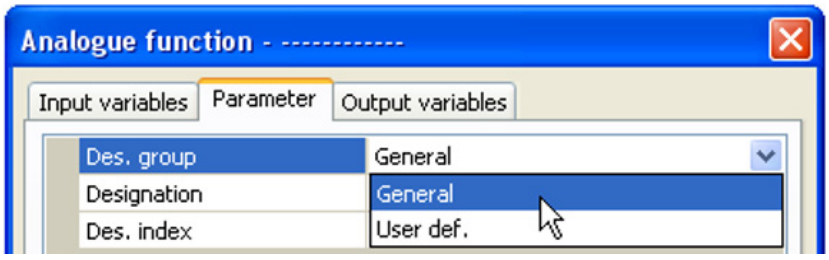


Working with TAPPS2 is described in the manual for **TAPPS2** (see "**Help / Manual**" menu item or "**F1**" key in **TAPPS2**).

Designation

After selecting and inserting the function in the drawing interface, you define the function designation.

Example: Analogue function



Enter the function designation by selecting a predefined designation from a "general" designation group or from user defined designations.

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

How to create user defined designations is described in the "**Designations**" chapter.

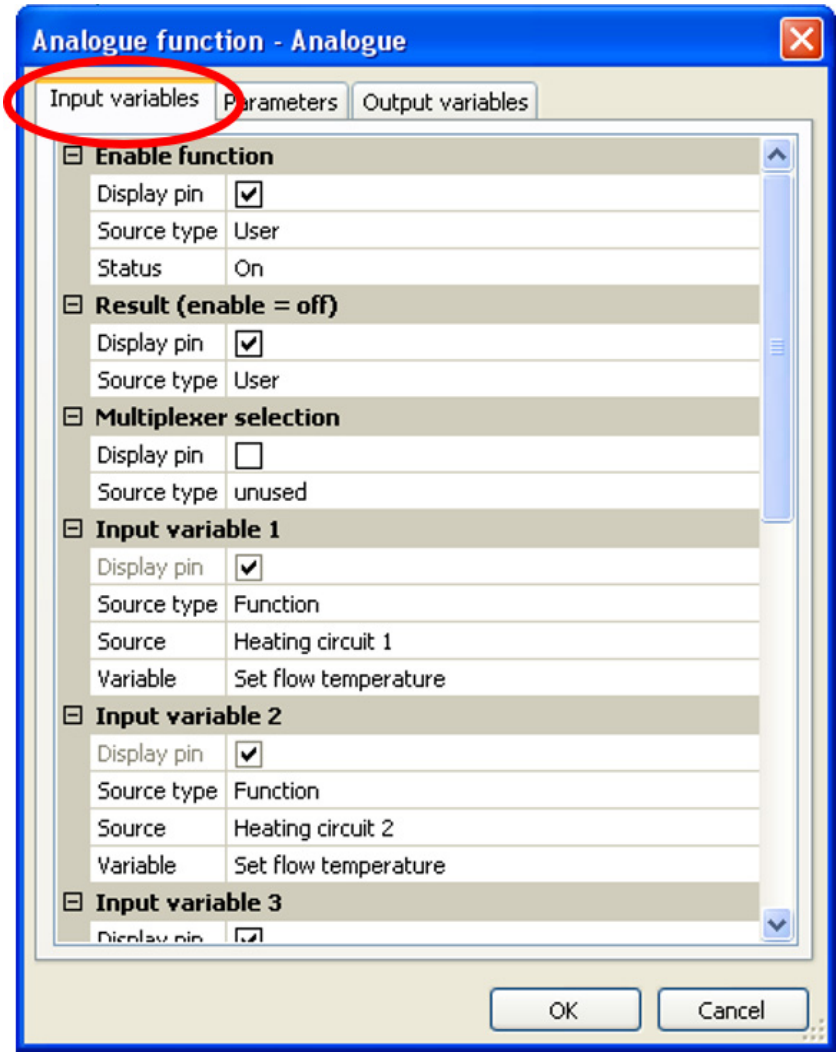
Input variables

Input variables constitute the link to output variables from other function modules or other sources.

The descriptions of the function modules state the signal type for every input variable. **Digital** input signals (ON/OFF) can be applied as ***standard*** or ***inverse***.

Every function module has the "**Enable**" input variable, which represents the fundamental activation of the entire function. It permits simple blocking or enabling of the entire function by means of a **digital signal** (ON/OFF).

Example: Analogue function



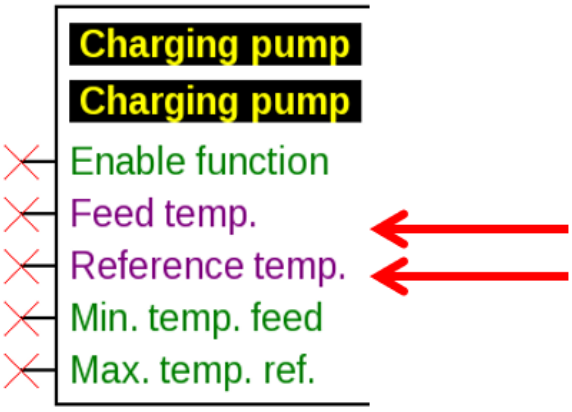
The following **source types** are available to choose from:

- **User**
- **Functions**
- **Fixed values**
- **System values**
- **DL bus**
- **CAN bus analogue**
- **CAN bus digital**
- **M-Bus**
- **KNX bus (only if module is fitted)**
- **Modbus (only if module is fitted)**

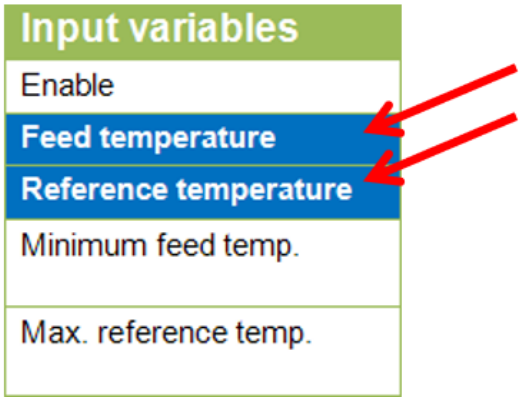
Important: For every input variable, it is important to note the input signal type:
Analogue (numeric value) or **digital** (OFF/ON).

Certain input variables are always **essential** for the function to operate and **cannot** be set to "**unused**". They appear in **purple** in TAPPS2 and are highlighted in the **description** of the functions. Others can be optionally linked to sources.

Example: TAPPS2

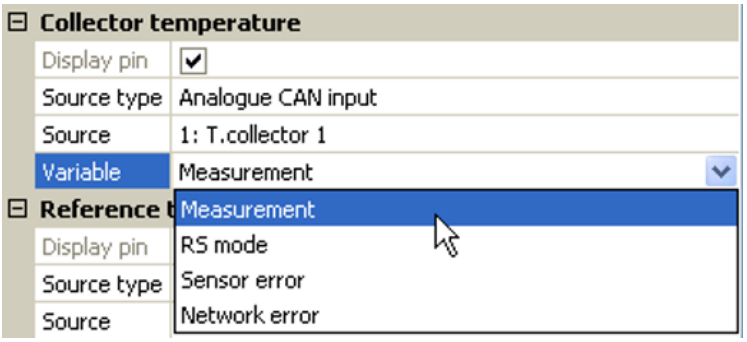


Depiction in the manual:



After linking to the source, you define which information (which variable) from the source will be transferred to the function.

Example: CAN bus analogue



- **Measurement** – the value measured
- **RAS mode** – subject to the setting of the switch on the room sensor (RAS, RASPT, RAS-PLUS, RAS-F), the following analogue values will be issued:

Automatic	0
Standard	1
Lowered	2
Standby	3

- **Sensor error** – digital value; ON if a sensor error occurs
- **Network error** – digital value; ON if a timeout is active (= error). This application is **not** yet available for the M-Bus.

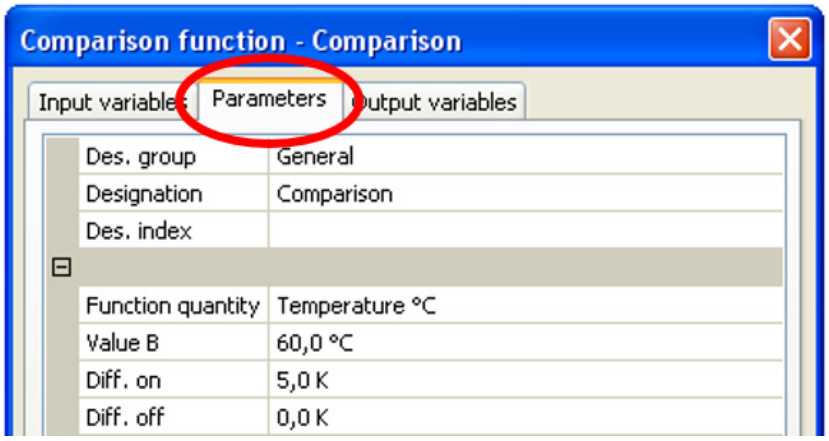
When linked to a **function**, the **output variables** are displayed for selection.

Parameters

These parameters are values and settings which are specified by the user.

They are settings which allow users to adjust the module to match the properties of their system.

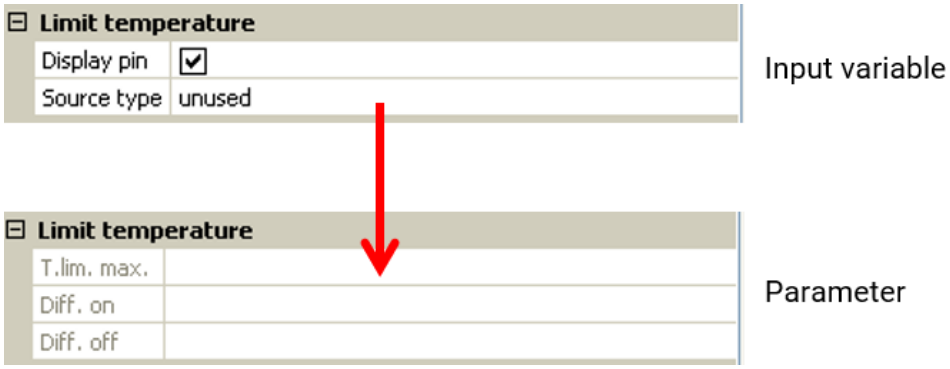
Example: Comparison function



The parameters menu may also be divided into further sub-menus in the C.M.I. view, depending on the function.

If optional sensors are not used, the settings for them are shown in **grey** and they cannot be programmed.

Example: Solar control, limit temperature input variable is unused



Hystereses

Many parameters have adjustable start and stop differentials which have the effect of a switching hysteresis.

Example:

Demand temperature in the Heating demand function

Demand temperature	
T.dem. set	60,0 °C
Diff. on	1,0 K
Diff. off	9,0 K

Demand is triggered at T.dem. set + Diff. on (= **61 °C**); shutdown is triggered at T.dem. set + Diff. off (= **69 °C**).

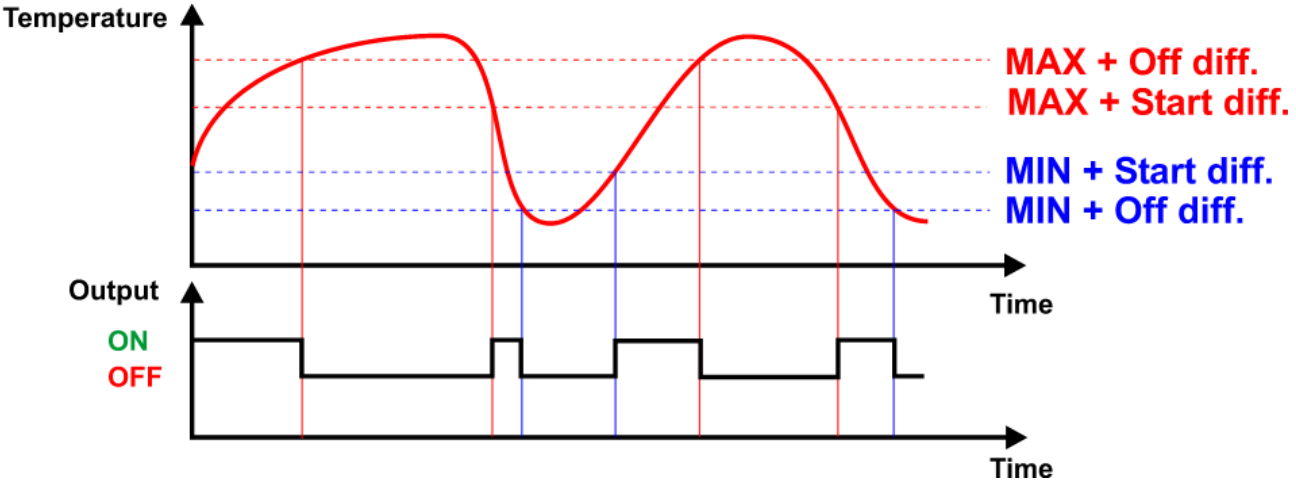
The values of Diff. on and Diff. off can also be negative, but are always added to the set temperature.

Example of a negative Diff value:

Demand temperature	
T.dem. set	60,0 °C
Diff. on	-9,0 K
Diff. off	0,0 K

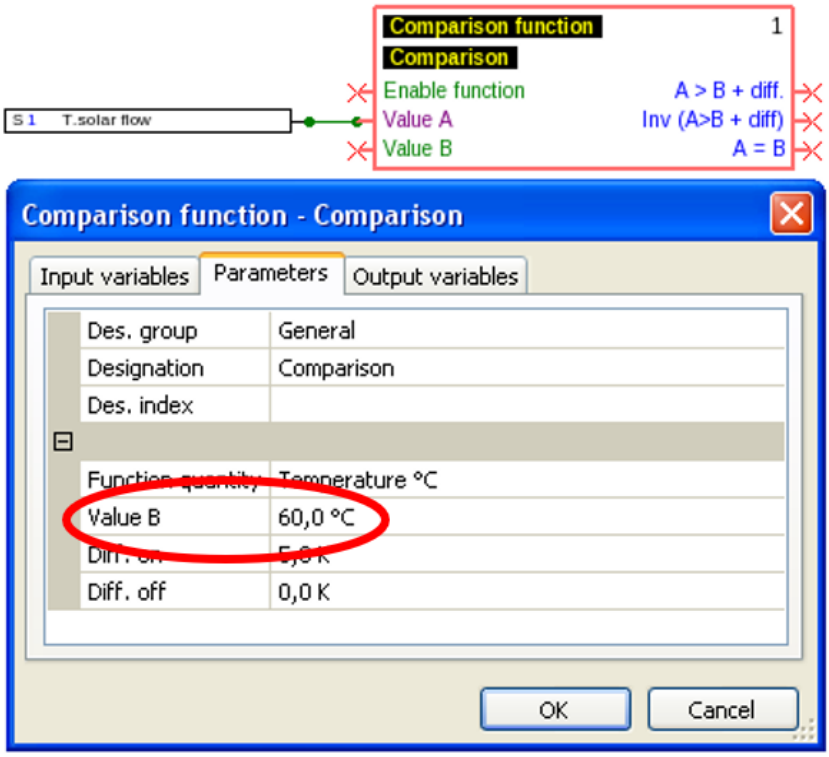
Here, demand is triggered at T.dem. set + Diff. on (= **51 °C**); shutdown is triggered at T.dem. set + Diff. off (= **60 °C**).

Schematic diagram of start and stop differentials for MAX and MIN thresholds

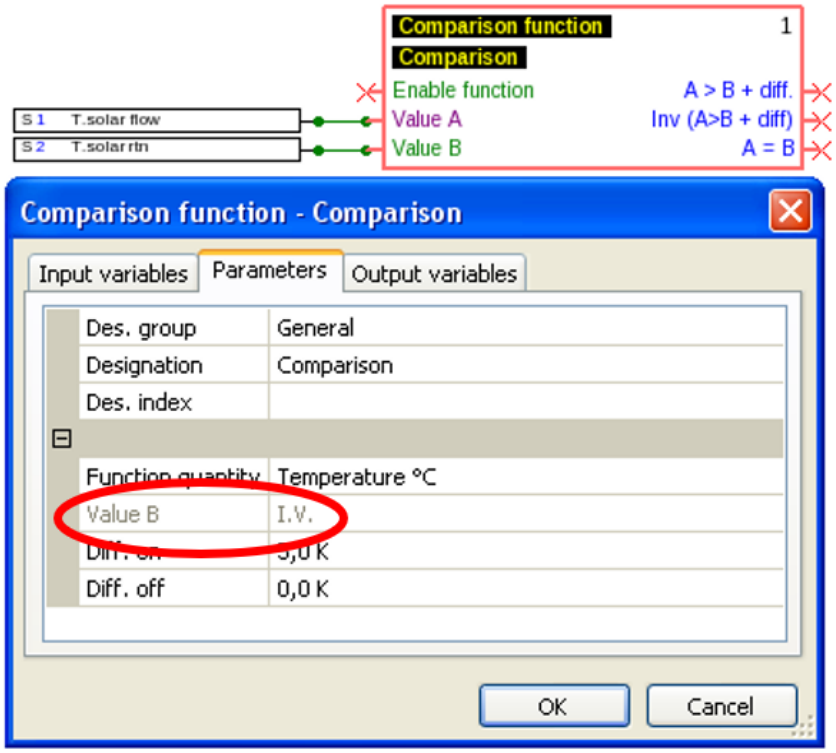


Some **input variables** can be either defined by the user or linked to other sources (inputs, functions, etc.). If they are not linked, their value is defined in the parameters area by the user instead. However, if the link is set up, the value will be displayed in grey in the parameters area and "I.V." will be given as the value.

Example: Comparison function



Value B was **not** linked in the input variables and must therefore be defined in the parameters.



Value B was linked in the input variables, so the value is shown in grey in the parameters with "I.V.".

Function quantities

In many functions you can choose from a wide range of function quantities. These function quantities have units with varying numbers of decimal places.

In all function calculations (exception: curve function), the units are converted to the **smallest** unit in each case (l/min to l/h; min, h and days to s; MWh to kWh; m/s to km/h; m and km to mm; mm/h and mm/min to mm/day; m³/h and m³/min to m³/day)

Table of all function quantities

Function quantity	Decimal places	Function quantity	Decimal places
dimensionless	**0**	Liter	**0**
dimensionless (,1)	**1**	Cubic meter	**0**
Performance factor	**2**	Flow rate (all)	**0**
dimensionless (,5)	**5**	Output [kW]	**2**
Temperature °C	**1**	Energy kWh	**1**
Global radiation [W/m^2]	**0**	Energy MWh	**0**
CO_2-content [ppm]	**0**	Voltage [V]	**2**
Percent	**1**	Amperage [mA]	**1**
Absolute humidity [g/m^3]	**1**	Amperage [A]	**1**
Pressure [bar]	**2**	Resistance [kΩ]	**2**
Pressure [mbar]	**1**	Number of pulses	**0**
Pressure [Pascal]	**0**	Speed (all)	**0**
Seconds	**0**	Euro	**2**
Minutes	**0**	Dollar	**2**
Hours	**0**	Degree (angle)	**1**
Days	**0**		

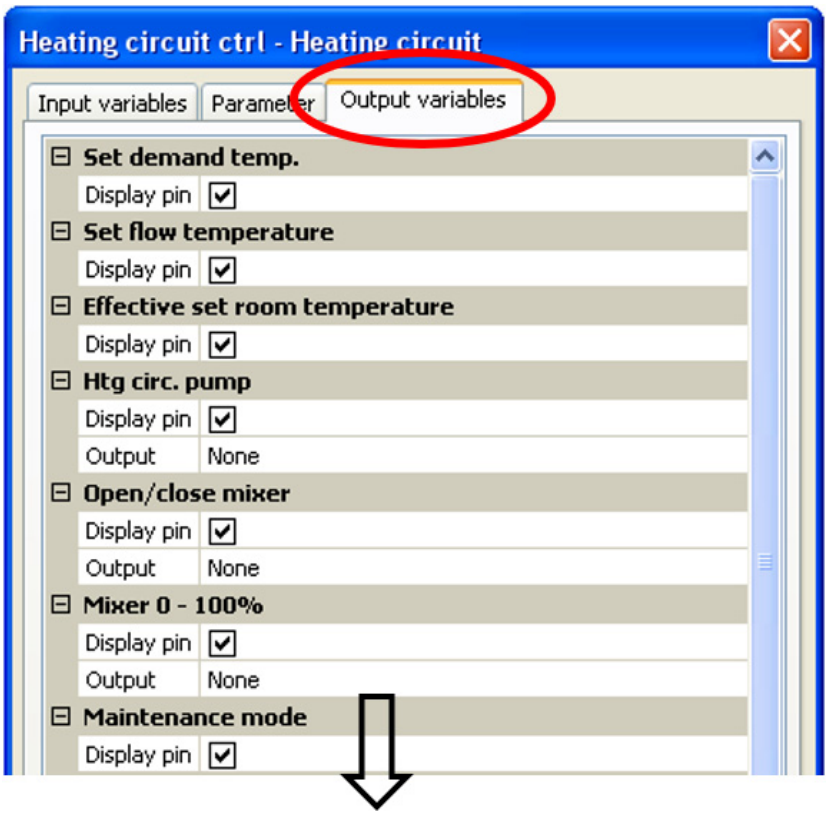
Example: If a value of 100.0 % (Percent function quantity) is applied as "dimensionless" in a function, the value will be the dimensionless size 1000.

Output variables

Output variables represent the results of the function module. They can serve as the input variables for another function, or can be linked to bus outputs. A single output variable can also be linked **multiple times** to function input variables or bus outputs.

The number of output variables varies greatly depending on the function.

Example: In the "**Comparison**" function there are just 3 output variables; in the "**Heating circuit**" function there are 23.



Important: For every output variable, it is important to note the type of variable value for further links:

Analogue (numeric value) or **digital** (OFF/ON).

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**.

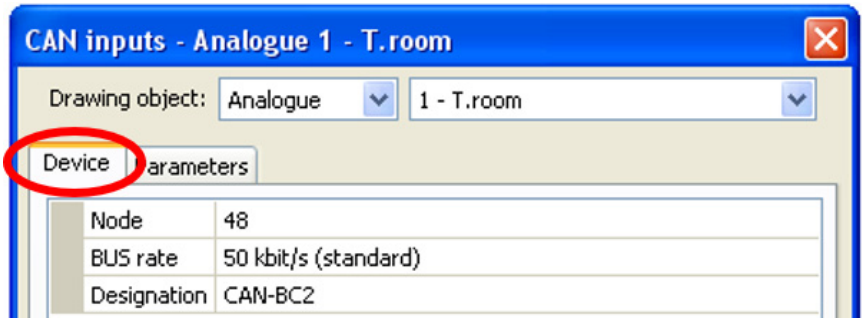
Up to 62 CAN bus devices can be operated in one network.

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.

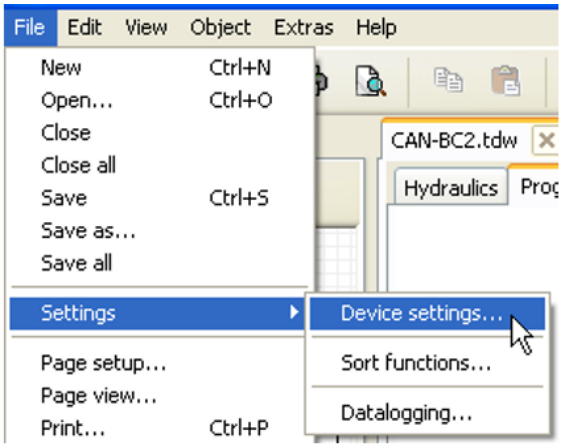
If a CAN input or CAN output is inserted into the drawing, the device settings can be defined for the first time. These settings then apply to all other CAN elements as well.

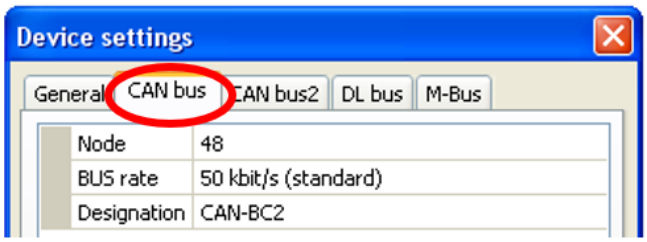
CAN settings for the converter

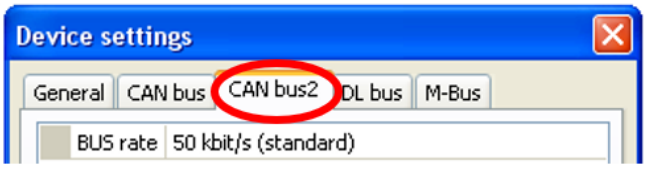


The bus rate setting only applies to the primary CAN bus network.

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







Primary CAN bus network **Potential-free CAN bus network**

Node

Definition of a **unique** CAN node number (setting range: 1-62). The node number applies to **both** sides of the bus converter. The factory-set node number of the converter is 48.

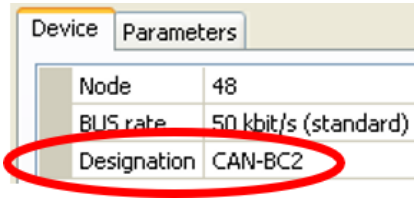
Bus rate

The standard bus rate of the CAN network is **50 kbit/s** (50 kBd), which is preset for the CAN bus devices. An individual bus rate can be set for each side of the CAN bus converter ("CAN bus 2" = potential-free, disconnected CAN bus network).

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

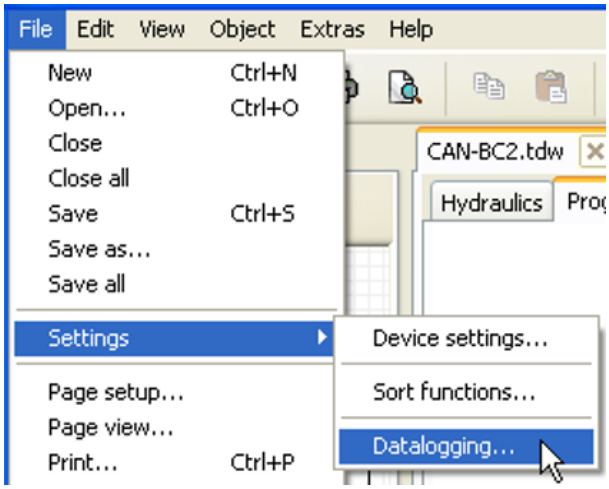
The bus rate can be set to between 5 and 500 kbit/s, with lower bus rates allowing longer cable networks (see installation instructions).

Designation



Every converter can be given its own designation.

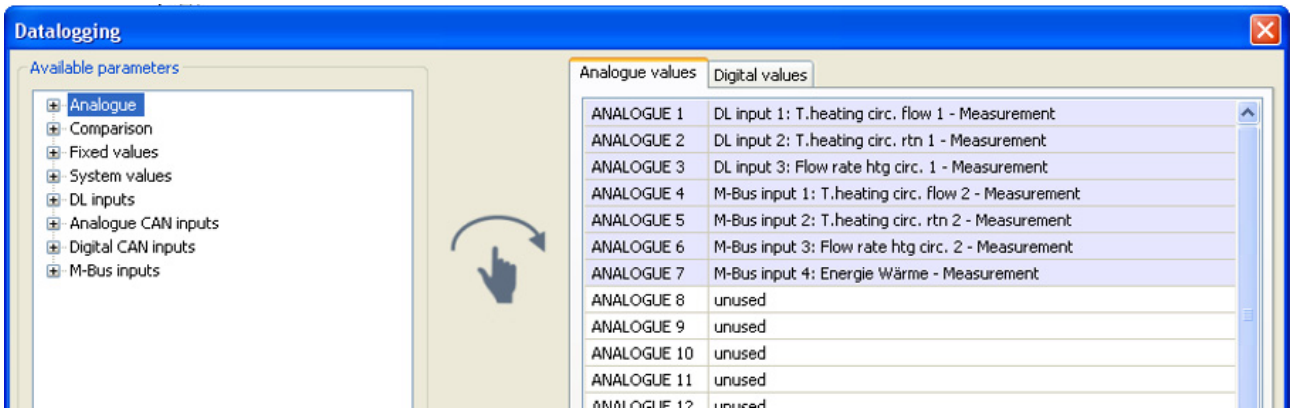
Datalogging



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

There are no pre-set values.

Example: Some analogue values have already been defined for CAN datalogging



CAN datalogging requires C.M.I. version 1.26.2 or higher and Winsol version 2.07 or higher.

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 bus converter saves the current values to a logging buffer and locks this to prevent overwriting (if requests are received from another C.M.I.) until the data is read, at which point the logging buffer is 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 bus converter can issue a maximum of 64 digital and 64 analogue values that are defined in the "**CAN bus/datalogging**" menu.

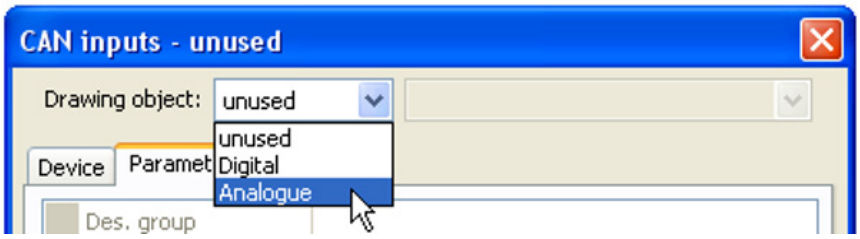
The sources for the values to be logged can be M-Bus / DL bus / CAN bus inputs, function output variables, fixed values and system values.

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.

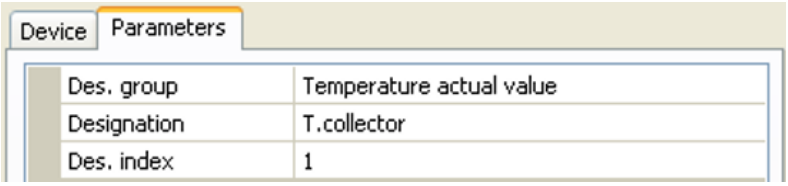
Example: On CAN analogue **input** 1, the value applied is that of CAN analogue **output** 1 **from** the device with node number 1.

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.

Example:



CAN bus timeout

Definition of 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 imported 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 last value transmitted or a definable substitute value should be issued (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 the 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 the **sensor check** is set to active, a monitoring function.

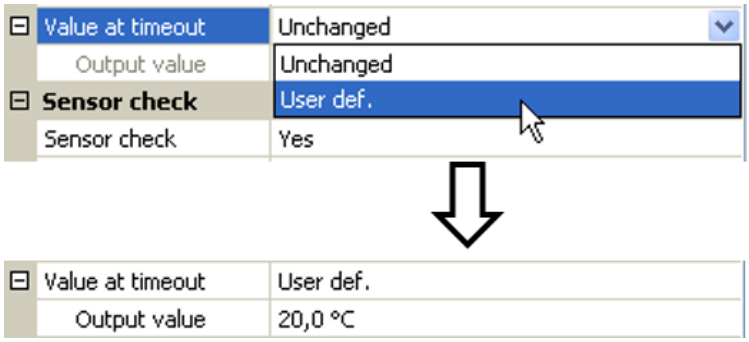
Unit	
Measured variable	User def.
Unit	Temperature °C
Sensor correction	0,0 K

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.



Sensor check

If you set the 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

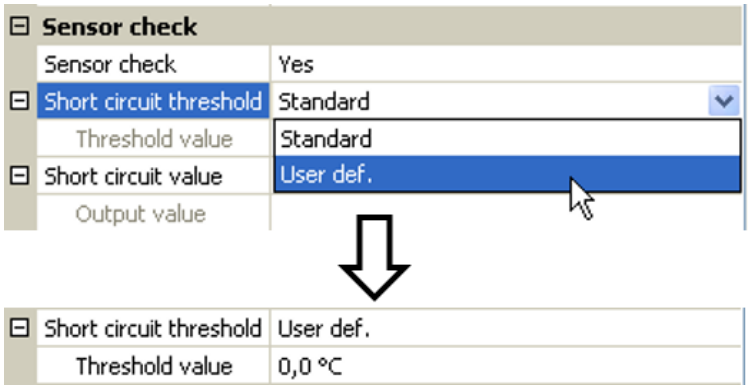
This setting is only displayed if **sensor check is active and** the measured variable is set to "**User def.**".

If the "**Sensor check**" is active, the **sensor error** from a CAN input is available as a function input variable: status "**No**" for a sensor that is working correctly and "**Yes**" for one that is faulty (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 a short circuit or 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, the sensor error is available for **all** inputs, CAN inputs and DL inputs.

CAN digital inputs

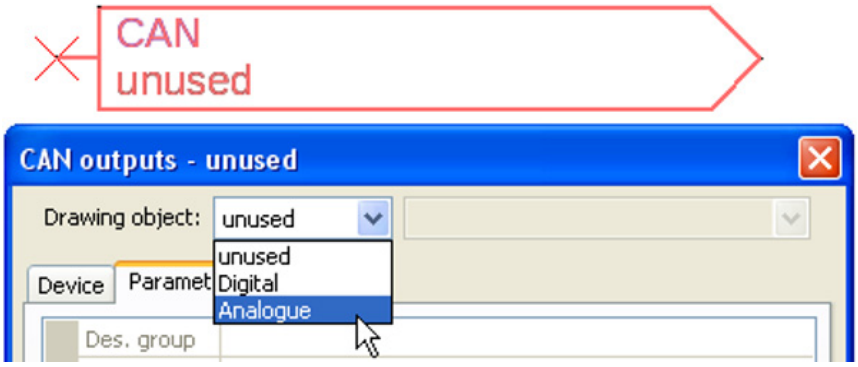
Up to 64 CAN digital inputs can be programmed. They are defined by specifying the **transmission** node number and the number of the **transmission** node's CAN output.

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 last status transmitted ("Unchanged") or a definable substitute status should be issued if 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 bus converter.



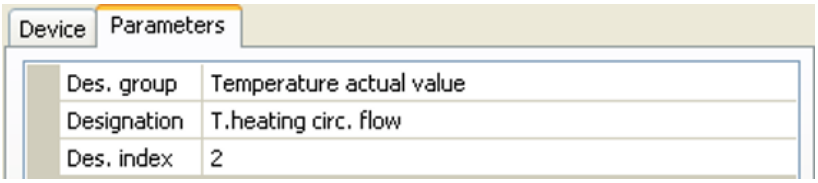
Link to the source in the module which supplies the value for the CAN output.

- **DL inputs**
- **M-Bus inputs**
- **KNX inputs (with fitted module)**
- **Modbus inputs (with fitted module)**
- **Functions**
- **Fixed values**
- **System values**

Example: Source: M-Bus input 1

Input variable	
Source type	M-Bus input
Source	1: T.heating circ. flow 2
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.

Transmission condition

Example:

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

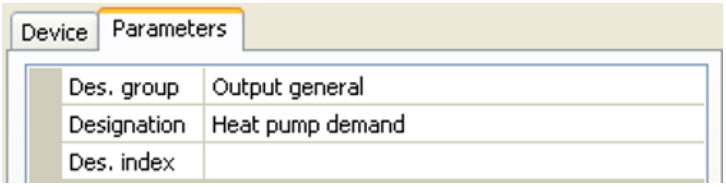
If change > 10	A new transmission will be made if the current value has changed by more than the quantity specified (1.0 K in this example) compared to the last transmitted value. In the module, the unit of the source is applied together with the corresponding decimal place. (Minimum value: 1)
Blocking time 00:10 [mm:ss]	If the value changes within 10 seconds of the last transmission by more than 1.0 K, the value is nevertheless only transmitted again after 10 seconds. (Minimum value: 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 value: 1 minute)

CAN digital outputs

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

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

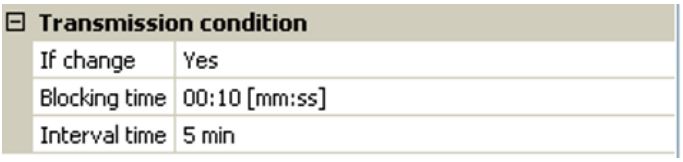
Designation



Every CAN digital output can be given its own designation. The designation can be selected from various designation groups or can be user defined.

Transmission condition

Example:



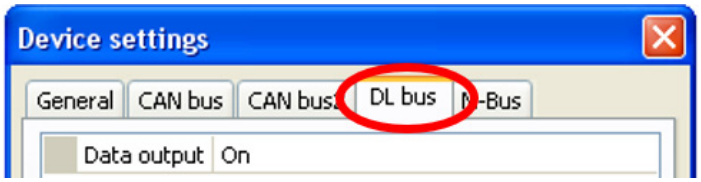
If change yes/no	Transmission of the value if a status change occurs
Blocking time 00:10 [mm:ss]	If the value changes within 10 seconds of the last transmission, the value is nevertheless only transmitted again after 10 seconds. (Minimum value: 1 sec)
Intervallzeit 5 Min	The value is transmitted every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

DL bus

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

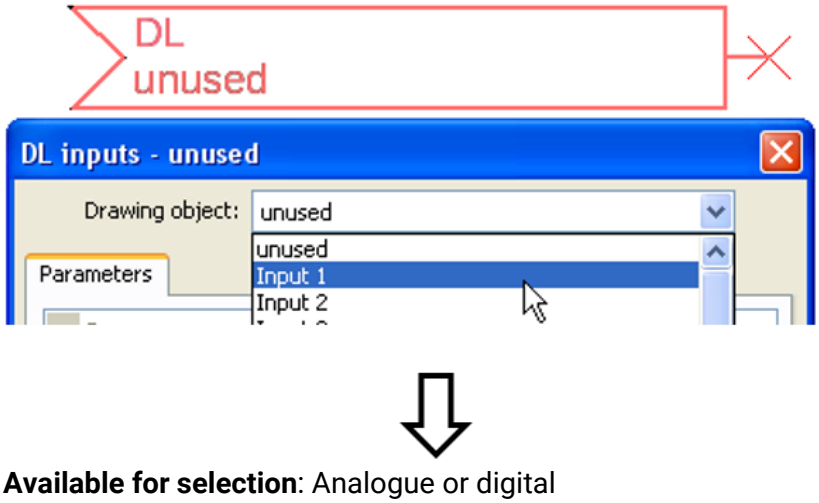


In the "File / Settings / Device settings / DL bus" menu, you can activate or deactivate the data **output** for **datalogging** via the DL bus and for display on the **RAS-PLUS** room sensor. The C.M.I. is used for DL datalogging. Only the input and output values and the 2 heat meters are included in 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



Available for selection: Analogue or digital

General	
Type	Analogue
Address	1
Index	1

DL bus address and DL bus index

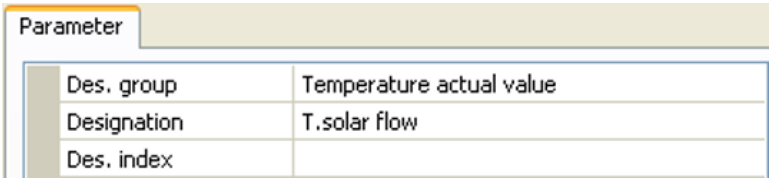
Every DL sensor must have its own **DL bus address**. Setting the address of a DL sensor is described in the sensor's datasheet.

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.

Example:



DL bus timeout

As long as the information continues to be imported 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 last value transmitted or a definable substitute value should be issued (only when the measured variable is set to: **User def.**).

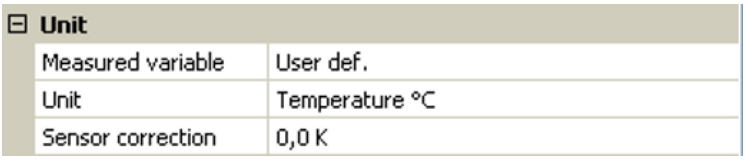
The **network error** can also be selected as the source of a function input variable, which allows the controller to react appropriately to a failure of the DL bus or DL sensor.

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

Unit

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

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



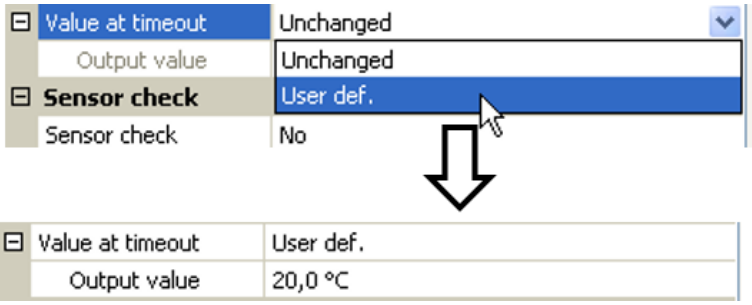
Every DL input is assigned a **unit**, which can differ from the unit used by the DL sensor. A wide range of units is available to choose from.

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 the 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.



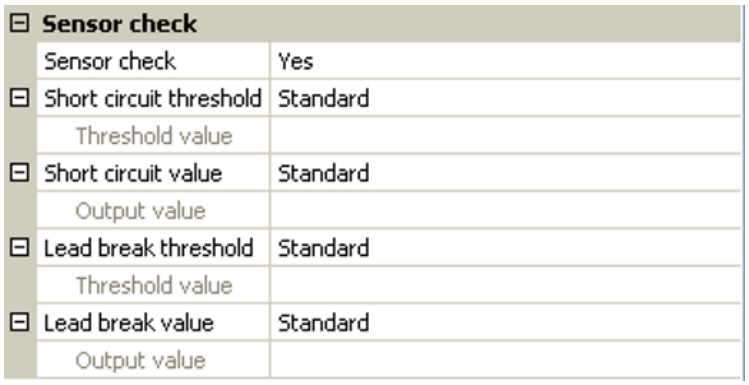
Sensor check

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

Sensor error

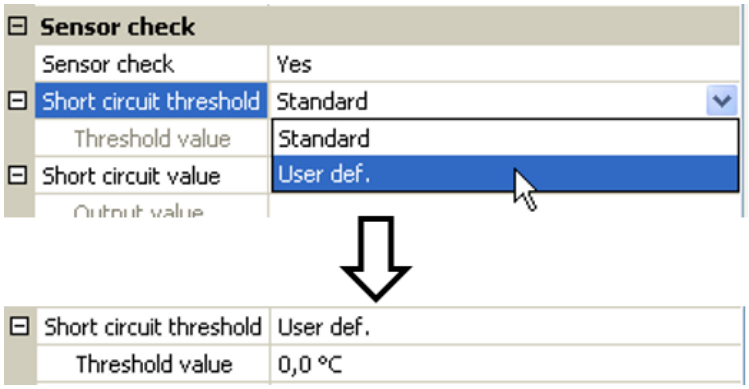
This setting is only displayed if **sensor check is active** and the measured variable is set to "**User def.**".

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



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 a short circuit or 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 as well as analogue values. 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:

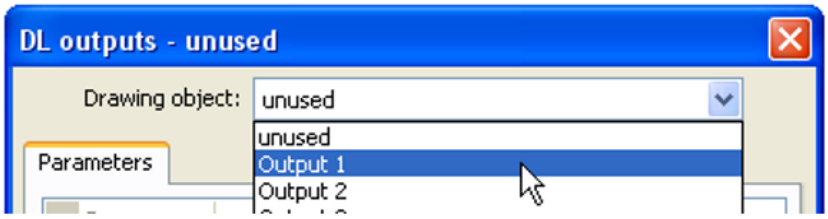
The bus converter supplies the maximum bus load of **100 %**. The bus loads of the DL sensors are listed in the technical data of each DL sensor.

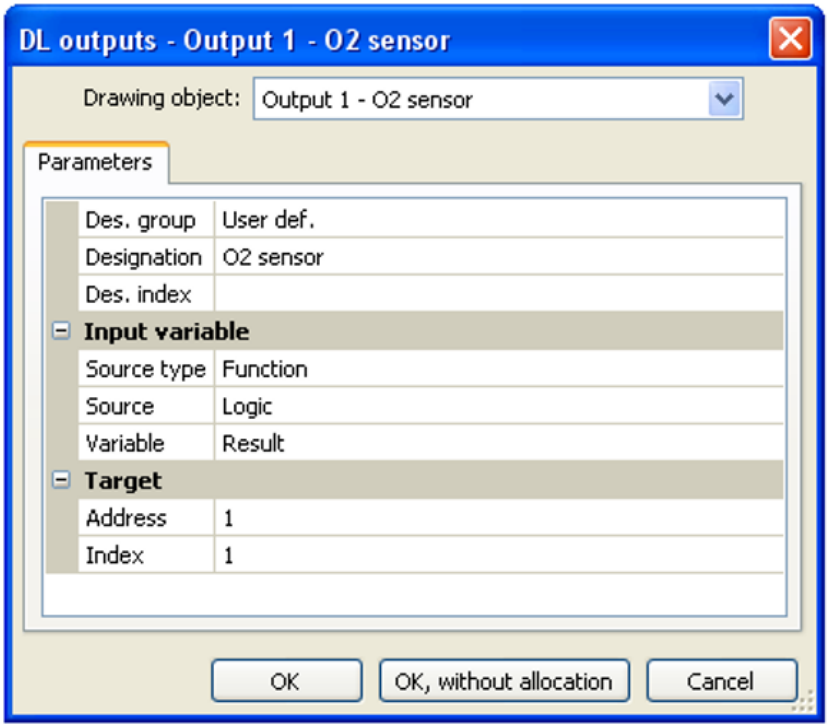
Example: DL sensor FTS4-50DL has a bus load of **25 %**. Consequently up to four FTS4-50DL sensors can be connected to the DL bus.

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 issued.

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.

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

Provision has been made for the specification of an index number, but there is not yet any DL bus device which requires that information.

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

M-Bus

The M-Bus is a master/slave system for reading data from energy and volume meters (electricity, heat, water, gas).

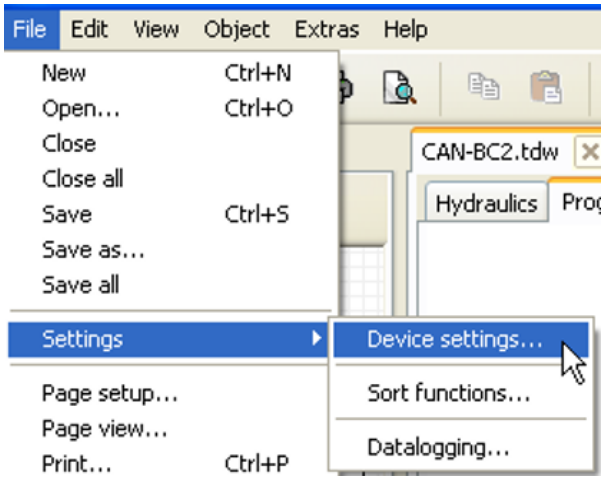
The CAN-BC2 is designed for up to 4 M-Bus "unit loads". Up to 4 M-Bus meters, each with 1 unit load, can therefore be connected. The bus converter (master) cyclically reads the values from the individual devices. The interval time is adjustable.

As a master, this bus converter is therefore suitable for the parallel connection of up to four M-Bus meters (slaves).

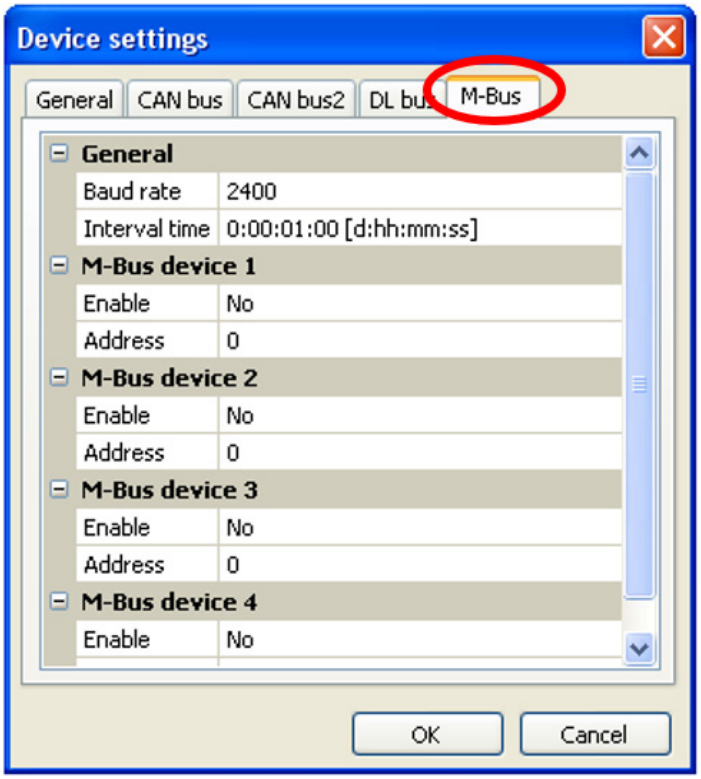
In total, a maximum of 32 M-Bus values can be read per bus converter. There must only be one master in the M-bus system.

This menu contains all the information and settings needed to set up an M-Bus network.

Settings



In the Device settings / M-Bus menu, the general settings for the M-Bus and the addresses of the M-Bus devices are defined



Baud rate

The standard baud rate of the M-Bus devices is 2400 Bd. The factory setting does therefore not usually need changing.

Interval time

The readout intervals can be adjusted from 10 seconds to 2 days. Longer intervals use up less battery life in battery operated M-Bus meters.

M-Bus device 1 – 4

For every connected M-Bus device, enabling must be set to "**Yes**" and the **primary** slave **address** must be entered (between 0 and 250). The primary slave address is set at the M-Bus device in accordance with the manufacturer's instructions.

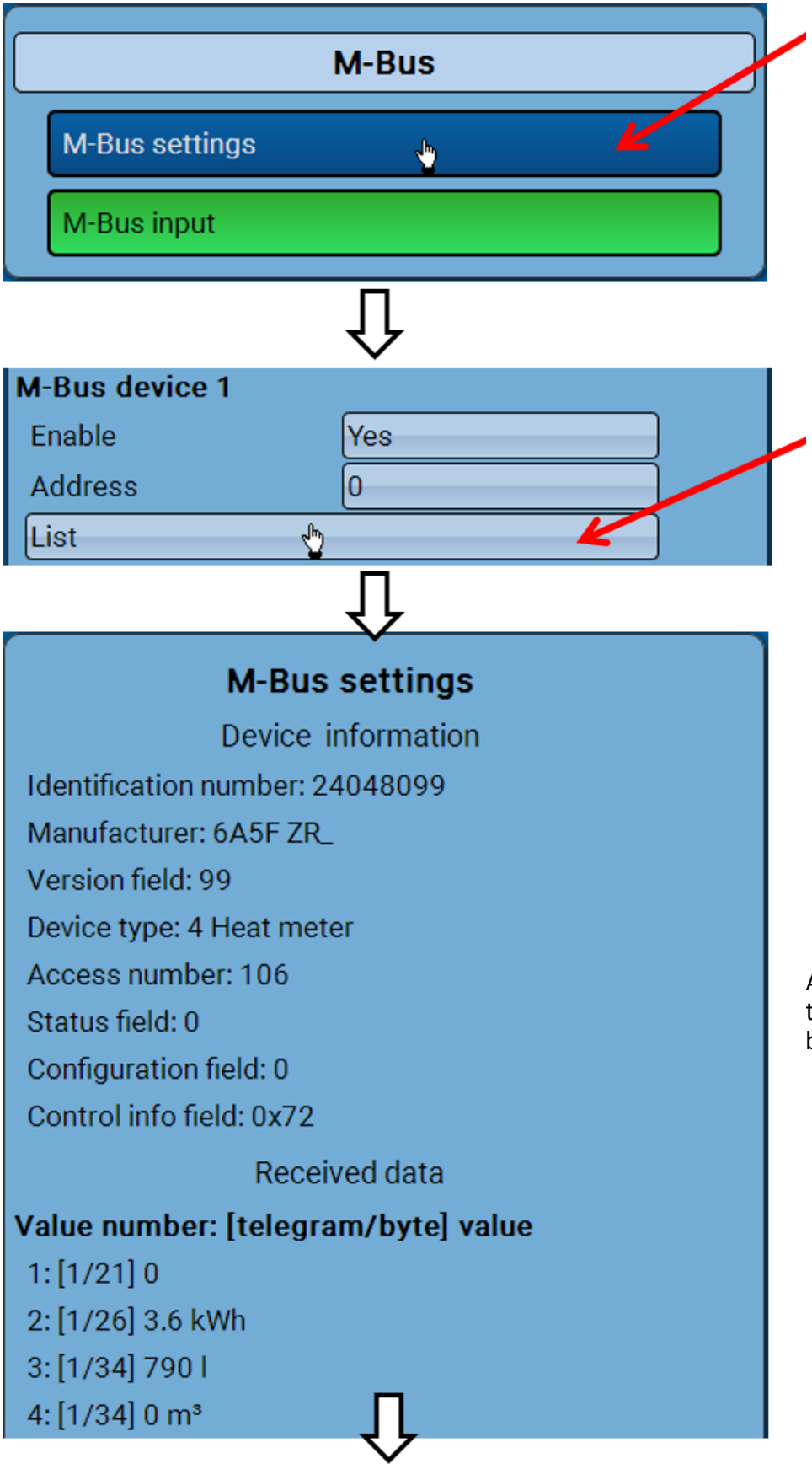
The same slave address cannot be used twice in the M-Bus network.

M-Bus Eingang

Up to 32 M-Bus inputs can be programmed.

For a **connected** M-Bus device, device information and data received can be **read** by pressing the "**List**" button.

Example: C.M.I. view for a connected M-Bus meter



After 255 access attempts, the access number is reset to 0.

Device information

Information about the device and manufacturer is shown at the top. The item "Data type" also enables "Device information" to be selected, in order to read out data such as the identification number or device type.

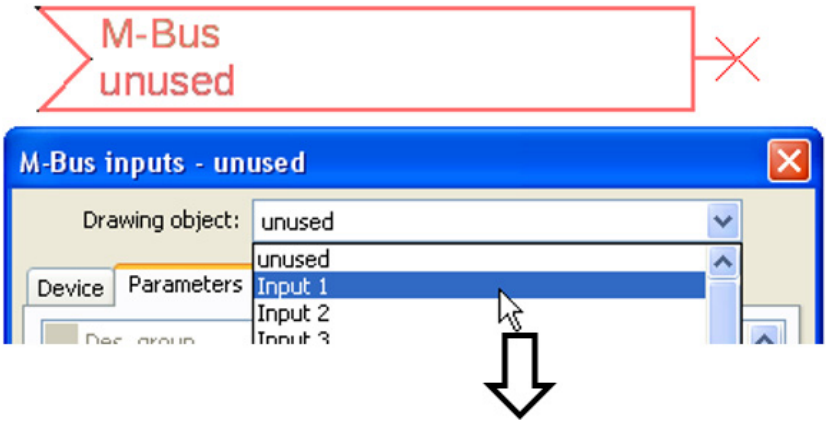
Received data

Up to 128 values per meter can be shown here. The order is defined according to the telegram address and the **start byte**. In addition, the value read is shown with the unit.

Example: Value 2 comes from telegram address 1 and start byte 26. Values 3 and 4 both relate to byte 34, but with different units.

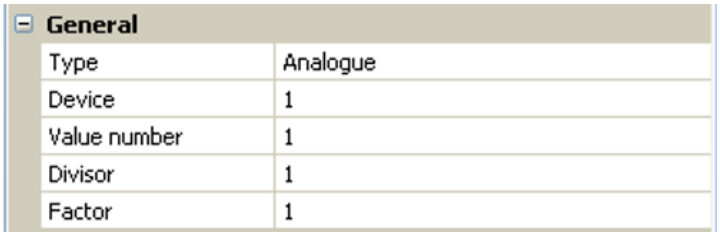
The manuals issued by the M-Bus device manufacturers contain more details about the values.

Example: Programming the parameters of M-Bus input 1



Available for selection: **Analogue** or **digital**

In most cases, analogue (numeric) values are applied.



General

Device: Entry of the **device number** as per the device settings (1-4)

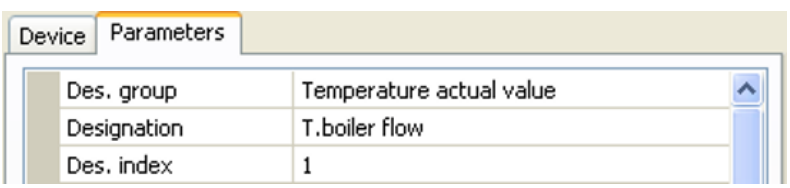
Value number: Entry of the value number from the "**List**" of device information read (C.M.I. menu **M-Bus settings**)

Divisor / factor: Entry of a divisor or factor to adjust the value read to the actual quantity (e.g. correct positioning of the decimal point).

Designation

Every M-Bus input can be given its own designation. The designation can be selected from various designation groups or can be user defined. In addition, up to 16 index numbers can be issued.

Example:



Unit

If the measured variable is set to "**Automatic**", the unit of measurement specified by the M-Bus device will be applied in the bus converter.

Unit	
Measured variable	Automatic

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

Unit	
Measured variable	User def.
Unit	Temperature °C
Sensor correction	0,0 K
Value at timeout	Unchanged

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

Sensor correction

The value of the M-Bus input can be corrected by applying a fixed differential value.

Value at timeout

This setting is only displayed if the measured variable is set to "**User def.**". This application is **not** yet available.

Sensor check

If you set the sensor check to "**Yes**", the **sensor error** of the M-Bus value is available as a digital input variable for a function.

This application is only useful if user defined threshold and output values are specified for the sensor error.

Sensor check	
Sensor check	Yes

Sensor error

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

Sensor error: Status "**No**" for a correct value **within** the threshold values and "**Yes**" for a value **outside** the thresholds. This allows the controller to react to the failure of an M-Bus device, 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	

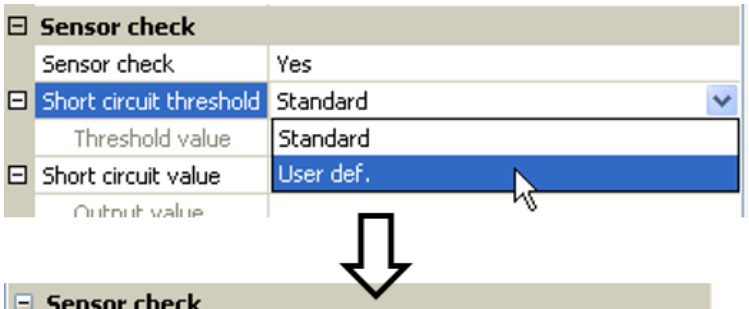
In order to make good use of the sensor check, the short circuit and lead break thresholds should be changed from "Standard" to "**User defined**" and the required threshold values defined. The required short circuit and lead break values will subsequently also be defined by the user.

If the measurement read is **below** the defined **short circuit threshold** or **exceeds** the **lead break threshold**, the relevant **output values** will be applied instead of the measurement.

By selecting suitable thresholds and output values, a fixed value can be specified for the bus converter in the event of a measurement failure, to allow a function to continue operating in emergency mode (fixed hysteresis: 10 or 1.0 °C).

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

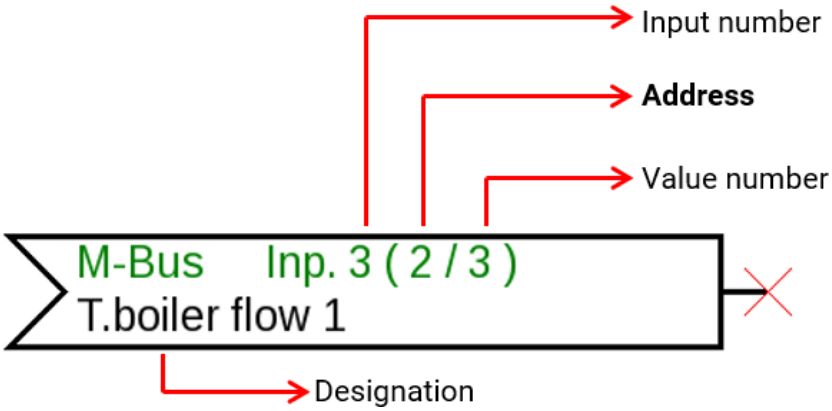
Example: Temperature



Sensor check	
Sensor check	Yes
Short circuit threshold	User def.
Threshold value	10,0 °C
Short circuit value	User def.
Output value	50,0 °C
Lead break threshold	User def.
Threshold value	100,0 °C
Lead break value	User def.
Output value	70,0 °C

If the measurement is below 10 °C, 50 °C will be issued; if it exceeds 100 °C, 70 °C will be issued.

Once the parameter entries have been completed by pressing **OK**, the M-Bus input in **TAPPS2** will look like this:



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

"Date" system values

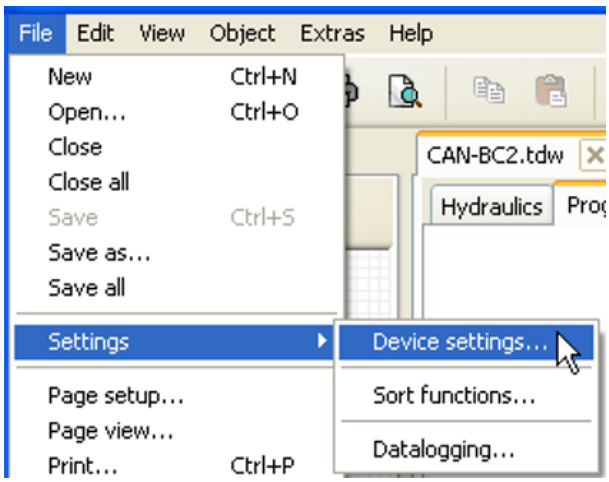
- **Day**
- **Month**
- **Year (without century)**
- **Day of the week (starting with Monday)**
- **Calendar week**
- **Day of the year**
- **Day pulse**
- **Month pulse**
- **Year pulse**
- **Week pulse**

The "Pulse" values generate a single pulse per time unit.

"Sun" system values

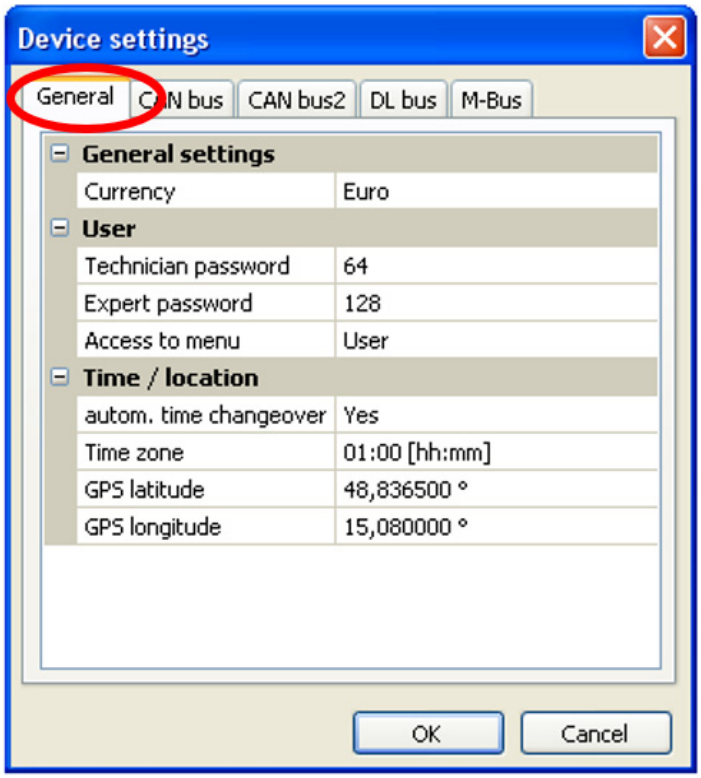
- **Sunrise** (time)
- **Sunset** (time)
- **Minutes until sunrise** (on the same day; does not go beyond midnight)
- **Minutes since sunrise**
- **Minutes until sunset**
- **Minutes since sunset** (on the same day; does not go beyond midnight)
- **Solar altitude** (see shading function)
- **Direction 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 bus converter and bus settings to be made.

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.

Bus settings

These settings are described in the chapters on the relevant bus.

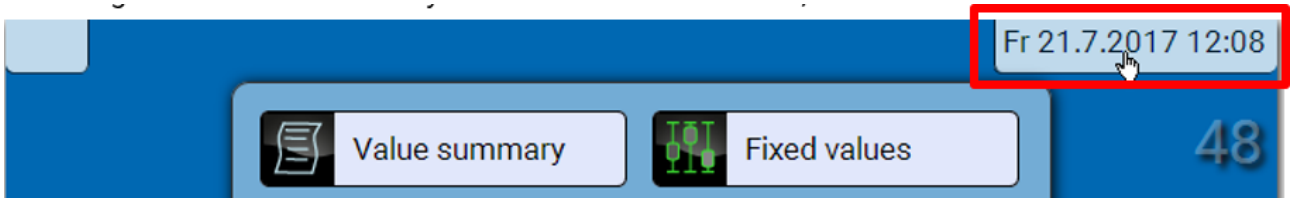
C.M.I. Menü

Date / time / location

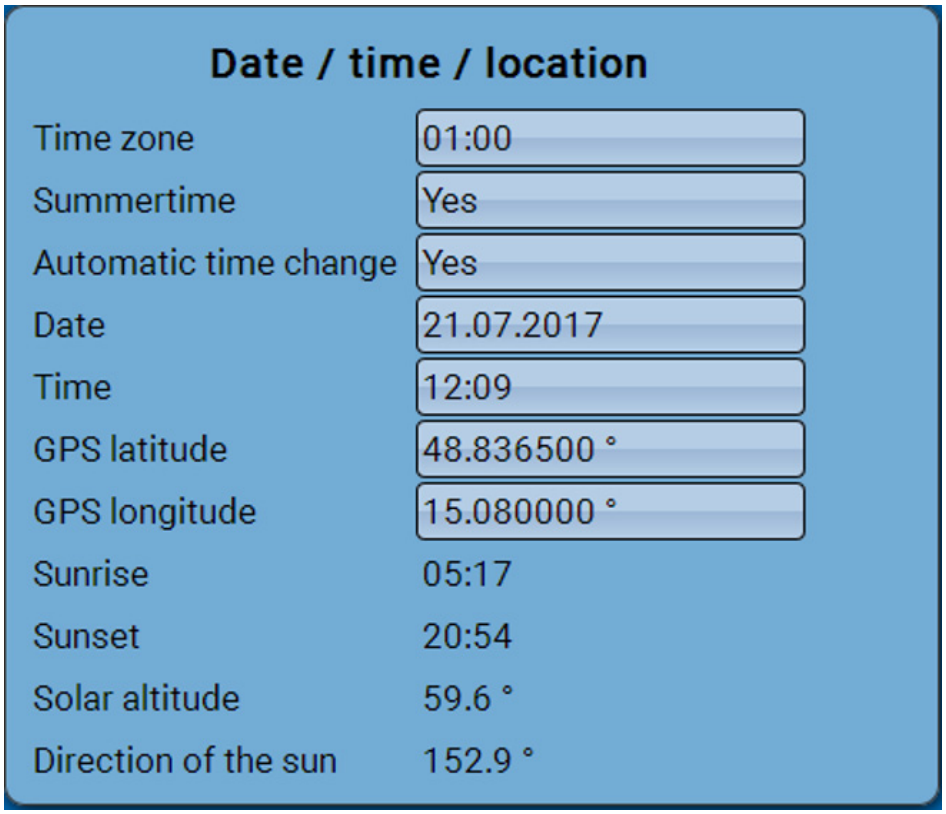
The **Date** and **Time** are shown in the status line at the top right.

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

Selecting this 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.

The system value parameters are displayed first.

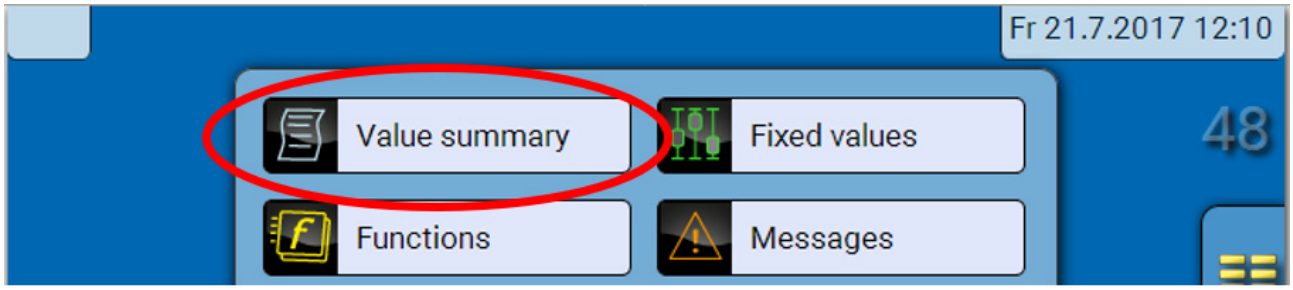
- **Time zone** – specifies the time zone relative to **UTC** (= "Universal Time Coordinated", also known as GMT (= Greenwich Mean Time)). In the example, the time zone is set to "UTC + 01:00".
- **Summertime** – "**Yes**" if summertime is active.
- **Automatic time change** – if "**Yes**", the time 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).

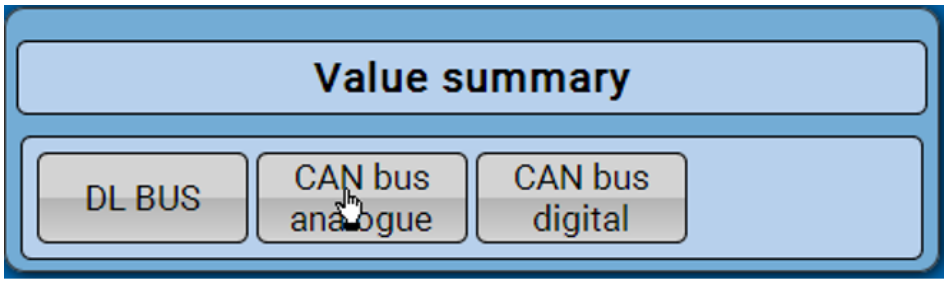
  The factory default settings for the GPS data are for the location of Technische Alternative in Amaliendorf, Austria.
- **Sunrise** - Time
- **Sunset** - Time
- **Solar altitude** – specified in ° as measured from the geometric horizon (0°), zenith = 90°
- **Direction of sun** – specified in ° as measured from the north (0°)
  North = 0°
  East = 90°
  South = 180°
  West = 270°

Value summary

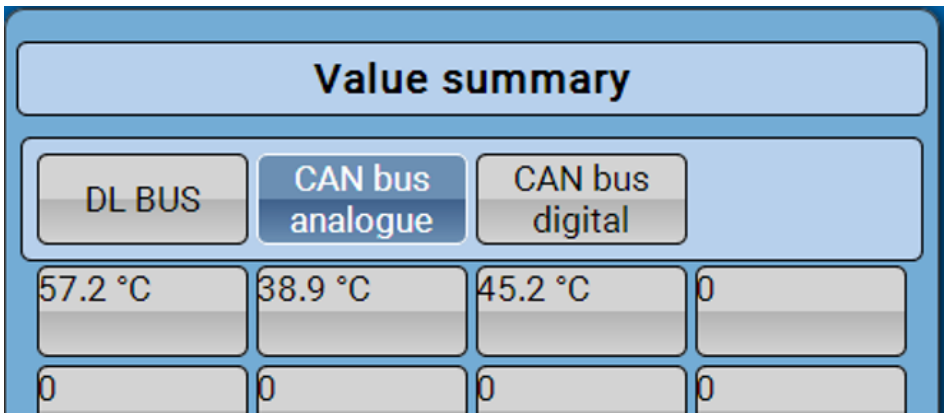
This menu item shows the current values for the **DL inputs** and the analogue and digital **CAN inputs**.



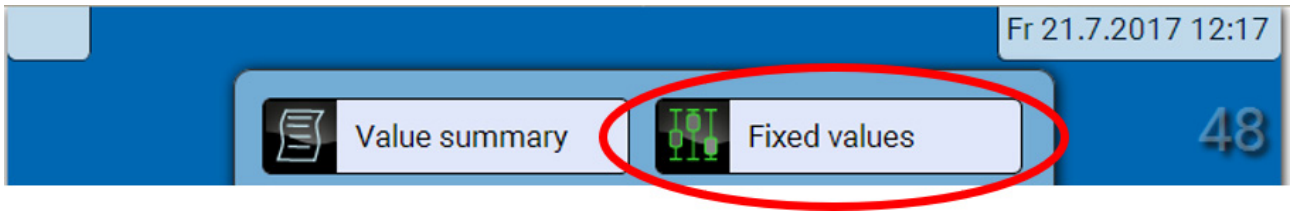
The various values are displayed by selecting the group required.



Example: CAN bus analogue

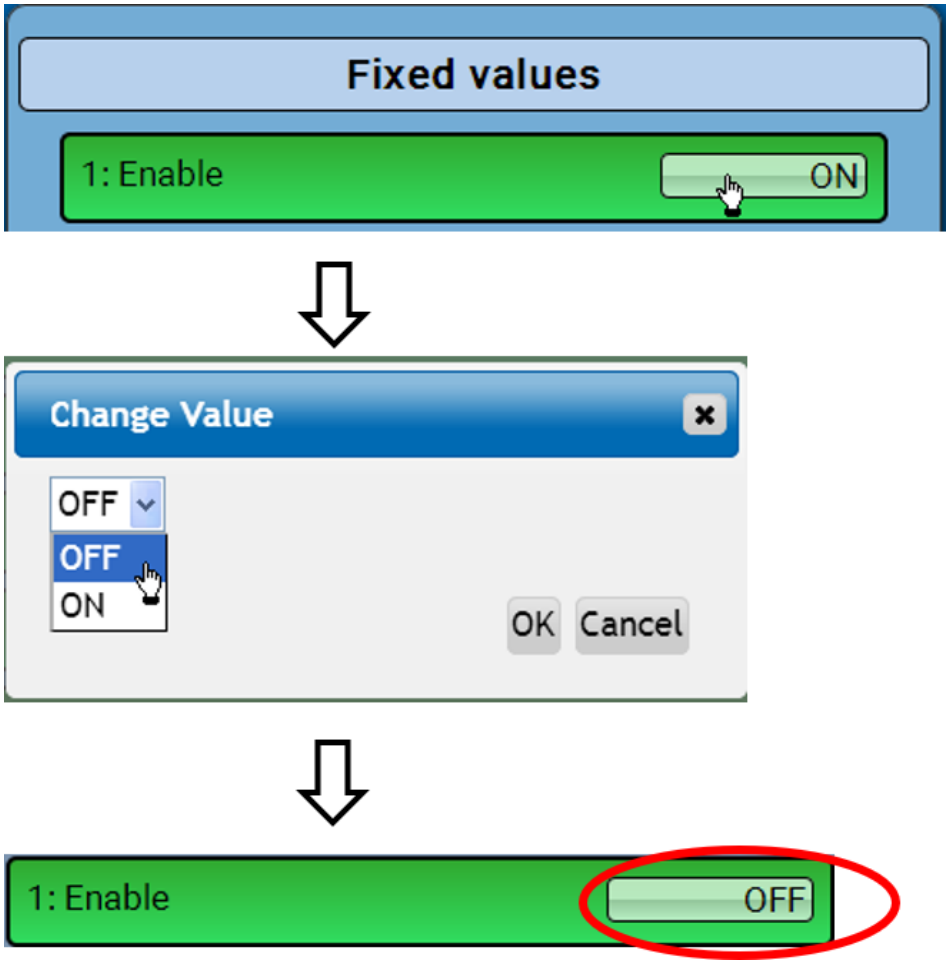


Fixed values



Changing a digital fixed value

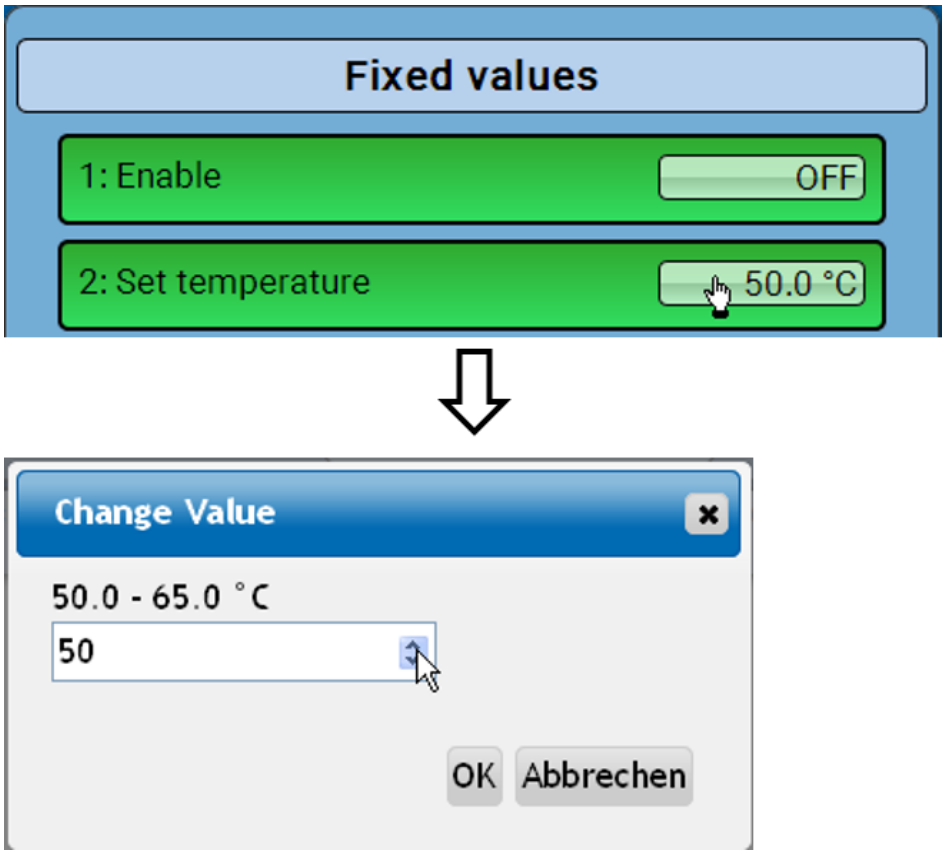
Selecting a button with a **light background** allows you to change the fixed value.
Example: Changeover from **ON** to **OFF** via a selection box



Changing an analogue fixed value

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

Example:



The current value is shown (example: 50.0°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:

Activating a fixed pulse value

Tapping a button with a **light background** allows you to activate the pulse.

General settings

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

This menu serves to input settings which then take effect for all other menus and displays.

Simulation – cannot be used in the bus converter

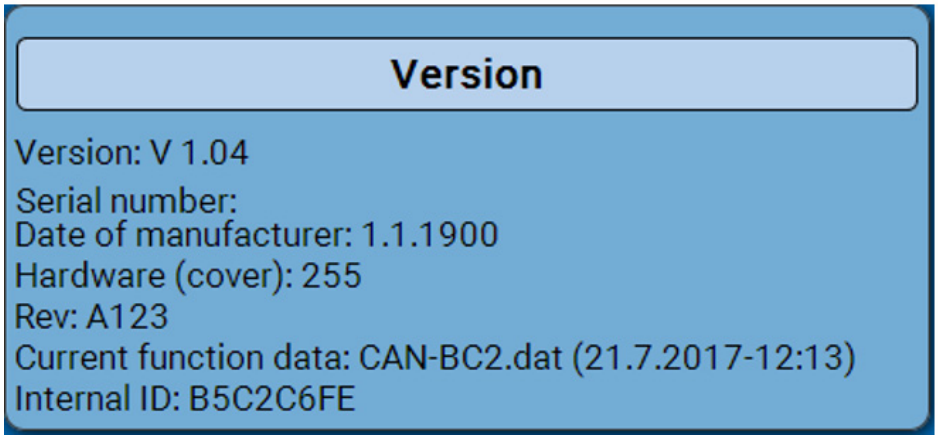
Access to menu – defines which user levels have access to the **main menu**. If only **technicians** or **experts** are permitted access to the menu, a **password** must be entered when selecting the main menu.

Currency – select the currency for yield metering

User defined designations – all elements can be given a designation 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 serial number, internal production data and the name of the current function data (with date).

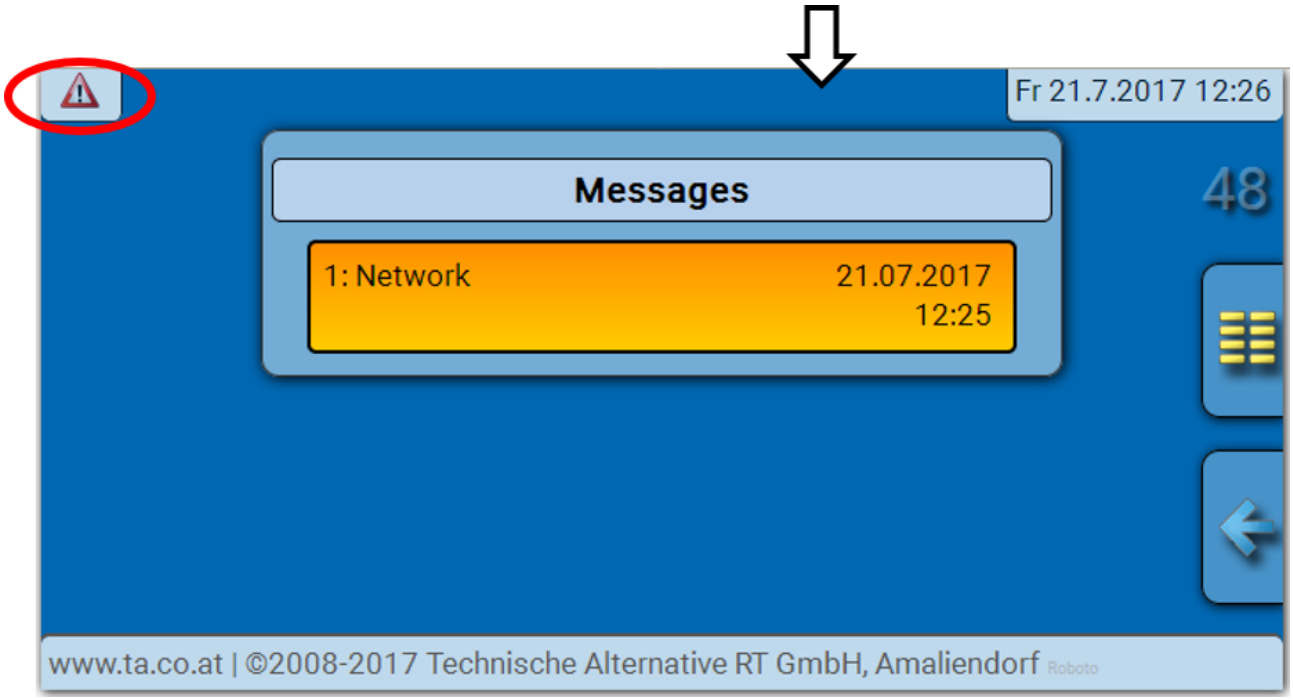


The serial number is also visible on the module's rating plate.

Messages

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

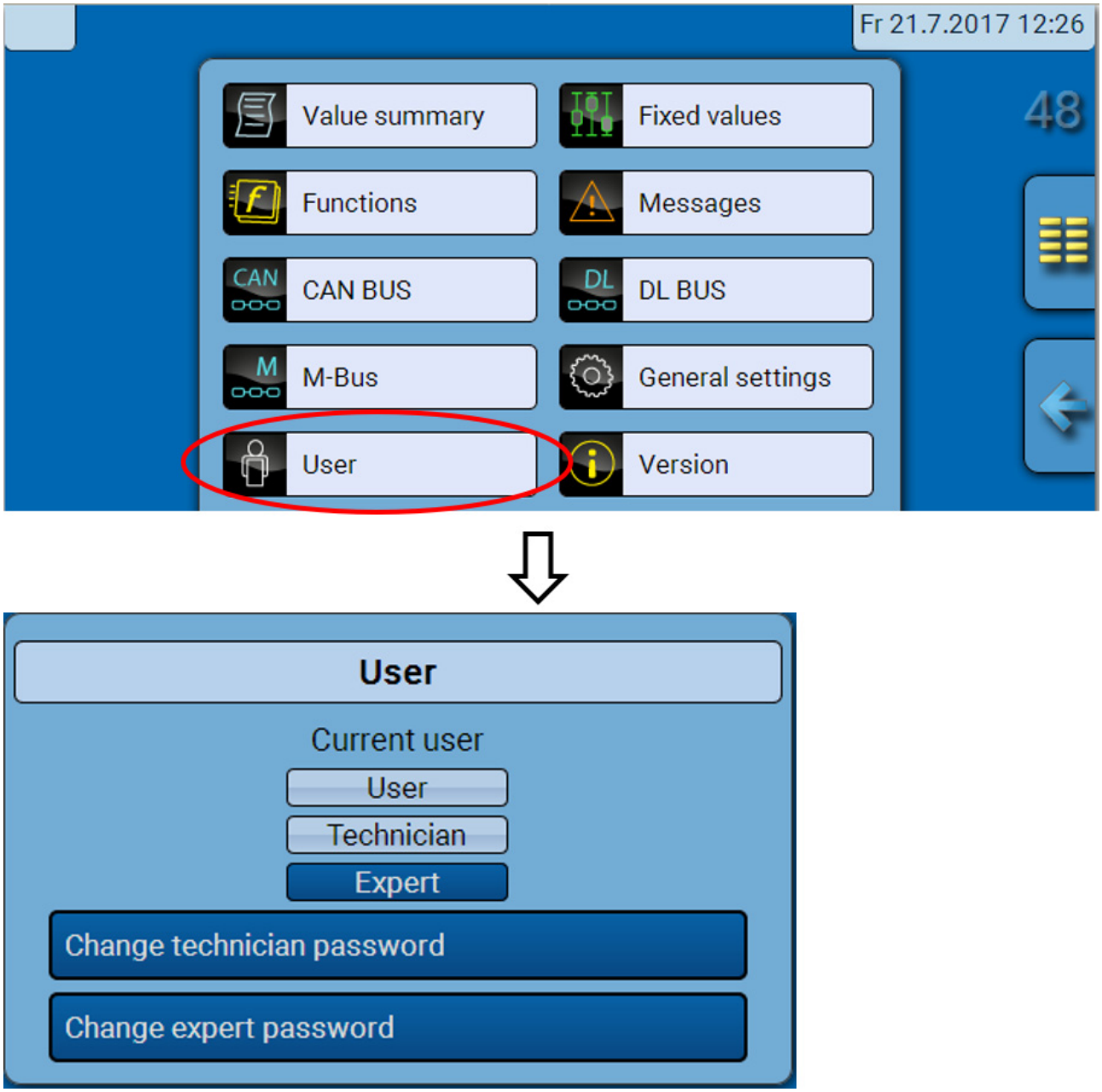
Example: Message 1 is active.



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

More detailed information on the messages is provided in the programming manuals for the UVR16x2, RSM610 and CAN-I/O 45.

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 restart, the bus converter is always in the user level.

The password is set in the TAPPS2 program and can be modified by accessing the expert level.

List of permitted actions

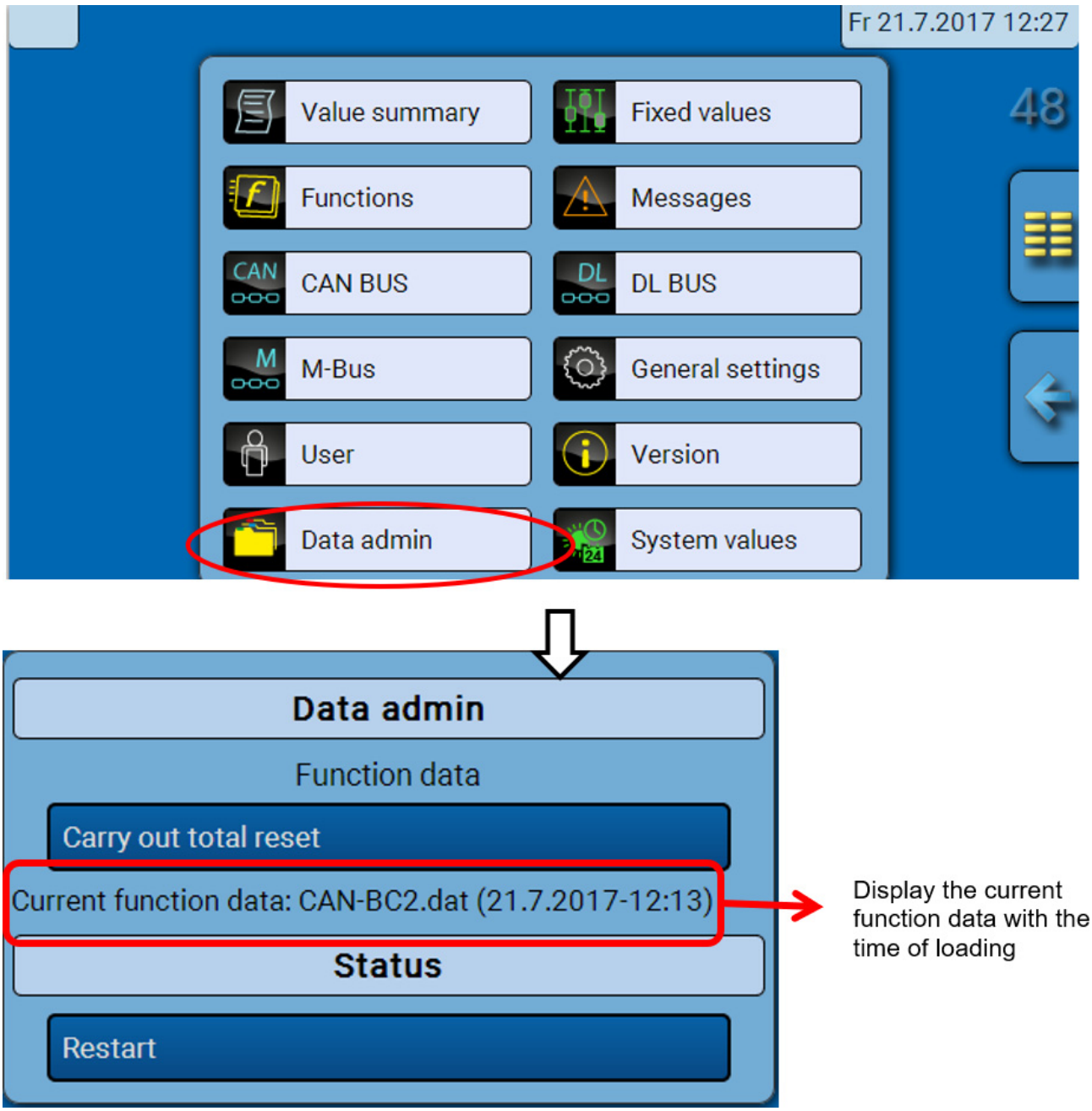
User level	Displays and permitted actions
User	• **Access to main menu** only if enabled for "**User**" in the "General settings" • Value summary • **Fixed values**: Changes to the value or status of the fixed values enabled for users; no access to parameters • **Functions**: Shows the **function status**; no access to the parameters • **Messages**: Shows active messages • **CAN bus**, **M-Bus and DL bus**: No access to parameters • **General settings**: No access possible • **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 **fixed values** parameters (except for type and measured variable; value and status only if enabled for user or technician), no new definitions • **General settings**: Changes to and new definitions of **user defined designations**; currency selection • **Functions**: Changes to user defined input variables and parameters • All settings in the • **CAN bus**, **M-Bus** and **DL bus** menus • **Data administration** actions
Expert	**All** actions and **all** displays are accessible.

Automatic changeover

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

Data administration

C.M.I. - Data administration menu



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 bus converter following a confirmation prompt, without disconnecting the bus converter from the network.

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

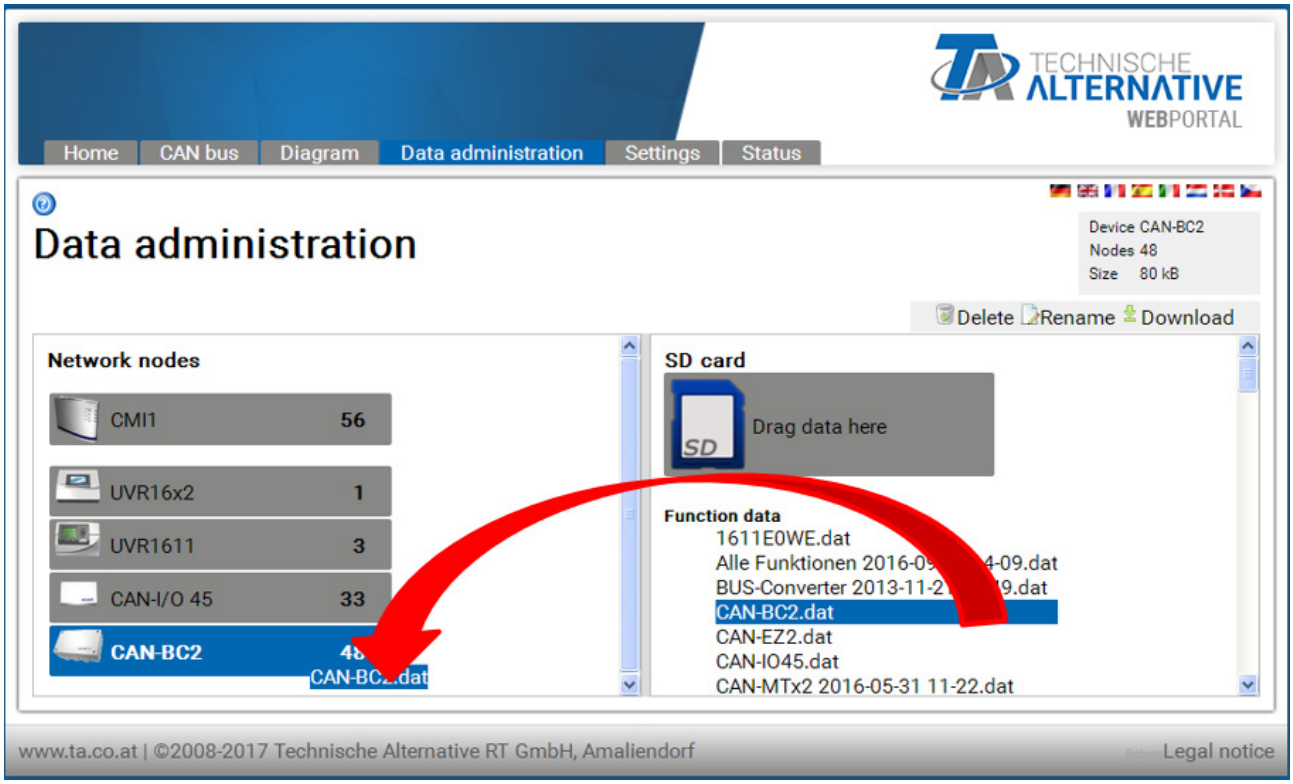
In the **data admin** C.M.I. menu, function data can be loaded or saved and the firmware (the operating system) can be loaded onto the module.

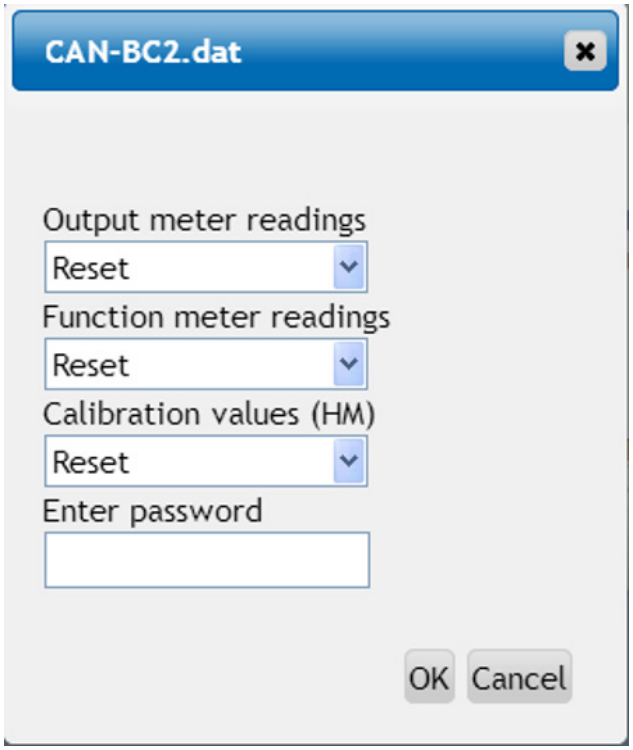
A separate operating system version is required for each language. Consequently, unlike the UVR16x2 controller, the bus converter does not have a menu for language selection.

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

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 bus converter

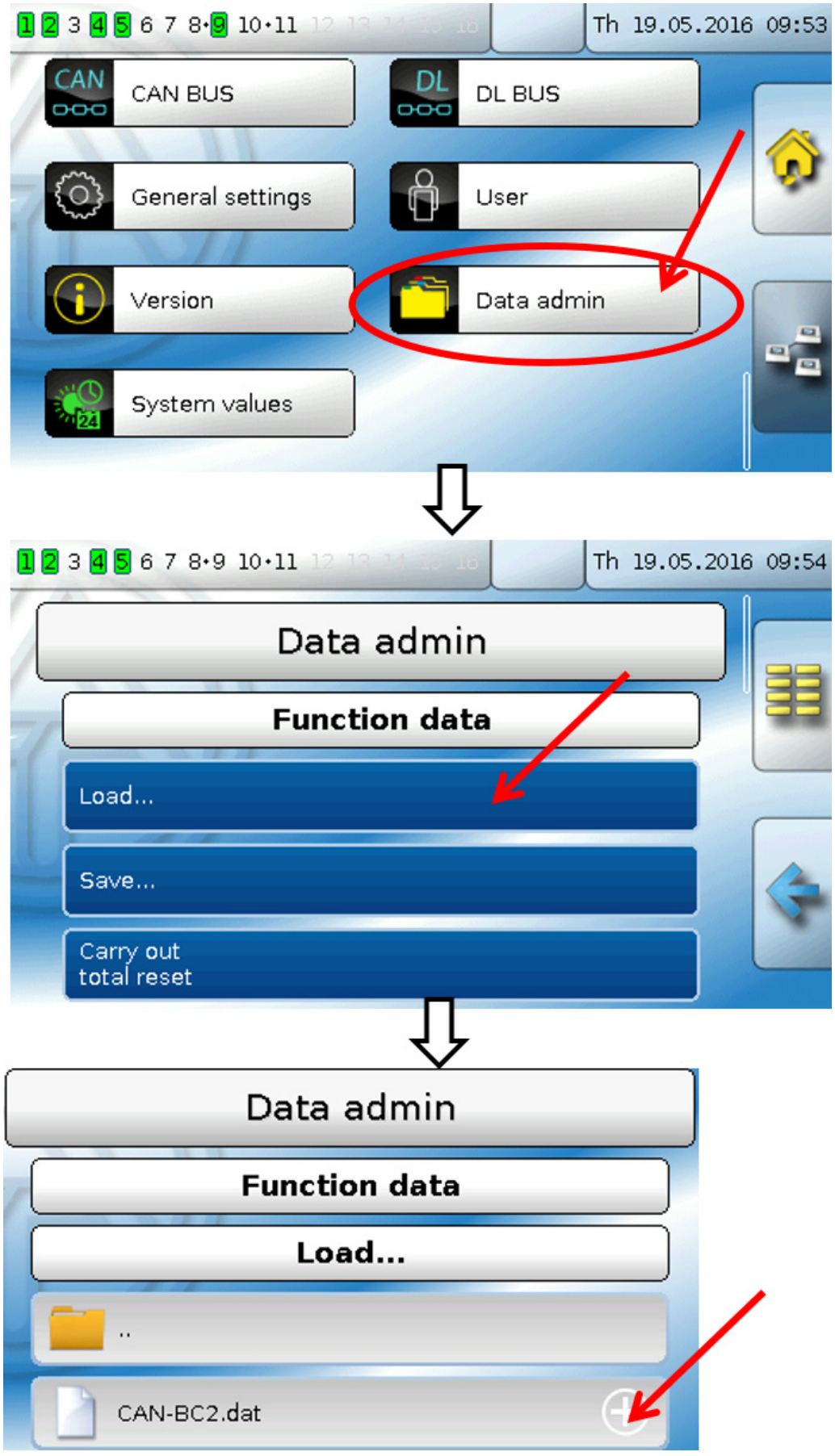




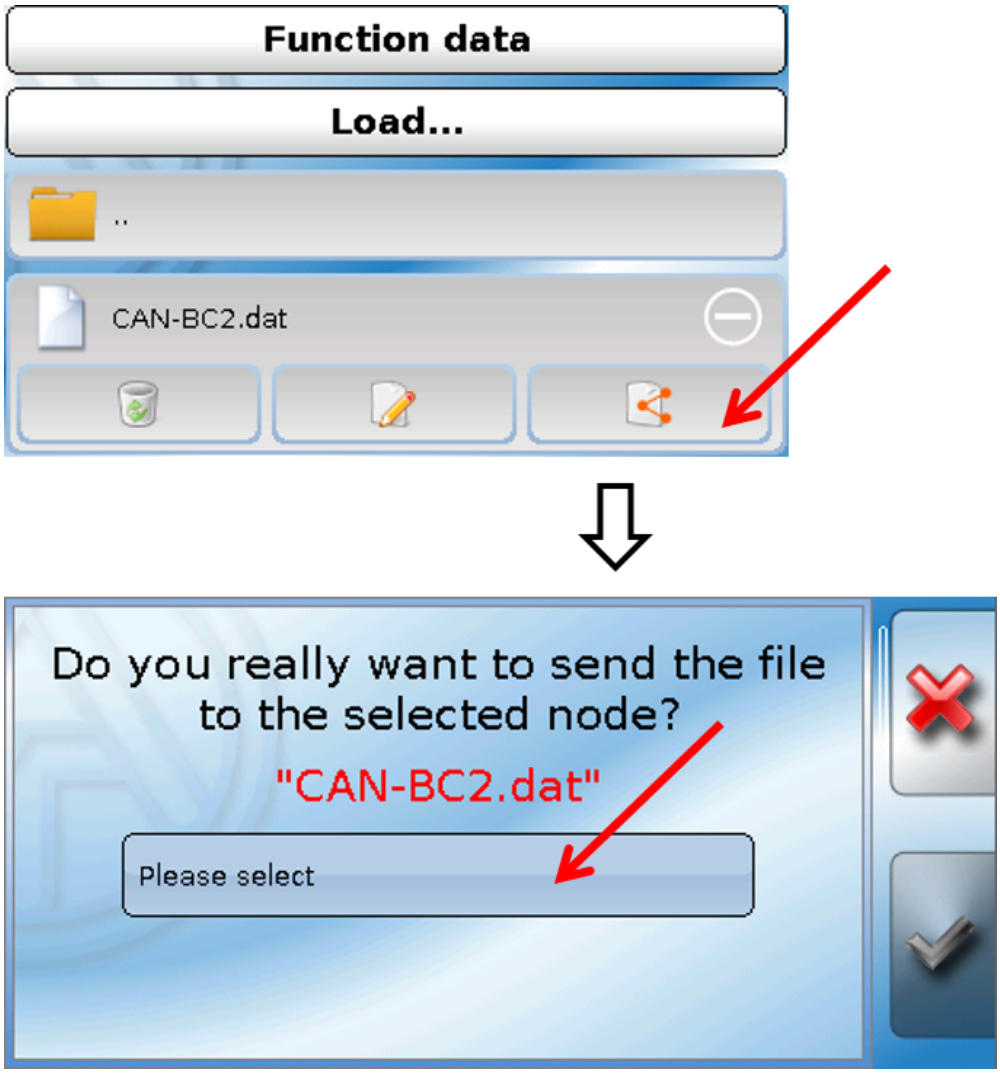
Before the data transfer starts, you will be asked to provide meter readings and the **expert** or **technician password** for the bus converter.

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.



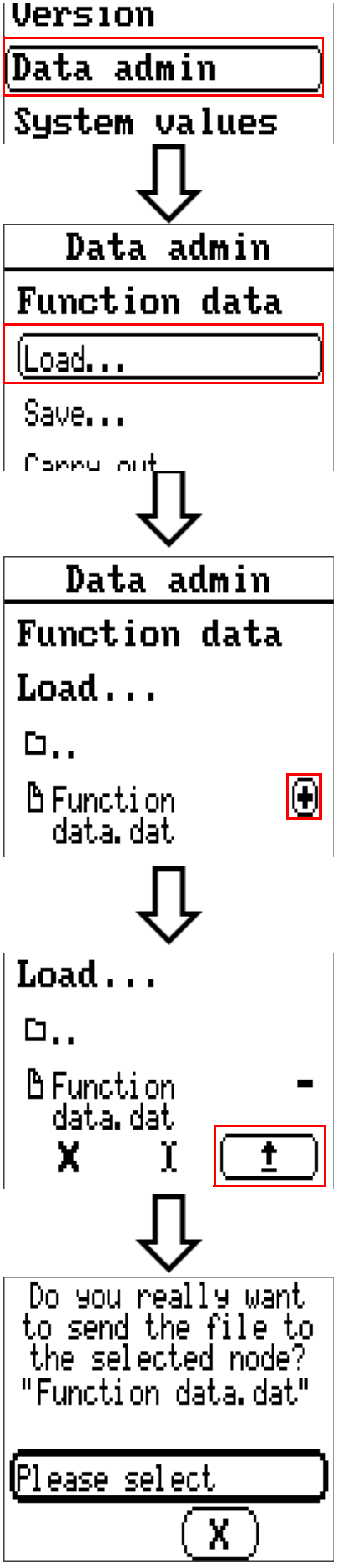
In order to send the file to the module, tap the plus symbol. A number of options will appear for selection.



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.

Loading function data or firmware via UVR610

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



Select the node number and then select ✓.

Tapping ✗ cancels the action.

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

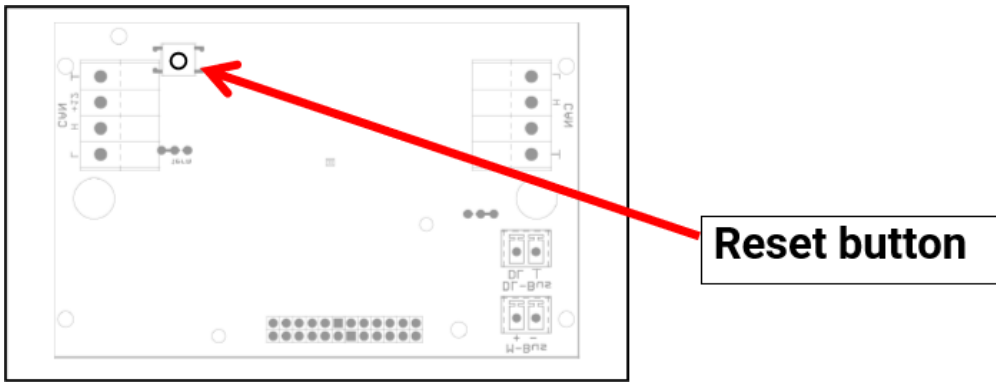
Reset

The reset button is located behind a hole in the cover.

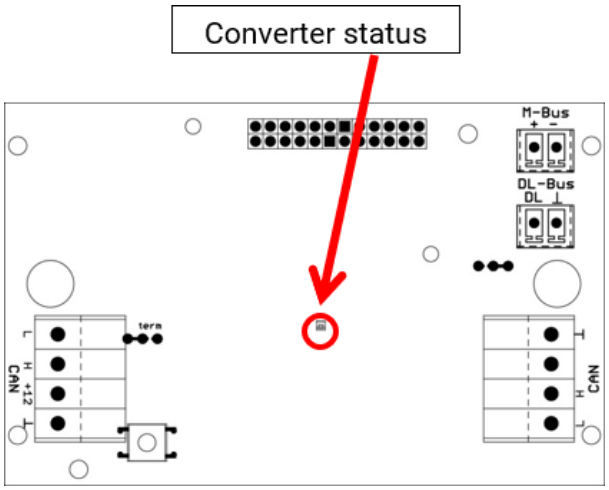
Pressing the reset button **briefly** will restart the bus converter (= reset).

Total reset: Pressing the button 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 for all bus inputs and outputs, fixed values, system values and the CAN bus settings.



LED status indicators



Status indicators at converter start

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

Technical data

Max. bus load (DL bus)	100%
CAN bus	Standard data rate 50 kbit/s, adjustable from 5 to 500 kbit/s for both sides of the CAN bus
M-Bus	Standard baud rate 2400 Bd; adjustable from 300 to 38,400 Bd; data from max. 4 M-Bus devices can be read
IP rating	IP40
Protection class	II - safety insulated ⧈
Permissible ambient temperature	+5 to +45°C

Subject to technical modifications.

EU Declaration of Conformity

Document number / Date:	TA17065 / 02.02.2017
Manufacturer:	Technische Alternative RT GmbH
Address:	A-3872 Amaliendorf, Langestraße 124

The manufacturer bears sole responsibility for issuing this Declaration of Conformity.

Product designation:	CAN-BC2
Brand names:	Technische Alternative RT GmbH
Product description:	CAN bus converter

The item described above complies with the following directives:

2014/35/EU	Low Voltage Directive
2014/30/EU	Electromagnetic compatibility
2011/65/EU	RoHS directive on restricting the use of certain hazardous substances

The following harmonised standards have been applied:

EN 60730-1: 2011	Automatic electrical controls for household and similar use. Part 1: General requirements
EN 61000-6-3: 2007 +A1: 2011 + AC2012	Electromagnetic compatibility (EMC). Part 6-3: Generic standards. Emission standard for residential, commercial and light-industrial environments
EN 61000-6-2: 2005 + AC2005	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Noise immunity for industrial environments
EN 50581: 2012	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Attachment of CE label: On packaging, operating instructions and type plate

CE

Issued by: Technische Alternative RT GmbH
A-3872 Amaliendorf, Langestraße 124

Authorised signature

Dipl.-Ing. Andreas Schneider, General manager,
02.02.2017

This declaration certifies conformity with the listed directives, but does not guarantee any properties.
The safety instructions in the product documents supplied must be observed.

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Warranty conditions

Note: The following guarantee conditions do not in any way limit the legal right to warranty, but rather expand your rights as a consumer.

1. The company Technische Alternative RT GmbH provides a one-year warranty from the date of purchase for all the devices and parts which it sells. Defects must be reported immediately upon detection and within the guarantee period. Technical support knows the correct solution for nearly all problems. In this respect, contacting us immediately will help to avoid unnecessary expense or effort in troubleshooting.

2. The warranty includes the free of charge repair (but not the cost of on site fault-finding, removal, refitting and shipping) of operational and material defects which impair operation the event that a repair is not, for reasons of cost, worthwhile according to the assessment of Technische Alternative, the goods will be replaced.

3. Not included is damage resulting from the effects of over-voltage or abnormal ambient conditions. Likewise, no warranty liability can be accepted if the device defect is due to: transport damage for which we are not responsible, incorrect installation and assembly, incorrect use, non-observance of operating and installation instructions or incorrect maintenance.

4. The warranty claim will expire, if repairs or actions are carried out by persons who are not authorised to do so or have not been so authorised by us or if our devices are operated with spare, supplementary or accessory parts which are not considered to be original parts.

5. The defective parts must be sent to our factory with an enclosed copy of the proof of purchase and a precise description of the defect. Processing is accelerated if an RMA number is applied for via our home page www.ta.co.at. A prior clarification of the defect with our technical support is necessary.

6. Services provided under warranty result neither in an extension of the warranty period nor in a resetting of the warranty period. The warranty period for fitted parts ends with the warranty period of the whole device.

7. Extended or other claims, especially those for compensation for damage other than to the device itself are, insofar as a liability is not legally required, excluded.

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