

M-Cx M-Bus Display Units / Level Converters

C3 / C20 - the ideal master for your small M-Bus installation. The members of the C3/C20 family are ideally suited for M-Bus installations with up to 3 or 20 meters.

All devices offer a for remote read-out of meter-data by a PC with software. Additionally the allows real stand-alone operation with the integrated LCD and keypad. Therefore meter data can be displayed on-site with few keystrokes.

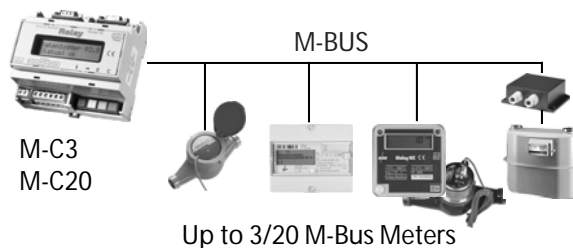
The consumption data of all meters are displayed sequentially by pressing buttons. Individual meter data can be brought up for further analysis.



Features

- Central Readout for All M-Bus Meters
- Displays Data from up to 3 or 20 EN1434-3 M-Bus Meters
- Level Converter to PC applications such as Prodition
- DIN-rail Mounted
- Operation on-site via Keypad / LCD
- Suppression of echo
- Short circuit protection
- Overcurrent protection

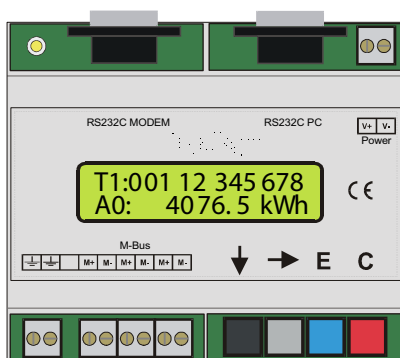
Model Type	Model	Description
	M-C3	M-Bus Level Converter to RS232 with Display, Up to 3 Devices
	MTW-I-25F-6	M-Bus Level Converter to RS232 with Display, Up to 3 Devices
Technical Data	Operating Voltage	11..28 Vdc / 13V..18Vac
	Power Consumption	5W DC / 9W AC
	Operating Temp	0..55°C
	M-Bus	According to EN1434-3, RS232
	M-Bus Voltage	32V (without loads)
	M-Bus Current	C3: max. 4.5mA (max. 3 meters) C20: max 30mA (max. 20 meters)
	Overcurrent Threshold	60mA
	Bus Resistance	approx. 100Ohm
	Transmission Speed	300 .. 9600 baud
	User Interface	4 push buttons LCD with 2 lines with 16 characters (back-lit)
	Screw Terminals	M-Bus (3 times) Power Supply (GND, TXD, RXD)
	Plug-in Terminals	2 x RS232 as 9_PIN D-Sub Connector 1 x PC
	Housing	IP40 Light Grey Plastics
	Mounting	DIN-rail
	Agency Approvals	Emmission: DIN EN50081-1, EN 55022 class B, EN 60555 Immunity: DIN EN50082-2, ENV 50140, ENV 50204, EN 61000-4-4
	Dimensions	W106 x H96 x D58mm

Network Diagram**M-Bus Display /
Level Converter**

The M-Bus is a low cost, 2-wire field bus system for reading and remote powering of consumption meters for heat, gas, water, electricity. The physical layer and basic elements of the protocol are defined in the european standard EN 1434-3.

General Information

All devices can be operated as a transparent level converter and as a remote display with keyboard or by remote control. The datalogger adds the possibility to read all the meters in the network automatically and store the data into the internal FLASH memory.



RS232 PC: PC interface for service and level converter operation

RS232 MODEM: Modem interface (currently not supported)

M-Bus: M+, M- M-Bus terminals (3 pairs). M-Bus devices are wired polarity independent in parallel to the same line. The signs +, - mark only the different bus lines.

⊕ ⊖ Earth for symmetry of M-Bus

Power: V+ Power supply: positive terminal for DC (10..28VDC)

- V-** Power supply: negative terminal for DC
- Polarity independent for AC, 13..27VAC
 - Please do not connect mains supply !!

LED lamp: The green LED is on if the power supply is connected and the microcontroller is ready for operation.

RS232 interface

The M-Bus can be accessed by an RS232C interface. A PC should be connected to the right DB9 socket or a modem to the left DB9 plug. Only one of these connectors can be used simultaneously. You can attach a 1:1 serial cable to PC.

Simultaneous use of interfaces

In case of a local readout using the keyboard of the remote display or during an automatic readout the RS232 interfaces do not have access to the M-Bus. These functions can produce temporary disturbances in communication. Additionally the datalogger performs no automatic readout of meter data during the operation by keyboard or serial interface.

Hints for installation

- Write down the individual ID no. of the meters in the flats / houses
- Configure the meters or M-Padpuls adaptors
- Configure the M-Bus Display / Datalogger (using keyboard or with the service software FService on a Laptop)
- Log in with the Passcode B (predefined to: 00001767)
- Setup baud rates, search mode .. in the menu „Display config.“

- Start search for installed meters with „List of slaves - AutomaticSearch“
- Check the list of slaves for missing meters, you can add missing slaves manually if it is necessary
- Change the predefined passcodes (at least passcode B) 4

Trouble shooting

- No LED is on: Check power supply and fuse.
- Display shows “Status: overload”: Check the M-Bus wiring for short circuits and ground loops. Defective slaves can also produce an overcurrent. The source for the short circuit can be found easier by removing some bus segments from the M-Bus terminals.
- One or more meters are not detected in automatic search procedure: Retry automatic search. Check baud rate and address of this meter. You can manually add the meter to the list of slaves and then perform a single readout of this meter.
- No reply from meter: Check baudrate and address of this meter. Check the bus extension: The bus voltage must be >24V at any slave. Temporarily remove other bus segment.
- „Status: Error“: M-Cx in waiting status (inactive): Press "Down Arrow" and C keys simultaneously to view the list of errors. Please note the error codes and then delete the error codes by pressing the "Right Arrow" key. The most important error codes can be decoded using the table in the addendum.
- Wrong Passcode: Please do the following steps, if you have forgotten the passcode: Do the actions which are described in “Status: Error” and then press the key again. Please write down the 16 digit string (display config) and send it together with the firmware version no. and serial no. to info@syxtsense.com by email. We will send you a working passcode.

Planning M-Bus Networks

Two aspects must be considered before projecting M-Bus networks:

1. The signals must not be distorted to much by the influence of the capacitance of the cable. The capacitance of the network depends on the length of the network, this means the total sum of cable length. Lower baudrates allow a higher bus capacity.
2. Each meter must be supplied by the M-Bus with a minimum voltage of 24V. The voltage drop on the bus line is caused by the transmit current of the communicating slave of up to 20mA, the supply current of the slaves in the respective bus segment, the internal resistance of the M-Bus master, the resistance of the cable and the connection resistances of the joints. The distance between a slave and the master is inverse dependent on the number of slaves in this segment and on the cable diameter.

The maximum allowed resistance of the cable R_L between the M-Cx can be estimated with the following formulas (N = no. of unit load, each 1.5mA):

N slaves at end of cable: to be defined

N slaves equally distributed: to be defined

The calculation for a standard phone cable e.g. JYSTY nx2x0.8 (75Ohm/km, 150nF/km) presents the following values:

Baudrate	9600 Baud	2400 Baud	300 Baud
Max. total cable length (@ 150nF/km)	1km	4km	12km
No. of unit loads in the respective segment	Max. Distance to the meter (@75Ohm/km)		
	Equally Distributed	Slaves at the end of cable	
3	4.0km	4.0km	
20	2.5km	1.5km	

There are remote repeaters available for extending the network length and the number of connected slaves. Cascading these remote repeaters allows a nearly unlimited bus extension. The place in which a remote repeater is placed must provide a mains supply.

Shielding

Tests performed by the M-Bus usergroups showed the result that a shielding of the M-Bus cable is not necessary. Please avoid a connection between any of the bus lines to the shielding or protective ground.

M-Bus Display Operation and Configuration

Function

The M-Bus Display allows reading the meters using the keyboard and viewing the consumption values on the LCD. The reading personell is then able to get the data of many meters from one central location without the need to enter all the flats and without further technical equipment (laptop..). The M-Bus software Prodion can used to collect the metering data via the M-Cx units.

Installation

After login with a passcode (predefined as 00001767) the operator gets access to the menu system, which is described later. It is important to generate the list of meters for readout of data. The automatical search for installed meters will be much faster, if the user reduces the search options in search mode or search baudrates (e.g. searching with 300 baud is very slow). These options can be selected in the menu "Display config." You should also change passcode B to prevent other persons from changing the setup and passcodes.

Error messages

An exceed of the maximum allowed current and short circuit are signalled with LEDs under the terminal lid compartment and also on the LCD. If there are problems with interpretation of the M-Bus data the display shows "Status: Error". The "list of errors" is shown on the LCD after simultaneously pressing the "Arrow Down" and C keys in the inactive state. Please note the error codes and then delete the error codes by pressing the "Arrow Right" key. The most important error codes can be decoded using the table in the addendum. On restart after power fail the error list is also deleted.

Passcode protection

The M-Bus Display distinguishes between 3 passcode modes and 2 passcode levels:

The operator is requested to enter a passcode after pressing any key in the standard mode (mode A). In this mode the passcode A (reader's passcode) gives only low level access limited to readout functions. The caretaker or tenant can read single meters by selection from the list of slaves or all meters from the network. It is not possible to change the list of slaves or other options of the M-Bus Display here.

The login with the passcode B instead of passcode A gives access to the complete menu. On delivery the predefined value for passcode A is 00000000 and for passcode B is 00001767. This allows a simple login to level A by just pressing the E-key. We strongly recommend to change passcode B to avoid manipulation by unauthorized persons. You can setup the passcode from the menus "Display config. – New passcode A" and "Display config. – New passcode B".

Access by ID:

The M-Bus Display supports a different setup of the passcode mode from the menu "Display config. – Passcode mode". If this mode is activated, the user (tenant) can make a readout limited to his own meter(s). After first key-press the tenant is requested to type in the ID (identification no.) of the required slave. Afterwards this single meter is read and its data displayed. Please note that only meters which support secondary addressing are readable in this mode. The access to the menu is possible in this mode after input of the ID 00000000 and login with the described passcodes.

Access by Adr:

This mode allows a direct readout of meters using their primary addresses without any login procedure. This mode is similar to "Access by ID". The primary address for global readout 254 is used by default. So by just pressing the E key you can read a meter if there is only one meter connected. The cursor keys allow editing the address. You can leave the input mask and step to the passcode request by pressing the "Arrow Right" key three times.

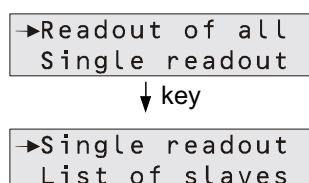
Keyboard Operation

Basics

Besides the control using Fservice the device includes 4 keys and a backlitged display for comfortable, local access to all functions. The buttons give a very precise, mechanical feedback and each input is acknowledged by an acoustic signal (beep). Execution of menu entries and input of numbers are described later. The device automatically returns to inactive state after some minutes without input.

Selection of a menu entry

An arrow marks the active menu entry on the LCD. The arrow is moved down with the "Arrow Down" key (black) and up with the "Arrow Up" key (grey). Pressing the E button (blue) executes the currently selected menu entry. The C button (red) cancels the input and exits from the menu.



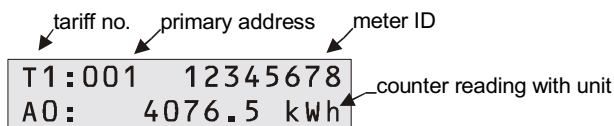
NOTE: After input of passcode and confirming with the E key the main menu is activated. You can always see two entries of this menu. The first displayed lines are "Readout of all" and "Single readout". By pushing the "Arrow Down" button the LCD scrolls to the next part of the menu. In this example the line "Single readout" will then be marked with the arrow. This submenu would be entered by pressing the E key.

Input of numbers

The "Arrow Down" button increments the number of the active position by one. After the 0 it restarts with the 9 again. The "Arrow Right" key moves the cursor to the next position on the right. The active position is blinking. After pressing "Arrow Right" at the most right digit the cursor moves to the most left digit. The E button ends and acknowledges the input regardless of the current position. You can cancel the input with the C key.

Displayed data

The device only displays the most important data for reasons of easy interpretation and not to confuse the reading personell. Some meters offer actual and historical values, different tariffs and additional devices like pulse counters in a heat meter. The first row always shows the primary address and ID for a clear association of the data to the respective meter. The first two characters in this row give information about the tariff.



- A: current value (storage no. 0)
- B: due-date value (storage no. 1)
- E: value with error flag
- digit: no. of device

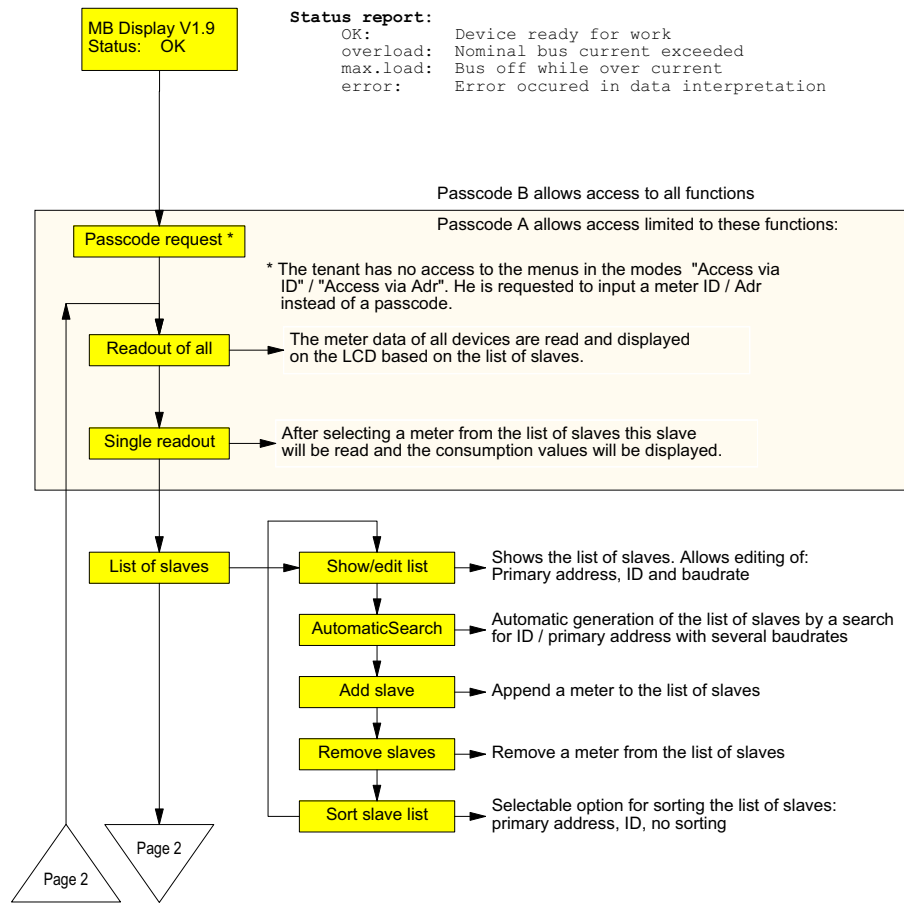
The second row displays the due-date or the data with physical unit. The first two characters show information which distinguishes between the different values: The character "A" marks current values which are characterized by storage no. 0. The character "B" appears with due-date values (storage no. 1). If the respond frame of the slave

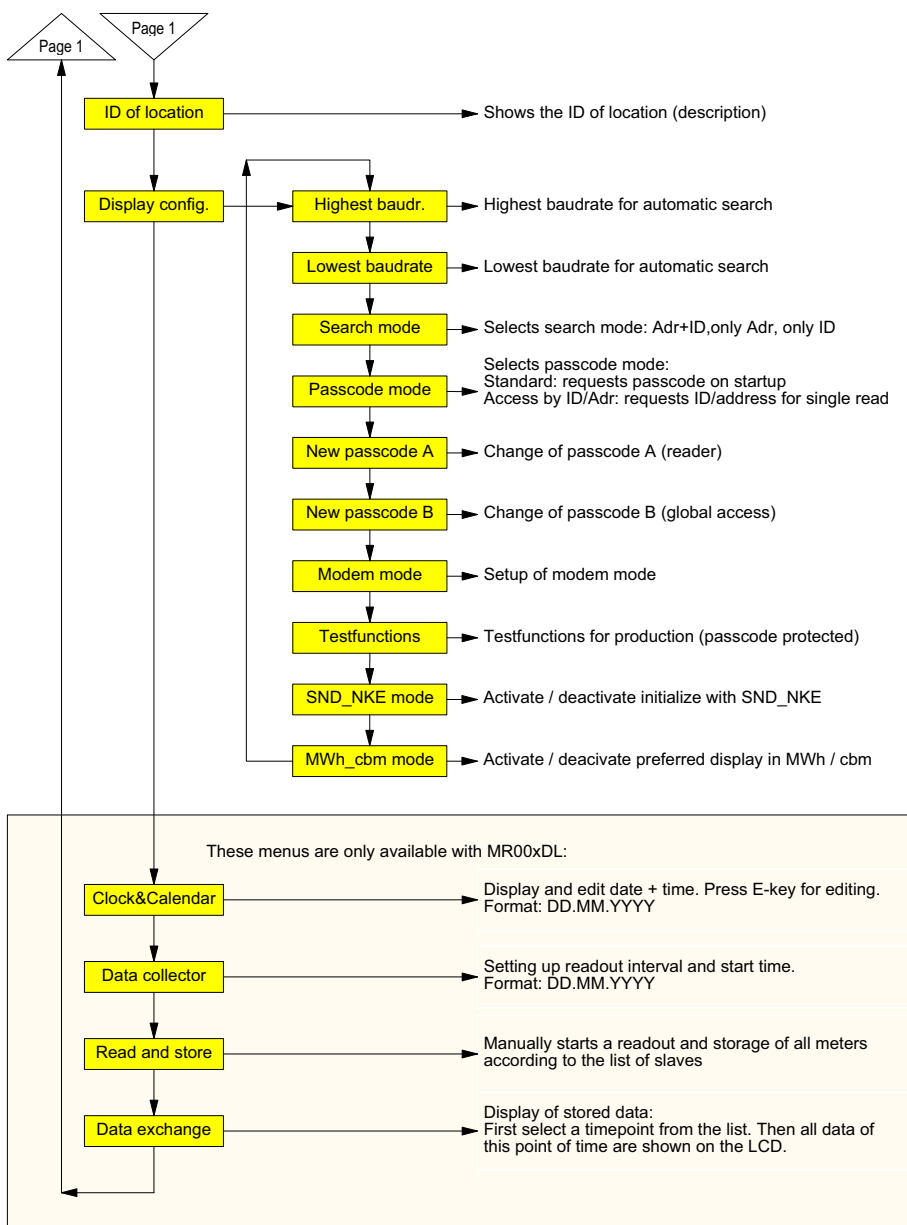
contains activated temporary or permanent error bits in the Status byte , an "E" will be shown. The first character follows one digit for the device (0 = main device).

Filtering data

To make the readout of data easy the device only displays the most important values of the meters. Only the first respond telegram after initialization with SND_NKE is supported. The data is limited to tariff 0 to 3, device 0 to 7, storage no. 0 and 1 and function "instantaneous". The marking of these values is described above. The energy, volumes, temperatures (flow, return, differential), volume flow and power are displayed if they are included with the respond frame. The limitation is derived from accepting only the VIF's \$00..\$1F, \$58..\$63 and \$6E. These are the following basic units and additional power of tens: Wh, J, l, kg, W, l/h °C and HCA. Also available points of time are supported. A maximum number of 30 entries can be viewed from one meter.

Menu Structure





Description of the most important menus

Readout of all

This entry reads all meters according to the list of slaves and displays their data. For each meter its baud rate and primary or secondary address is used for communication.

Single readout

The readout of single meters also uses information from the list of slaves. The submenu shows the list with the information of position, primary address and ID. The meter will be read after moving the cursor to the desired position and pressing the E button.

Automatical generation of the list of slaves

The automatical search for installed meters with generation of the list of slaves is started from the menu entry "List of slaves – AutomaticSearch" with the E key. The C button cancels the current part of search and jumps to the next search step. Especially searching with 300 baud takes much time. You should select just the needed baudrates from the menu "Display config. – Highest baudrate / Lowest baudrate" to avoid unnecessary long search times. It is also possible to limit the search to primary or secondary address using the menu "Display config. – Search mode". At the end of the search the display shows the number of detected meters. You should check the entries of the list of slaves from the menu "List of slaves- Show/edit list".

Editing the list of slaves

The entries in the list of slaves can also be edited by the user using the menu "List of slaves – Show/edit list". Move the cursor to the desired position and start the edit mode with the E key. You can

change the chars with the "Arrow Down" button and step to the next position with the "Arrow Right" button. The E key confirms and the C key cancels editing. The changes affect only the list of slaves, but not the meter options itself. Editing entries is useful if a meter has been exchanged. It is also possible to add new meters from the menu "List of slaves – Add slave" or to delete single meters from the submenu "– Remove slaves".

Setup of baud rates

On delivery the M-Bus Display / Datalogger is configured to search with all supported baudrates: 300 and 2400 bd. You can accelerate the search procedure by limiting the search baudrates with "Display config. – Highest baudrate" and "Lowest baudrate".

Implemented elements of protocol and data types

The device includes no meter-specific interpretation, but accepts all meters with a M-Bus telegram according to the documentation of the M-Bus Usergroup and the European standard EN1434-3, which fulfill the following demands:

- Variable data structure (mode 1) or fixed data structure (mode 1 or mode 2)
- Number formats:
 - Integer (8bit, 16bit, 24bit, 32bit, 48bit, 64bit)
 - Real (32bit)
 - BCD (2digit, 4 digit, 6digit, 8digit, 12 digit, 16digit)

Error Codes

The following table shows the error codes. See "Error fixing – Status: Error":

Code	Error
\$00	No error
\$01	RAM error (please send the device to us for repair)
\$11	EEPROM write problem
\$18, \$19, \$1C	EEPROM read problem
\$20	Problem with communication to real time clock
\$30, \$31, \$32, \$33	Problem with FLASH memory
\$51, \$52	Problem with data in real time clock
\$61, \$62	Problem with YModem transmit , Xmodem reception