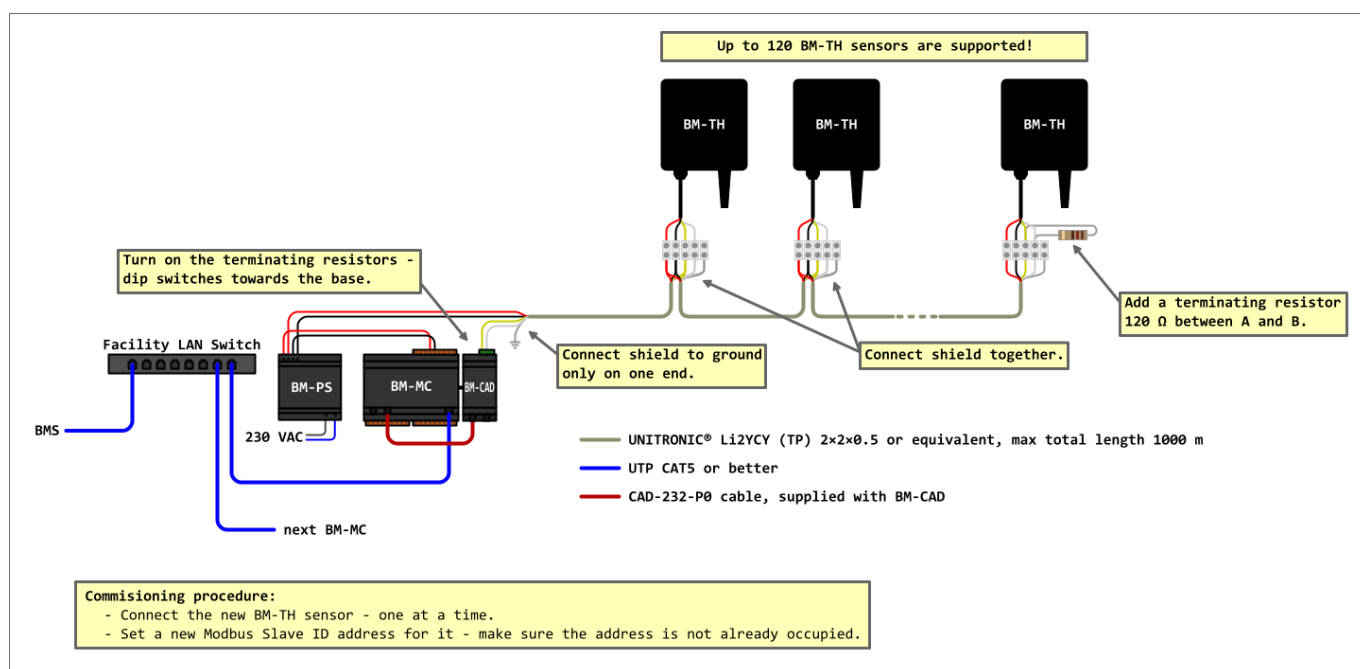


1. Temperature and humidity monitoring

The system is intended for monitoring temperatures and relative humidity in rack cabinets of data centers. Allows connection of up to 120 sensors to one controller. The number of controllers per system is practically unlimited.

1.1. HW and wiring



1.2. SW (TH-MC & Configurator)

1.2.1. Main page

TH Monitoring Configurator v1.0.0

New unassigned sensor: - 00,0 °C 00,0 %RH

1

001.	21,8 °C	58,2 %RH	025.	00,0 °C	00,0 %RH	049.	00,0 °C	00,0 %RH	073.	00,0 °C	00,0 %RH	097.	00,0 °C	00,0 %RH
002.	00,0 °C	00,0 %RH	026.	00,0 °C	00,0 %RH	050.	00,0 °C	00,0 %RH	074.	00,0 °C	00,0 %RH	098.	00,0 °C	00,0 %RH
003.	00,0 °C	00,0 %RH	027.	00,0 °C	00,0 %RH	051.	00,0 °C	00,0 %RH	075.	00,0 °C	00,0 %RH	099.	00,0 °C	00,0 %RH
004.	00,0 °C	00,0 %RH	028.	00,0 °C	00,0 %RH	052.	00,0 °C	00,0 %RH	076.	00,0 °C	00,0 %RH	100.	00,0 °C	00,0 %RH
005.	00,0 °C	00,0 %RH	029.	00,0 °C	00,0 %RH	053.	00,0 °C	00,0 %RH	077.	00,0 °C	00,0 %RH	101.	00,0 °C	00,0 %RH
006.	00,0 °C	00,0 %RH	030.	00,0 °C	00,0 %RH	054.	00,0 °C	00,0 %RH	078.	00,0 °C	00,0 %RH	102.	00,0 °C	00,0 %RH
007.	00,0 °C	00,0 %RH	031.	00,0 °C	00,0 %RH	055.	00,0 °C	00,0 %RH	079.	00,0 °C	00,0 %RH	103.	00,0 °C	00,0 %RH
008.	00,0 °C	00,0 %RH	032.	00,0 °C	00,0 %RH	056.	00,0 °C	00,0 %RH	080.	00,0 °C	00,0 %RH	104.	00,0 °C	00,0 %RH
009.	00,0 °C	00,0 %RH	033.	00,0 °C	00,0 %RH	057.	00,0 °C	00,0 %RH	081.	00,0 °C	00,0 %RH	105.	00,0 °C	00,0 %RH
010.	00,0 °C	00,0 %RH	034.	00,0 °C	00,0 %RH	058.	00,0 °C	00,0 %RH	082.	00,0 °C	00,0 %RH	106.	00,0 °C	00,0 %RH
011.	00,0 °C	00,0 %RH	035.	00,0 °C	00,0 %RH	059.	00,0 °C	00,0 %RH	083.	00,0 °C	00,0 %RH	107.	00,0 °C	00,0 %RH
012.	00,0 °C	00,0 %RH	036.	00,0 °C	00,0 %RH	060.	00,0 °C	00,0 %RH	084.	00,0 °C	00,0 %RH	108.	00,0 °C	00,0 %RH
013.	00,0 °C	00,0 %RH	037.	00,0 °C	00,0 %RH	061.	00,0 °C	00,0 %RH	085.	00,0 °C	00,0 %RH	109.	00,0 °C	00,0 %RH
014.	00,0 °C	00,0 %RH	038.	00,0 °C	00,0 %RH	062.	00,0 °C	00,0 %RH	086.	00,0 °C	00,0 %RH	110.	00,0 °C	00,0 %RH
015.	00,0 °C	00,0 %RH	039.	00,0 °C	00,0 %RH	063.	00,0 °C	00,0 %RH	087.	00,0 °C	00,0 %RH	111.	00,0 °C	00,0 %RH
016.	00,0 °C	00,0 %RH	040.	00,0 °C	00,0 %RH	064.	00,0 °C	00,0 %RH	088.	00,0 °C	00,0 %RH	112.	00,0 °C	00,0 %RH
017.	00,0 °C	00,0 %RH	041.	00,0 °C	00,0 %RH	065.	00,0 °C	00,0 %RH	089.	00,0 °C	00,0 %RH	113.	00,0 °C	00,0 %RH
018.	00,0 °C	00,0 %RH	042.	00,0 °C	00,0 %RH	066.	00,0 °C	00,0 %RH	090.	00,0 °C	00,0 %RH	114.	00,0 °C	00,0 %RH
019.	00,0 °C	00,0 %RH	043.	00,0 °C	00,0 %RH	067.	00,0 °C	00,0 %RH	091.	00,0 °C	00,0 %RH	115.	00,0 °C	00,0 %RH
020.	00,0 °C	00,0 %RH	044.	00,0 °C	00,0 %RH	068.	00,0 °C	00,0 %RH	092.	00,0 °C	00,0 %RH	116.	00,0 °C	00,0 %RH
021.	00,0 °C	00,0 %RH	045.	00,0 °C	00,0 %RH	069.	00,0 °C	00,0 %RH	093.	00,0 °C	00,0 %RH	117.	00,0 °C	00,0 %RH
022.	00,0 °C	00,0 %RH	046.	00,0 °C	00,0 %RH	070.	00,0 °C	00,0 %RH	094.	00,0 °C	00,0 %RH	118.	00,0 °C	00,0 %RH
023.	00,0 °C	00,0 %RH	047.	00,0 °C	00,0 %RH	071.	00,0 °C	00,0 %RH	095.	00,0 °C	00,0 %RH	119.	00,0 °C	00,0 %RH
024.	00,0 °C	00,0 %RH	048.	00,0 °C	00,0 %RH	072.	00,0 °C	00,0 %RH	096.	00,0 °C	00,0 %RH	120.	00,0 °C	00,0 %RH

2

Main

Events

System

allOKerralarm

Sensors count1100

average

min

max

Temperature21,8 °C0,0 °C21,8 °C

Humidity58,2 %RH0,0 %RH58,2 %RH

3

23.04.2024 15:02

- | | |
|---|--|
| 1 | New sensor |
| 2 | Sensor table - Select empty single cell to Assign new sensor to cell or select assigned cer to un-assign (only if new sensor is empty) |
| 3 | Statistics of all sensors. |

TH Monitoring Configurator v1.0.0

New unassigned sensor: » 21,8 °C 58,1 %RH

Assign

001.	00,0 °C	00,0 %RH	025.	00,0 °C	00,0 %RH	049.	00,0 °C	00,
002.	00,0 °C	00,0 %RH	026.	00,0 °C	00,0 %RH	050.	00,0 °C	00,
003.	00,0 °C	00,0 %RH	027.	00,0 °C	00,0 %RH	051.	00,0 °C	00,
004.	00,0 °C	00,0 %RH	028.	00,0 °C	00,0 %RH	052.	00,0 °C	00,
005.	00,0 °C	00,0 %RH	029.	00,0 °C	00,0 %RH	053.	00,0 °C	00,
006.	00,0 °C	00,0 %RH	030.	00,0 °C	00,0 %RH	054.	00,0 °C	00,

Press [Assign] to assign new sensor to selected cell 001.

TH Monitoring Configurator v1.0.0

New unassigned sensor: - 00,0 °C 00,0 %RH

Unassign

001. 21,8 °C 58,1 %RH	025. 00,0 °C 00,0 %RH	049. 00,0 °C 00,
002. 00,0 °C 00,0 %RH	026. 00,0 °C 00,0 %RH	050. 00,0 °C 00,
003. 00,0 °C 00,0 %RH	027. 00,0 °C 00,0 %RH	051. 00,0 °C 00,
004. 00,0 °C 00,0 %RH	028. 00,0 °C 00,0 %RH	052. 00,0 °C 00,
005. 00,0 °C 00,0 %RH	029. 00,0 °C 00,0 %RH	053. 00,0 °C 00,
006. 00,0 °C 00,0 %RH	030. 00,0 °C 00,0 %RH	054. 00,0 °C 00,

Press [Unassign] to move selected sensor 001 to New sensor.

TH Monitoring Configurator v1.0.0

New unassigned sensor: - 00,0 °C 00,0 %RH

Unassign **Clear alarm**

001.  21,8 °C 58,1 %RH	025. 00,0 °C 00,0 %RH	049. 00,0 °C 00,
002. 00,0 °C 00,0 %RH	026. 00,0 °C 00,0 %RH	050. 00,0 °C 00,
003. 00,0 °C 00,0 %RH	027. 00,0 °C 00,0 %RH	051. 00,0 °C 00,
004. 00,0 °C 00,0 %RH	028. 00,0 °C 00,0 %RH	052. 00,0 °C 00,
005. 00,0 °C 00,0 %RH	029. 00,0 °C 00,0 %RH	053. 00,0 °C 00,
006. 00,0 °C 00,0 %RH	030. 00,0 °C 00,0 %RH	054. 00,0 °C 00,

Press [Clear Alarms] to clear alarms from selected cell.

Multiple cells can be selected.

TH Monitoring Configurator v1.0.0

New unassigned sensor: - 00,0 °C 00,0 %RH

Clear error

001.	21,8 °C	58,1 %RH	025.	00,0 °C	00,0 %RH	049.	00,0 °C	00,
002.	00,0 °C	00,0 %RH	026.	00,0 °C	00,0 %RH	050.	00,0 °C	00,
003.	00,0 °C	00,0 %RH	027.	00,0 °C	00,0 %RH	051.	00,0 °C	00,
004.	00,0 °C	00,0 %RH	028.	00,0 °C	00,0 %RH	052.	00,0 °C	00,
005.	00,0 °C	00,0 %RH	029.	00,0 °C	00,0 %RH	053.	00,0 °C	00,
006.	00,0 °C	00,0 %RH	030.	00,0 °C	00,0 %RH	054.	00,0 °C	00,

Press [Clear error] to clear errors from selected cell.

Multiple cells can be selected.

1.2.2. Events list

MC put all events (sensors move and alarms) in FIFO list (100 events in total). On Configurator page Events last 25 events are shown.

TH Monitoring Configurator v1.0.0

Events

date	time	event	data
yyyymmdd	hhmmss.ddd	eeeeeeiii	vvvvvvvvvv
20240412	101314.153	004006001	0000000648
20240412	100711.714	004005001	0000000649
20240412	100634.094	004010000	0000000001
20240412	100549.343	004010001	0000000000
20240412	100025.932	004010000	0000000001
20240412	100019.812	004010002	0000000000
20240412	100006.984	004010000	0000000002
20240412	100000.281	004010001	0000000000
20240412	095854.000	001001000	0000000010
20240412	095847.000	001001000	0000000009
20240412	095252.000	001001000	0000000008
20240412	094955.000	001001000	0000000007
20240411	132810.000	001001000	0000000006
20240411	130706.135	004008001	0000000645
20240411	130706.135	004006001	0000000645
20240411	130706.135	004004001	0000000227
20240411	130706.135	004002001	0000000227
20240411	130647.082	004007001	0000000645
20240411	130640.732	004005001	0000000645
20240411	130640.732	004003001	0000000227
20240411	130615.332	004001001	0000000227
20240411	130511.600	004010005	0000000001
20240411	130342.248	004010000	0000000005
20240411	130335.979	004010001	0000000000
20240411	130253.618	004010000	0000000001

clear

Legend:

- yyyy year
- mm month
- dd date
- hh hour
- mm minute
- ss second
- ddd milisecond
- eeeee..... event (001xxx=general, 004xxx=TH)
- iii sensor index (0..120)
- vvvvvvvvv value

Events:

eeeeee iii vvvvvvvvv	
001001 000 reset_cnt	system reset
001002 000 0	events array cleared
004001 iii temperature	Temperature HI alarm triggered
004002 iii temperature	Temperature HI alarm gone
004003 iii temperature	Temperature LO alarm triggered
004004 iii temperature	Temperature LO alarm gone
004005 iii humidity	Humidity HI alarm triggered
004006 iii humidity	Humidity HI alarm gone
004007 iii humidity	Humidity LO alarm triggered
004008 iii humidity	Humidity LO alarm gone
004010 iii new_index	Sensor moved

robotina

Main

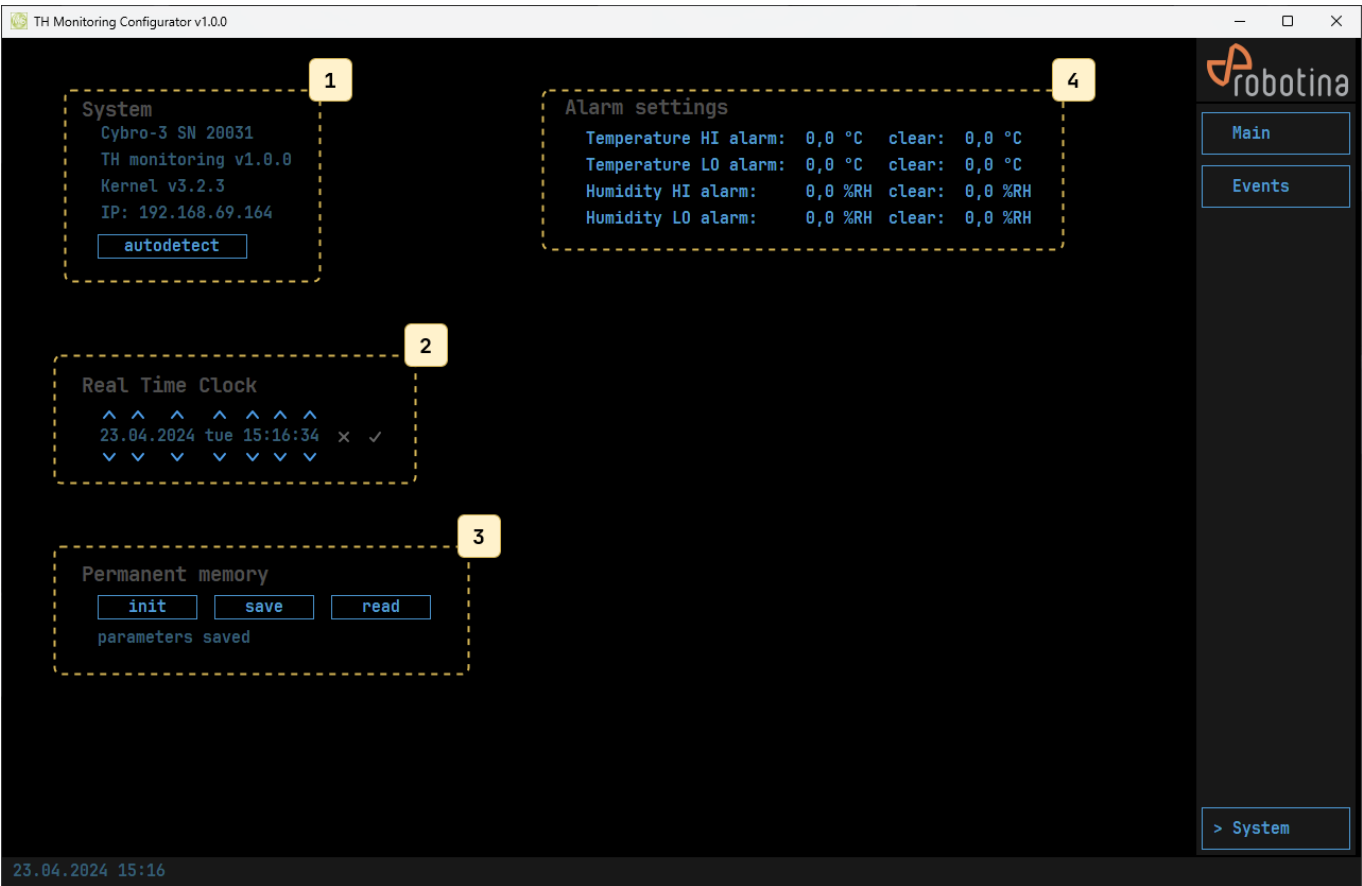
> Events

System

12.04.2024 10:13

1.2.3. System

System overview and settings.



1	System settings: - MC serial number - SW version - MC Kernel version - MC IP
2	MC RTC Important for event logger
3	Permanent memory management: Alarm settings are stored to permanent (EEPROM) memory
4	Alarm settings Set to 0 to disable alarm or alarm clear functionality.

2. Modbus TCP/IP

Unit ID: 1

Supported Modbus TCP/IP function codes:

- Read Holding Registers (0x03)
- Write Single Register (0x06)
- Write Multiple Registres (0x10)

2.1. Holding Registers

Variable	PLC variable	Address	Access	Data type	Description
Sensors (si=sensor index 0..120; 0=unassigned (new) sensor)					
Index	si	$10 * si + 0$	RW	I16	Sensor index (si); when changed sensor will be moved to new index, but only if new space is empty
Status	th_status[si]	$10 * si + 1$	RO	I16	Temperature sensor status 0 = no sensor, 1 = OK, 2 = Error, no response
Temperature	th_temperature[si]	$10 * si + 2$	RO	I16	Measured temperature in 0.1 °C (234 = 23,4 °C)
Humidity	th_humidity[si]	$10 * si + 3$	RW	I16	Measured relative humidity in 0.1 %RH (654 = 65,4 %RH)
Alarm Temperature HI	th_temperature_alarm_hi[si]	$10 * si + 4$	RW	I16	Measured temperature over set high limit 0 = idle 1 = alarm
Alarm Temperature LO	th_temperature_alarm_lo[si]	$10 * si + 5$	RW	I16	Measured temperature below set low limit 0 = idle 1 = alarm
Alarm Humidity HI	th_humidity_alarm_hi[si]	$10 * si + 6$	RW	I16	Measured humidity over set high limit 0 = idle 1 = alarm
Alarm Humidity LO	th_humidity_alarm_lo[si]	$10 * si + 7$	RO	I16	Measured humidity below set low limit 0 = idle 1 = alarm
Spare	0	$10 * si + 8$	RO	I16	0
Spare	0	$10 * si + 9$	RO	I16	0
Statistics					
Sensors count	th_count_all	1210	RO	I16	The number of all sensors that are configured

Variable	PLC variable	Address	Access	Data type	Description
Sensors OK	th_count_ok	1211	RO	I16	The number of all sensors communicating correctly
Sensors Error	th_count_err	1212	RO	I16	Number of all sensors not responding (not communicating)
Sensors Alarm	th_count_alarm	1213	RO	I16	The number of all sensors that are in alarm (temperature or humidity outside the set limits; if the limits are set)
Average temperature	th_temperature_avg	1214	RO	I16	Average temperature of all sensors communicating properly
Minimal temperature	th_temperature_min	1215	RO	I16	The minimum temperature of all sensors communicating properly
Maximal temperature	th_temperature_max	1216	RO	I16	The maximum temperature of all sensors that communicate correctly
Average humidity	th_humidity_avg	1217	RO	I16	Average relative humidity of all sensors communicating correctly
Minimal humidity	th_humidity_min	1218	RO	I16	Minimum relative humidity of all sensors communicating properly
Maximal humidity	th_humidity_max	1219	RO	I16	Maximum relative humidity of all sensors communicating correctly
Spare	0	1220-1229	RO	i16	0
General settings					

Variable	PLC variable	Address	Access	Data type	Description
Temperature HI Limit	th_temperature_alarm_hi_limit	1230	RW	I16	Limit for temperature HI alarm in 0.1 °C (500 = 50,0 °C); 0 = No temperature HI alarm
Temperature HI Clear	th_temperature_alarm_hi_clear	1231	RW	I16	Limit for clear of temperature HI alarm in 0.1 °C (450 = 45,0 °C), must be lower than Temperature HI Limit; 0 = No auto clear of temperature HI alarm
Temperature LO Limit	th_temperature_alarm_lo_limit	1232	RW	I16	Limit for temperature LO alarm in 0.1 °C (50 = 5,0 °C); 0 = No temperature LO alarm
Temperature LO Clear	th_temperature_alarm_lo_clear	1233	RW	I16	Limit for clear of temperature LO alarm in 0.1 °C (100 = 10,0 °C), must be higher than Temperature LO Limit; 0 = No auto clear of temperature LO alarm
Humidity HI Limit	th_humidity_alarm_hi_limit	1234	RW	I16	Limit for humidity HI alarm in 0.1 %RH (500 = 50,0 %RH); 0 = No humidity HI alarm
Humidity HI Clear	th_humidity_alarm_hi_clear	1235	RW	I16	Limit for clear of humidity HI alarm in 0.1 %RH (450 = 45,0 %RH), must be lower than Humidity HI Limit; 0 = No auto clear of humidity HI alarm

Variable	PLC variable	Address	Access	Data type	Description
Humidity LO Limit	th_humidity_alarm_lo_limit	1236	RW	I16	Limit for humidity LO alarm in 0.1 %RH (50 = 5,0 %RH); 0 = No humidity LO alarm
Humidity LO Clear	th_humidity_alarm_lo_clear	1237	RW	I16	Limit for clear of humidity LO alarm in 0.1 %RH (100 = 10,0 %RH), must be higher than humidity LO Limit; 0 = No auto clear of humidity LO alarm
Spare	0	1238	RO	I16	0
Spare	0	1239	RO	I16	0