

NZM-XMC

Measuring and Communication Module



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Original Operating Instructions

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Translation of the original operating manual

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Danger! **Dangerous electrical voltage!**

Before commencing the installation

- Disconnect the power supply of the device.
- Ensure that devices cannot be accidentally restarted.
- Verify isolation from the supply.
- Earth and short circuit.
- Cover or enclose neighbouring units that are live.
- Follow the engineering instructions IL (previously AWA) of the device concerned.
- Only suitably qualified personnel in accordance with EN 50110-1/-2 (VDE 0105 Part 100) may work on this device/system.
- Before installation and before touching the device ensure that you are free of electrostatic charge.
- The functional earth (FE) must be connected to the protective earth (PE) or to the potential equalisation. The system installer is responsible for implementing this connection.
- Connecting cables and signal lines should be installed so that inductive or capacitive interference does not impair the automation functions.
- Install automation devices and related operating elements in such a way that they are well protected against unintentional operation.
- Suitable safety hardware and software measures should be implemented for the I/O interface so that a line or wire breakage on the signal side does not result in undefined states in the automation devices.
- Ensure a reliable electrical isolation of the low voltage for the 24 volt supply. Only use power supply units complying with IEC 60364-4-41 (VDE 0100 Part 410) or HD 384.4.41 S2.
- Deviations of the mains voltage from the rated value must not exceed the tolerance limits given in the specifications, otherwise this may cause malfunction and dangerous operation.
- Emergency stop devices complying with IEC/EN 60204-1 must be effective in all operating modes of the automation devices. Unlatching the emergency-stop devices must not cause restart.
- Devices that are designed for mounting in housings or control cabinets must only be operated and controlled after they have been installed with the housing closed. Desktop or portable units must only be operated and controlled in enclosed housings.

- Measures should be taken to ensure the proper restart of programs interrupted after a voltage dip or failure. This should not cause dangerous operating states even for a short time. If necessary, emergency-stop devices should be implemented.
- Wherever faults in the automation system may cause damage to persons or property, external measures must be implemented to ensure a safe operating state in the event of a fault or malfunction (for example, by means of separate limit switches, mechanical interlocks etc.).

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0 Introduction

This manual is the documentation for the NZM...-XMC-... measuring and communication modules.

The manual describes both device series - NZMx-XMC-S0 and NZM...-XMC-MB.

0.1 Target group

The content of the manual is written for engineers and electricians. A specialist knowledge of electrical engineering is needed for commissioning.

0.2 Other manuals on the devices

Additional information on the NZM...-XMC... measuring modules is provided in the instruction leaflet IL01219006.

The PDF file is available on the Internet at:

<http://www.eaton.de/EN/EatonDE/ProdukteundLoesungen/Electrical/Kundensupport/index.htm>

Customer Support → Download Center – Documentation → Installation Instructions → Quick Search “01219006”

0.3 List of revisions



From the 05/10 edition the manual AWB1230-1630en has been renamed to MN01219001Z-EN.

Edition date	Page	Subject	New	Modification	Deleted
11/16	49, 50	Technical data		✓	
04/14	11	„Voltage tap when using multiple NZM-XMC-TC-MB devices“	✓		
	49 ff.	Technical data		✓	
05/13	49 ff.	Technical data		✓	
10/12	various	New NZM-XMC-TC-MB device model	✓		
07/11	All	General revision		✓	
05/10	–	XMC-MB-250 device	✓		
	40	chapter 5, „Display“	✓		
	43	chapter 6, „Expansion cards“	✓		
	All	General revision		✓	
07/09		First edition (07/09 AWB1230-1630en)			

0 Introduction

0.4 Writing conventions

0.4 Writing conventions

The symbols used in this manual have the following meanings:

0.4.1 Hazard warnings of material damages

NOTICE

Warns about the possibility of material damage.

0.4.2 Hazard warnings of personal injury



CAUTION

Warns of the possibility of hazardous situations that may possibly cause slight injury.



WARNING

Warns of the possibility of hazardous situations that could result in serious injury or even death.



DANGER

Warns of hazardous situations that result in serious injury or death.

0.4.3 Tips



Indicates useful tips.

1 Device overview

1.1 Introduction

The NZM...-XMC-... range covers measuring devices for electrical variables in three-phase systems. It is designed with a new mounting and installation concept.

The energized cables are passed through the device. Punch screws are used to fasten the device to the cables and the voltage is measured.

Actual values, minimum values and maximum values can be measured and output over a specified period for currents, voltages and power.

The measuring and communication modules can be used flexibly within a voltage range of 35 V to 600 V and a current range of 1.5 to 500 A (or up to 630 A in conjunction with a mounting kit).

The NZM...-XMC-...measuring and communication module can be mounted at any location inside a cabinet. Alternatively the device can be fixed to a mounting plate.

The system can be used regardless of the design and type of circuit-breaker involved.

All existing circuit-breakers and switch-disconnectors can be used. Only the minimum clearance of the circuit-breaker must be taken into account for mounting.

Once properly installed on wires or buss bars, the device withstands weights up to 75 kg.

1 Device overview

1.2 Device types

1.2 Device types

Two sizes of NZM...-XMC-... measuring modules are available and are matched to the current ranges of circuit-breaker NZM.

- Construction size 2 (NZM**2**-XMC-MB-250) for currents up to 250 A
- Construction size 3 (NZM**3**-XMC) for currents up to 600 A

Both sizes are available in 3 pole (NZM...-XMC-...) or 4 pole (NZM...-**4**-XMC-...) versions.

One version is provided with a digital S0 output (see also the note on page 7) and another version is provided with a MODBUS interface and display interface. A total of ten types (basic devices) of NZM-XMC measuring and communication modules are available.

In addition, a universal measuring module (NZM-XMC-TC-MB) for external transformer connections (transducer) is also available. The data for this module is compatible with that of the above basic devices to a large extent, and the module provides a large degree of flexibility in terms of the desired current range. The device is powered with a 230 VAC voltage.

In addition, a mounting kit (NZM-XMC-KIT-630) for a maximum current of 630 A and a LED display (NZM-XMC-DISP) used to show readings are available.

Table 1: Overview of device types

Device type	Amount of poles	Maximum current [A]	Property
Basic devices			
NZM2-XMC-S0	3	300	Digital output S0
NZM3-XMC-S0	3	500	Digital output S0
NZM2-4-XMC-S0	4	300	Digital output S0
NZM3-4-XMC-S0	4	500	Digital output S0
NZM2-XMC-MB-250	3	250	+ Modbus + display interface
NZM2-XMC-MB	3	300	+ Modbus + display interface
NZM3-XMC-MB	3	500	+ Modbus + display interface
NZM2-4-XMC-MB-250	4	250	+ Modbus + display interface
NZM2-4-XMC-MB	4	300	+ Modbus + display interface
NZM3-4-XMC-MB	4	500	+ Modbus + display interface
Universal device			
NZM-XMC-TC-MB			+ Modbus
Mounting kit			
NZM-XMC-KIT-630	3	630	+ Modbus + display interface
Display			
NZM-XMC-DISP			Display device for all basic devices

1.3 Features

Table 2: Comparison between some of the characteristics of the NZM...-XMC... basic devices and the NZM-XMC-TC-MB universal device

Feature	NZM...-XMC...	NZM-XMC-TC-MB
Supply voltage	24 V DC	230 V AC
Current transformer	integrated	external
Voltage indication ledge	With set screw	With connection or voltage transformer
Number of digital inputs	2	–
Number of digital outputs	2 + 2 S0 pulse outputs	2 (alarm or S0 pulse)
Harmonic	–	THD (V + I)
Per-phase energy values	yes	no



S0 interface

The S0 interface is a hardware interface for transferring electrical measured values. It is defined in the DIN 43 864 standard.

The data is transferred by means of weighted pulses (pulses per kWh); the weighting depends on the type of meter. Ensure correct polarity when connecting the interface, since the output is implemented as a transistor or optocoupler.

A maximum voltage of 27 V DC can be connected.

The maximum power flow is approx. 30 mA.

The signal is generated by the meter as a current pulse.

A power flow less than 3 mA corresponds to a Low value.

A larger power flow is interpreted as a High value.

Note:

The S0 interface described above must not be confused with the S0 bus within an ISDN installation!

2 Installation

2.1 Basic devices

The NZM...-XMC... measuring modules (basic devices) can be mounted in two ways:

They can be secured either to a mounting plate or “suspended” only from the conductors.



DANGER

Electric current! Danger to life!

Only skilled or instructed persons may carry out the following operations.

- ▶ Guide the cable through the three tunnels. Ensure that the phase sequence L1, L2, L3, N and the current direction are correct. If necessary use a cable adapter.

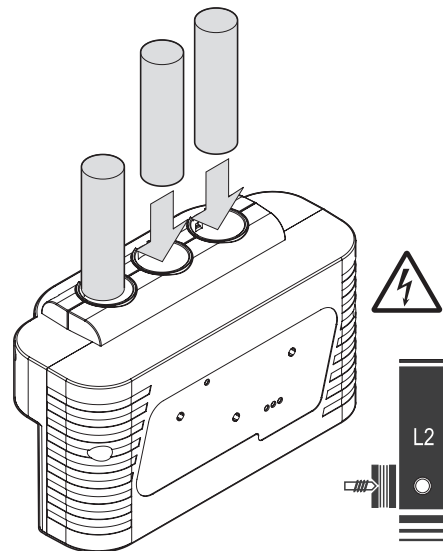


Figure 1: Inserting the cables

- ▶ Fasten the device (if required) to the mounting plate.
For this the device does not have to be fastened separately, but is simply secured by the cables or the distribution rail.

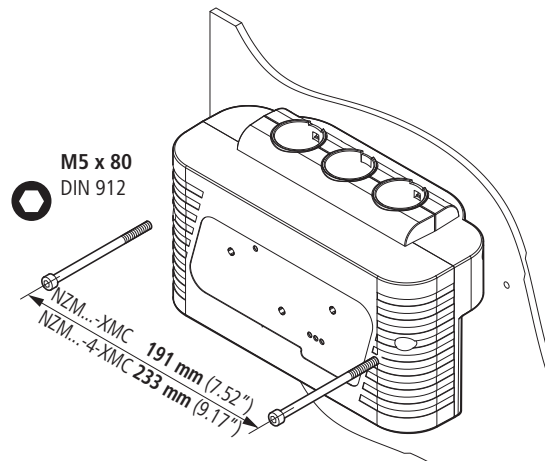


Figure 2: Attachment to the mounting plate

- ▶ Tighten the screws for the cable terminals.

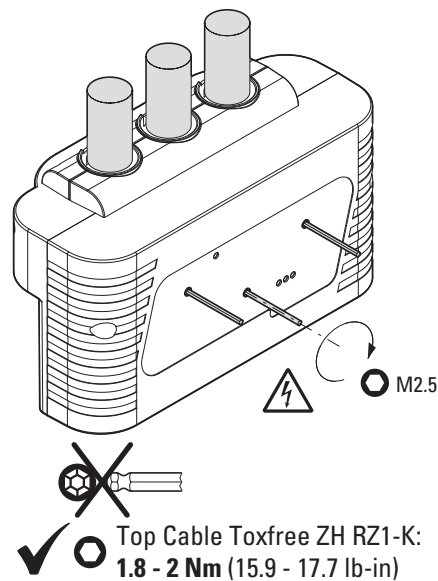


Figure 3: Tightening the screws



DANGER

Danger of electrical shock!

For this wear protective gloves and use an insulated Allen key. Screws must punch the copper in order to perform the voltage sensing.

2 Installation

2.2 Universal module



Hexagon keys with a ball head are not suitable for tightening the screws.

The recommended tightening torque for the Toxfree ZH RZ1-K top cable is 1.8 to 2 Nm.

Installation must be such that the phase assignment matches the front labeling L1, L2 and L3. This defines the device's direction of phase rotation.

The conduction direction is set with register 1301, bit 0.

The device is preconfigured for "outgoing section", i.e. for power flow from top to bottom.

For an incoming unit, the power flow is bottom to top.

This is done by setting bit 0 in register 1301 to TRUE. The positive direction of current flow then corresponds with the above situation.

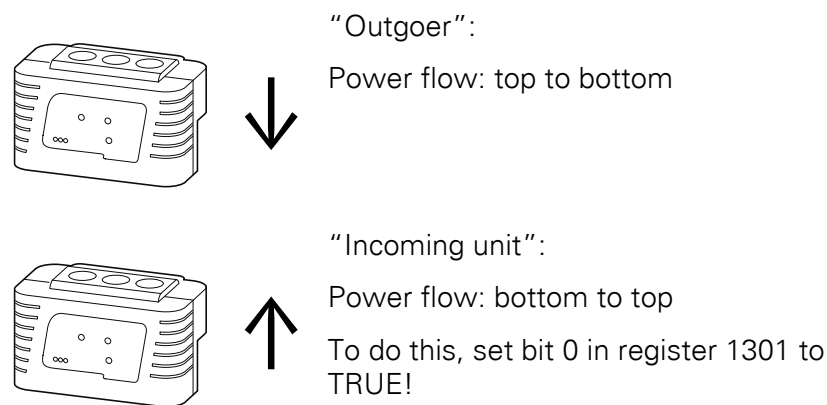


Figure 4: Power flow

2.2 Universal module

The NZM-XMC-TC-MB universal module uses top-hat rail mounting.

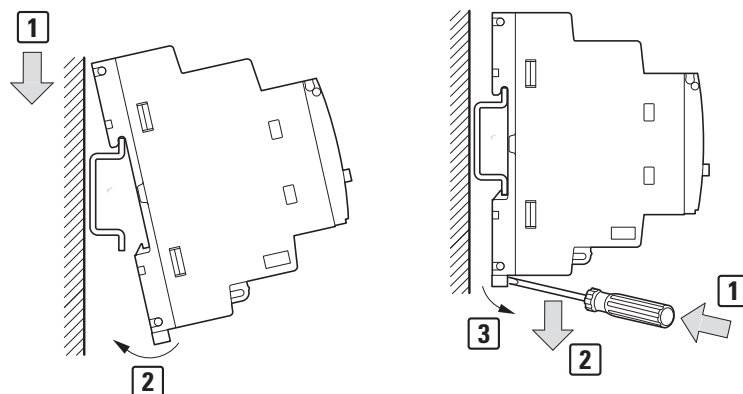


Figure 5: For top-hat rail mounting and external transformer connection

2.3 Voltage tap when using multiple NZM-XMC-TC-MB devices

If you are using multiple NZM-XMC-TC-MB modules, you can use a single voltage tap and connect it to multiple modules. In this case, the voltage tap must be connected to the mains either directly or via a voltage transformer with appropriate fuse protection. It then needs to be connected to the modules in parallel using terminals 10 to 13.



Take into account the maximum cable length and the associated voltage drop.

The wiring must follow the schematic diagram in → Figure 6.

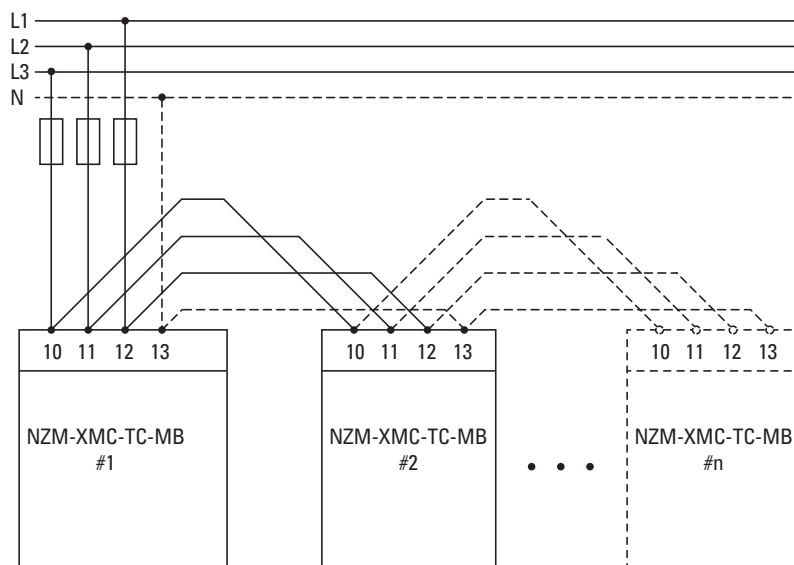


Figure 6: Wiring for multiple NZM-XMC-TC-MB modules

3 Operation

3.1 Operating the NZM-XMC-TC-MB universal module

3 Operation

The commissioning and operation of the NZM...-XMC-... measuring module are described in the following.

3.1 Operating the NZM-XMC-TC-MB universal module

The Reset button can be used to start the device and pre-configure the communication parameters.

- Pressing the button for at least one second will restart the device.
- In order to enable the preset communication parameters, disconnect the device from the supply voltage, hold the Reset button down, connect the supply voltage, and release the button. After five seconds, the device will be running with the preset communication parameters.

3.2 LED indicators

The NZM...-XMC-... measuring module is provided with four LEDs:

- Power On LED: Flashing means that the device is connected and working properly.
- Three LEDs L1, L2 and L3 indicate the following:
 - Continuously lit: Phase and voltage are correct
 - Fast flashing: No phase voltage present
 - Slow flashing: phase sequence error

3.2.1 Pulse Output

Pulse output is done via an NPN optoisolated transistor output.

3.3 Network operation

The device is designed for operation in solidly grounded Wye networks with four cables.

3.4 Connecting the device

3.4.1 Connection for NZM...XMC-S0

The following figure shows the connections of the NZM...-XMC-S0 version.



Figure 7: Connections for NZM...-XMC-S0 device version

The following table shows the connection assignment.

Table 3: Connection assignment for NZM...-XMC-S0

Connection	Description
Pulse output	3 x 3.5 mm Phoenix Contact MC 1.5/4-ST-3.5
1	Base voltage
2	NPN collector
3	NPN emitter
Power supply	2 x 7.62 mm Phoenix Contact GMVSTBR 2.5/2-ST-7.62
8	GND
9	24 V DC supply voltage

3 Operation

3.4 Connecting the device

3.4.2 Suppressor

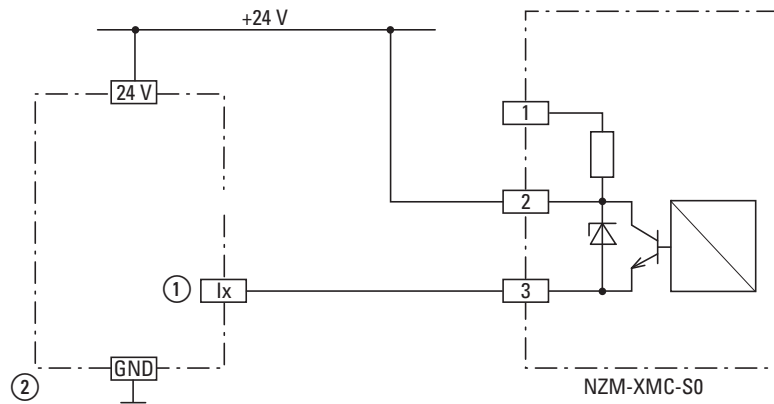


Figure 8: Wiring of output S0 with positive logic
(= a pulse is a TRUE at the input)

- ① S0 input of a non-Eaton device
- ② GND

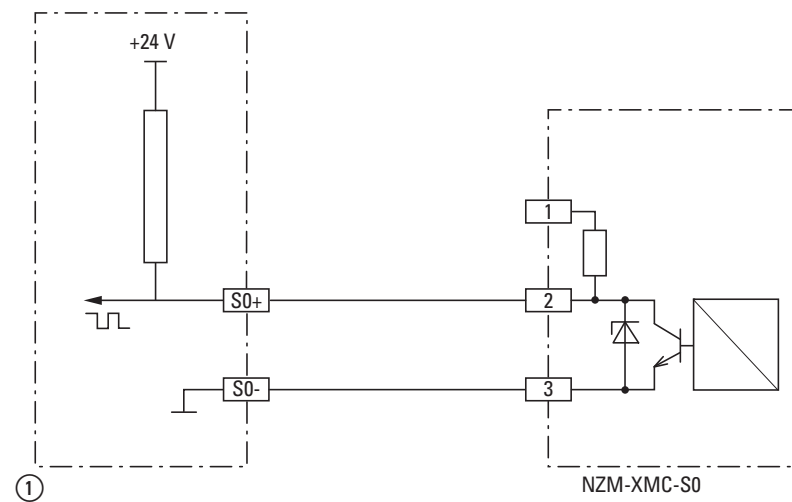


Figure 9: Wiring of output S0 with negative logic
(= a pulse is a FALSE at the input according to EN 62053-31)

- ① S0 input of a non-Eaton device
- NZM2-XMC-S0:
The energy pulse rate is 15 pulses/kWh (300 A).
- NZM3-XMC-S0:
The energy pulse rate is 7 pulses/kWh (500 A).

The pulse duration is 120 ms in each case.

3.4.3 Connections for NZM...-XMC-MB and NZM...-XMC-MB-250

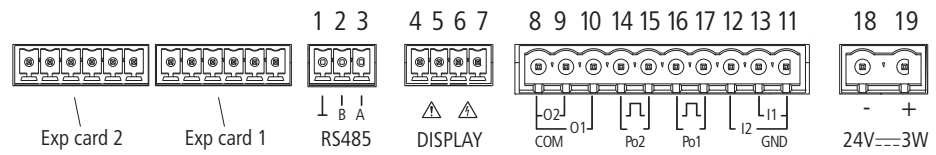


Figure 10: Connections for device versions NZM...-XMC-MB and NZM...-XMC-MB-250

The following table shows the connection assignment.

Table 4: Connection assignment for NZM...-XMC-MB and NZM...-XMC-MB-250

Connection	Description
Modbus (isolated)	
1	Data Ground
2	B RS485
3	A RS485
Modbus display (not isolated)	
4 x 3.5 mm Phoenix Contact MC 1.5/4-ST-3.5	
4	0 V
5	B RS485
6	A RS485
7	5 V DC (built-in)
Inputs/outputs (isolated)	
10 x 5.08 mm Phoenix Contact MVSTBR 2.5/10-ST-5.08	
8	Common output (1/2 common)
9	Output 2
10	Output 1
11	GND (built-in with pin 18)
12	Input 2 (referenced to GND)
13	Input 1 (referenced to GND)
14	Pulse output 2 (Collector)
15	Pulse output 2 (Emitter)
16	Pulse output 1 (Collector)
17	Pulse output 1 (Emitter)
Supply	
2 x 7.62 mm Phoenix Contact GMVSTBR 2.5/2-ST-7.62	
18	GND
19	24 V DC supply voltage

NOTICE

Pin 18 (24 V DC supply) is internally connected to Pin 11 (I/O).

3 Operation
 3.4 Connecting the device

3.4.4 Wiring of inputs

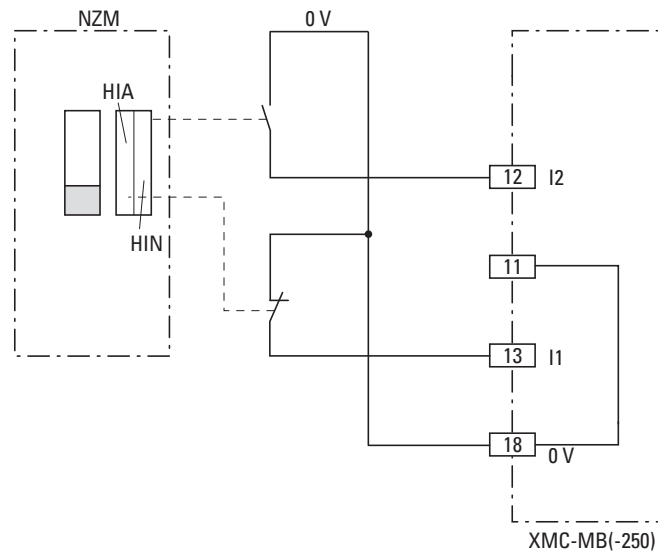


Figure 11: Wiring of inputs for status display NZM

3.4.5 Wiring of outputs

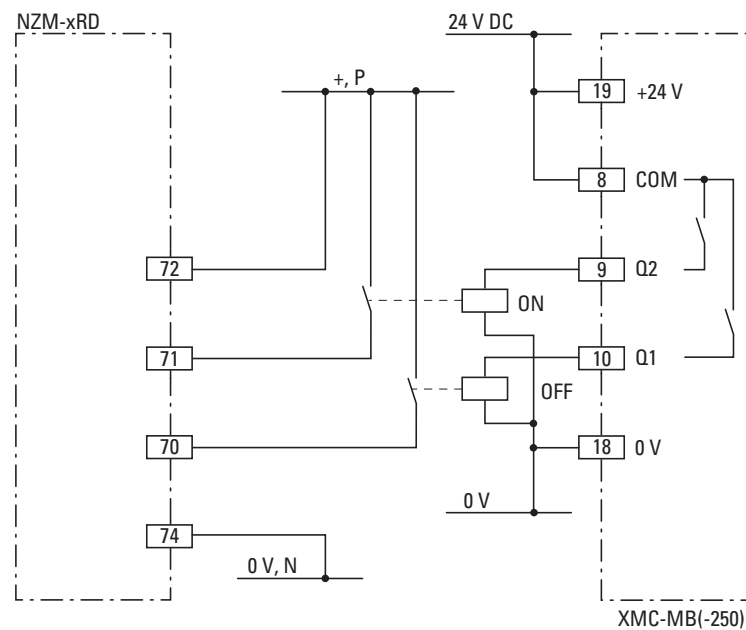


Figure 12: Wiring of outputs for actuation of a remote drive

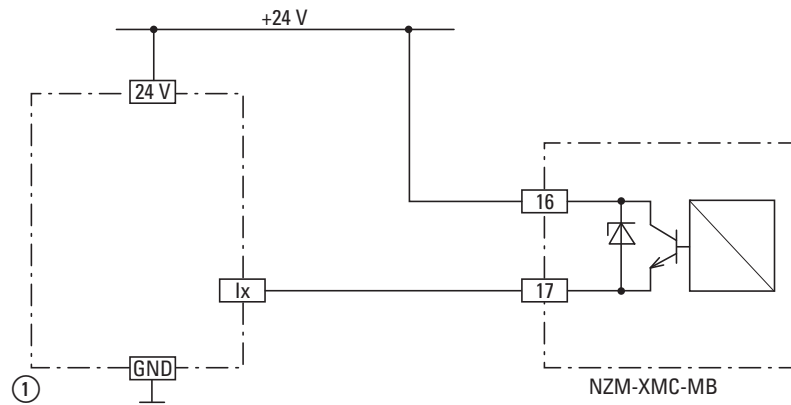


Figure 13: Wiring of output S0 with positive logic
(= a pulse is a TRUE at the input)

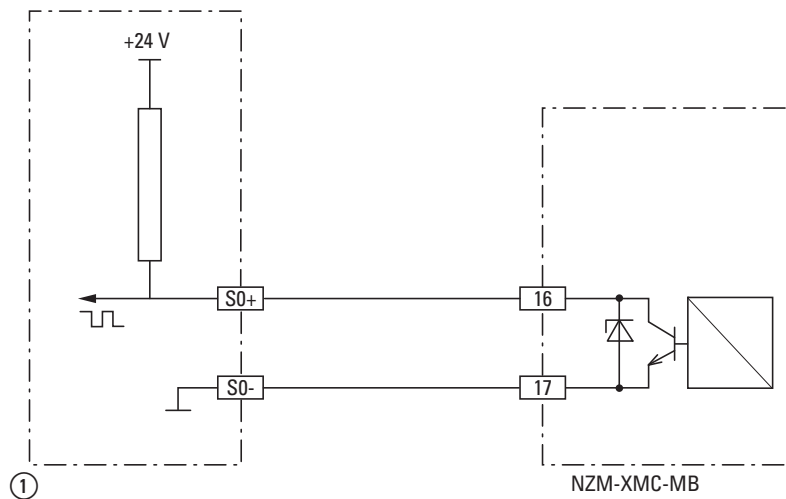


Figure 14: Wiring of output S0 with negative logic
(= a pulse is a FALSE at the input according to EN 62053-31)

3 Operation

3.4 Connecting the device

3.4.6 Connection for NZM-XMC-TC-MB

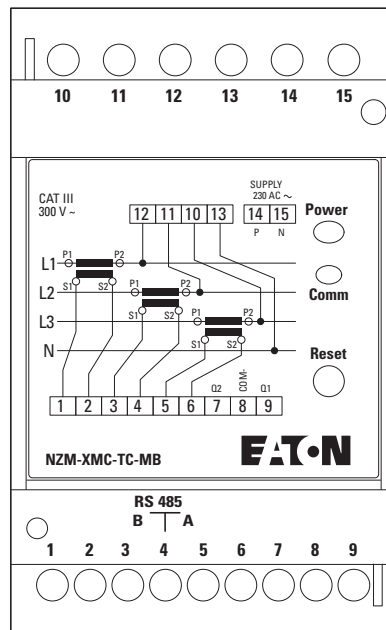


Figure 15: Connection for NZM-XMC-TC-MB

Table 5: Connection assignment

Connection	Description
1	Current transformer S1 for L1
2	Current transformer S2 for L1
3	Current transformer S1 for L2
4	Current transformer S2 for L2
5	Current transformer S1 for L3
6	Current transformer S2 for L3
7	Output 2
8	Root for outputs
9	Output 1
10	Voltage L3
11	Voltage L2
12	Voltage L1
13	N neutral conductor
14	Supply N
15	Supply P1 230 V AC
Modbus	Phoenix plug
B	RS485 B
S	Data Ground
A	RS485 A

3.4.7 PC connection with NZM-XMC-USB485

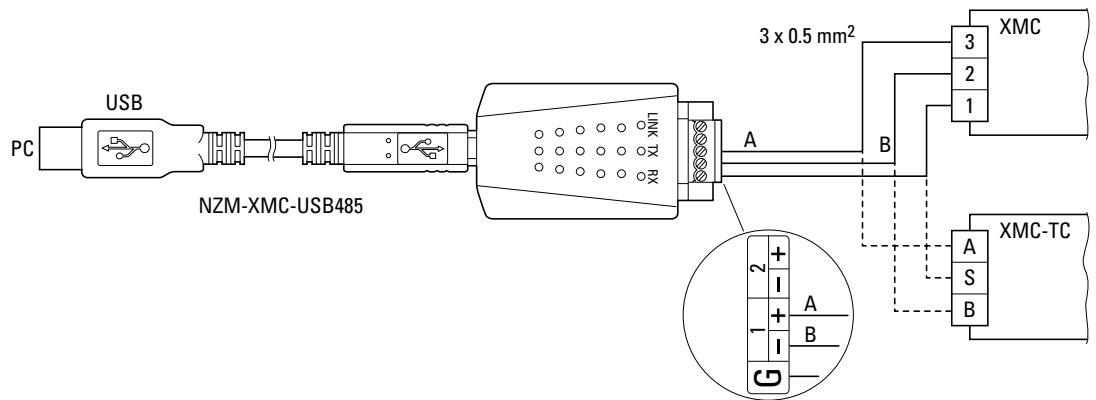


Figure 16: PC connection with NZM-XMC-USB485

3.4.8 Additional power supply

The device must be fed with 3 W power supply and a DC voltage of 24 V DC $\pm 10\%$.

➔ This applies to size 3 only!

Use the NZM-XMC-AC device for connecting devices with 230 V.

➔ Due to their smaller size, NZM2...-XMC-MB-250 devices are not compatible with NZM-XMC-AC devices.

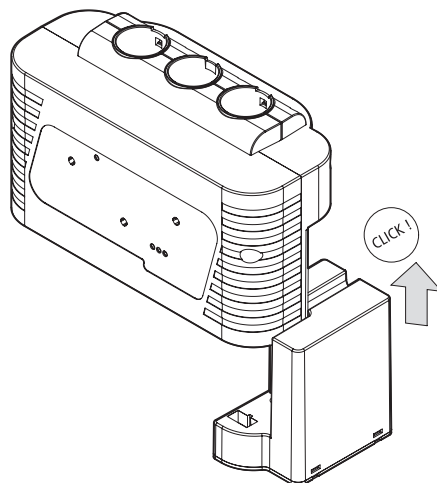


Figure 17: Connecting to the additional power supply

3 Operation

3.4 Connecting the device

3.4.9 Connecting the display

The pins 4 to 7 are provided on the NZM...-XMC-MB(-250) device for connecting the NZM-XMC-DISP display unit.

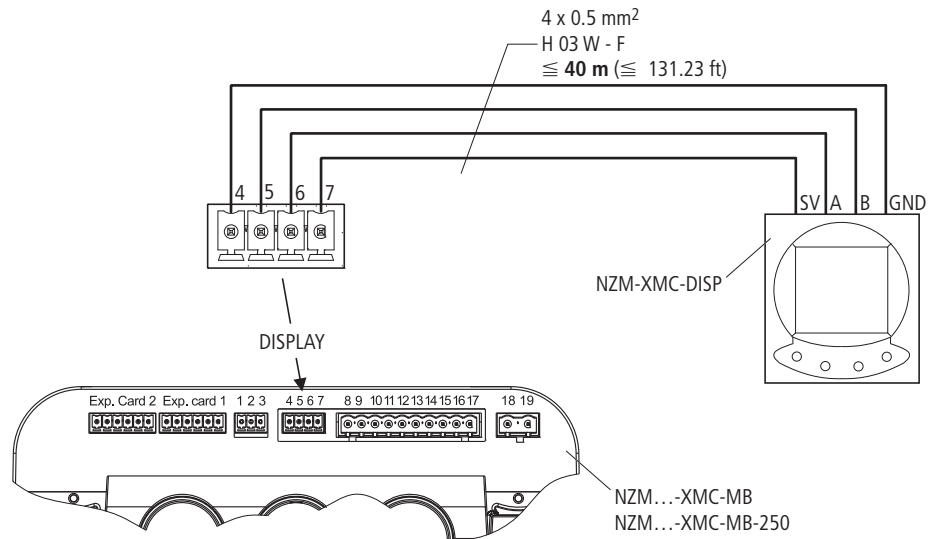


Figure 18: Display unit connections



The NZM-XMC-DISP display cannot be connected to the NZM-XMC-TC-MB universal device.

4 Configuring the device

This chapter applies to all NZM...-XMC-... measuring module devices equipped with a Modbus interface (i.e. NZM...-XMC-MB...).

Table 6: Summary of Modbus function codes

Function code Modbus RTU	Description		Supported by NZM...-XMC-MB...
1	Read multiple coil status	Read variable bit (coils)	yes
2	Read status of several inputs	Read variable bit (inputs)	no
3	Read several holding registers	Read word variables (register)	yes
4	Read multiple input registers	Read word variables (inputs)	no
5	Write individual coils	Write bit variable	yes
6	Write individual registers	Writing of a word variable	no
8	Test loopback diagnostics (00: response query data)	Connection test	no
15	Write multiple coils	Read multiple bit variables (coils)	no
16	Write multiple registers	Writing multiple word variables (register)	yes

The default configuration for addressing the device is as follows:

MODBUS device address: 2
9600 Baud; no parity; 1 Stop bit, 8 data bits

To change these configuration parameters, two registers with function code 16 can be written to address 0. Address 0 is processed as broadcast and received by all modules. The registers contain the device's serial number, the settings for the Modbus address and the Baud rate.

The Modbus address and the data rate take effect immediately on receipt of the message; the device does not have to be reset.

Table 7: Device configuration data

Modbus	Variable	Value range	
		NZM...-XMC-... basic devices	NZM-XMC-TC-MB universal device
3000, 3001	Device serial number	0 - 999999999	0 - 999999999
3002H ¹⁾	Device address	1 - 255	1 - 255
3002L ²⁾	Baud rate	0: 9600 Bit/s 1: 19200 Bit/s 2: 38400 Bit/s	0: 9600 Bit/s 1: 19200 Bit/s

- 1) H = High byte
2) L = Low byte

Access as broadcast only (address 0)

4 Configuring the device

4.1 Configuration of NZM basic devices

4.1 Configuration of NZM basic devices

4.2 MODBUS register

Following are the Modbus registers for the NZM...-XMC-MB measuring modules.

Table 8: Configuration of the Modbus registers

Variable	Register	Type R = read/ W = write	→ page
Electrical parameters	0 - 95	R	23
Maximum values of the electrical parameters	96 - 191	R	26
Minimum values of the electrical parameters	192 - 287	R	26
Communications setup	1000 - 1002	R/W	26
Password setup	1050 - 1051	R/W	26
General configuration	1100 - 1105	R/W	27
Alarm 1	1150 - 1156	R/W	28
Alarm 2	1160 - 1166	R/W	28
Alarm 3	1170 - 1176	R/W	28
Alarm 4	1180 - 1186	R/W	28
Alarm 5	1190 - 1196	R/W	28
Alarm 6	1200 - 206	R/W	28
Mean value over time window	1250 - 1251	R/W	29
Special device configuration	1300 - 1400	R/W	30
Address and baud rate (broadcast)	3000 - 3002	W	21
Serial number	10000 - 10001	R	–
Expansion card 1	20000 - 20003	R/W	45
Expansion card 2	20010 - 20013	R/W	45



To activate changes, write TRUE to coil 2000.

Following is a description of the register assignments.

4.2.1 Electrical parameters

Registers 0 to 95 (or 287) store the electrical values measured by the device (actual values).

Two Modbus registers are required for each value. This means that each parameter represents a register with a length of 32 bits (of "signed long" type).

The even-numbered register (left-hand side of the "Register" column in Table 9) contains the high section of the integer value, whilst the odd-numbered register with the (right-hand side of the "Register" column in Table 9) contains the low section of the integer value.



Some Modbus drivers decrement the register number automatically according to the original convention of the Modbus system. This is also the case with drivers of XC controllers.

In other words, the register number of the desired parameter in the application must be incremented by 1 in the query.

Example:

If, for example, L1 current is to be polled, register addresses 3 (= 2 + 1) (high) and 4 (= 3 + 1) (low) must be polled.

The following Table 9 lists the electrical parameters.

4 Configuring the device

4.2 MODBUS register

Table 9: Electrical parameters

Parameter no.	NZM...-XMC-...		NZM-XMC-TC-MB		Actual value register		Maximum value register		Minimum value register		R/W
	Parameters	Unit	Parameters	Unit	high	low	high	low	high	low	
1	Voltage L1	1 mV	Voltage L1	mV	0	1	96	97	192	193	R
2	Current L1	mA	Current L1	mA	2	3	98	99	194	195	R
3	Active power L1	W	Active power L1	W	4	5	100	101	196	197	R
4	Reactive power L1	var	Reactive power L1	var	6	7	102	103	198	199	R
5	Power factor L1	–	Power factor L1	–	8	9	104	105	200	201	R
6	Voltage L2	1 mV	Voltage L2	mV	10	11	106	107	202	203	R
7	Current L2	mA	Current L2	mA	12	13	108	109	204	205	R
8	Active power L2	W	Active power L2	W	14	15	110	111	206	207	R
9	Reactive power L2	var	Reactive power L2	var	16	17	112	113	208	209	R
10	Power factor L2	–	Power factor L2	–	18	19	114	115	210	211	R
11	Voltage L3	1 mV	Voltage L3	mV	20	21	116	117	212	213	R
12	Current L3	mA	Current L3	mA	22	23	118	119	214	215	R
13	Active power L3	W	Active power L3	W	24	25	120	121	216	217	R
14	Reactive power L3	var	Reactive power L3	var	26	27	122	123	218	219	R
15	Power factor L3	–	Power factor L3	–	28	29	124	125	220	221	R
16	Power 3-phase	W	Power 3-phase	W	30	31	126	127	222	223	R
17	Inductive reactive power 3-phase	var	Inductive reactive power 3-phase	var	32	33	128	129	224	225	R
18	Capacitive reactive power 3-phase	var	Capacitive reactive power 3-phase	var	34	35	130	131	226	227	R
19	Consumed capacitive reactive energy L1	kvarh	3-phase cos φ	–	36	37	132	133	228	229	R
20	Power factor 3-phase	–	Power factor 3-phase	–	38	39	134	135	230	231	R
21	Frequency cable Lx	Hz x 10	L1 frequency	Hz x 10	40	41	136	137	232	233	R
22	Consumed active energy L1	kWh	Voltage L1-L2	mV	42	43	138	139	234	235	R
23	Consumed active energy L2	kWh	Voltage L2-L3	mV	44	45	140	141	236	237	R
24	Consumed active energy L3	kWh	Voltage L3-L1	mV	46	47	142	143	238	239	R
25	Produced active energy L1	kWh	% THD V1	% x 10	48	49	144	145	240	241	R
26	Produced active energy L2	kWh	% THD V2	% x 10	50	51	146	147	242	243	R
27	Produced active energy L3	kWh	% THD V3	% x 10	52	53	148	149	244	245	R

4 Configuring the device

4.2 MODBUS register

Parameter no.	NZM...-XMC-...		NZM-XMC-TC-MB		Actual value register		Maximum value register		Minimum value register		R/W
	Parameters	Unit	Parameters	Unit	high	low	high	low	high	low	
28	Consumed inductive reactive energy L1	kvarh	% THD I1	% x 10	54	55	150	151	246	247	R
29	Consumed inductive reactive energy L2	kvarh	% THD I2	% x 10	56	57	152	153	248	249	R
30	Consumed inductive reactive energy L3	kvarh	% THD I3	% x 10	58	59	154	155	250	251	R
31	Active energy 3-phase	kWh	Active energy 3-phase	kWh	60	61	156	157	252	253	R
32	Inductive reactive energy 3-phase	kvarh	Inductive reactive energy 3-phase	kvarh	62	63	158	159	254	255	R
33	Capacitive reactive energy 3-phase	kvarh	Capacitive reactive energy 3-phase	kvarh	64	65	160	161	256	257	R
34	Apparent power	VA	Apparent power	VA	66	67	162	163	258	259	R
35	Max. Demand of parameter defined in register 1250/1251	W VA mA	Max. Demand of parameter defined in register 1250/1251	W VA mA	68	69	164	165	260	261	R
36	Consumed capacitive reactive energy L2	kvarh	Averaged current, 3-phase	mA	70	71	166	167	262	263	R
37	Consumed capacitive reactive energy L3	kvarh	Neutral current	mA	72	73	168	169	264	265	R
38	Apparent power L1	VA	Apparent power L1	VA	74	75	170	171	266	267	R
39	Apparent power L2	VA	Apparent power L2	VA	76	77	172	173	268	269	R
40	Apparent power L3	VA	Apparent power L3	VA	78	79	174	175	270	271	R
41	Built-in (no function)	–	Built-in (no function)	–	80	81	176	177	272	273	R
42	Max. demand value 2	–	Max. demand value 2	–	82	83	178	179	274	275	R
43	Max. demand value 3	–	Max. demand value 3	–	84	85	180	181	276	277	R
44	Apparent energy 3-phase	kVAh	Apparent energy 3-phase	VAh	86	87	182	183	278	279	R
45	Produced active energy 3-phase	kWh	Produced active energy 3-phase	kWh	88	89	184	185	280	281	R
46	Produced inductive reactive energy 3-phase	kvarh	Produced inductive reactive energy 3-phase	kvarh	90	91	186	187	282	283	R
47	Produced capacitive reactive energy 3-phase	kvarh	Produced capacitive reactive energy 3-phase	kvarh	92	93	188	189	284	285	R
48	Produced apparent energy 3-phase	kVAh	Produced apparent energy 3-phase	kVAh	94	95	190	191	286	287	R

4 Configuring the device

4.2 MODBUS register

4.2.2 Maximum and minimum electrical parameters

Registers 96 to 191 store the maximum values of each parameter (see column "Maximum" in Table 9). Registers 192 to 287 likewise store analog the minimum values recorded (see column "Minimum" in Table 9).

4.2.3 Communication (RS485) setup

For the communication (RS485) registers 1000 to 1002 are used.

Register	Variable	Value range NZM-XMC	Value range NZM-XMC-TC-MB
1000H ¹⁾	Protocol	0 - Modbus	0 - Modbus
1000L ²⁾	Device address	1 - 255 (default: 2)	1 - 255 (default: 2)
1001H ¹⁾	Baud rate	0: 9600 Bit/s (default) 1: 19200 Bit/s 2: 38400 Bit/s	0: 9600 Bit/s (default) 1: 19200 Bit/s
1001L ²⁾	Parity	0: no (default) 1: odd 2: flat	0: no (default) 1: odd 2: flat
1002H ¹⁾	Data bits	1 - 8 Bit	1 - 8 Bit
1002L ²⁾	Stop bits	0: 1 Bit (default) 1: 2 Bits	0: 1 Bit (default) 1: 2 Bits

1) H = High byte

2) L = Low byte



In order to activate the changes, write TRUE to coil 2000 as the next frame.

4.2.4 Password setup

The settings can be protected with a password in order to prevent data from being (accidentally) deleted. The password will be required in order to make any changes to the settings.

The registers 1050 and 1051 are used to set the password.

4.2.4.1 Password setting

In order to protect the settings, the password must be written at position 1050, followed by writing 0x0100 at position 1051.

4.2.4.2 Delete password

For un-protecting the registers, it is required to write, in the same command, the password at position 1050, and a 0 at position 1051.

4.2.5 Specifying the frequency measurement and pulse outputs for energy values

These variables allow to perform some general settings.

- Register 1101L sets from which cable will the device measure the frequency (register 40h).
- Registers 1103 and 1104 define the pulse output rate.
The specified value is the energy required for each pulse, in Wh.

Register value	1 pulse per
1000	1 kWh
100	100 Wh
10	10 Wh
1	1 Wh

For example, a value of 100 in register 1103 will cause a pulse to always be produced as soon as 100 Wh are consumed.

- Register 1105 sets the pulse width in steps of 10 milliseconds.
- A value of 1 pulse/kWh is set as the default value.

Register	Variable	Value range
1101L ¹⁾	Frequency measurement	0: Cable L1 1: Cable L2 2: Cable L3
1101H ²⁾	Not used	–
1103	Pulse rate for active energy [Wh × pulse]	0 (deactivated) 1 - 9999
1104	Pulse rate for reactive energy [Wh × pulse]	0 (deactivated) 1 - 9999
1105	Pulse width [in ten-millisecond steps]	–

1) L = Low byte

2) H = High byte

4 Configuring the device

4.2 MODBUS register

4.2.6 Alarm setup

Up to six different alarm messages (load warnings) can be set. These can be stored in six corresponding register ranges (→ Table 10). These are the alarm settings for the maximum and minimum values, the release delay, the monitored parameters and the output.

Table 10: Registers for alarm messages

No. of the alarm	NZM-XMC-MB register range	NZM-XMC-TC-MB register range
1	1150 - 1155	1150 - 1155
2	1160 - 1165	1200 - 1205
3	1170 - 1175	
4	1180 - 1185	
5	1180 - 1195	
6	1200 - 1205	

Register	Variable	Value range
1150, 1151	Maximum value	Depends on parameter (default: 0)
1152, 1153	Minimum value	Depends on parameter (default: 0)
1154	Delay	0 - 9999 s (default: 0)
1155H ¹⁾	Parameter code	1 - 48
1155L ²⁾	Out	0: Alarm disabled 1: Basic device output 1 2: Basic device output 2 3 - 6: Expansion card 1 outputs 7 - 10: Expansion card 2 outputs (not in model NZM...-XMC-MB-250)

1) H = High byte

2) L = Low byte



To activate changes, write TRUE to coil 2000.

4.2.7 Mean value over time window (Max. Demand)

Parameter No. 35 (max. demand) is configured here; any other parameter is assigned for this purpose. The selected value of this parameter is sampled at short time intervals within the time window, and the average value of the sampled values is calculated.

The mean value is a moving average formed only from the discrete values determined in the selected period. If, for example, a period of 60 minutes is selected, the mean value applies to the last 60 minutes.

Registers 1250 and 1251 define the behavior of the measuring device for the max. demand setting:

- The code of the parameter to be monitored must be entered in register 1250.
- The window time is specified, in minutes, in register 1251.

Register	Variable	Range
1250	Parameter code	0: no maximum setting X: Parameter code (1 - 48)
1251	Time window (the period in which the max. demand must be determined)	1 - 60 minutes

4.2.7.1 Overview of Modbus coils

Table 11: Modbus coils

Variable	Coil	Part no.	Function code
Digital outputs	0 - 9	R/W	1; 5
Digital inputs	10 - 19	R	1
Restart the whole device ¹⁾	2000	W	5
Delete power values	2100	W	5
Initialize max. demand	2101	W	5
Delete maximum and minimum values	2102	W	5
Delete power (max./min., demand value)	2103	W	5
Delete maximum acceptance value	2104	W	5

1) = acceptance of a new configuration

4 Configuring the device

4.2 MODBUS register

4.2.7.2 Special device configuration

Modbus register 1300

Modbus register 1300 can be used to configure the following settings:

- Bit 0:
 - 0 = voltage indication, phase – neutral conductor
 - 1 = voltage indication, phase – phase
- Bit 1:
 - 0 = PO 1 active energy, PO 2 reactive energy
 - 1 = PO 1 active energy, PO 1 active energy

Modbus register 1301

Modbus register 1301 can be used to change the direction of current and the phase sequence as follows:

- Bit 0:
 - 0 = Positive power flow from top to bottom (outgoer)
 - 1 = Positive power flow from bottom to top (feeder unit – default value)
- Bit 1:
 - 0 = Phase order OK, as indicated on the device.
 - 1 = phases 1 and 3 are swapped.

Modbus registers 1400 - 1405

The firmware version is saved in registers 1400 to 1405.

4.2.7.3 Digital outputs (Modbus function code 5)

The range from 0 to 9 is available for the digital outputs. The outputs are optically decoupled semiconductor outputs.

- 0, 1: Digital outputs of NZM...-XMC-... basic device
- 2 to 5: for expansion card 1
- 6 to 9: for expansion card 2

4.2.7.4 Digital inputs

The range from 10 to 19 is available for the digital inputs.

- 10, 11: Digital outputs of NZM...-XMC-... basic device
- 12 to 15: for expansion card 1
- 16 to 19: for expansion card 2

4.2.7.5 Reset (coil 2000)

Resets the device. The setting is returned to 0.

4.2.7.6 Delete energy values (coil 2100)

This clears the counter for the power. The value is reset automatically to 0.

4.2.7.7 Delete maximum demand (coil 2101)

Initializes the maximum acceptance value and clears the previous value. All the stored values used to calculate the maximum demand value will be reset. To do this, registers 68 and 69 are set to a value of 0.

4.2.7.8 Delete maximum and minimum values (coil 2102)

This deletes the maximum and minimum values of each parameter. The setting is returned to 0.

4.2.7.9 Deleting power values (maximum/minimum, acceptance value) (coil 2103)

This setting corresponds to the sending of the three commands above. The setting is returned to 0.

The following actions are performed:

- Delete power values
- Max. demand
- Delete maximum and minimum value

4.2.7.10 Delete maximum value of maximum demand (coil 2104)

Resets the maximum value of the maximum demand value. Registers 164 and 165 are set to a value of 0. The ongoing calculation will not change.

4.2.7.11 Resetting the NZM-XMC-MB communication settings

The following section describes the steps for resetting the settings:

- ▶ Switch off the device.
- ▶ Connect digital input 1 to a logic "0" and digital input 2 to a logic "1".
- ▶ LED 1 will be off, rest will be on.
You have 2 seconds for connecting both digital inputs to "0".
- ▶ LED 1 will be on.
You have 2 seconds for connecting both digital inputs to "1".
- ▶ LED 1 will be off, rest will be on.
You have 2 seconds for connecting both digital inputs to "0".

The communication registers will be reset to their default settings (Modbus address 2, 9600 bps, 8, n, 1); the device will be automatically reset.

4 Configuring the device

4.3 NZM-XMC-TC-MB universal device configuration

4.3 NZM-XMC-TC-MB universal device configuration

4.4 MODBUS register

Following are the Modbus registers for the NZM-XMC-TC-MB universal device.

Table 12: Modbus register configurations for NZM-XMC-TC-MB

Variable	Register	Type R = read/ W = write
Electrical parameters	0 - 95	R
Maximum values of the electrical parameters	96 - 191	R
Minimum values of the electrical parameters	192 - 287	R
Communications setup	1000 - 1002	R/W
General configuration	1100 - 1105	R/W
Alarm 1	1150 - 1156	R/W
Alarm 2	1160 - 1166	R/W
Alarm 3	1170 - 1176	R/W
Alarm 4	1180 - 1186	R/W
Alarm 5	1190 - 1196	R/W
Alarm 6	1200 - 1206	R/W
Mean value over time window	1250 - 1251	R/W
Special device configuration	1300 - 1400	R/W
Address and baud rate (broadcast)	3000 - 3002	W
Serial number	10000 - 10001	R



To activate changes, write TRUE to coil 2000.

When using the NZM-XMC-TC-MB universal device, the activation frame must be sent directly after the change frame. In other words, every change must be directly activated (stored).

Following is a description of the register assignments.

4.4.1 Electrical parameters

Registers 0 to 95 (or 287) store the electrical values measured by the device (actual values).

Two Modbus registers are required for each value. This means that each parameter represents a register with a length of 32 bits (of "signed long" type).

The register with the even numbers (left side of the "Register" column in Table 9) contains the high section of the integer value, while the register with the odd numbers (right side of the "Register" column in Table 9) contains the low section.



Some Modbus drivers decrement the register number automatically according to the original convention of the Modbus system.

This is also the case with drivers of XC controllers.

In other words, the register number of the desired parameter in the application must be incremented by 1 in the query.

Example:

If, for example, L1 current is to be polled, register addresses 3 (= 2 + 1) (high) and 4 (= 3 + 1) (low) must be polled.

The following Table 9 lists the electrical parameters.

4 Configuring the device

4.4 MODBUS register

Table 13: Electrical parameters

Parameter no.	NZM...-XMC-...		NZM-XMC-TC-MB		Actual value register		Maximum value register		Minimum value register		R/W
	Parameters	Unit	Mode parameter	Unit	high	low	high	low	high	low	
1	Voltage L1	1 mV	Voltage L1	mV	0	1	96	97	192	193	R
2	Current L1	mA	Current L1	mA	2	3	98	99	194	195	R
3	Active power L1	W	Active power L1	W	4	5	100	101	196	197	R
4	Reactive power L1	var	Reactive power L1	var	6	7	102	103	198	199	R
5	Power factor L1	–	Power factor L1	–	8	9	104	105	200	201	R
6	Voltage L2	1 mV	Voltage L2	mV	10	11	106	107	202	203	R
7	Current L2	mA	Current L2	mA	12	13	108	109	204	205	R
8	Active power L2	W	Active power L2	W	14	15	110	111	206	207	R
9	Reactive power L2	var	Reactive power L2	var	16	17	112	113	208	209	R
10	Power factor L2	–	Power factor L2	–	18	19	114	115	210	211	R
11	Voltage L3	1 mV	Voltage L3	mV	20	21	116	117	212	213	R
12	Current L3	mA	Current L3	mA	22	23	118	119	214	215	R
13	Active power L3	W	Active power L3	W	24	25	120	121	216	217	R
14	Reactive power L3	var	Reactive power L3	var	26	27	122	123	218	219	R
15	Power factor L3	–	Power factor L3	–	28	29	124	125	220	221	R
16	Power 3-phase	W	Power 3-phase	W	30	31	126	127	222	223	R
17	Inductive reactive power 3-phase	var	Inductive reactive power 3-phase	var	32	33	128	129	224	225	R
18	Capacitive reactive power 3-phase	var	Capacitive reactive power 3-phase	var	34	35	130	131	226	227	R
19	Consumed capacitive reactive energy L1	kvarh	3-phase cos φ	–	36	37	132	133	228	229	R
20	Power factor 3-phase	–	Power factor 3-phase	–	38	39	134	135	230	231	R
21	Frequency cable Lx	Hz x 10	Frequency L1	Hz x 10	40	41	136	137	232	233	R
22	Consumed active energy L1	kWh	Voltage L1-L2	mV	42	43	138	139	234	235	R
23	Consumed active energy L2	kWh	Voltage L2-L3	mV	44	45	140	141	236	237	R
24	Consumed active energy L3	kWh	Voltage L3-L1	mV	46	47	142	143	238	239	R
25	Produced active energy L1	kWh	% THD V1	% x 10	48	49	144	145	240	241	R
26	Produced active energy L2	kWh	% THD V2	% x 10	50	51	146	147	242	243	R
27	Produced active energy L3	kWh	% THD V3	% x 10	52	53	148	149	244	245	R
28	Consumed inductive reactive energy L1	kvarh	% THD I1	% x 10	54	55	150	151	246	247	R
29	Consumed inductive reactive energy L2	kvarh	% THD I2	% x 10	56	57	152	153	248	249	R
30	Consumed inductive reactive energy L3	kvarh	% THD I3	% x 10	58	59	154	155	250	251	R

Parameter no.	NZM...-XMC-...		NZM-XMC-TC-MB		Actual value register		Maximum value register		Minimum value register		R/W
	Parameters	Unit	Mode parameter	Unit	high	low	high	low	high	low	
31	Active energy 3-phase	kWh	Active energy 3-phase	kWh	60	61	156	157	252	253	R
32	Inductive reactive energy 3-phase	kvarh	Inductive reactive energy 3-phase	kvarh	62	63	158	159	254	255	R
33	Capacitive reactive energy 3-phase	kvarh	Capacitive reactive energy 3-phase	kvarh	64	65	160	161	256	257	R
34	Apparent power	VA	Apparent power	VA	66	67	162	163	258	259	R
35	Max. Demand of parameter defined in register 1250/1251	W VA mA	Max. Demand of parameter defined in register 1250/1251	W VA mA	68	69	164	165	260	261	R
36	Consumed capacitive reactive energy L2	kvarh	Averaged current, 3-phase	mA	70	71	166	167	262	263	R
37	Consumed capacitive reactive energy L3	kvarh	Neutral current	mA	72	73	168	169	264	265	R
38	Apparent power L1	VA	Apparent power L1	VA	74	75	170	171	266	267	R
39	Apparent power L2	VA	Apparent power L2	VA	76	77	172	173	268	269	R
40	Apparent power L3	VA	Apparent power L3	VA	78	79	174	175	270	271	R
41	Built-in (no function)	–	Built-in (no function)	–	80	81	176	177	272	273	R
42	Max. demand value 2	–	Max. demand value 2	–	82	83	178	179	274	275	R
43	Max. demand value 3	–	Max. demand value 3	–	84	85	180	181	276	277	R
44	Apparent energy 3-phase	kVAh	Apparent energy 3-phase	VAh	86	87	182	183	278	279	R
45	Produced active energy 3-phase	kWh	Produced active energy 3-phase	kWh	88	89	184	185	280	281	R
46	Produced inductive reactive energy 3 phase	kvarh	Produced inductive reactive energy 3-phase	kvarh	90	91	186	187	282	283	R
47	Produced capacitive reactive energy 3-phase	kvarh	Produced capacitive reactive energy 3-phase	kvarh	92	93	188	189	284	285	R
48	Produced apparent energy 3-phase	kVAh	Produced apparent energy 3-phase	kVAh	94	95	190	191	286	287	R

4.4.2 Maximum and minimum electrical parameters

Registers 96 to 191 store the maximum values of each parameter (see column “Maximum” in Table 9). Registers 192 to 287 likewise store analog the minimum values recorded (see column “Minimum” in Table 9).

4 Configuring the device

4.4 MODBUS register

4.4.3 Communication (RS485) setup

For the communication (RS485) registers 1000 to 1002 are used.

Register	Variable	Value range NZM-XMC	Value range NZM-XMC-TC-MB
1000H ¹⁾	Protocol	0 - Modbus	0 - Modbus
1000L ²⁾	Device address	1 - 255 (default: 2)	1 - 255 (default: 2)
1001H ¹⁾	Baud rate	0: 9600 Bit/s (default) 1: 19200 Bit/s 2: 38400 Bit/s	0: 9600 Bit/s (default) 1: 19200 Bit/s
1001L ²⁾	Parity	0: no (default) 1: odd 2: flat	0: no (default) 1: odd 2: flat
1002H ¹⁾	Data bits	1 - 8 Bit	1 - 8 Bit
1002L ²⁾	Stop bits	0: 1 Bit (default) 1: 2 Bits	0: 1 Bit (default) 1: 2 Bits

1) H = High byte

2) L = Low byte



In order to activate the changes, write TRUE to coil 2000 as the next frame.

4.4.4 Configuring the transformer ratio

The NZM-XMC-TC-MB universal module can perform current and voltage measurements with transformers. The transformer ratio must be entered for this purpose.

Register	Variable	Value range
1100, 1101	Primary voltage	0 - 100000
1102	Secondary voltage	0 - 999
1103	Primary current	0 - 10000
1105H ¹⁾		0 - THD / 01 - D

1) H = High byte

If the voltage is connected directly without a transformer, a value of 1 must be entered into registers 1100 and 1101; a value of 1 must also be entered into register 1102 for the secondary voltage.

For currents, the device will always assume a ratio of X:5. Because of this, only the primary current needs to be entered into register 1103.

Example

Say you want to measure a maximum current of 250 A, so you use a 300/5 A transformer and write a value of 300 to register 1103 (FC 16).

In order to activate the value, you would then have to write TRUE directly to coil 2000 as the next frame (FC 5).

If you are using a transformer with a ratio of 1:1, enter the primary current times five. Using the above example, the transformer would be 300/1 A and a value of 1500 would have to be entered into the register.

4.4.5 Configuring the outputs

The outputs Q1 and Q2 can be used in three different ways:

- Remote output,
- Alarm output
- Pulse output for energy values

Remote output

The outputs can be switched with direct Modbus RTU commands. This is intended for driving remote operators for circuit-breakers, for example.

Coil	Out
0	1
1	2

If TRUE is written to coil 1, output 2 will be activated; if, in contrast, FALSE is written to coil 1, output 2 will be de-energized.

Alarm output

Table 14: Registers for alarm messages

Out	Register area
1	1150 - 1155
2	1200 - 1205

Register	Variable	Value range
1150, 1151	Maximum value	Depends on parameter (default: 0)
1152, 1153	Minimum value	Depends on parameter (default: 0)
1154	Delay	0 - 9999 seconds (default: 0)
1155H ¹⁾	Parameter code	1 - 48 (no energy values)
1155L ²⁾	Free	–

1) H = High byte

2) L = Low byte



In order to activate the changes, write TRUE to coil 2000 as the next frame.

4 Configuring the device

4.4 MODBUS register

Pulse output

Register	Variable	Value range
1150, 1151	Pulse rate (Wh x pulse)	Depends on parameter (default: 0)
1152, 1153	Minimum value	Depends on parameter (default: 0)
1154	Delay	0 - 9999 seconds (default: 0)
1155H ¹⁾	Parameter code	31, 48 – energy values Note: If 31 or 48 is entered as a parameter code, the output will be used as a pulse output and the pulse frequency (Wh x pulse) will be entered in registers 1150 and 1151. The pulse duration for energy values is 100 ms.
1155L ²⁾	Free	

1) H = High byte

2) L = Low byte



In order to activate the changes, write TRUE to coil 2000 as the next frame.

4.4.6 Mean value over time window (Max. Demand)

Parameter No. 35 (max. demand) is configured here; any other parameter is assigned for this purpose. The selected value of this parameter is sampled at short time intervals within the time window, and the average value of the sampled values is calculated.

The mean value is a moving average formed only from the discrete values determined in the selected period. If, for example, a period of 60 minutes is selected, the mean value applies to the last 60 minutes.

Registers 1250 and 1251 define the behavior of the measuring device for the set value for Max. Demand: the code of the parameter to be monitored must be entered in register 1250. Register 1251 sets the window time in minutes.

Register	Variable	Value range
1250	Parameter code	0: no maximum setting 16: power 3-phase 34: apparent power 3-phase 36: Averaged current, 3-phase
1251	Time window (the period in which the max. demand it to be determined)	1 - 60 minutes

4.4.6.1 Overview of Modbus coils

Variable	Coil	Part no.	Function code
Digital outputs	1 -2	R/W	1; 5
Restart the whole device ¹⁾	2000	W	5
Delete power values	2100	W	5
Initialize max. demand	2101	W	5
Delete maximum and minimum values	2102	W	5
Delete power (max./min., demand value)	2103	W	5
Delete maximum acceptance value	2104	W	5

1) = acceptance of a new configuration

4.4.6.2 Delete energy values (coil 2100)

This clears the counter for the power. The value is reset automatically to 0.

4.4.6.3 Delete maximum demand (coil 2101)

Initializes the maximum acceptance value and clears the previous value. All the stored values used to calculate the maximum demand value will be reset. To do this, registers 68 and 69 are set to a value of 0.

4.4.6.4 Delete maximum and minimum values (coil 2102)

This deletes the maximum and minimum values of each parameter. The register is erased to 0 automatically.

4.4.6.5 Deleting power values (maximum/minimum, acceptance value) (coil 2103)

This setting corresponds to the sending of the three commands above. The register is erased to 0 automatically.

The following actions are performed:

- Energy values are deleted.
- Max. demand is deleted.
- Delete maximum and minimum value.

4.4.6.6 Delete maximum value of maximum demand (coil 2104)

Resets the maximum value of the maximum demand value. Registers 164 and 165 are set to a value of 0. The ongoing calculation will not change.

5 Display

5.1 Introduction

The NZM-XMC-DISP display unit is used to display the electrical variables measured by the basic devices. The data is transferred via an RS485 interface. Display has the function of masters in the communication and consequently, periodically, it interrogates to the measuring device to read the electrical parameters that are needed.

5.2 Surface mounting

The display shows the measured and calculated values in four lines. The values of the cables L1, L2 and L3 are shown together. The bottommost line will show the calculated value.

The display is provided with four pushbutton actuators at the bottom edge.

- “Reset” pushbutton clears the display.
- Arrow pushbutton actuator switches to the next value.
- “max” pushbutton shows the maximum values.
- “min” pushbutton shows the minimum values.

5.3 Order of displays

The following graphics show examples of values in the order how they are shown on the display by scrolling with the arrow pushbutton actuator.

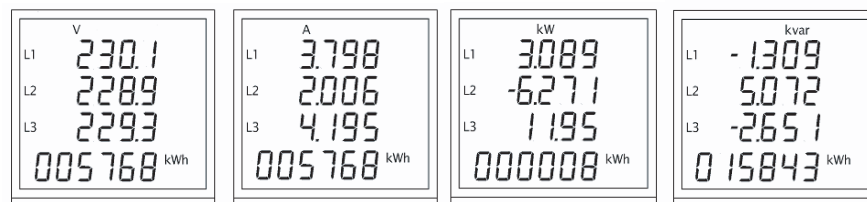


Figure 19: Order of displays (example)

- The first (i.e. left) display shows the voltage (measured in V = Volt). Pressing the arrow pushbutton actuator activates the next display:
- The measured currents are shown (measured in A = Amps).
- Pressing the pushbutton actuator again then causes the active power (measured in kW = Kilowatts) to be shown in the third display from left.
- Pressing the pushbutton actuator again causes the display of the reactive power (measured in kvar).

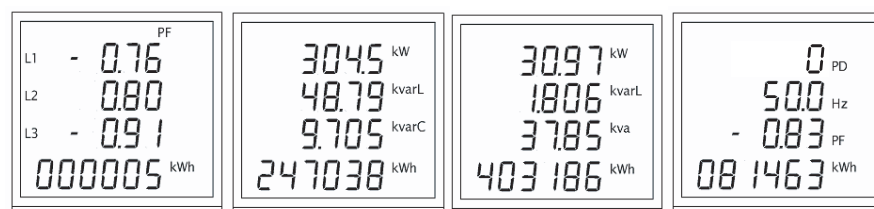


Figure 20: Continuation of the above display order

- The next display shows the phase-related power factor (p.f.).
- This is followed by information on power as well as inductive and capacitive reactive power.
- The third display shows the relevant information on reactive power.
- The last display shows the values PD (power direction), frequency, and PF (power factor). Further pressing of the arrow button starts a new display cycle.

5.3.1 Showing different energy types

Holding down the arrow pushbutton actuator for two seconds moves the display of line 4 between the different energy types (active, reactive and apparent). Press the arrow pushbutton actuator for two seconds to move to the next energy type.

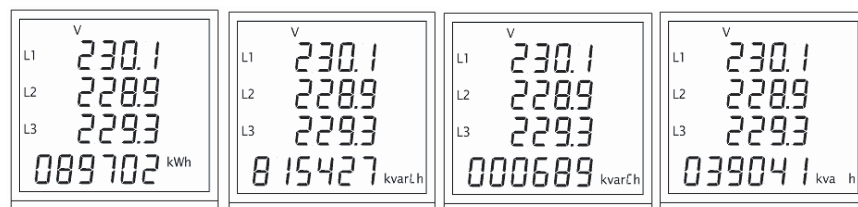


Figure 21: Order of the different energy types displayed

5.3.2 Display maximum and minimum values

Pressing the max. and min. pushbutton actuators will display the maximum and minimum values for the current screen. The relevant display texts will flash.

5.3.3 Deleting maximum and minimum values

To clear the indicated maximum and minimum values, press the "max" and "min" keys at the same time. To toggle between the options "yes" and "no" (→ Figure 22), use the "max" key.

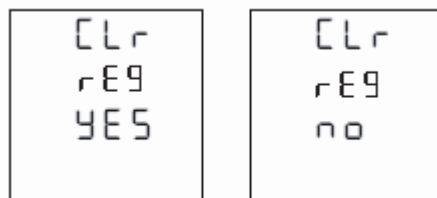


Figure 22: Deleting maximum and minimum values

If the display shows "yes" on the bottom line, pressing the arrow key will delete the value and cause the display to switch to the next display: the power values.

Pressing the arrow key enables you to delete the power values as well. The max button can be used to toggle between "yes" and "no".

5 Display

5.3 Order of displays

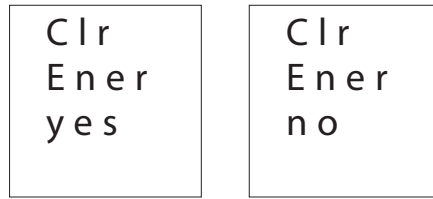


Figure 23: Display when deleting energy values

You can delete the energy value by pressing the arrow pushbutton actuator when "yes" is displayed. The following display is then shown in which the default screen is set:

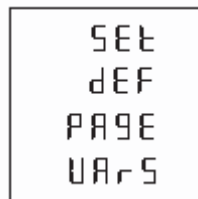


Figure 24: Default display after deleting power values

After the arrow key is pressed, the following display will appear. This is used to set the default value of the energy display in line 4.

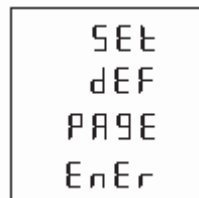


Figure 25: Default display of energy values in line 4

This is followed by the switch-off delay for the display backlight.

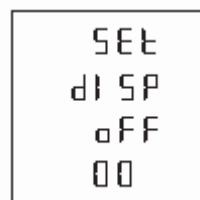


Figure 26: Switch-off delay for display backlight.

6 Expansion cards

The following expansion cards are available for types NZM...-XMC-MB....

NZM2-XMC-MB and NZM3-XMC-MB devices take up to two expansion cards, and devices NZM2-...-MB-250 one expansion card.

➔ These expander boards can not be retrofitted but must be ordered with the device.

➔ The illustrations below show only the large enclosure type.

6.1 Relay cards

The relay card provides the circuit-breaker with two or four relays.

The relays can be switched manually or linked with alarms.

➔ Technical data ➔ Page 49.

6.1.1 Two relays card

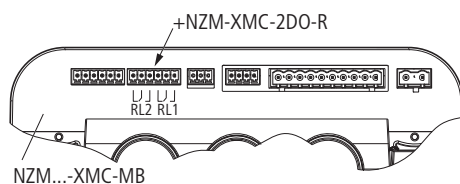


Figure 27: +NZM-XMC-2D0-R, 2 changeover contacts

6.1.2 Four relays card

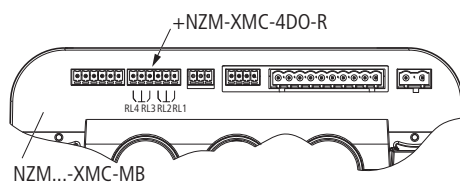


Figure 28: +NZM-XMC-4D0-R, 4 N/O contacts

6 Expansion cards

6.1 Relay cards

6.1.3 Technical data

	Unit	+NZM-XMC-2D0-R	+NZM-XMC-4D0-R
Connection		Phoenix Contact MC 1.5/6-ST-3.5 or similar	
Maximum load current AC	A	10	5
Maximum load current DC	A	5	5
Insulation	V AC	3000	3000
Maximum Voltage Open contacts	V AC	1000	750
Max. switching duty NO	VA	2500	750
	W	150	90
Max. switching duty NC	VA	750	–
	W	90	–

6.1.4 Configuration

Write access to the configuration register is through MODBUS.

6.1.4.1 Manual trigger of the relays

Each relay is linked with a Modbus coil, i.e. the desired state (Low or High) is written to a linked Modbus coil (Modbus command 05).

Coil	Outputs
0	NZM-XMC: Output Q1
1	NZM-XMC: Output Q2
2	Relay card 1: Output RL1
3	Relay card 1: Output RL2
4	Relay card 1: Output RL3
5	Relay card 1: Output RL4

6.1.4.2 Trigger by alarm

Alarms (registers 1150 to 1200) can also be configured to the relay cards' outputs.

6.2 Analog expansion card

Provides the circuit-breaker with an insulated analog output.

Via MODBUS registers, output can be selected as current or voltage output.

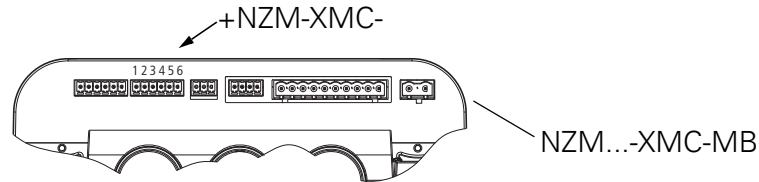


Figure 29: +NZM-XMC-1AO, 1 insulated analog output

Table 15: Pin assignment

PIN	Configuration
1, 2, 3	V+/I _{Out}
4, 5, 6	V-/I _{In}

6.2.1 Technical data

Table 16: +NZM-XMC-1AO technical data

	Unit	+NZM-XMC-1AO
Connection		Phoenix Contact MC 1.5/6-ST-3.5 or similar
Current output max. load	Ω	470
Voltage output internal impedance	Ω	330
Isolation U _{rms}	V	2750

6.2.2 Configuration

Write access to the configuration register is through MODBUS. The analog expansion card is fitted in slot 1.

Modbus	Description	Area
20000-1	Lower limit value	Depend on parameter
20002-3	Upper limit value	Depend on parameter
20004H	Output mode	0: 0 - 20 mA 1: 4 - 20 mA 2: 0 - 10 mA
20004L	Mode parameter	0 - 48

The analog expansion card is fitted in slot 2.

6 Expansion cards

6.2 Analog expansion card

Modbus	Description	Area
20010-1	Lower limit value	Depend on parameter
20012-3	Upper limit value	Depend on parameter
20014H	Output mode	0: 0 - 20 mA 1: 4 - 20 mA 2: 0 - 10 V
20014L	Mode parameter	0 - 48

Changes are fully applied after NZM...-XMC-... reset.

Example

The user wants to link an analog 0 - 20 mA current output to parameter "Voltage phase 1". In addition, the output current is to be 0 mA at $U = 100 \text{ V}$ and the output level 20 mA at $U = 300 \text{ V}$.

The analog expansion card is fitted in slot 1.

20000-1 = 100000
 20002-3 = 300000
 20004H = 0 - 20004L = 1

Hexadecimal: 20000:0x0001; 20001:0x86A0; 20002:0x0004; 20003:0x93E0;
 20004:0x0001



The voltage is given in mV.

6.3 Digital expansion card

Provides the circuit-breaker with four isolated digital connections (input or output) with an operating voltage of up to 48 V DC.

I/O function is configurable via Modbus registers.

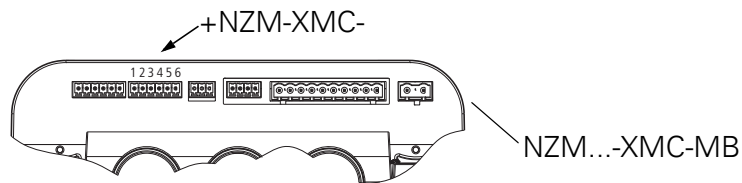


Figure 30: +NZM-XMC-4DI-4DO, 4 insulates digital connections

Table 17: Pin assignment

PIN	Configuration
1	Power supply
2	I/O 1
3	I/O 2
4	I/O 3
5	I/O 4
6	GND

6.3.1 Connection

No external supply Logic level: +5 V - 0 V	External supply V DC Logic level: V DC - 0 V																		
configured as input	configured as output																		
<table border="1"> <tr><td>1</td><td>NC</td></tr> <tr><td>2</td><td rowspan="4">} Input: 5 to 0 V DC</td></tr> <tr><td>3</td></tr> <tr><td>4</td></tr> <tr><td>5</td></tr> <tr><td>6</td><td>GND</td></tr> </table>	1	NC	2	} Input: 5 to 0 V DC	3	4	5	6	GND	<table border="1"> <tr><td>1</td><td>24 V DC</td></tr> <tr><td>2</td><td rowspan="4">} Output: 24 V DC</td></tr> <tr><td>3</td></tr> <tr><td>4</td></tr> <tr><td>5</td></tr> <tr><td>6</td><td>GND</td></tr> </table>	1	24 V DC	2	} Output: 24 V DC	3	4	5	6	GND
1	NC																		
2	} Input: 5 to 0 V DC																		
3																			
4																			
5																			
6	GND																		
1	24 V DC																		
2	} Output: 24 V DC																		
3																			
4																			
5																			
6	GND																		

6 Expansion cards
 6.3 Digital expansion card

6.3.2 Technical Data

	Unit	+NZM-XMC-4DI-4DO
Connection		Phoenix Contact MC 1.5/6-ST-3.5 or similar
Max. input/output voltage	V	48
Output high voltage (no external power supply)	V	5
Input impedance	MΩ	1
Output impedance	Ω	100
Isolation U_{rms}	V	2750

6.3.3 Configuration

The digital expansion card can be fitted in slot 1 or 2.

The digital expansion card is fitted in slot 1.

Modbus	Description	Area
20000	Configuration of slot 1	0 - ... all digital connections as outputs 1 - ... all digital connections as inputs

The digital expansion card is fitted in slot 2.

Modbus	Description	Area
20010	Configuration of slot 2	0 - ... all digital connections as outputs 1 - ... all digital connections as inputs

Changes are fully applied after NZM...-XMC-... reset.

7 Appendix

7.1 Technical data

7.1.1 Basic devices

	Unit	NZM...-XMC-S0	NZM...-XMC-MB(-250)
General			
Dimensions (W x H x D)	mm	209 x 132 x 91 (3 pole) 251 x 132 x 91 (4 pole)	NZM...XMC-MB 209 x 132 x 91 (3 pole) 251 x 132 x 91 (4 pole) NZM...XMC-MB-250 125 x 132 x 87 (3 pole) 165 x 132 x 87 (4 pole)
Weight	g	850 (3 pole) 975 (4 pole)	NZM...XMC-MB 850 (3 pole) 975 (4 pole) NZM...XMC-MB-250 750 (3 pole) 875 (4 pole)
Power supply			
Voltage	V DC	24 ±10 %	24 ±10 %
Maximum current	mA	200	200
Conductor		Phoenix Contact GMVSTBR 2.5-2-ST-7.62	Phoenix Contact GMVSTBR 2.5-2-ST-7.62
Voltage measurement			
Rated operating voltage	V AC	600	600
Maximum surge voltage 8/20 μs	kV	8	8
Voltage range	V AC	72 - 600	72 - 600
Surge impedance (impedance)	kΩ	1000	1000
Frequency	Hz	45 - 65	45 - 65
Accuracy		0.4 % measured value + 0.1 % FS (full scale)	0.4 % measured value + 0.1 % FS (full scale)
Category: EN 61010		CAT IV-600 V	CAT IV-600 V
Current measurement			
Rated operational current	A AC	300 (300 A version) 500 (500 A version)	300 (300 A version) 500 (500 A version)
Current Range	A AC	1 - 350 (300 A version) 1 - 740 (500 A version)	1 - 350 (300 A version) 1 - 740 (500 A version)
Maximum current impulse for 1s	kA	30	30
Frequency	Hz	45 - 200	45 - 200
Accuracy		0.45 % measured value + 0.05 % FS (full scale)	0.45 % measured value + 0.05 % FS (full scale)
Category: EN 61010		CAT IV-600 V	CAT IV-600 V

7 Appendix

7.1 Technical data

	Unit	NZM...-XMC-S0	NZM...-XMC-MB(-250)
Power monitoring			
Accuracy		-	0.95 % measurement + 0.05 % FS
Accuracy of active power		Class 1 (IEC 62053-21) ¹⁾	Class 1 (IEC 62053-21) ¹⁾
Accuracy reactive energy		-	Class 2 (IEC 62053-23) ¹⁾
Pulse Output			
Part no.		NPN-isolated transistor	NPN-isolated transistor
VCE max	V	48	48
VCE sat	V	0.2	0.2
I _c maximum	mA	50	50
I _c recommended	mA	10	10
Isolation	kV	3	3
Max. switching frequency	Hz	2	4
Pulse width	ms	120	500 (default setting) 20 (minimal)
Energy pulse rate	Pulse/kWh	15 (300 A version) 7 (500 A version)	1 (default setting)
Environmental Conditions			
Operating temperature	°C	-15 - +55	-15 - +55
Storage temperature	°C	-40 - +80	-40 - +80
Humidity (non-condensing)	%	5 - 95	5 - 95
Maximum operating height	m	2000	2000
Degree of protection		IP20	IP20
Digital output			
Part no.		-	-
Maximum voltage	V	-	70
Maximum current	mA	-	120
Digital input			
Maximum voltage	V	-	50
V _{IHmax}	V	-	3
Modbus output - RS485			
Data rate	Bit/s	-	9600, 19200, 38400
Stop bits		-	1, 2
Parity		-	none, odd, even
Modbus output – Display			
DC supply voltage	V DC	-	5
Maximum current	mA	-	180
Operating temperature	°C		-10 - + 50

1) If a three-pole module is being used, unbalanced loads will have a negative impact on accuracy

7.1.2 Universal device

Size	Unit	NZM-XMC-TC-MB
General		
Dimensions (W x H x D)	mm	52 x 85 x 70
Weight	g	210
Standards		Category III - 300 V AC / 520 V AC EN-61010 IEC 664, VDE 0110, UL 94, IEC 801, IEC 348, IEC 571-1, EN 61000-6-3, EN 61000-6-1, EN 61010-1, EN 61000-4-11, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 55011, CE
mounting		DIN 46277 (rail) (EN 50022)
Power supply		
Rated operational voltage	V AC	230 (single-phase)
Voltage tolerance	%	-15 / +10
Frequency	Hz	50/60
Maximum consumption	VA	3
Protection	A	0.5 - 2 (part no. gL or M)
min. terminal capacity	mm ²	1
Accuracy		
Voltage		0.5 % ±1 digit
Current		0.5 % ±1 digit
Power / energy		0.5 % ±1 digit
Current / voltage sensors		
Power Factor		0.5 - 1
Measuring range limiting: ITF / Shunt		0.2 - 120 % / 2 - 120 %
Measuring circuit		
Voltage: phase – neutral conductor / phase – phase	V AC	300 / 520
Frequency	Hz	45 - 65
Rated operational current	A	5
Long-term overload		1.2 x I _n
Power consumption for voltage measurement	VA	0.7
Power consumption for current measurement: ITF / Shunt	VA	0.9 / 0.75
min. terminal capacity (voltage measurement)	mm ²	1
min. terminal capacity (current measurement)	mm ²	2.5

7 Appendix

7.1 Technical data

Size	Unit	NZM-XMC-TC-MB
Outputs		
Opto-isolated transistor outputs		NPN
Maximum switching voltage	V DC	24
Maximum switching current	mA	50
Maximum frequency	Pulse/s	5
Pulse duration	ms	100
Environmental Conditions		
Operating temperature	°C	-10 - +50
Humidity, non condensing	%	5 - 95
Maximum operating height	m	2000
Degree of protection		IP30

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