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Configuration

5 Configuration

► NOTICE

Before starting

Before switching on, make sure that the device was stored at the specified ambient temperature (-20 ... +55 °C) for at least 30 minutes.

Parameters of the module can be read, edited and saved with 'M110 Configurator' software. The full list of parameters is shown in the Table 5.1.

The software and its user guide can be found on the CD included.

Module has to be configured first before operating in RS485 network.

The following steps are required:

- Install M110 Configurator on the PC.
- Connect the module to the USB interface of the PC over RS485-USB interface adapter IC4 (not included). Connect the D+/D- terminals of the module with the D+/D- contacts of the adapter.
- Connect the power supply to 24V/0V terminals of the module.
- Turn on the power supply.
- Run the Mx110 Configurator.

If the factory settings of the module have not been changed, the connection to the module is automatically established, the module automatically recognized, its configuration parameters read out and an appropriate configuration mask open.

If it does not happen, parameters of the configurator have to be changed.

Table 5.1 Configuration parameters

Name	Parameter	Valid value	Meaning	Default setting
Basic parameters				
dev	Device	up to 8 characters		MK110-8D4R
ver	Firmware version	up to 8 characters		Manufacturer
Network parameters				
bPS	Baud rate, kbit/s	0	2.4	9.6
		1	4.8	
		2	9.6	
		3	14.4	
		4	19.2	
		5	28.8	
		6	38.4	
		7	57.6	
LEn	Data bits *	0	7	8
		1	8	
PrtY	Parity *	0	none	none
		1	even	
		2	odd	
Sbit	Stop bits *	0	1	1
		1	2	
A.Len	Address bits	0	8	8
		1	11	
Addr	Device address	1...247		16

Configuration

Name	Parameter	Valid value	Meaning	Default setting
t.out	Time-out, s	0...600		0
Rs.dL	Response delay, ms	0...45		2
Input parameters				
Tin.C	Debouncing filter	0	off	0
		1	on	
Output parameters				
THPD	PWM period, s	1...900	1...900	1
O.ALr	Safe output status, %	0...100	0...100	0
Log	Output logic	0	RS485	0
		1	direct logic	
		2	NOT	
		3	AND	
		4	OR	
		5	one impulse	
		6	PWM	
		7	trigger	
O.dl	On/Off-delay	0	no delay	0
		1	on-delay	
		2	off-delay	
Tim	Output_delay,_x0.1s	0...65535	x 0.1 s	0

* Invalid network parameter combinations:

- *prty=0; sbit=0; len=0*
- *prty=1; sbit=1; len=1*
- *prty=2; sbit=1; len=1*

Operation

6 Operation

In the operation mode the module is controlled by a network Master in Modbus network. It can be performed in different ways:

- Individual control in digital mode (see to 6.3)
- Individual control in PWM mode (see to 6.4)
- Group control (see to 6.5)

Modbus functions 03, 04 for reading and 15, 16 for writing can be used.

6.1 Functional test

To check functioning of module MK110-24.8D.4R the following steps shall be performed:

- Connect the module to USB-port of the PC using a USB/RS485 adapter.
- Run M110 Configurator on the PC.
- If the connection has not been established automatically, the network parameters of the configurator have to be changed.
- Choose menu item ‘Device -> I/O status...’. A new window “Output status” will open.
- For each output the PWM duty cycle (pulse to period ratio) between 0 and 1 can be set, so that output is switched on/off or a continuous pulse train is generated.
- Output resistance for MK110-8D.4R modification can be optionally measured with an ohmmeter.
- Max resistance on closed outputs – 1 ohm.
- Min resistance on open outputs – 2 Mohm.
- If there are any deficiencies in functioning, contact technical support of akYtec GmbH.

6.2 Input/Counter Status

Input status can be read out as bit mask. The appropriate Modbus registers are given in Table 6.2. The least significant bit of the mask corresponds to input 1.

To reset the counter in the appropriate register 0 shall be specified.

6.3 Individual ON/OFF control

Using function Modbus 15 (0x0F) "Write Multiple Coils" the certain number of outputs can be controlled. The command shall include the following:

- Start address (0x0000 to 0x0003)
- Number of described bits (0x0001 to 0x0004)
- Byte number n (0x01)
- Information (bit mask, n bytes)

Addressing of separate cells is given in Table 6.3.

6.4 Individual control in PWM mode

Using pulse-width modulation average value of voltage can be changed. Pulses with the specified repetition period (thpd) and duty ratio (ratio between one-pulse time and its repetition period) will be generated sequentially via output.

Output status depending on entered duty ratio is given in Table 6.1. Function 16 is used for writing.

Operation

Table 6.1 Pulse width modulation

Duty cycle		Output status
Configuration	Modbus command	
0	0	0
1	1000	1
between 0 and 1	between 0 and 1000	Pulses with duty ratio between 0 and 100%

The PWM period (**THPD**) is usually set during the configuration. The period can also be changed by a Modbus command, and the following should be noted:

Parameter 'Duty cycle'

► NOTICE

The configurator uses not the Modbus protocol but its own internal communication protocol. Therefore, range of value in configuration and in Modbus command can differ. For example, the duty cycle must be set to 1 for switching on the output DO1 during the functioning test. In a Modbus command the duty cycle must be written as 0001 in register 0000.

Permanent memory

► NOTICE

As the permanent memory is not unlimited rewritable (approx. 10^6 times), it is not advisable to change the parameters 'THPD (PWM period) and 'O.ALr' (Safe output status) by Modbus commands as often as, for instance, PWM duty cycle.

Minimum period of pulse-width modulation is 50 ms and can't be changed.

6.5 Group control

Group control is performed using Modbus function 16. Thus the output status bitmask (see Tab. 6.2) has to be written into the register 50 (0x0032). This way all outputs can be controlled simultaneously. Bit 0 corresponds to the output 1.

With the transfer of the mask the generation of the pulse is stopped and the outputs are set in accordance with the mask.

6.6 Fault condition

If the data exchange on the serial port is interrupted (i. e. there is no command from the master within the time specified by the parameter **t.out**) all outputs are set to a safe status. The 'Fault Condition' is a combination of all safe PWM duty cycle values, set in parameter **O.ALr** (Safe output status) for each output.

In this condition the following applies:

- LED "FAULT" is on.
- As soon as a query is received from the host device, indication is off.
- Outputs remain in safe status, until the command about status change is received from the host device.
- If **t.out** parameter is set to 0, then fault status doesn't occur.

Parameters **t.out** and **O.ALr** can be set during configuration or operation as well. The note 'Permanent memory' in sec. 6.3 should be taken into account.

6.7 Memory addressing

All variables and parameters in Table 6.2 are specified for type uint16.

Variables in Table 6.3 are specified for type bool

R – access to readout

W – access to write

Operation

Table 6.2 Modbus register

Parameter	Unit	Value		Access	Address	
		Configuration	Modbus-Command		hex	dec
Duty cycle DO1	-	0...1	0...1000	RW	0000	0000
Duty cycle DO2	-	0...1	0...1000	RW	0001	0001
Duty cycle DO3	-	0...1	0...1000	RW	0002	0002
Duty cycle DO4	-	0...1	0...1000	RW	0003	0003
Safe output status (O.ALr) DO1	-	0...100	0...1000	RW	0010	0016
Safe output status (O.ALr) DO2	-	0...100	0...1000	RW	0011	0017
Safe output status (O.ALr) DO3	-	0...100	0...1000	RW	0012	0018
Safe output status (O.ALr) DO4	-	0...100	0...1000	RW	0013	0019
PWM period (THPD) DO1	s	1...900	1...900	RW	0020	0032
PWM period (THPD) DO2	s	1...900	1...900	RW	0021	0033
PWM period (THPD) DO3	s	1...900	1...900	RW	0022	0034
PWM period (THPD) DO4	s	1...900	1...900	RW	0023	0035
Time-out (t.out)	s	0...600	0...600	RW	0030	0048
Bit mask of output status	-	-	0...15	RW	0032	0050
Bit mask of input status	-	-	0...255	R	0033	0051
Counter DI1	-	0...65535	0...65535	RW	0040	0064
Counter DI2	-	0...65535	0...65535	RW	0041	0065
Counter DI...	-	0...65535	0...65535	RW
Counter DI8	-	0...65535	0...65535	RW	0047	0071
Logic DO1 (Log)	-	0...7	0...7	RW	0050	0080
Logic DO2 (Log)	-	0...7	0...7	RW	0051	0081
Logic DO3 (Log)	-	0...7	0...7	RW	0052	0082
Logic DO4 (Log)	-	0...7	0...7	RW	0053	0083
Delay type DO1 (O.dl)	-	0...2	0...2	RW	0060	0096
Delay type DO2 (O.dl)	-	0...2	0...2	RW	0061	0097
Delay type DO3 (O.dl)	-	0...2	0...2	RW	0062	0098
Delay type DO4 (O.dl)	-	0...2	0...2	RW	0063	0099
Delay DO1 (Tim)	0.1 s	0...65535	0...65535	RW	0070	0112
Delay DO2 (Tim)	0.1 s	0...65535	0...65535	RW	0071	0113
Delay DO3 (Tim)	0.1 s	0...65535	0...65535	RW	0072	0114
Delay DO4 (Tim)	0.1 s	0...65535	0...65535	RW	0073	0115

Table 6.3 Output status binary addresses for Modbus function 15

Output	Access	Address	
		hex	dec
DO1	W	0000	0000
DO2	W	0001	0001
DO3	W	0002	0002
DO4	W	0003	0003

7 Logic Connections

As soon as for any output parameter Logic (**Log**) is not equal to 0, then its control by the host device is terminated. The output status depends on parameters Logic (**Log**), Delay Type (**O.dl**) and Delay (**Tim**). The parameters are set during configuration (refer to 5). Time diagram and I/O distribution are given in Tables 7.4, 7.5. Readout function can be used further.

7.1 Parameter logic

In output parameter Logic (**log**) logic connections between inputs and outputs are established.

Table 7.1 Parameter **log**

No.	Value	Description
0	RS485	Output is controlled by the host device
1	direct logic	Direct connection between output and input
2	NOT	Inverted connection between output and input
3	AND	Two inputs are connected with output by logic "AND"
4	OR	Two inputs are connected with output by logic "OR"
5	one impulse	When rising edge at input, at output pulse with length specified in parameter Tim is generated.
6	PWM	At activated input, at output pulses with repetition period THPD and length Tim are generated continuously
7	trigger	If DIa=1 and DIb=0, then DO=1 If DIb=1, then DO=0

Till parameter Time-out (**t.out**) > 0 is used and fault status is indicated (refer to 6.6), outputs with log > 0 will not be set to "Safe output status" (**O.ALr**). Output status will be determined by the selected logic further.

7.2 Delay Type Parameter

Parameter Delay Type (**O.dl**) determines, whether delay occurs and the delay type.

Table 7.2 Parameter **O.dl**

No.	Value	Description
0	no delay	Without delay
1	on-delay	Delay during activation
2	off-delay	Delay during deactivation

7.3 Delay Parameter

Parameter Delay (**Tim**) determined delay at output or pulse length depending on logic (**Log**) and delay type (**O.dl**). Delay value can be entered within the range from 0 to 6553.5 s with increment 0.1 s.

Table 7.3 Delay Influence

log	o.dl=0	o.dl=1	o.dl=2
0	-	-	-
1	-	Delay during activation	Delay during deactivation
2	-	Delay during activation	Delay during deactivation
3	-	Delay during activation	Delay during deactivation
4	-	Delay during activation	Delay during deactivation
5	-	Pulse length	Pulse length
6	-	Pulse length	Pulse length
7	-	-	-

7.4 Time Diagram and Distribution

Table 7.4 Time Diagram

Log		O.dl		
No.	Value	0 (no delay)	1 (on-delay)	2 (off-delay)
1	direct logic			
2	NOT			
3	AND			
4	OR			
5	one impuls		Not used	Not used
6	PWM		Not used	Not used
7	trigger		Not used	Not used

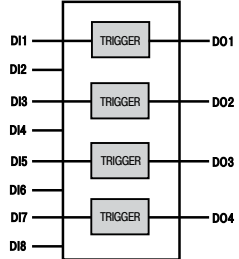
If DIa=1 and DIb=0,
then DO=1
If DIb=1, then DO=0

Logic Connections

Table 7.5 I/O Distribution

Log		Distribution
No.	Value	
1	direct logic	
2	NOT	
3	AND	
4	OR	
5	one impuls	
6	PWM	

Logic Connections

Log		Distribution
No.	Value	
7	trigger	

Factory Settings Restoration

8 Factory Settings Restoration

If communication between the computer and the module is not established, and network parameters of the module are unknown, then for network parameters factory settings shall be restored. The following steps shall be performed:

- Power off the module.
- Remove cover on the front panel of the module.
- Install X2 jumper. The module will operate with network parameters set by the manufacturer, user's settings are saved.
- Power on again.



Dangerous voltage

The voltage on some components of the circuit board can be dangerous! Direct contact with the circuit board or penetration of a foreign body in the enclosure must be avoided!

- Start configuration program "M110 Configurator".
- Enter value from Table 8.1 in window "Connect Device" or press button "Use factory settings" (refer to Fig. 8.1).

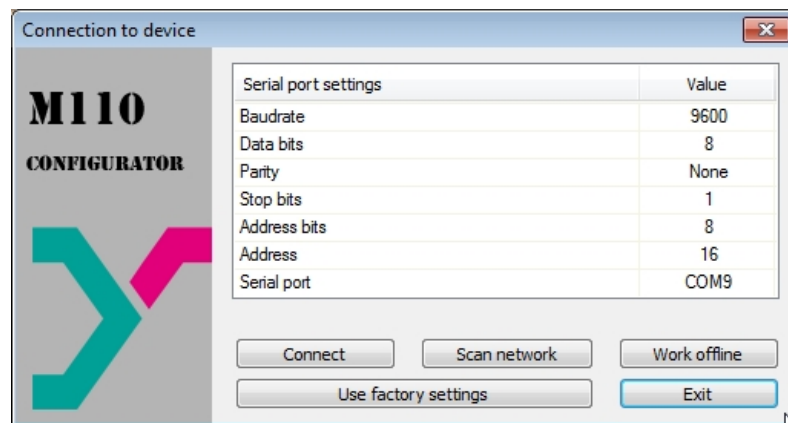


Fig. 8.1 M110 Configurator start window

- Press button "Connect". Connection will be established with factory network parameters.
- Main window of the configurator is opened. Now saved parameters of the module can be read out (refer to Figure 8.2).
- Open folder "Network parameters" in the main window of "M110 Configurator" and write values of the network parameters

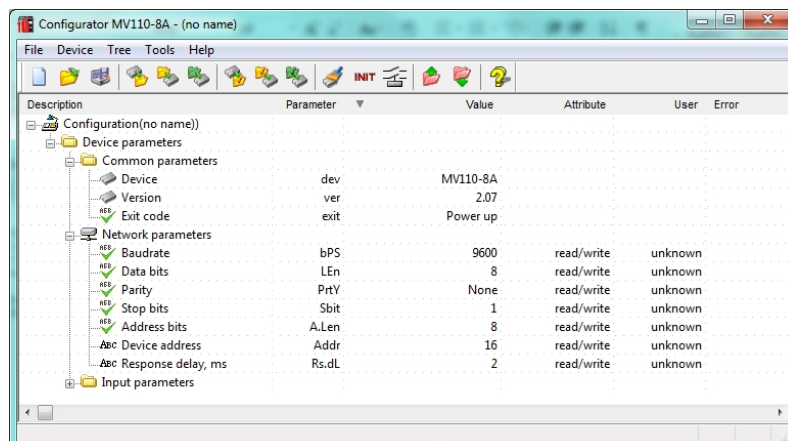


Fig. 8.2 M110 Configurator main window

Factory Settings Restoration

- Close "M110 Configurator"
- Turn off the power supply
- Remove X2 jumper
- Install the cover
- Turn on the power supply
- Restart "M110 Configurator"
- Enter the written network parameters
- Press button "Connect".

The module is ready for operation.

Table 8.1 Factory settings for network parameters

Parameter	Name	Factory setting
Baud rate	bPS	9600
Data bits	LEn	8
Parity	PrtY	none
Stop bits	Sbit	1
Address bits	A.Len	8
Address	Addr	16
Response delay, ms	Rs.dL	2

Maintenance

9 Maintenance

The maintenance includes:

- cleaning of the housing and terminal blocks from dust, dirt and debris
- checking the fastening of the device
- checking the wiring (connecting leads, fastenings, mechanical damage).

The device should be cleaned with a damp cloth only. No abrasives or solvent-containing cleaners may be used. The safety information in section 3 must be observed when carrying out maintenance.

Transportation and storage

10 Transportation and storage

Pack the device in such a way as to protect it reliably against impact for storage and transportation. The original packaging provides optimum protection.

If the device is not taken immediately after delivery into operation, it must be carefully stored at a protected location. The device should not be stored in an atmosphere with chemically active substances.

Permitted storage temperature: -25...+55 °C

► NOTICE

Transport damage, completeness

The device may have been damaged during transportation.

Check the device for transport damage and completeness!

Report the transport damage immediately to the shipper and akYtec GmbH!

Scope of delivery

11 Scope of delivery

- Module MK110-24.8D.4R 1
- User guide 1
- CD with software and documentation 1

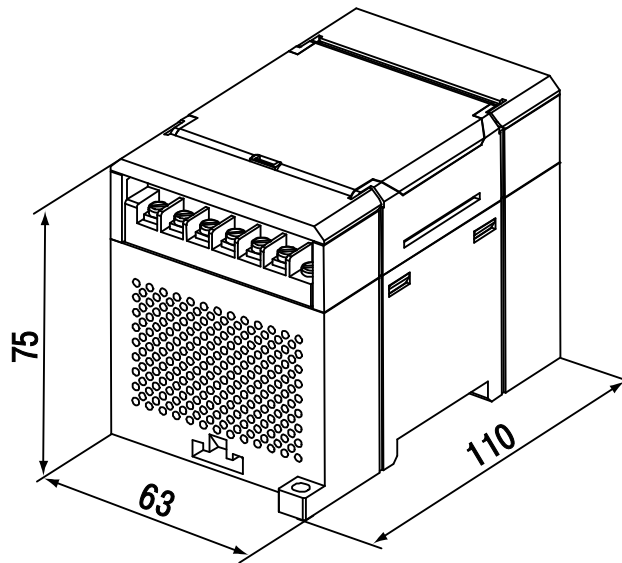


Fig. A.1 External dimensions

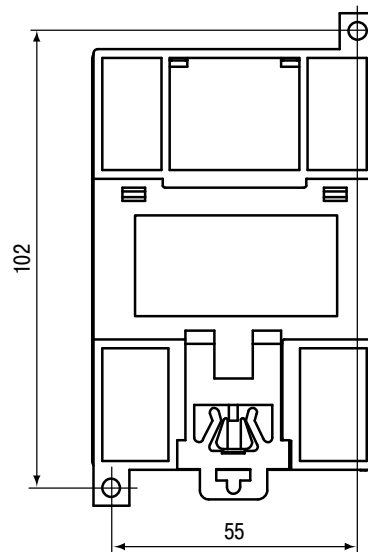


Fig. A.2 Wall mounting dimensions

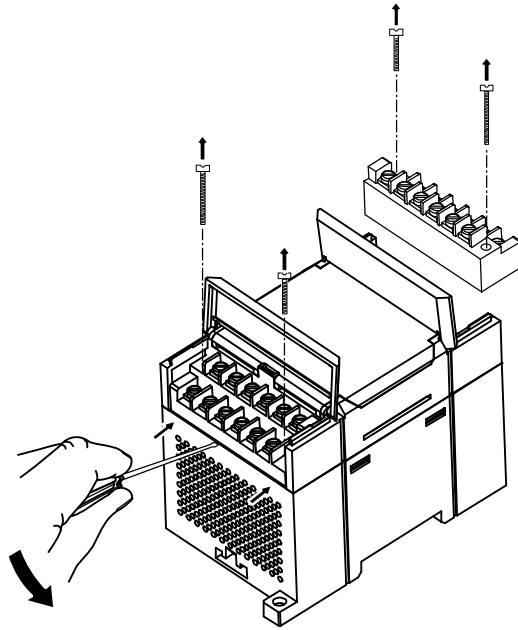


Fig. A.3 Replacement of terminal blocks