

Digital Indicator

AD-MM 400 FE

Manual



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1 About this manual

This manual is part of the product.

- Read the operating instructions thoroughly before using the unit.
- Keep the operating manual for the entire life of the product and keep it ready for reference.
- Pass the manual to each subsequent owner or user of the product.

1.1 Structure of warnings

WARNING



Warning Note

Please refer to the documentation. This symbol is intended to warn you of possible dangers that may occur during installation, commissioning and use.

- Here are measures to avoid the danger.
- ...

DANGER



Hazard Statement

Danger of injury or serious injury. Before starting work, switch the system and the device free of stress.

- Here are measures to avoid the danger.
- ...

2 Security

2.1 Intended use

WARNING



Damage

The operating and maintenance instructions in this operating manual and maintenance conditions must be strictly adhered to.

The AD-MM 400 FE is intended for connection to an RS-485 interface on the other devices are connected.

The AD-MM 400 FE can be connected to a PC or laptop via the configuration interface.

The AD-MM 400 FE is intended for installation in front panels of control cabinets.

The AD-MM 400 FE has a connection for the supply voltage and can be connected with An alternating voltage up to 250V AC or 24V DC.

Any other use is not intended! Unauthorized modifications and alterations On the product lead to considerable safety risks and are eliminated Security reasons prohibited! For damages resulting therefrom or for damages Adamczewski elektronische Messtechnik GmbH is not liable for unauthorized use.

Faults which can affect the safety are immediate remove! The installer must give the operator the operating instructions make available. Installer and operator must provide the operating instructions beginning their activities.

2.2 Predictable misapplication

This product may not be used in any of the following cases:

- In potentially explosive atmosphere. Operating in potentially explosive atmospheres Sparks may cause fires, fire or explosions.
- Use in humans and animals.

2.3 Safe Handling

This product is state of the art and recognized safety rules. Each device is activated before delivery and safety.

Operate this product only in perfect condition, taking into account the operating instructions, the usual regulations and guidelines as well as the applicable safety regulations and accident prevention regulations.

Extreme environmental conditions affect the function of the product.

- Protect product from impact
- Use only in indoor areas
- Protect product from moisture

2.4 Qualification of personnel

Assembly, commissioning, operation, maintenance, decommissioning and disposal May only be carried out by suitably qualified personnel. Work on electrical parts may only be carried out by trained personnel Qualified electrician in accordance with the applicable regulations and Guidelines.

2.5 Changes to the product

Unauthorized modifications to the product can lead to malfunctions Prohibited for safety reasons.

2.6 Use of spare parts and accessories

The product can be replaced by the use of unsuitable spare parts and accessories to be damaged. Please use only original spare parts and accessories Manufacturer.

2.7 Disclaimer

For damage and consequential damage caused by non - observance of the technical Regulations, instructions and recommendations, the manufacturer assumes No liability or warranty. The manufacturer and the sales company Shall not be liable for any costs or damages incurred by the User or any third party Use of this appliance, especially if the appliance is not used properly, Misuse or interference of the connection, malfunctions of the device or of the device Connected devices. For non-intended use adheres Neither the manufacturer nor the sales company.

3 Product Description

The monitor module AD-MM 400 FE is a display and control unit for the front door installation. It can be connected to other devices of the Adamczewski elektronische Messtechnik GmbH or to devices from other manufacturers via its RS-485 interface. The display is via a graphical TFT display.

The AD-MM 400 FE communicates with the connected devices via the Modbus protocol. It can function both as a Modbus master and a Modbus slave.

As a Modbus master, the AD-MM 400 FE records the data of the connected Modbus slaves and displays them. The data, even from different slaves, can be combined in the displays as desired.

As a Modbus slave, the AD-MM 400 FE displays data it receives via the interface from a Modbus master. Again, the displays are freely configurable.

3.1 Properties

- Display and control unit for the front door installation
- Display via graphical TFT display
- RS-485 interface, Modbus RTU
- Operation as Modbus master or Modbus slave possible
- Modifiable slave address when operating as a Modbus slave
- Device configuration and firmware update with Configuration Software AD-Studio via its own AD-PC interface
- Creating custom ads with the Configuration Software AD-Studio

3.2 Scope of Delivery

- AD-MM 400 FE
- All required plug-in connection terminals
- This manual

For configuration with the Configuration Software AD-Studio , you need the optional VarioPass programming adapter.

3.3 Ordering Code

AD-MM 400 FE Standard version with RS-485 and configuration interface

VarioPass (optional) Parameterization adapter for USB

3.4 Block Diagram

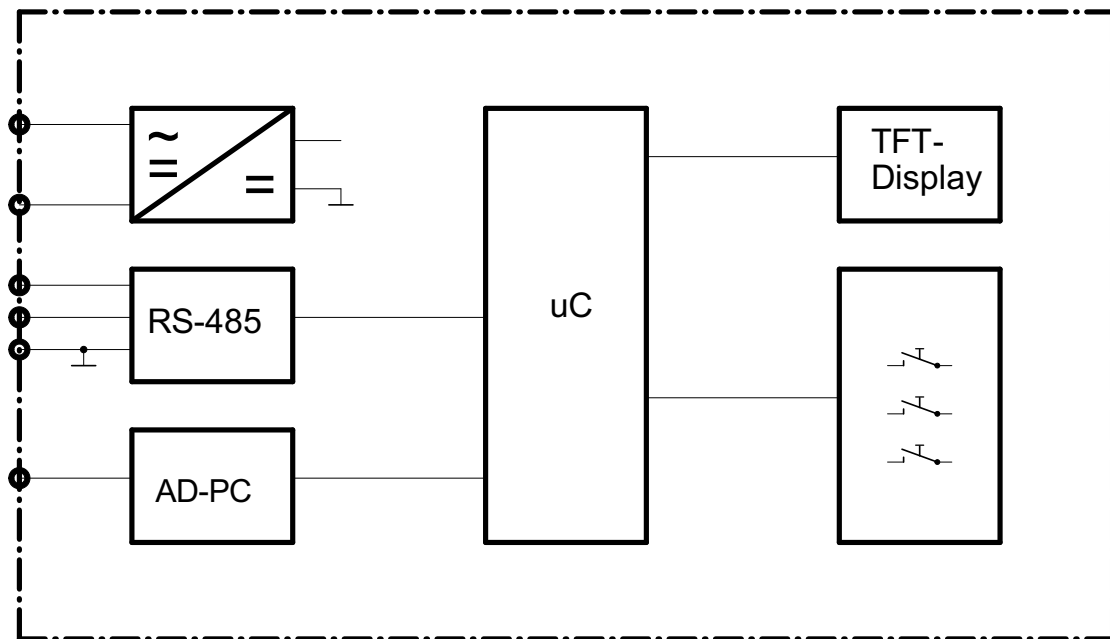


Figure 3.1: Blockdiagram of the AD-MM 400 FE

3.5 Display and Controls

The AD-MM 400 FE has a color TFT display for displaying the data and three buttons for operation and configuration. Short and long keystrokes are evaluated differently.

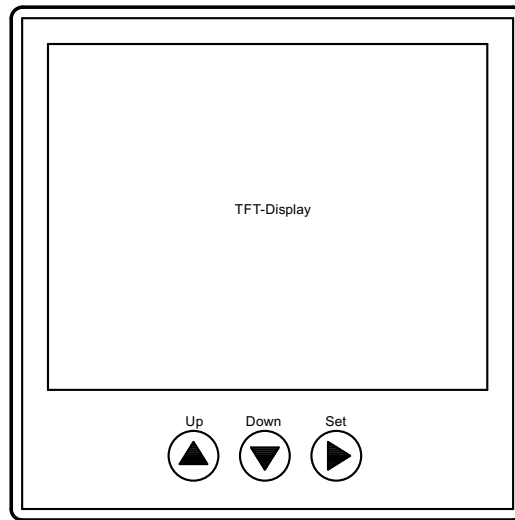


Figure 3.2: Display and control elements of the AD-MM 400 AD-MM 400 FE

Function of the keys. Multiple functions are separated by ';':

Key 'Up' Scroll up; increment number

Key 'Up', long Switch from manual to autoscroll display mode

Key 'Down' Scroll down; decrement the digit

Key 'Down', long Switch from manual to autoscroll display mode

Key 'Set' Confirm the entry

Key 'Set', long Switch from display mode to menu and back; cancel current entry

4 Specifications

4.1 RS-485 interface

The connection to the other devices must be established via a twisted shielded bus cable. The order of the devices among each other is arbitrary. For reasons of electromagnetic compatibility, the shield must be connected at both ends to a large area and to be connected in a good conducting manner to the protective end. The wiring must be in a bus structure. Branch lines longer than 5 m should be avoided. The two ends of the bus line must be terminated with a resistance of 120 Ω .

Description	Value	Unit
Norm	RS-485	
Baudrate	19200	Baud
Data bits	8	
Stopbits	1	
Parity	even	
Protocol	Modbus RTU	
Max. Cable length	1200 ¹	m

¹ This is only a guideline. The actual line length may vary depending on cable quality and interference on the transmission path down or up.

4.2 Supply

4.2.1 AC Supply

Description	Min	Rated	Max	Unit
Voltage	50	230	253	V AC
Frequency	40	50	60	Hz
Power consumption			2,5	VA

4.2.2 DC Supply

Description	Min	Rated	Max	Unit
Voltage ¹	20	24	253	V DC
Power consumption			1.5	W

¹ The polarity of the voltage at the connection terminals must be observed.

4.3 Case

Description	Value	Unit
Enclosure Type	Enclosure Housing to IEC 61554	
Housing Size HxWxD	96 x 96 x 44	mm
Panel Cutout HxB	92 (+0.8) x 92 (+0.8)	mm
Protection class	IP20	
Terminal technology	screw terminals, pluggable	
Cross-section	2.5 4	mm ² , fine-stranded mm ² , solid
Weight	350	g

4.4 Ambient Conditions

Description	Min	Rated	Max	Unit
Pollution degree		2		
Protection class		II ¹		
Ambient temperature	0	20	50	° C
Transport and Storage	-10		70	° C

¹ No Protective Conductor

4.5 EMC, Safety Regulations, Product Standard

Description	Value	Unit
Discharge static electricity	IEC 61000-4-2	
Electromagnetic fields ¹	IEC 61000-4-3	
Fast Transients, Burst	IEC 61000-4-4	
Surge voltages, Surge	IEC 61000-4-5	
Conducted RF Signals	IEC 61000-4-6	
Interference emission	EN55011, CISPR11 class B, living area	
Safety regulations	EN61010-1	
Product family standard	EN 61326	

¹ Low noise is possible during interference.

4.6 Galvanic Isolation, Test Voltages

Description	Value	Unit
Auxiliary Voltage to RS-485	4	kV, 1 min.

5 Assembly and Commissioning

5.1 Electrical Connection

DANGER



Life hazard due to electric shock

The terminals of the auxiliary voltage inputs are hazardous to contact.

- Disconnect mains voltage and secure against restarting.
- Ensure contact protection of the connections.
- Protect all connections from electrostatic discharge.

5.2 Commissioning the device

- Disconnect the power supply.
- Check tension free.
- Mount the unit.
- Supply and RS-485.
- Turn power on.
- Configure device. See Chapter 6 for details
- Check function.

6 Configuration

The information in this chapter refers to the configuration of the AD-MM 400 FE with the Configuration Software AD-Studio via the configuration interface.

6.1 Operating modes

The AD-MM 400 FE can be either a Modbus master (default setting) or a Modbus slave. The operating mode can be changed under 'Device functions' in the Configuration Software AD-Studio .

6.1.1 AD-MM 400 FE as Modbus Master

In this operating mode, the AD-MM 400 FE automatically reads the value for each display line of a display from the holding register of a slave. The display lines are configured independently of the display and can be freely assigned to one or more displays. Values ??of different slaves can thus be combined and displayed on a display. The picture shows the basic arrangement.

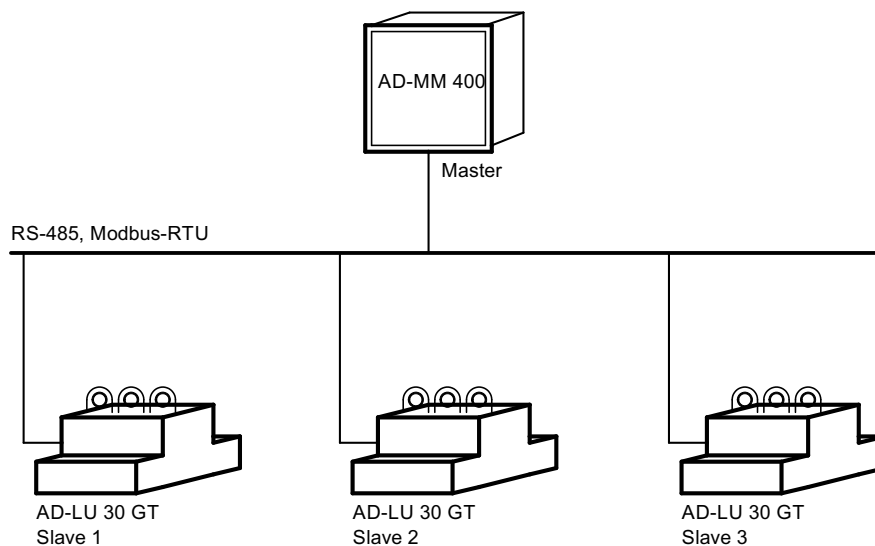


Figure 6.1: AD-MM 400 FE as Modbus-Master

How to use the AD-MM 400 FE as Modbus Master

1. Set the operating mode to 'Master'.
2. The Modbus data tables of the connected slaves must be known.
3. Set the desired slave address on all slaves.
4. Make sure that all slaves and the AD-MM 400 FE use the same baud rate and parity. When using devices of the Adamczewski elektronische Messtechnik GmbH , you do not have to worry about it because all devices use the same settings (19200 baud, 8 data bits, even parity, 1 stop bit).
5. Determine the desired display lines by entering the required data per display line in the configprogram as shown in the figure. The parameters are essentially self-explanatory and explained in detail in the chapter 6.2.2. Unused display lines do not need to be edited.

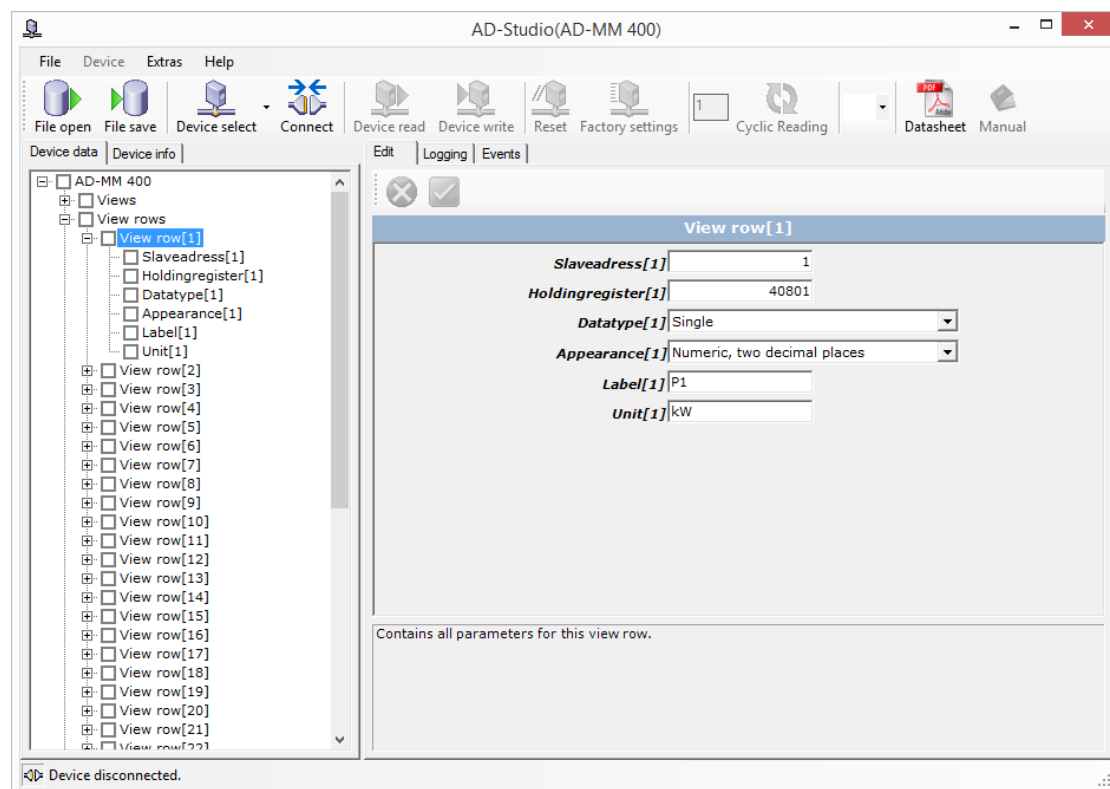


Figure 6.2: Configure the lines of the AD-MM 400 FE with the Configuration Software AD-Studio

6. Assign the index of a configured display row to all the ads you want to represent, the number of display lines to display, and each display line.

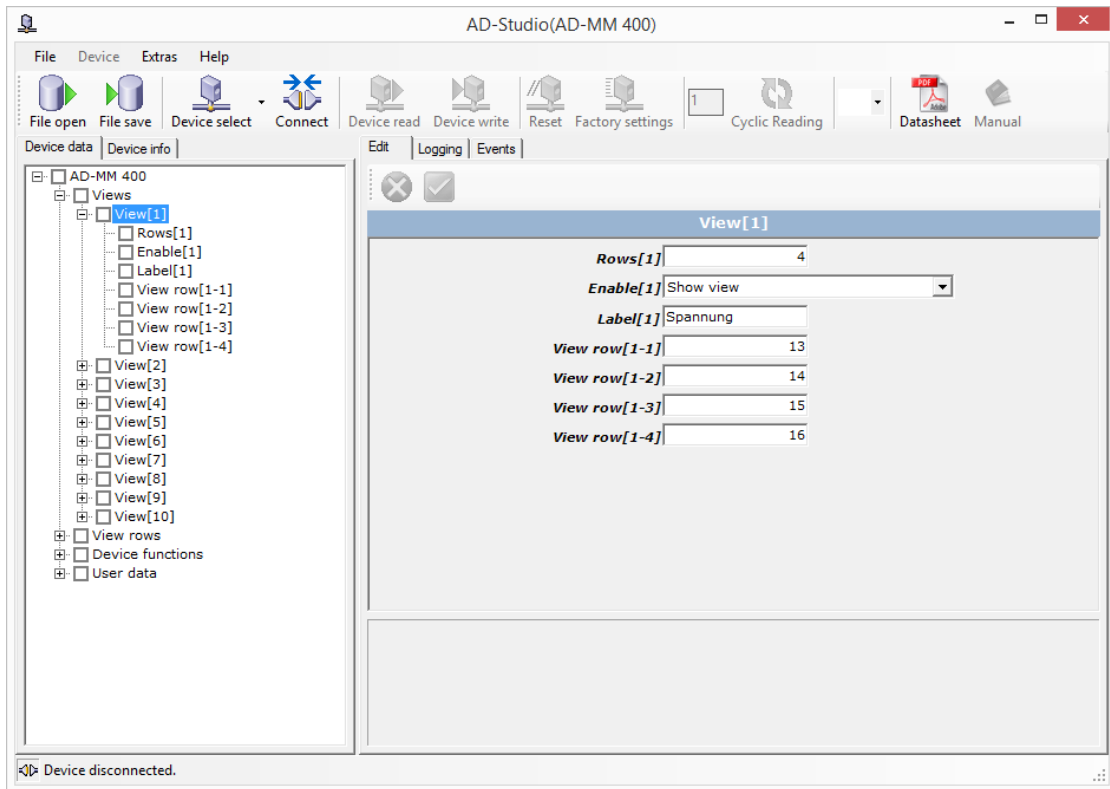


Figure 6.3: Configure the display of the AD-MM 400 FE with the Configuration Software AD-Studio

7. Change the 'Display' parameter of all unused displays to the 'Do not display' value to skip these screens when scrolling.

6.1.2 AD-MM 400 FE as Modbus slave

In this operating mode, the AD-MM 400 FE receives the values to be displayed from an external Modbus master, e.g. A PLC or a PC. The configuration of the displays is similar to that described in 6.1.1.

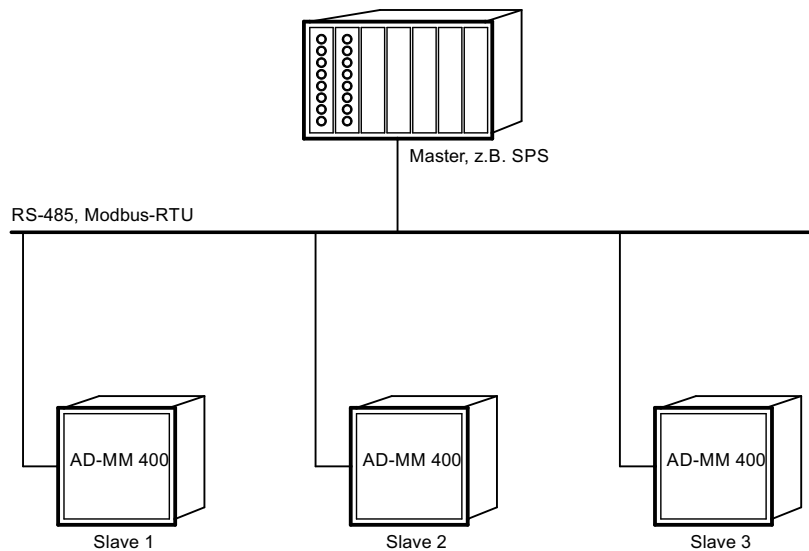


Figure 6.4: AD-MM 400 FE as Modbus slave

How to use the AD-MM 400 FE as a Modbus Slave

1. Set the operating mode to 'Slave'.
2. Set the desired slave address of the AD-MM 400 FE .
3. Ensure that all slaves and the Modbus master use the same baud rate and parity.
4. The configuration of the display lines and displays is exactly the same as in the master operating mode.
5. The AD-MM 400 FE now behaves like any other Modbus slave. Modbus function 16 (Write Multiple Registers) can now write data to the configured registers. Details on data formats and data transfer can be found in chapter 7.

6.2 Parameters

The following is a reference to the parameters that can be modified with the Configuration Software AD-Studio .

INFO



Display lines and displays

The configuration of the individual display lines and the displays can only be carried out with the Configuration Software AD-Studio because of the amount of the resulting data.

6.2.1 Views

The AD-MM 400 FE can display up to 10 Views. These can be scrolled automatically with the 'up' and 'down' buttons either manually or with a timer.

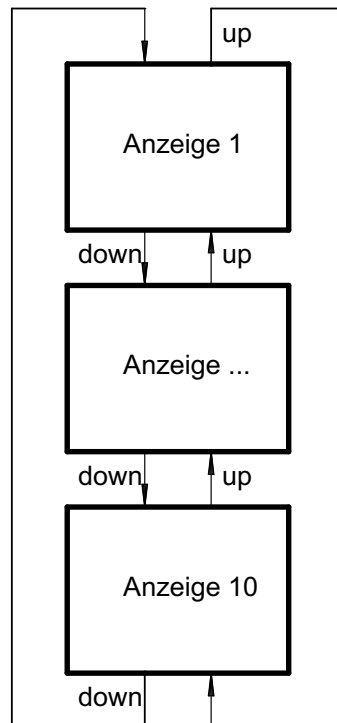


Figure 6.5: scroll through the views

A view contains a title line and can contain one to four lines of data. The following illustrations show the display of one-to-four-line displays on the display. A line can be seen as a logical unit, which can represent a numerical value in various ways. The height of the row depends on the number of rows to display.

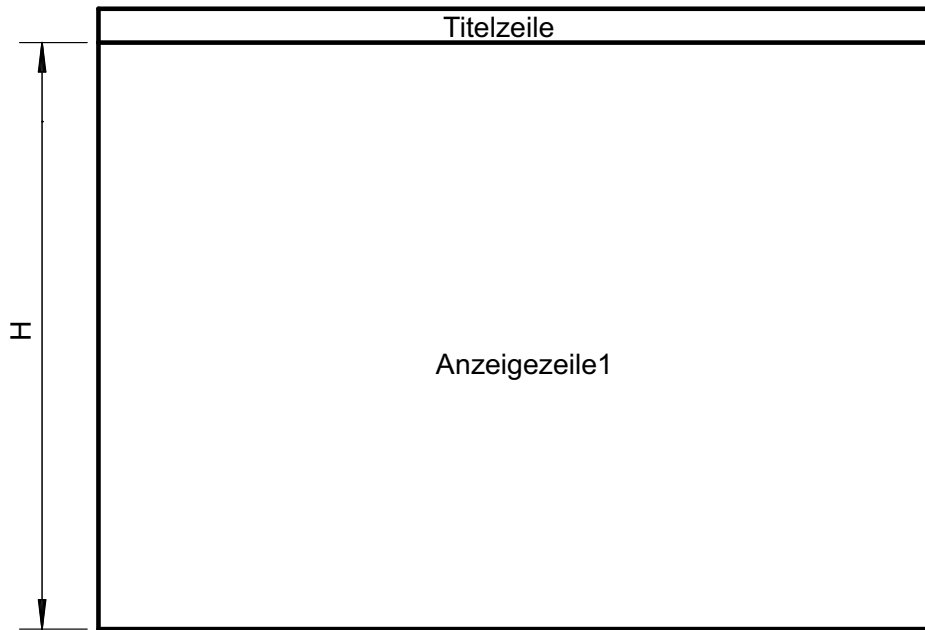


Figure 6.6: single-line displaylayout

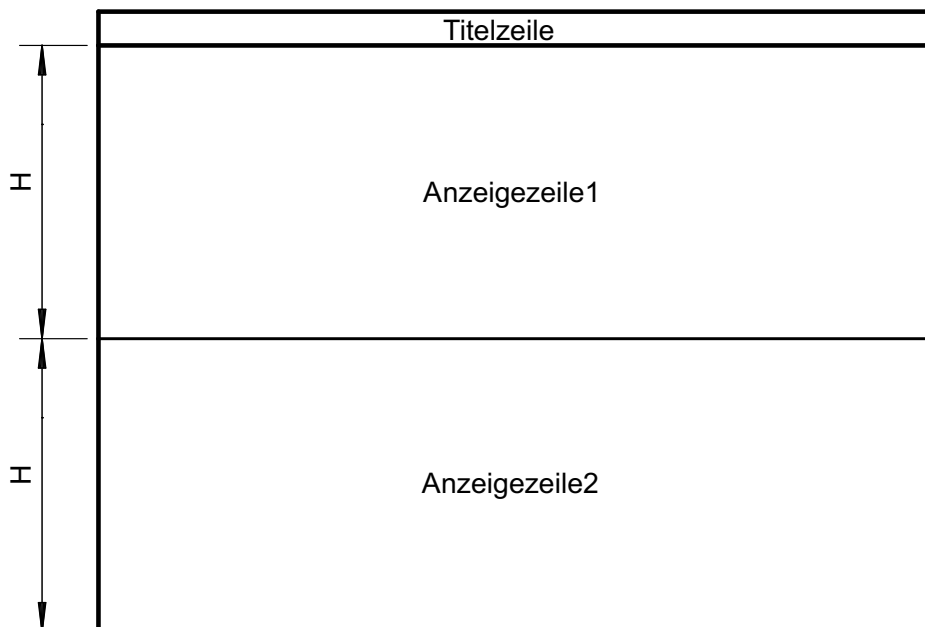


Figure 6.7: two-line displaylayout

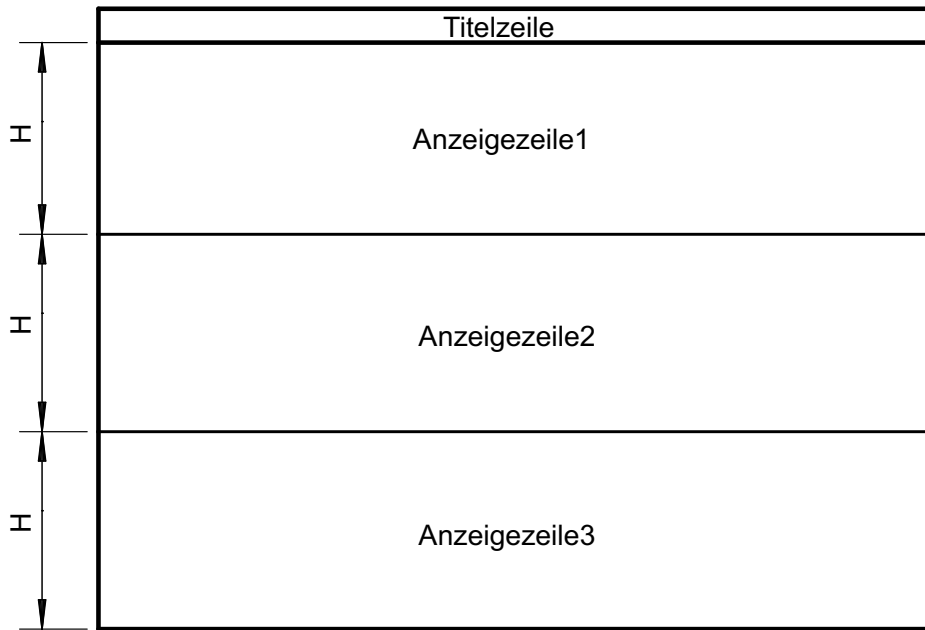


Figure 6.8: three-line displaylayout



Figure 6.9: four-line displaylayout

The following parameters are available to configure the displays.

INFO



Default values of the AD-MM 400 FE

The AD-MM 400 FE contains as default values exemplary settings with which the data of the AD-LU 30 GT can be displayed as slave.

Name	Standardvalue	Range	Unit
Lines	1	1 ... 4	
Show	Show	Do not show, Show	
Label	1	0 ... 20	Character
Display line1	1	1 ... 40	
Display line2	1	1 ... 40	
Display line3	1	1 ... 40	
Display line4	1	1 ... 40	

¹ The exemplary data of the AD-LU 30 GT are not shown because of the better overview.

The 'Rows' parameter determines the number of rows displayed in this view. The 'Display' parameter determines whether a display is displayed or not. The indices of the display lines to be displayed are determined with 'Display line1' ... 'Display line4'.

6.2.2 display lines

A display line can currently display numeric values ??only as a numeric display. Other types of presentation, such as bar charts or time charts, are planned.

Numeric Values Display

The numerical display shows the numerical value together with the physical unit and other information. The size of the font is determined automatically depending on the number of display lines. The distribution of the display line is shown in the following figure.



Figure 6.10: Splitting the display line into areas

value As a master, the AD-MM 400 FE automatically fetches the value from a holding register of the slave. In the slave mode, the values transferred by the master are displayed here.

unit The physical unit of the value is displayed in this area.

Slave: register The slave address and the register are displayed here for information and control.

Label Freely definable label text for the displayed data.

The following parameters are available for configuring the display lines.

Name	Standardvalue	Range	Unit
Slave address	1	1 ... 247	
Holding register	1	0 ... 65535	
Data type	1	U08, S08, U16, S16, U32, S32, Single	
Representation	1	X ² XX ² X.XX ² X.XXX ² X.XXXX ² X. AUTO ³ Bar chart ⁴ Time chart ⁴	
Label	1	0 ... 10	Character
Unit	1	0 ... 6	Character

¹ The exemplary data of the AD-LU 30 GT are not shown because of the better overview.

² Numerical representation with the number of decimal places selected.

³ Numerical representation with automatic determination of the decimal places.

⁴ Planning

6.2.3 device functions

General or superior parameters can be configured in the device functions.

Name	Standardvalue	Range	Unit
Brightness	50	10 ... 100	%
Autoscroll Interval	5	3 ... 60	s
Master / Slave Mode	Master	Master, Slave	
RS-485 slave address	1	1 ... 247	123

The background lighting of the TFT display can be individually set with 'Brightness'. With 'Autoscroll Interval', the dwell time until the next display can be set by the automatic scrolling.

Master/Slave mode can be used to determine whether the AD-MM 400 FE is acting as master or slave on Modbus.
With 'RS-485 slave address', the slave address of the AD-MM 400 FE can be determined in slave mode. In the master mode, this parameter has no meaning.

7 Modbus

The AD-MM 400 FE has an RS-485 interface as standard, via which it communicates either as a Modbus master or as a Modbus slave via the Modbus RTU protocol. By default, the AD-MM 400 FE works as a Modbus master.

7.1 RS-485 interface parameter

The RS-485 interface works by default with the parameters listed under 4.1. A possibility to change these parameters is currently not provided and is also not necessary when using devices of the Adamczewski elektronische Messtechnik GmbH .

7.2 Changing the slave address

If the AD-MM 400 FE is operating in slave mode, the slave address can be changed with the Configuration Software AD-Studio . The slave address is not relevant as a Modbus master.

INFO



Confirmation of the slave address

The slave address is not accepted until the AD-MM 400 FE is rebooted.

7.3 Data format

All data larger than one byte is sent in the Big-Endian format according to Modbus specification.

An exception is the checksum. It is sent in the format 'Little-Endian'.

Example: The number 4660 (0x1234) is transmitted as follows: 0x34, 0x12.

7.4 Data types

The following data types are used.

Type	Size	Range
Bool	1 byte	0 ... 1
U16	2 byte	0 ... $2^{16} - 1$
U32	4 bytes	0 ... $2^{32} - 1$
Single	4 byte	IEEE 754

7.5 Supported Functions

The AD-MM 400 FE supports the following functions as master and slave on the RS-485 interface.

3 (0x03) Read Holding Registers.

16 (0x10) Write Multiple Registers.

7.5.1 Read Holding Registers

This function is used to read one or more registers.

Example: The master sends a request with the start address 40801 (0x9F61) And a number of registers to be read from 2 (0x0002) to the slave:

Slave	Function	Register High	Register Low	Number High	Number Low	CRC Low	CRC High
1	0x03	0x9F	0x61	0x00	0x02

If everything is correct, the slave responds with the number of bytes and the registers requested:

Slave	Function	Number Bytes	Reg0 High	Reg0 Low	Reg1 High	Reg1 Low	CRC Low	CRC High
1	0x03	4	0x00	0x00	0x00	0x00

In the event of an error, the slave responds with an error message:

Slave	Error Code	Exception	CRC0	CRC1
1	0x83	see 7.6		

7.5.2 Write Multiple Registers

This function is used to write one or more registers.

The master sends a request with the start address, the number of registers and the To be written to the slave:

Slave	Func.	Reg. High	Reg. Low	Number High	Number Low	Bytes	Value High	Value Low	CRC Low	CRC High
1	0x10									

If all data are correct, the slave responds with the start address and the number of written registers:

Slave	Func.	Reg. High	Reg. Low	Number High	Number Low	CRC Low	CRC High
1	0x10						

In the event of an error, the AD-MM 400 FE will respond with an error message:

Slave	Error Code	Exception	CRC Low	CRC High
1	0x90	see 7.6

7.6 Exception Codes

In the event of an error, the AD-MM 400 FE will respond with a Error telegram and one of the following exception codes. As The function code is returned with 0x80.

- 1 (0x01)** The Modbus function is not supported.
- 2 (0x02)** The register address does not exist.
- 3 (0x03)** The data is invalid.

8 Wiring diagrams

8.1 RS-485

The figure shows the configuration of the RS-485 interface with several nodes in a Modbus segment according to the specification 'Modbus over serial line'.

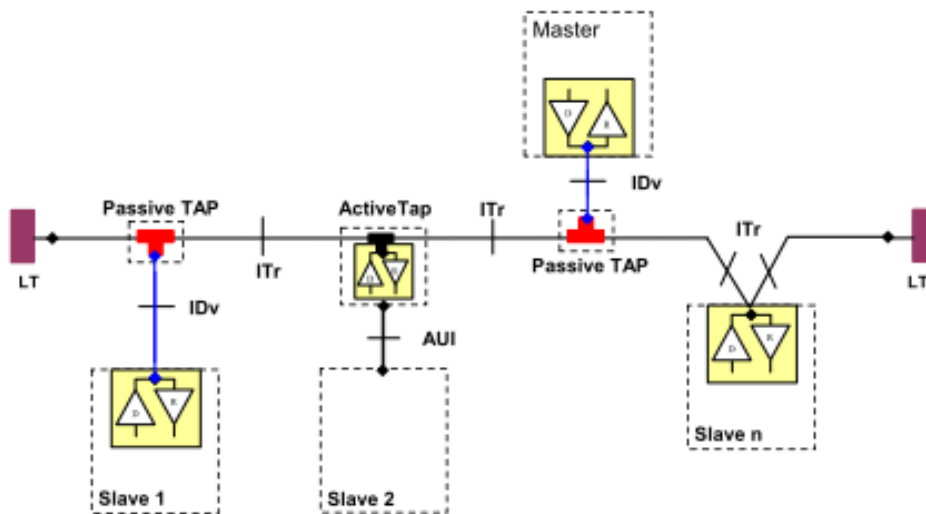


Figure 8.1: RS-485 with several subscribers

ITr A twisted, shielded cable must be used as a bus cable

IDv Passive spur lines must be as short as possible

Masse The ground connection of all bus nodes must be connected to each other and connected to the end of the bus, if possible at the bus master

LT The bus line must be terminated at both ends with terminating resistors of 120 Ohm between lines A and B.

8.2 Terminal assignment

Plug, terminal	Function
M1, 1	RS-485 A
M1, 2	RS-485 B
M1, 3	RS-485 Masse
M4, 1	Power supply AC1, DC-
M4, 2	Power supply AC2, DC+
M6	3mm jack for VarioPass

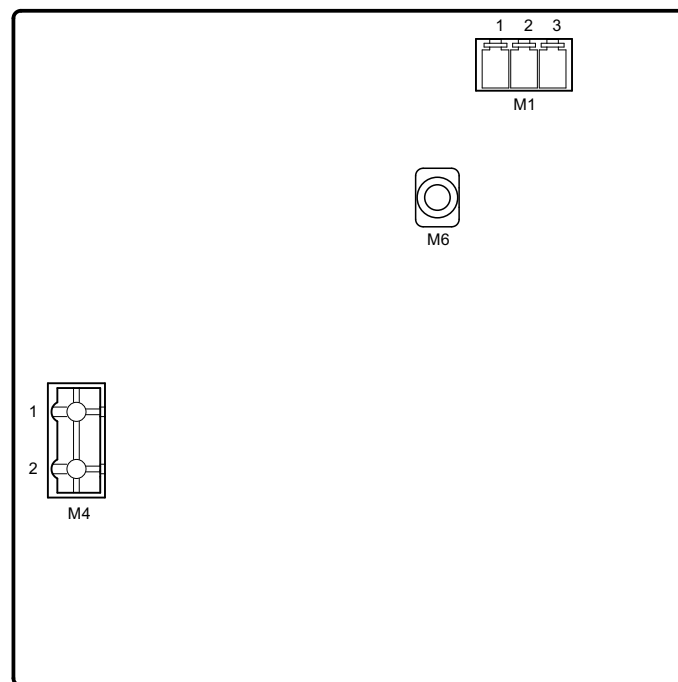


Figure 8.2: Terminal assignment of AD-MM 400 FE . View from back.

9 Appendix

9.1 Maintenance

During proper operation of the AD-MM 400 FE , this is maintenance-free. The device may only be repaired by the manufacturer in case of damage.

9.2 Malfunction

If an error or a fault occurs, try to find the cause first. If the error persists, please contact the manufacturer or dealer of the device, which can be found in chapter 9.4.

9.3 Revisions

Revision	Date	Remarks
1.2	2021-05-18	document name changed
1.1	2016-07-27	added images
1.0	2015-10	Document created

9.4 Addresses

If you have questions about the product, wishes or suggestions, please contact the manufacturer of the product:

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