MA 21 connector unit
as Leuze multiNet plus slave and as protocol converter

TECHNICAL DESCRIPTION

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1   General information

1.1   Explanation of symbols

The symbols used in this operating manual are explained below.

Attention!
This symbol precedes text messages which must strictly be observed. Failure to comply with this information can result in injuries to personnel or damage to the equipment.

Notice!
This symbol indicates text passages containing important information.

1.2   Declaration of conformity

The MA 21 modular connector units have been designed and manufactured in accordance with applicable European directives and standards.

Notice!
A copy of all declarations of conformity available for this product can be found in the appendix of this handbook (see chapter 10.1 "EU Declaration of Conformity" on page 37).

The manufacturer of this product, Leuze electronic GmbH + Co. KG in D-73277 Owen/Teck, uses a certified quality assurance system in accordance with ISO 9001.

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1.3   Description of MA 21 functions

The MA 21 modular connector unit is used to connect Leuze identification systems (IDS) featuring an RS 232 interface such as BCL 22, RFM 32, VR and hand-held scanners to other interfaces such as RS 422, TTY or to the Leuze multiNet (depending on device type). This is accomplished by transmitting the data from the IDS via an RS 232 (V.24) interface to the MA 21 where a module converts it to the respective protocol. The data format of the RS 232 interface corresponds to the standard Leuze data format.

1.4   Definition of terms

For better understanding of the explanations provided in this document, a definition of terms follows below:

- **Online command:**
  These commands refer to the respective connected ident device and may be different depending on the device. These commands are not interpreted by the MA4xDP-k, but are instead transmitted transparently (see description of ident device).
- **IDS:**
  Ident systems, e.g. barcode readers, RFID readers, VisionReader…
- **CR:**
  Cross reference
- **Leuze multiNet plus:**
  Proprietary, fast, client network based on RS 485

2 Safety notices

2.1 General safety notices

Documentation

All entries in this technical description must strictly be observed, in particular those in the "Safety notices" section. Keep this technical description in a safe place. It should be accessible at all times.

Safety regulations

Observe the locally applicable legal regulations and the rules of the employer's liability insurance association.

Repair

Repairs must only be carried out by the manufacturer or an authorised representative.

2.2 Safety standards

The devices of the series MA 21 were developed, manufactured and tested in accordance with the applicable safety standards. They correspond to the state of the art.

2.3 Intended use

⚠ **Attention!**

The protection of personnel and the device is guaranteed only if the device is operated in a manner corresponding to its intended use.

Areas of application

The MA 21 connector unit is used to connect hand-held scanners or other devices featuring an RS 232 interface to the Leuze multiNet plus network or to connect directly to a host computer featuring an RS 232, RS 422, RS 485 or TTY interface.

2.4 Working safely

Attention!
Access to or changes on the device, except where expressly described in this operating manual, are not authorised.

Safety regulations
Observe the locally applicable legal regulations and the rules of the employer's liability insurance association.

Qualified personnel
Mounting, commissioning and maintenance of the device may only be carried out by qualified personnel.
Electrical work must be carried out by a certified electrician.

3   Specifications of the MA 21

3.1   General specifications of the MA 21

Electrical data

Interface type (selectable)	RS 232, with electrical isolation (MA 21 110)
	RS 422, with electrical isolation (MA 21 130)
	RS 485, with electrical isolation (MA 21 100)
	RS 485 multiNet, with system connection and electrical isolation (MA 21 100.2)
	TTY, with electrical isolation (MA 21 120)
Service interface	RS 232 internal, with data format, 9600 Bd, 8 data bits, no parity, 1 stop bit 9-pin Sub-D connector
Switching input (only MA 21 100.2)	12 … 36 V DC
Operating voltage	18 … 36 V DC
Power consumption	max. 9 VA with IDS
	max. 4 VA without IDS
Operating voltage of external devices	5.2 V DC $\pm$ 5% (not for MA 21 100.2) max. 0.8 A

Indicators   see "Indicator LEDs" on page 14

RDY LED - green	Power
ERR LED - yellow	Error message
ACT LED - red	Transparent mode
DTR LED - green	Data transmission

Mechanical data

Protection class	IP 65
Weight	640 g
Dimensions (H x W x D)	130 x 90 x 93mm
Housing	diecast aluminium

Environmental data

Operating temperature range	0°C … +50°C
Storage temperature range	-20°C … +60°C
Air humidity	max. 90% rel. humidity, non-condensing
Vibration	tested acc. to IEC 68.2.6
Shock	tested acc. to IEC 68.2.27
Electromagnetic compatibility	tested acc. to IEC 801

3.2 Dimensioned drawing

A: LED indicators
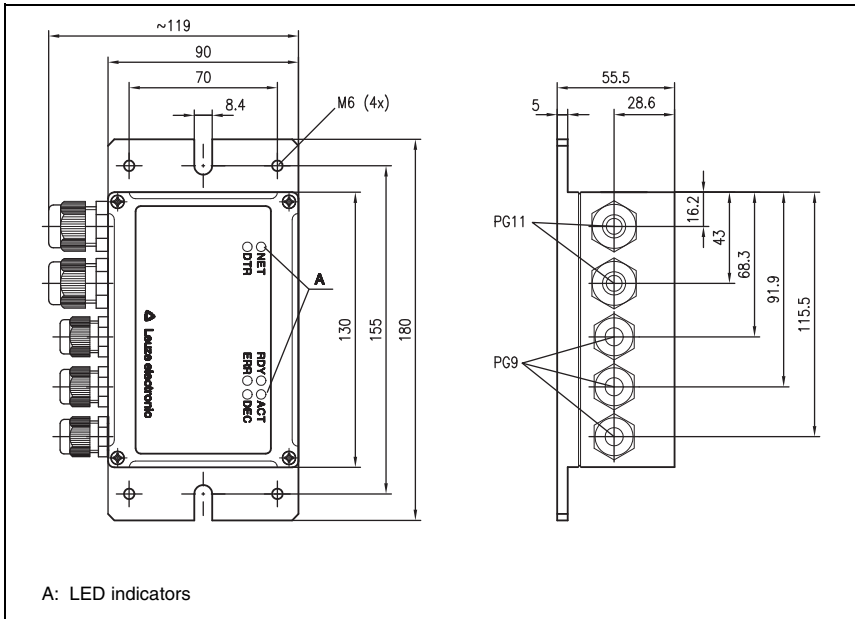
Figure 3.1: Dimensioned drawing of the MA 21

3.3 Functions of the MA 21

General information

The MA 21 connector unit is used to connect hand-held scanners or other devices featuring an RS 232 interface to the Leuze multiNet plus network or to connect directly to a host computer featuring an RS232, RS422, RS485 or TTY interface.

The MA 21 is a variation of the MA 30. For this reason the MA 21 contains operational controls and display elements that have no function.

These operational controls and display elements are labelled accordingly in the description that follows.

Leuze multiNet plus
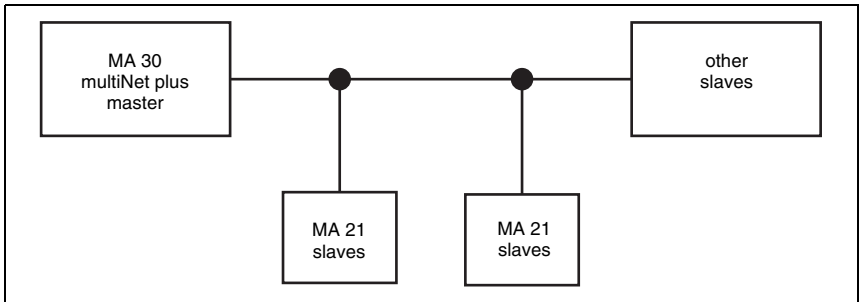
Figure 3.2: MA 21 as a slave in the Leuze multiNet plus

Slaves in the multi-Net

All Leuze barcode readers and decoders that are multiNet plus compatible, can be used as slaves, e.g. the following devices

- BCL 21 with MA 2
- BCL 31 with MA 2L
- MA 21 100 with hand-held reader
- MA 21 100 with external device
- MA 21 100.2 with RFMx2
- MA 21 100.2 with VRxxxx

Two-wire RS 485

The Leuze multiNet plus is optimised for fast transmission of scanner data to a primary host computer. Physically it consists of a two-wire RS 485 interface which is controlled by a software protocol - the multiNet plus protocol. This makes wiring the network easy and inexpensive since the network wiring is passed through from slave to slave.

For the multiNet shielded, twisted pair conductors should be used. This allows a total network length of up to 1200 m.

If you would like to operate the MA 21 directly on the host computer, it is also possible to use the various interfaces (RS 232, RS 422, TTY or RS 485) as well as various protocols such as 3964/RK512 (not MA 21 100.2).

Protocols

Moreover, various data and frame formats can be selected from the software setup (except for the MA 21 100.2, see chapter 6.1 "Configuring the interfaces with the BCL-Config software"). All standard protocols including 3964/RK512 are thus covered.

3.4   Addressing in the network

Addressing via ASCII address

Addressing the individual barcode readers or devices is necessary for the functioning of the network so that the data read can be matched to a station. Leuze uses 2-byte ASCII addressing in multiNet plus. This addressing is included in each data telegram. This address must be selected at the stations via software or hardware (rotary switch).

The following rules apply:

Master (MA 30):	Addr. 00
Slaves:	Addr. 01 to Addr. 30 (sequentially numbered)

No address may occur twice in the network. The numbering must be without gaps, i.e. all addresses up to the last slave address (=last subscriber in the network) must be occupied.

Notice!

Be careful to select the network addresses correctly during commissioning.
The logical order of the assigned addresses does not have to correspond to the physical order of the read stations in multiNet plus.
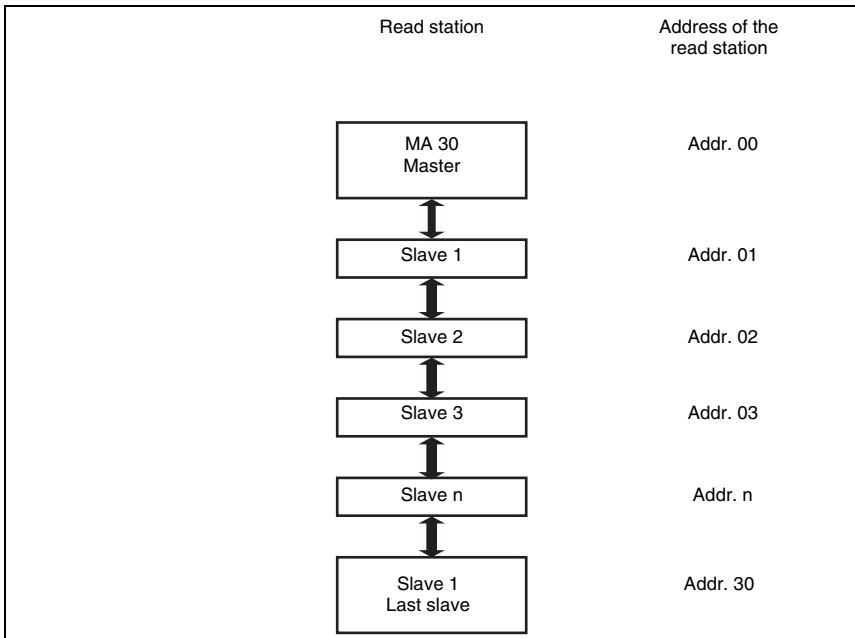
Figure 3.3: Assignment of the network addresses

3.5   Operational controls of the MA 21

The operational controls of the MA 21 are described in the following.

The figures show the MA 21 with opened housing cover.

Operational controls of the MA 21 100, MA 21 110, MA 21 120, MA 21 130
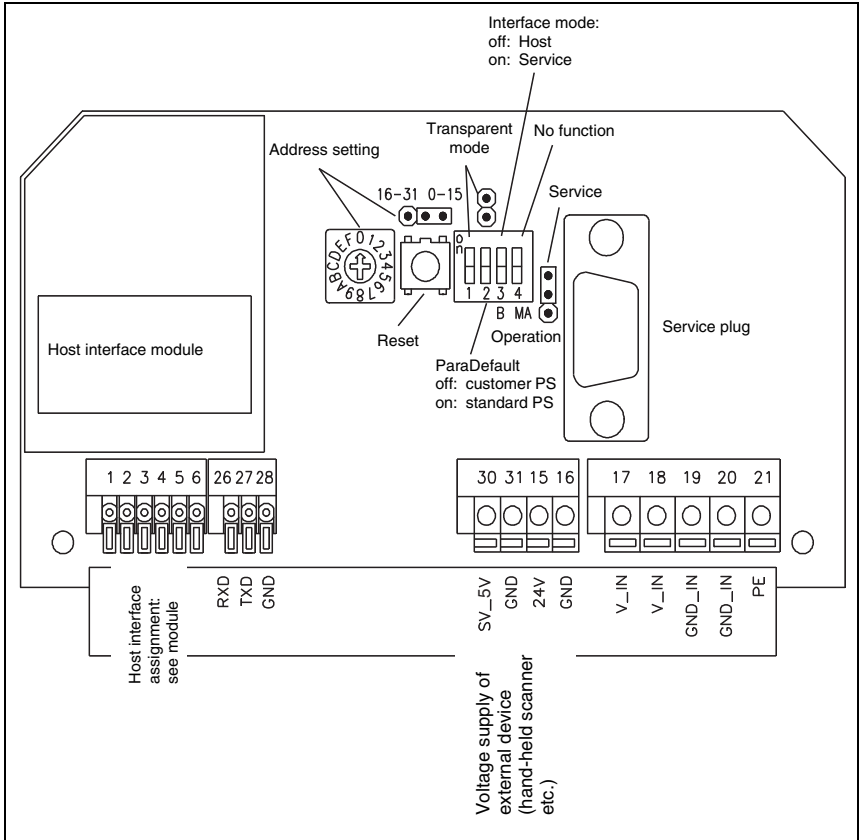
Figure 3.4: Front view: Operational controls of the MA 21 100, MA 21 110, MA 21 120, MA 21 130

Particularities:

- no connection for switching input/switching output
- voltage supply of external device (hand-held scanner etc.):
  - terminals 30 and 31: $5.2\,V\,DC \pm 5\%$, max. $0.8\,A$
  - terminals 15 and 16: $24\,V\,DC$

Operational controls of the MA 21 100.2
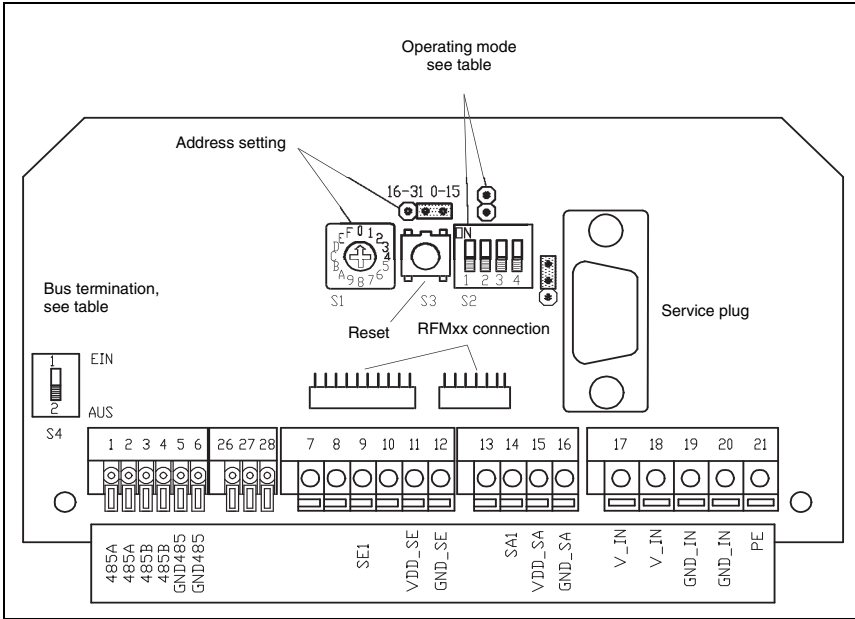
Figure 3.5: Front view: Control elements of the MA 21100.2

Particularities:

- no separate voltage supply
- connection option for switching input/switching output
- for RS 232 devices with system connector (RFM 12, RFM 32, RFM 62, BCL 21, VR-KB)

Element	Function
Host interface module	Pluggable interface card for host communication, choice of RS 232, RS 485, RS 422 and TTY
Setting the network address:	Set the device address on the rotary encoder switch or on the encoding jumper
Rotary switch	Position **0**: If the MA 21 is to serve as protocol converter from RS 232 to RS 485, RS 422 and TTY in stand-alone mode (not multiNet!) Position **1 … F**: multiNet slave address (MA 21 100 and MA 21 100.2)
Jumper	Can be set from 1 to F (15 positions) for addressing in multiNet plus Position **0 … 15** (right): lower address range 0 … 15 Position **16 … 30** (left): upper address range 16 … 30
Ribbon cable connection to the BCL xx	Not used with the MA 21
RESET button	Press >0.2s and<4s: warm start Press 4s: cold start
DIP switch 1 **transparent mode**	Off: Online commands that are transmitted via the host interface or multiNet, are interpreted and executed by the MA 21. On: Online commands that are transmitted via the host interface or multiNet, are not interpreted and go directly to the BCL/RF device.
DIP switch 2 **ParaDefault** (MA 21 100.2 no function)	Off: With cold start, customer parameter set loaded On: With cold start, standard parameter set loaded
DIP switch 3 **interface mode**	Off: Host-interface active/service interface ready to listen On: Service interface active/ host-interface deactivated
DIP switch 4 **source**	"Off": Service interface connected to MA 21 (operation). "On": Service interface connected to connected BCL/RF device (configuration of the RS 232 device via service).
Jumper service/operation	Top: Service/listen (standard setting)
Service connector	Sub-D 9-pin connector, RS 232 interface for service/setup operation
Host interface (not MA 21 100.2)	Terminals 1 … 6: Connection terminals for the host computer, PIN assignments dependent on interface module

Element	Function
Switch S4 **bus termination RS 485**	Position **1**: Bus termination **switched on** Position **2**: Bus termination **switched off**, necessary for the network
Client interface	Terminals 26 … 28: Connection terminals for the external RS 232 (not assigned with MA 21 100.2)
Voltage supply of external device not MA 21 100.2	Terminals 30 and 31: 5.2 V DC ± 5%, max. 0.8 A terminals 15 and 16: 24 V DC
Operating voltage	Terminals 17 … 21: Connection terminals for operating voltage (18 … 36 V DC) MA 21 and connected device. ⚠ **Attention!** *PE must be connected due to the interference-suppression circuit!*

Indicator LEDs

Located at the rear are 6 LEDs that indicate the operating states of the MA 21:
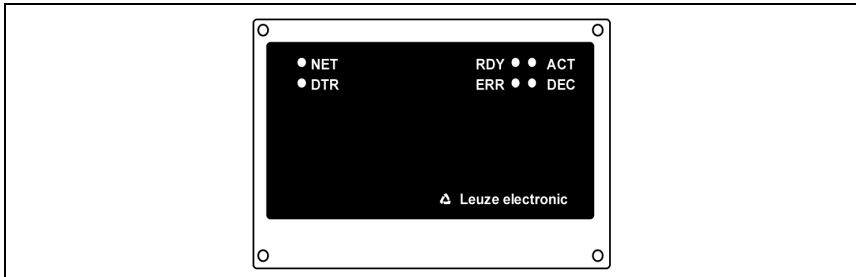
Figure 3.6: Rear view: LEDs on the MA 21

LED	State	Meaning
RDY (green) Operational readiness (ready)	flashing	• Setup menu is active • A reset or restart is being performed
	continuous light	• Ready
ERR (yellow) Error	flashing	• Special function is being performed • Setup menu is active
	continuous light	• Hardware error or serious software error • Reset is being started

LED	State	Meaning
ACT (red) Indicates whether the MA 21 is in transparent mode	light off	• Online commands are interpreted and executed
	continuous light	• Online commands are not interpreted
DEC (green)	Not featured on the MA 21	
NET (green)	Not featured on the MA 21	
DTR (green) Data transmission		Indicates data transmission to the host interface of the MA 21

3.6   Service mode

Service interface

The MA 21 offers the service interface for commissioning the connector unit. It can be accessed once the MA 21 housing cover has been removed and features a 9-pin, Sub-D connector (male).

Connection

You can use this to connect a PC or terminal to the MA 21 via the serial RS 232/V.24 interface in order to configure the device. The connection is made using a crossed RS 232 connection cable that establishes the RxD, TxD and GND connections. A hardware handshake via RTS, CTS is not supported at the service interface.

RS 232 connection cable
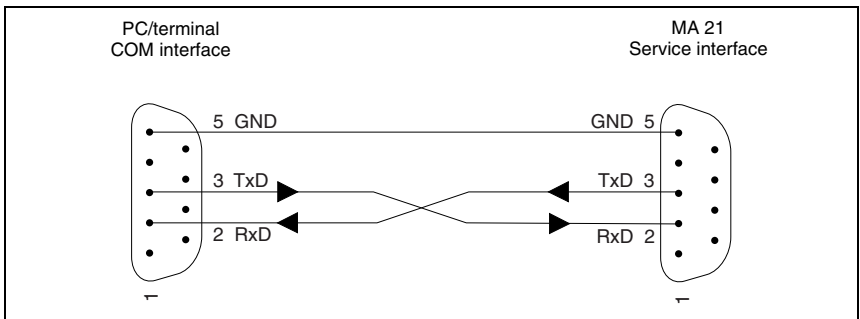
Figure 3.7: Connecting the service interface to a PC/terminal

Service DIP switch

In order to activate the service mode DIP switch 3 must be set to the "ON" position. The switch must always be in this position if commands are to be sent from a PC to the MA 21 via the service interface. If the switch is set to "OFF", you can passively listen the data.
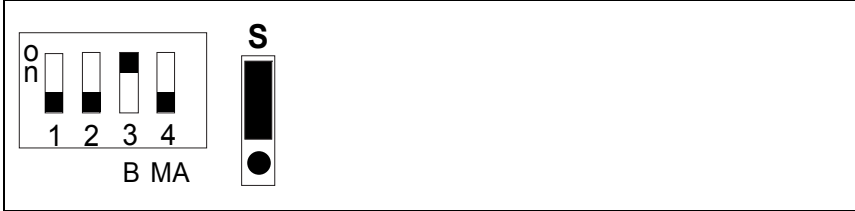
Figure 3.8: Position of the DIP switch and the jumper in the service network

Notice!

To be able to configure the connected device (RS 232) directly via the service interface, DIP switch 4 must also be set to "ON".

Attention!

Upon activation of the service mode the connection to the host computer is interrupted.

Data format of the service interface

If DIP switch 3 is set to "Service", the service interface always functions with the fixed data format

- 9600 baud
- 8 data bits
- 1 stop bit
- no parity
- no handshake

ASCII address

Attention!

*Please note that to communicate in the network, the **Frame format/Address mode/ASCII address** option must always be activated and the correct address must be selected.*

Data frame Structure

The data frame on the service interface is structured as follows:

	Prefix 1	Addr. HI	Addr. LO	Data	Terminator 1	Terminator 2
ASCII	STX	0	1	CODE	CR	LF
HEX	02h	30h	31h	43h 4Fh 44h 45h	0Dh	0Ah

Notice!

The "CODE" data content is only an example; normally the actual user data of the frame are shown here. Addr. 01 corresponds to slave 1 in the network.

Exiting service mode

As soon as DIP switch 3 is switched back to "Host", the host interface is reactivated.

Data monitoring

When the service interface is in this position, it is possible to "listen" to the data via the RS 232 as they are transferred from the MA 21 to the host computer (data monitoring).
To do this, you must set your PC / terminal to the host protocol as the host interface is only passively decoupled with no change of protocol.

Notice!

The configuration programs required for configuring the MA 21 xxx via the service interface, such as BCL-Config or RF-Config, can be downloaded from
www.leuze.de -> Download -> Identify *for BCL, RFID, VR etc.*
For further information on configuring see chapter 6.1 "Configuring the interfaces with the BCL-Config software".

4   Mounting

○
ⅈ *Notice!*

To mount the respective ident devices, please observe the notices in the corresponding operating instructions.

4.1   Mounting the MA 21

There are different types of mounting arrangements for the MA 21.

- Using 4 threaded holes (M6) or
- using the provided M8 screws in the lateral fastening grooves in the mounting plate.
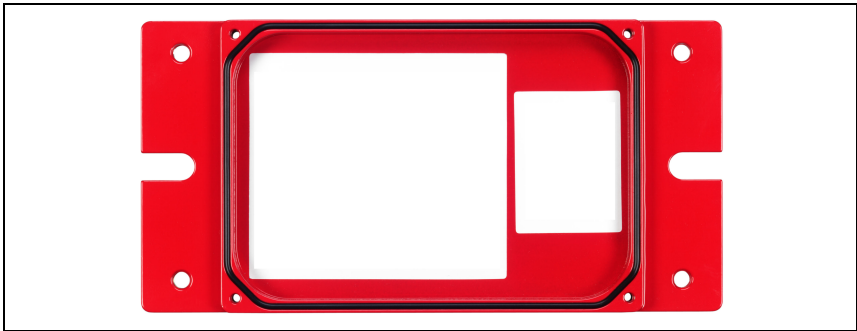
Figure 4.1: Fastening options for the MA 21

4.2   Arrangement of devices

Ideally, the MA 21 should be mounted so that it is easily accessible near the ident device in order to ensure good operability, e.g. for configuring the device connected.
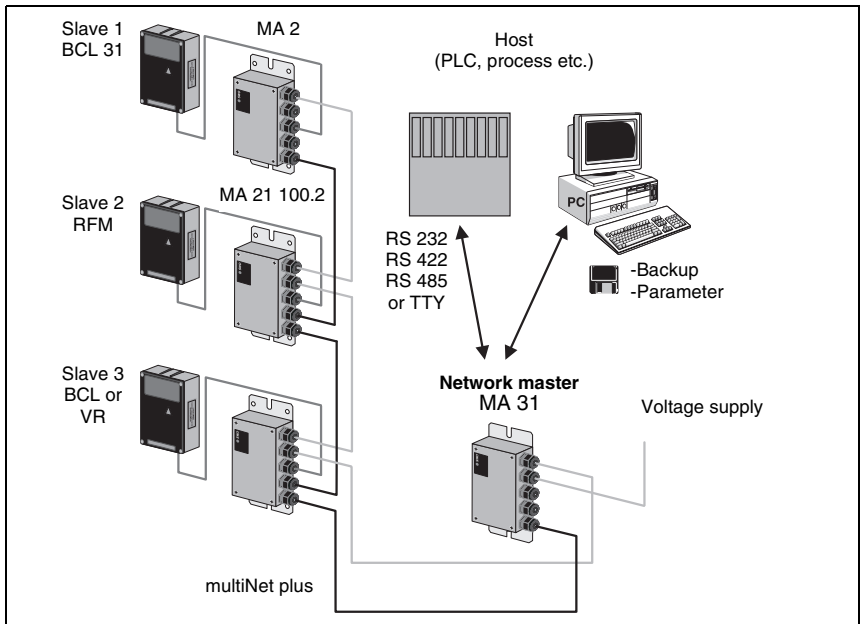
Figure 4.2: Example of arrangement of devices: Networking via multiNet plus

5   Connection

5.1   Connecting the host interface

Connection terminals: 1-6

Pin assignments of interface modules

⚠

Attention!

The pin assignments of the connection terminals are dependent on the interface module connected. The respective terminal designations are printed on the modules or affixed to the cover of the MA 21.

The type designation of the MA 21 indicates which interface module is installed:

MA 21Interface types

Type designation/ Order code	Interface module of the host interface	
MA 21 100	RS 485	For multiNet see chapter 5.2
MA 21 100.2	RS 485 multiNet plus with system connectors	
MA 21 110	RS 232	These versions use the MA 21 as an interface and protocol converter from RS 232 to the corresponding host interface (cf. following pages)
MA 21 120	TTY	
MA 21 130	RS 422	

5.1.1 RS 232 interface (MA 21 110)

The MA 21 110 functions as a protocol converter with two electrically isolated RS 232 interfaces (1 host, 1 client).

RS 232
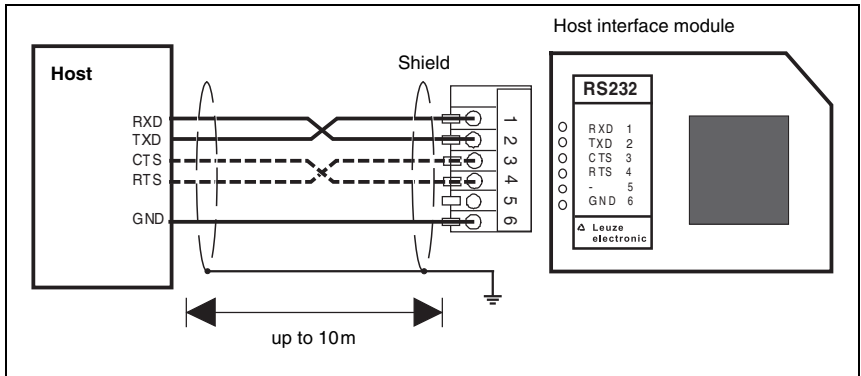
Figure 5.1: Connection of the MA 21110 to an RS 232 host computer

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凵 *Notice!*
The wiring for RTS and CTS must only be connected if RTS/CTS hardware handshake is used.

5.1.2 TTY interface (MA 21 120)

The MA 21 120 functions as an interface converter from RS 232 (client) to TTY (host).

TTY active

a) MA 21 active/host passive:
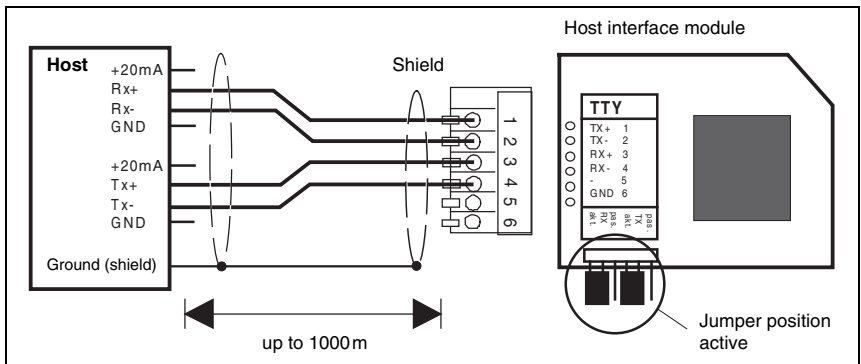
Figure 5.2: Active connection of the MA 21120 to a TTY host computer

TTY passive

b) MA 21 passive/host active:
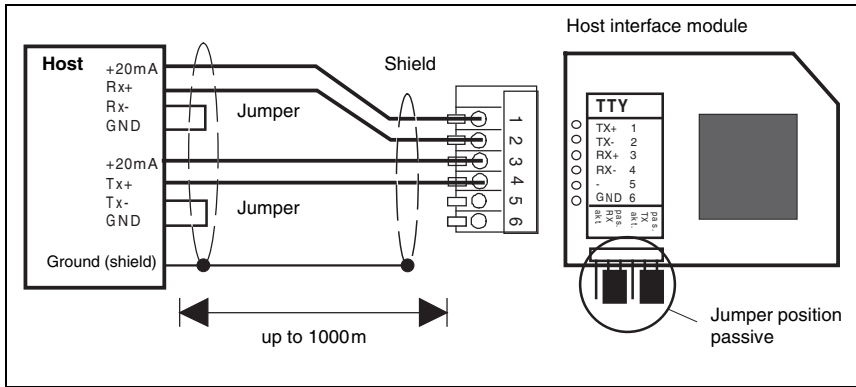
Figure 5.3: Passive connection of the MA 21120 to a TTY host computer

Hints for connecting the TTY interface:

- The active subscriber is the one which supplies the current (20mA).

- Switching between active/passive on the host interface card is carried out using two jumper pairs, independent for transmit (Tx) and for receive (Rx).

- The jumpers for active/passive switching must always be changed in pairs (upper and lower jumpers in the same position). Thus the current source and GND are switched internally at the MA 21 host interface module.

- Mixed operation is possible (transmit active/receive passive or vice versa).

- When switching between active and passive operation or vice versa, the pin order of the connection cable is changed (pin assignment).

5.1.3 RS 422 interface (MA 21 130)

With the MA 21 130 the client interface (RS 232) is converted to a 422 (host) interface. A protocol conversion is also possible.

RS 422
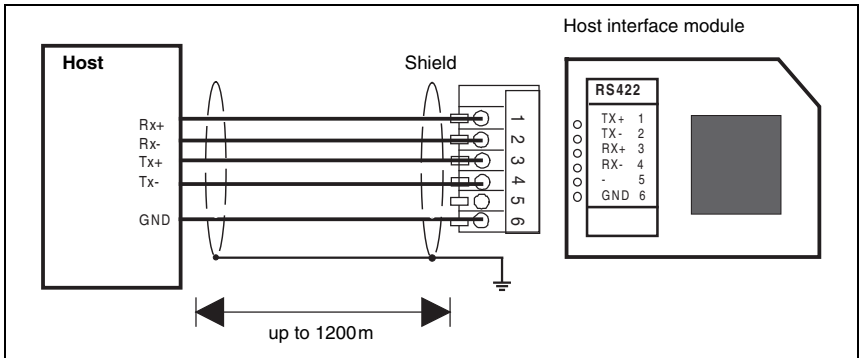
Figure 5.4: Connection of the MA 21130 to an RS 422 host computer

5.2 Connecting the multiNet plus interface

Connection terminals: 1-6 RS 485

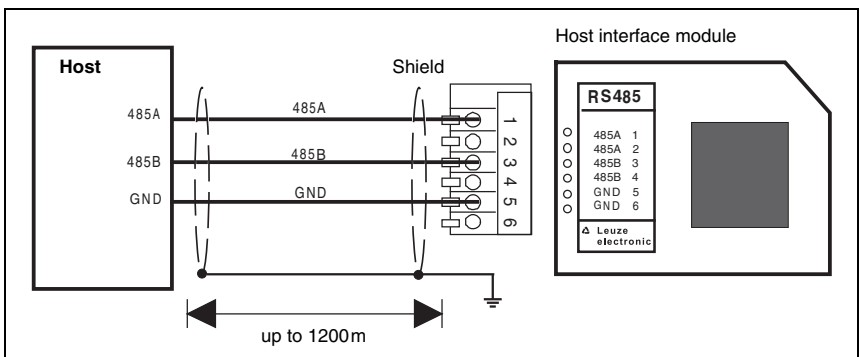### 5.2.1 RS 485 interface (MA 21 100 and MA 21 100.2)

RS 485

Figure 5.5: Connection of the MA 21100 to an RS 485 host computer

multiNet plus interface

The multiNet plus interface establishes the connection between the subscriber. Note that the RS 485 interface module must be plugged in. The two-wire RS 485 with galvanic decoupling is passed through from slave to slave.

Recommended network cable:	twisted pair
	cross section: min. 0.2 mm^2
	shielded
	copper resistance <100 Ω/km e.g. LiYCY 2 x 0.2 mm^2

multiNet plus wiring
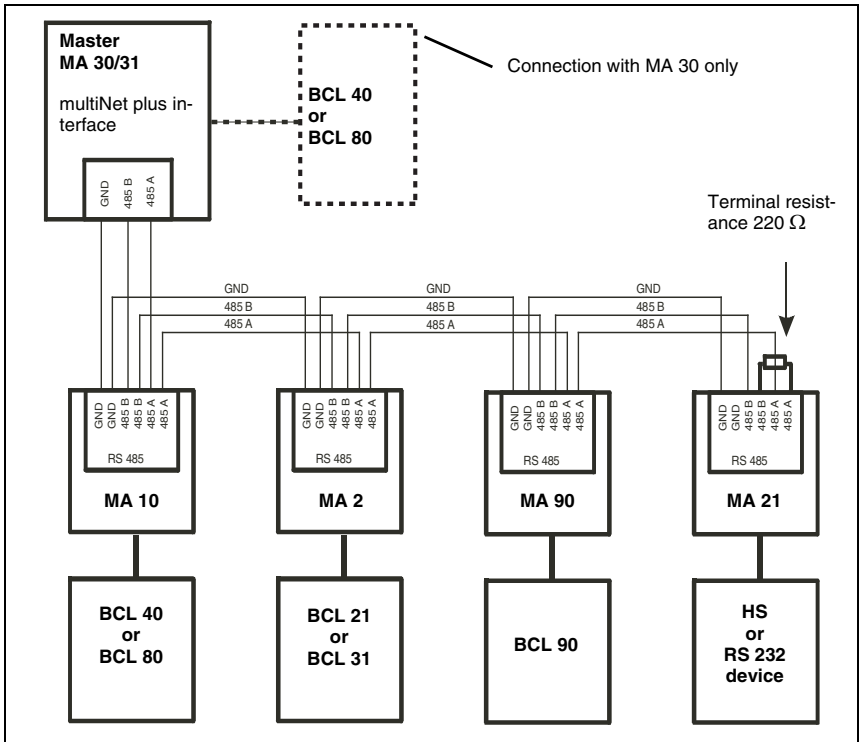
Figure 5.6: multiNet plus wiring

Hints for connecting the multiNet plus interface:

- *The RS 485 A, 485 B and GND lines are passed through in the network; for the MA 30, MA 21, MA 10 and MA 90 the corresponding terminals are doubly provided for this purpose.*

- *Connect the shielding to the slaves with GND.*

- *The maximum wire length in the network is 1200m.*

- *The (physically) last slave in the network should be fitted with a 220Ω terminating resistor between 485 A and 485 B. This prevents reflections and improves resistance to interference.*

- *485 A and 485 B wires must in no case be exchanged within the network. The multiNet will otherwise not function.*

5.3   Connecting the voltage supply

Connection terminals: 17-21 (for all MA 21)

Voltage supply
Connection terminals for the voltage supply of MA 21

Input voltage:	18 … 36 V DC	
Power consumption:	4 VA max., MA 21 without BCL	
Terminal 17, 18:	V_IN	(pos. operating voltage)
Terminal 19, 20:	GND_IN	(Reference potential, Ground)
Terminal 21:	PE	(protective conductor; earth)

Notice!

The terminals for V_IN and GND_IN are doubly supplied for ease of wiring. Thus the supply voltage can be passed through from one read station to the next.

5.4 Connecting an external device

5.4.1 Connecting the RS 232 client interface

Connection terminals: 26-28 (not for MA 21 100.2)

RS 232

Connection terminals for the RS 232 interface of an external device such as a hand-held scanner

Terminal 26:	RXD
Terminal 27:	TXD
Terminal 28:	GND

5.4.2 Connecting the voltage supply

Connection terminals: 15, 16, 30, 31 (not for MA 21 100.2)

Voltage supply

Various voltages are available: 5.2 V and 24 V fixed.

Terminals 15:	24 V
Terminals 16:	GND
Terminals 30:	$5.2V \pm 5\%$
Terminals 31:	GND

The 24 V client voltage supply is potential-free relative to the MA 21 voltage supply as well as the client interface.

6 Commissioning

Setting parameters

To activate network operation with the MA 21, it may be necessary to set several parameters. For best results use the BCL-Config or IRF-Config software for PCs, programs developed expressly for this purpose. With the aid of these programs, you can use a fixed data format via the service interface of the MA 21 to configure the host and client interface.

You can download the config. tool from **www.leuze.de -> Download -> Identify** for BCL, RFID, VR etc.

6.1 Configuring the interfaces with the BCL-Config software

6.1.1 Setting the host interface

Host interface

Prior to the initial commissioning of the host interface it must be set to the parameters of the host computer/PLC.
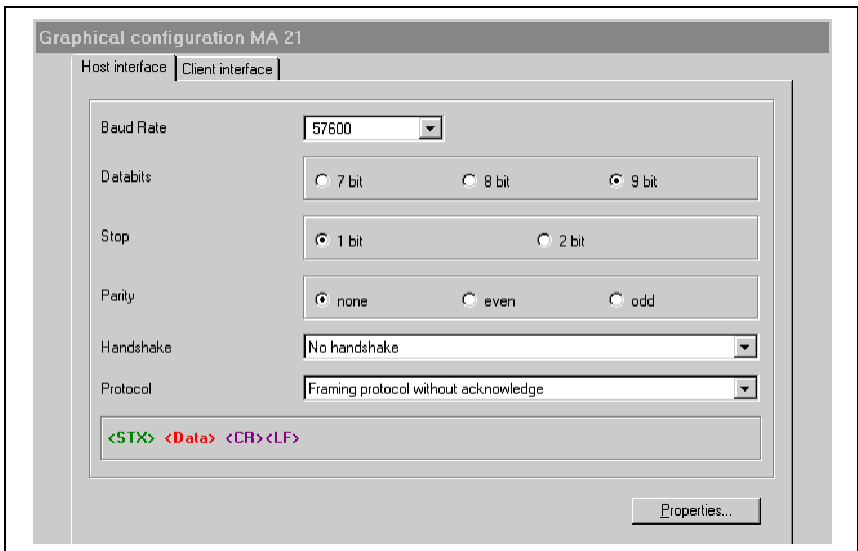
Figure 6.1: Standard setting for the Host Interface menu

Notice!

The host interface is the host connection, depending on the interface module used (connection terminals 1 to 6).

Select the desired baud rate, the stop bits, the data bits and the parity here. You can also set various handshake modes and protocols.

The RK512/3964 protocol can also be selected here. The individual parameters for this protocol can be found in the tree structure configuration under:

Communication -> customer interface -> 3964 / RK 512 protocol

⚠️ **Attention!**

If the MA 21 is operated in a network ("Leuze multiNet"), no changes may be made here. The MA 21 automatically sets itself to the multiNet protocol!

6.1.2　Setting the client interface

Client interface

Prior to the initial commissioning of the client interface, this must be set to the parameters of the external RS232 device.
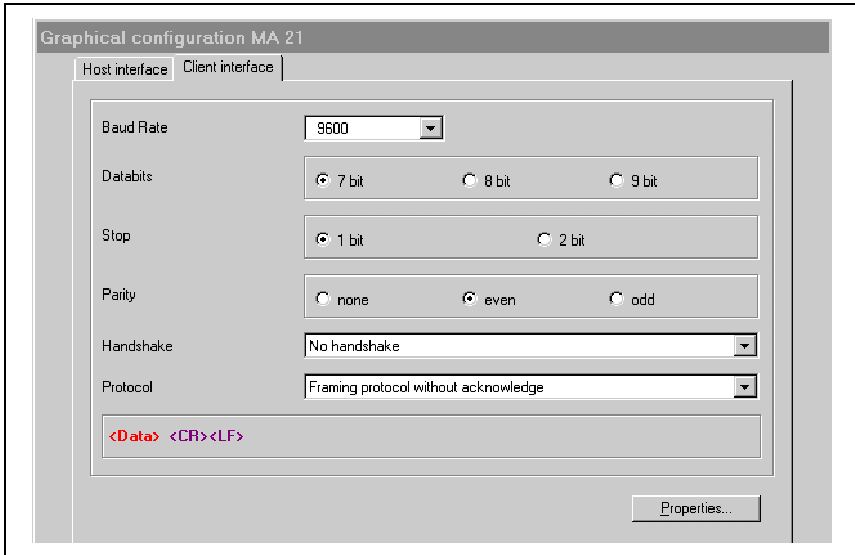

Figure 6.2: Standard settings of the Client Interface menu

◯ **Notice!**

The client interface is the connection to the external RS 232 device (connection terminals 26 to 28). A hardware handshake via RTS / CTS is not supported at the client interface.

6.2   Operating the MA 21 as multiNet plus slave

Initialising the network

- Set the appropriate slave address on the address selection switch (see also chapter 3.1).
- The last slave address must be set on the address switch on the MA 30.
- Set the "operation" operating mode on the slaves.
- Switch on the voltage supply.

Acknowledgements on the terminal window:		Meaning:
i>	00 M	M = master
i>	01 s	s = slave
i>	02 s	
i>	•	
i>	•	
i>	•	
i>	n s	n = last slave address (max 30)

If, following the initialisation phase (approx. 30 s), not all slaves are yet operational or a time-out (Addr.+T) has been output, please refer to chapter "Troubleshooting".

The connected slaves can now be contacted and configured from the master as if they were individual devices.

The only difference is:

Contacting a slave

Within the network each data telegram must contain an ASCII address that specifies for which slave the data are intended (cf. chapter 3.4)
Service mode: structure of the data frame.

6.3   Managing parameter sets in the MA 21

Parameter sets

The MA 21 is capable of managing three types of parameter sets
A "parameter set" refers to a memory area in the EEPROM that contains all settings (parameters) of a read station such as code type, number of digits, output formatting etc. in numerical form. The BCL-Config configuration software facilitates menu-driven parameter setting. For the software handling of the parameter sets, these are sequentially numbered from "0" to "2".

1.   Current parameter set ("0"):
     parameter set that can be changed via an online or offline setup and that contains the current settings of the MA 21.

2. Customer-specific parameter set ("1"):
   parameter set stored in the MA 21 that can be created as a copy of a valid, current parameter set for the purpose of storing customer-specific settings. As a result, the customer-specific data are retained following a hardware reset.

3. Factory parameter set ("2"):
   Leuze standard parameter set that cannot be changed.
   The settings correspond to the state upon delivery.
   By means of a hardware RESET (see chapter 6.4.2), it is possible to restore the factory settings of the MA 21.
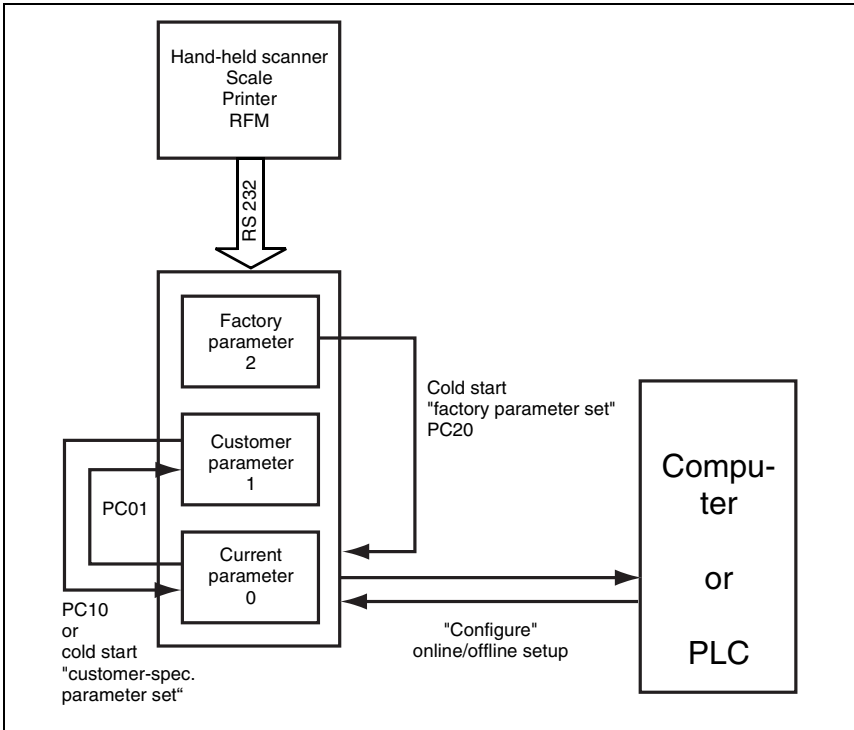
Figure 6.3: Managing parameter sets in the MA 21

The parameter sets are not erased by switching off the operating voltage. The current parameter set is used on start-up. If this is invalid, the customer-specific parameter set is loaded.

"parameter copy" command

With the online command "**Parameter Copy**", abbreviated "**PC**", you can copy a given parameter set as a backup, so to speak, into the customer-specific parameter set and use a hardware RESET to return the read station to this state at any time (cf. chapter 6.4.2).

Commands for handling the parameter sets via software:

PC01: copies the current parameter set to the customer-specific parameter set

PC10: copies the customer-specific parameter set to the current parameter set (corresponds to hardware RESET with customer-specific parameters)

PC20: copies the standard parameter set to the current parameter set (corresponds to hardware RESET with factory parameters)

6.4   Executing a RESET

6.4.1 Software RESET ("warm start")

Software RESET

In the event that the MA 21 no longer responds in spite of having applied the operating voltage, and the RDY LED no longer illuminates, you should first perform a software RESET. To do this, press the RESET button on the MA 21 for more than 0.2 and less than 4.0s.

The operating software will be restarted and the devices with the current parameters will be reinitialised. Following initialisation, the MA 21 responds with "S" and the RDY LED should illuminate.

If the MA 21 does not respond even after carrying out a warm start, there may be an error in the setup settings, i.e. in the "current parameter set" of the MA 21. A hardware RESET (see chapter 6.4.2) returns the parameter set of the MA 21 to a defined state so that the devices are operable again.

6.4.2 Hardware RESET ("cold start")

Hardware RESET

By means of a cold start, you can either reset the MA 21 to factory settings (factory parameter set) or to your customer-specific parameter set. Which parameter set is loaded depends on the position of DIP switch 2. Initiate a cold start by pressing the RESET button for more than 4s.

⚠ **Attention!**

A cold start replaces the current parameter set either with your customer-specific parameter set or the Leuze factory parameter set, i.e. any settings made there are lost. Therefore perform a hardware RESET only if the software cannot be started or if you intentionally want to reset the MA 21.

Customer-specific parameter set:
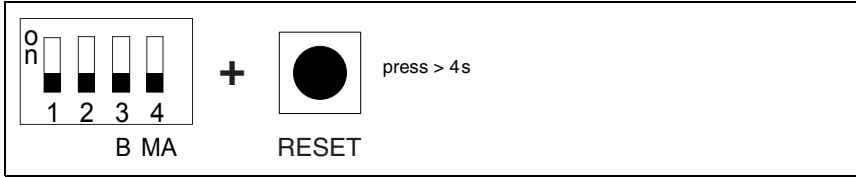
Factory parameter set:

Figure 6.4: Loadable parameter sets during cold start

7   Diagnostics and troubleshooting

If problems occur during commissioning of the MA 21, you can refer to the following table. Typical errors and their possible causes are described here as well as tips for their elimination.

No.	Error description	Possible error causes	Measures
Error when switching on			
1	No LED illuminates	• Incorrect polarity or improper connection of operating voltage	❏ Check connection, correct if necessary
2	RDY LED flashes for longer than 30 s after start-up	• "Power-ON" function test could not be carried out successfully	❏ Check the network wiring; switch the operating voltage off and back on again
3	With network operation, network master (Addr. "00") does not respond to the host	No communication between host and master: • Incorrect interface type plugged in • Interface incorrectly connected • Incompatible data format between host and MA 21 • DIP switch 3 set to "Service"	❏ Replace interface module ❏ Correct according to the connection diagram ❏ Check the data format and change in the master setup ❏ Set DIP switch 3 to "Host"
4	Master responds with "00S", the connected slaves do not respond	• Last slave address on the master MA 21 not set • DIP switch 4 set to "BCL"	❏ Use the rotary switch or master setup to set the last slave address ❏ Set DIP switch 4 to "MA 21"
5	Master responds with "00S", all connected slaves respond with time-out (e.g. "01T, 02T, 03T etc.)	• Interruption or polarity reversal of the multiNet plus interface (RS 485) • The slaves have not recognised the "multiNet" protocol type and are using a different data format	❏ Test and correct the connection; wires A and B must not be interchanged ❏ Test and correct settings for the host protocol of the slaves at the service interface data format: multiNet mode baud rate: 57600 protocol: multiNet plus slave
other errors on start-up			
6	Master and slaves respond with "Addr.+S", but MA 21 with time-out (e.g. 03T)	• MA 21 is not connected correctly or is using an incorrect data format • MA 21 is set to "Service"	❏ Test the connection of the MA 21, check host protocol (see above) ❏ Switch MA 21 to "Operation"

▲ Leuze electronic

No.	Error description	Possible error causes	Measures
Errors during operation			
7	DTR LED flashes but no data arrive at the host computer	• Incorrect protocol set at the host interface of the MA 21 • DIP switch 3 set to "Service"	❏ Set the protocol on the MA 21 to the values of the host computer ❏ Set DIP switch 3 to "Host"
8	RDY and ERR LEDs flash synchronously	• The MA 21 is in setup mode; no reading tasks can be performed while in this mode	❏ End setup and save if necessary; the MA 21 returns to operating mode
9	RDY LED does not illuminate	• Operating software of the MA 21 does not function properly	❏ Perform a software RESET

Notice!

*Please use **page 34 and page 33 as a master copy** should servicing be required.*
Mark the items in the "Measures" column which you have already examined, fill out the following address field and fax both pages together with your service contract to the fax number listed below.

Customer data (please complete) Leuze service fax number: +49 7021 573-199

Device type:	
Company:	
Contact person/ Department:	
Phone (direct):	
Fax:	
Street / No:	
ZIP code/City:	
Country:	

8 Type overview and accessories

8.1 Type overview of the MA 21

Part No.	Type designation	Remark
500 30481	MA 21 100	Protocol/interface converter - from RS 232 to RS 485/RS 485 multiNet
500 03125	MA 21 100.2	Protocol/interface converter - from RS 232 to RS 485 multiNet with system connection
500 30482	MA 21 110	Protocol/interface converter - from RS 232 to RS 232, electrically isolated
500 30483	MA 21 120	Protocol/interface converter - from RS 232 to TTY
500 30484	MA 21 130	Protocol/interface converter - from RS 232 to RS 422

9 Maintenance

9.1 General maintenance information

The MA 21 does not require any maintenance by the operator.

9.2 Repairs, servicing

Repairs to the device must only be carried out by the manufacturer.

↳ *Contact your Leuze distributor or service organisation should repairs be required.*
The addresses can be found on the inside of the cover and on the back.

Notice!

When sending devices to Leuze electronic for repair, please provide an accurate description of the error.

9.3 Disassembling, packing, disposing

Repacking

For later reuse, the device is to be packed so that it is protected.

Notice!

Electrical scrap is a hazardous waste! Observe the locally applicable regulations regarding disposal of the product.

10   Appendix

10.1   EU Declaration of Conformity

⚠   **Leuze electronic**

EG-Konformitätserklärung
EC-Declaration of conformity

Hersteller:
Manufacturer:

        Leuze electronic GmbH + Co KG
        In der Braike 1
        73277 Owen / Teck
        Deutschland

erklärt, unter alleiniger Verantwortung, dass die folgenden Produkte:
declares under its sole responsibility, that the following products:

Gerätebeschreibung:
Description of Product:

        MA 2x xxx
        MA 3x xxx

folgende Richtlinien und Normen entsprechen.
are in conformity with the standards an directives:

Zutreffende EG-Richtlinien:
Applied EC-Directive:

89/336/EWG	EMV-Richtlinie
73/23/EWG	Niederspannungs-Richtlinie

Angewandte harmonisierte Normen:
Applied harmonized standards:

EN 61000-6-2:2001	EMV Fachgrundnormen Störfestigkeit Industrie
EN 61000-6-3:2001	EMV-Fachgrundnormen Störaussendung Mischgebiete
EN 55022:1998 + A1:2000 + A2:2003	EMV-Funkstöreigenschaften ITE-Produkte
EN 55024:1998 + A1:2001 + A2:2003	EMV-Störfestigkeit, ITE-Produkte
EN 61000-4-2:1995 + A1:1998 + A2:2001	Entladung statischer Elektrizität (ESD)
EN 61000-4-3:2002 + A1:2002	Hochfrequente elektromagnetischer Felder
EN 61000-4-4:2004	Schnelle transiente elektr. Störgrößen (Brust)
EN 61000-4-6:1996 + A1:2001	Leitungsgeführte Störgrößen

Leuze electronic GmbH + Co KG   Owen, den ....*31.1.06*..............................
Postfach 11 11
In der Braike 1   ....*Heyne*..
73277 Owen / Teck
Deutschland   Michael Heyne   (Geschäftsführer)
                                                 (managing director)

10.2 ASCII table

HEX	DEC	CTRL	ABB	DESIGNATION	MEANING
00	0	^@	NUL	NULL	Null
01	1	^A	SOH	START OF HEADING	Start of heading
02	2	^B	STX	START OF TEXT	First character of text
03	3	^C	ETX	END OF TEXT	Last character of text
04	4	^D	EOT	END OF TRANSMISSION	End of transmission
05	5	^E	ENQ	ENQUIRY	Request to transmit data
06	6	^F	ACK	ACKNOWLEDGE	Positive response
07	7	^G	BEL	BELL	Bell symbol
08	8	^H	BS	BACKSPACE	Backspace
09	9	^I	HT	HORIZONTAL TABULATOR	Horizontal tabulator
0A	10	^J	LF	LINE FEED	Line feed
0B	11	^K	VT	VERTICAL TABULATOR	Vertical tabulator
0C	12	^L	FF	FORM FEED	Form feed
0D	13	^M	CR	CARRIAGE RETURN	Carriage return
0E	14	^N	SO	SHIFT OUT	Shift out
0F	15	^O	SI	SHIFT IN	Shift in
10	16	^P	DLE	DATA LINK ESCAPE	Data link escape
11	17	^Q	DC1	DEVICE CONTROL 1 (X-ON)	Device control 1
12	18	^R	DC2	DEVICE CONTROL 2 (TAPE)	Device control 2
13	19	^S	DC3	DEVICE CONTROL 3 (X-OFF)	Device control 3
14	20	^T	DC4	DEVICE CONTROL 4	Device control 4
15	21	^U	NAK	NEGATIVE (/Tape) ACKNOWL-EDGE	Negative acknowledge
16	22	^V	SYN	SYNCHRONOUS IDLE	Synchronization
17	23	^W	ETB	END OF TRANSMISSION BLOCK	End of data transmission block
18	24	^X	CAN	CANCEL	Cancel
19	25	^Y	EM	END OF MEDIUM	End of medium
1A	26	^Z	SUB	SUBSTITUTE	Substitution
1B	27	^[	ESC	ESCAPE	Escape
1C	28	^\	FS	FILE SEPARATOR	File separator
1D	29	^]	GS	GROUP SEPARATOR	Group separator
1E	30	^^	RS	RECORD SEPARATOR	Record separator

HEX	DEC	CTRL	ABB	DESIGNATION	MEANING
1F	31	^_	US	UNIT SEPARATOR	Unit separator
20	32		SP	SPACE	Space
21	33		!	EXCLAMATION POINT	Exclamation point
22	34		"	QUOTATION MARK	Quotation mark
23	35		#	NUMBER SIGN	Number sign
24	36		$	DOLLAR SIGN	Dollar sign
25	37		%	PERCENT SIGN	Percent sign
26	38		&	AMPERSAND	Ampersand
27	39		'	APOSTROPHE	Apostrophe
28	40		(	OPENING PARENTHESIS	Opening parenthesis
29	41		)	CLOSING PARENTHESIS	Closing parenthesis
2A	42		*	ASTERISK	Asterisk
2B	43		+	PLUS	Plus
2C	44		,	COMMA	Comma
2D	45		-	HYPHEN (MINUS)	Hyphen (minus)
2E	46		.	PERIOD (DECIMAL)	Period (decimal)
2F	47		/	SLANT	Slant
30	48		0		
31	49		1		
32	50		2		
33	51		3		
34	52		4		
35	53		5		
36	54		6		
37	55		7		
38	56		8		
39	57		9		
3A	58		:	COLON	Colon
3B	59		;	SEMI-COLON	Semi-colon
3C	60		<	LESS THAN	Less than
3D	61		=	EQUALS	Equals
3E	62		>	GREATER THAN	Greater than
3F	63		?	QUESTION MARK	Question mark
40	64		@	COMMERCIAL AT	Commercial AT
41	65		A		

HEX	DEC	CTRL	ABB	DESIGNATION	MEANING
42	66		B		
43	67		C		
44	68		D		
45	69		E		
46	70		F		
47	71		G		
48	72		H		
49	73		I		
4A	74		J		
4B	75		K		
4C	76		L		
4D	77		M		
4E	78		N		
4F	79		O		
50	80		P		
51	81		Q		
52	82		R		
53	83		S		
54	84		T		
55	85		U		
56	86		V		
57	87		W		
58	88		X		
59	89		Y		
5A	90		Z		
5B	91		[	OPENING BRACKET	Opening bracket
5C	92		\	REVERSE SLANT	Reverse slant
5D	93		]	CLOSING BRACKET	Closing bracket
5E	94		^	CIRCUMFLEX	Circumflex
5F	95		_	UNDERSCORE	Underscore
60	96		`	GRAVE ACCENT	Grave accent
61	97		a		
62	98		b		
63	99		c		
64	100		d		

HEX	DEC	CTRL	ABB	DESIGNATION	MEANING
65	101		e		
66	102		f		
67	103		g		
68	104		h		
69	105		i		
6A	106		j		
6B	107		k		
6C	108		l		
6D	109		m		
6E	110		n		
6F	111		o		
70	112		p		
71	113		q		
72	114		r		
73	115		s		
74	116		t		
75	117		u		
76	118		v		
77	119		w		
78	120		x		
79	121		y		
7A	122		z		
7B	123		{	OPENING BRACE	Opening brace
7C	124		l	VERTICAL LINE	Vertical line
7D	125		}	CLOSING BRACE	Closing brace
7E	126		~	TILDE	Tilde
7F	127		DEL	DELETE (RUBOUT)	Delete