

AKO-16624

MODBUS map in AKOCore controllers T & H

Introduction

This document is aimed at describing to the user the operation of the MODBUS RTU communications series protocol implemented by AKO in the AKOCore T & H controllers. We should take into account that we assume that the user who wants to interact with any of our equipment with communication capacity has some knowledge of the protocol.



IMPORTANT: The functions and parameters described below are available depending on the chosen unit, for more information consult the device's user manual.

Technical specifications

RS-485 communications

Physically speaking, the AKOCore devices can be connected to a RS-485 communications bus with other units. This is a multipoint connection where the maximum distance is 1200* m. The configuration of this bus should be identical to the one presented in the following table:

RS-485 SERIES CONFIGURATION	
Baud Rate	9600**, 19200, 38400, 57600
Data length	8 bits
Parity bit	No
Stop Bits	1 bit

Modbus protocol

The protocol defines a network configuration where a network manager device (master) coexists with one or several slaves, up to a maximum of 32 networked devices (247 in the case of placing repeaters in the RS-485 network).

Among the two transmission modes defined by the protocol: ASCII and RTU (Remote Terminal Unit), AKO adopts the RTU mode. It must be said that in a network of devices connected via the MODBUS protocol, devices cannot be shared using different transmission modes.

The datagram format in RTU format is:

Start frame	Address	Function	Data	CRC	End frame
3.5 T	1 byte (1 to 247)	1 integer	Max. 126 integers	1 integer	3.5 T

←————— Maximum length 255 bytes —————→

The maximum data unit is the integer (2 bytes)

T is the time of transition of one character.

Defined MODBUS functions

AKO solves the management of its devices using several basic functions of the MODBUS protocol:

Function	Definition	Description of operation
03	Read holding registers	Reading of multiple logs
06	Preset single registers	Writing a log
16	Preset multiple registers	Writing of multiple logs

Definitions

Types of log	
N	Numeric value.
Nx10	Numeric value multiplied by 10, it has to be divided by 10 to represent it correctly.
Nx100	Numeric value multiplied by 100, it has to be divided by 100 to represent it correctly.
UTF8	2 bytes utf8 (to represent texts)
BITS	Bit map, each bit represents a value, 0 = not active, 1 = active.
Types of access	
R	Read-only. (Parameters to display to the user in the parameter section)
W	Read and write. (Parameters to display to the user in the parameter section)

* Maximum distance at 9600 baud, the distance is reduced on increasing the baud rate.

**Default value.

Parameters

It allows the user to display and edit the operating parameters.

Temperature regulation and control (rE)

Register	Type	Access	Parameter	Description	Range	Min.	Def.	Max.
200	Nx10	W	SPt	Temperature setting (Set Point)	-500 - 200	-500	90	990
201	Nx10	W	C0	Probe 1 calibration (Offset)	-50 - 50	-50	0	50
202	Nx10	W	C1	Probe 1 differential (Hysteresis)	2 - 200	2	20	200
203	Nx10	W	C2	Set point top locking	-C3 - 200	C3	200	990
204	Nx10	W	C3	Set point bottom locking	-500 - C2	-500	0	C2
205	N	W	C4	Type of delay for the protection of the compressor	0 = Minimum time of compressor in OFF 1 = Minimum time of compressor in OFF and in ON in each cycle	0	0	1
206	N	W	C5	Protection delay time	0 - 120	0	0	120
207	N	W	C6	COOL relay status with fault in probe 1	0 = OFF; 1 = ON; 2 = According to C7 and C8	0	0	2
208	N	W	C7	Time of relay ON in the event of damaged 1 probe	0 - 120	0	10	120
209	N	W	C8	Tiempo del relé en OFF en caso de sonda 1 averiada	0 - 120	0	5	120
215	N	W	C19	Maximum start time from Pump Down	0 - 120	0	0	120
216	N	W	C20	Maximum time for pump down	0 - 15	0	0	15
217	N	W	C21	Probe to be displayed	0 = All probes 1 = Temp. Probe Cold room 2 = Evap. probe 2 3 = Probe 3	0	1	3
218	N	W	C22	Stop fans and compressor on opening door	0 = No; 1 = Yes	0	0	1
219	N	W	C23	Start-up delay for fans and compressor with door open	0 - 999	0	0	990
220	Nx10	W	C26	Probe 3 calibration (Offset)	-200 - 200	0	0	200
221	N	W	C40	Frequency of air extraction cycles (time between starts) (Only if o80 or o81=1) (0=Only keypad activation)	0 - 24	0	0	24
222	N	W	C41	Duration of air extraction cycles (0=deactivated)	0 - 600	0	0	600

Moisture regulation and control (rH)

Register	Type	Access	Parameter	Description	Range	Min.	Def.	Max.
230	Nx10	W	SPH	Moisture setting (Moisture set point)	300 - 1000	300	850	1000
231	Nx10	W	rH00	Moisture probe calibration (Offset)	-100 - 100	-100	0	100
232	Nx10	W	rH01	Moisture probe differential (Hysteresis)	5 - 100	5	50	100
233	Nx10	W	rH02	Top lock of the SPH	300 - 1000	rH03	1000	1000
234	Nx10	W	rH03	Bottom lock of the SPH	-500 - C2	300	300	rH02
235	N	W	rH04	Humidifier active during defrost	0 = No 1 = Yes	0	0	1
236	N	W	rH05	Maximum time for dehumidifier to be ON. From this value onwards, cold is activated to reduce moisture (0=Cold is not activated for this function)	0 - 240	0	0	240
237	N	W	rH06	Maximum time for heat provision via hot gas until resistors are activated.	0 - 240	0	0	240
238	N	W	rH07	Dehumidification function	0= Enabled 1= Disabled	0	0	1

Defrost (dEF)

Register	Type	Access	Parameter	Description	Range	Min.	Def.	Max.
250	N	W	d0	Defrost frequency	0 - 96	0	6	96
251	N	W	d1	Maximum defrost duration	0 - 255	0	In1	255
252	N	W	d2	Type of message during the defrost:	0 = Displays the real temperature 1 = Displays the temperature at the start of the defrost 2 = Displays the DEF message	0	2	2
253	N	W	d3	Maximum message duration	0 - 255	0	5	255
254	Nx10	W	d4	Final defrost temperature	-500 - 500	-500	80	500
255	N	W	d5	Defrost on connecting the unit	0 = No. First defrost according to d0 1 = Yes, first defrost according to d6	0	0	1
256	N	W	d6	Delay of the defrost start on connecting the unit	0 - 255	0	0	255
257	N	W	d7	Type of defrost:	0 = Resistors 1 = By air 2 = No defrost 3= Hot gas (condensing unit) 4= Hot Gas (Cycle reversal)	0	In1 / In2	4
258	N	W	d8	Count of time between defrost periods:	0 = Total real time 1 = Sum of the COOL operating time	0	0	1
259	N	W	d9	Drip time when a defrost finishes	0 - 255	0	1	255
815	N	W	d10	Start time of defrost 1 (-1: deactivated)*	-1 - 23	-1	-1	23
816	N	W	d11	Start time of defrost 2 (-1: deactivated)*	-1 - 23	-1	-1	23
817	N	W	d12	Start time of defrost 3 (-1: deactivated)*	-1 - 23	-1	-1	23
818	N	W	d13	Start time of defrost 4 (-1: deactivated)*	-1 - 23	-1	-1	23
819	N	W	d14	Start time of defrost 5 (-1: deactivated)*	-1 - 23	-1	-1	23
820	N	W	d15	Start time of defrost 6 (-1: deactivated)*	-1 - 23	-1	-1	23

* Parameters only available with the CAMM module installed

Evaporator fans (FAn)

Register	Type	Access	Parameter	Description	Range	Min.	Def.	Max.
270	Nx10	W	F0	Fans stop temperature	-500 - 500	-500	40	500
271	Nx10	W	F1	Probe 2 differential if fans are stopped	1 - 200	1	20	200
272	N	W	F2	Stop fans when compressor stops	0 = No; 1 = Yes,	0	0	1
273	N	W	F3	Status of the fans during the defrost	0 = Stopped 1 = Running	0	In1 / In2	1
274	N	W	F4	Start-up delay after defrost	0 - 99	0	2	99
275	N	W	F10	Maximum time permitted for fans to be off. (Anti-stratification function) (0=Disabled)	0 - 360	0	0	360
276	N	W	F11	Duration of anti-stratification function	0 - 900	0	0	900

Alarms (AL)

Register	Type	Access	Parameter	Description	Range	Min.	Def.	Max.
280	N	W	A0	Configuration of the temperature alarms	0 = Relative 1 = Absolute	0	0	1
281	Nx10	W	A1	Maximum in probe 1 alarm	A2- 990	A2	990	990
282	Nx10	W	A2	Minimum in probe 1 alarm	-500 - A1	-500	-500	A1
283	N	W	A3	Delay of temperature alarms in the start-up	0 - 120	0	0	120
284	N	W	A4	Delay of temperature alarms from the end of a defrost	0 - 99	0	0	99
285	N	W	A5	Delay of temperature alarms from when the A1 or A2 value is reached	0 - 99	0	30	99
286	N	W	A6	Delay of external alarm/severe external alarm on receiving a signal in digital input	0 - 120	0	0	120
287	N	W	A7	Delay of external alarm/severe external alarm deactivation when the signal in digital input disappears	0 - 120	0	0	120
288	N	W	A8	Show warning if the defrost ends for maximum time	0 = No 1 = Yes	0	0	1
289	N	W	A9	Alarm relay polarity	0 = Relay ON in alarm 1 = Relay OFF in alarm	0	0	1
290	Nx10	W	A10	Differential of temperature alarms	1 - 200	0	10	200
292	N	W	A12	Delay to open door alarm	0 - 120	0	10	120
293	N	W	A20	Configuration of moisture alarms	0 = Relative to the SPH 1 = Absolute	0	0	1
294	Nx10	W	A21	Maximum moisture alarm	A22 - 1000	A22	200	1000
295	Nx10	W	A22	Minimum moisture alarm	-500 - A21	-500	-400	A21
296	Nx10	W	A23	Differential of moisture alarms (A21 and A22)	1 - 200	1	2	200
297	N	W	A24	Delay of moisture alarms from when A21 or A22 are reached	0 - 99	0	30	99

Basic configuration (bcn)

Register	Type	Access	Parameter	Description	Range	Min.	Def.	Max.
310	N	W	b00	Delay of all functions on receiving power supply	0 - 255	0	0	255
311	N	W	b01	Cold room light timing	0 - 999	0	0	999
312	N	W	b10	Password function	0 = Inactive 1 = Block access to parameters 2 = Block keypad	0	0	2
313	N	W	PAS	Password	0 - 99	0	0	99
314	N	W	b20	MODBUS address	1 - 247	1	1	247
315	N	W	b21	Communication speed	0 = 9600bps 1 = 19200bps 2 = 38400bps 3 = 57600bps	0	0	3
316	N	W	b22	Acoustic alarm enabled	0 = No 1 = Yes	0	1	1
317	N	R	b23	Lower display function	0=Displays moisture 1=Displays time 2=Displays moisture and time alternately	0	0	2
319	N	W	Unt	Work units	0 = °C 1 = °F	0	0	1

Inputs and outputs (In0)

Register	Type	Access	Parameter	Description	Range	Min.	Def.	Max.
330	N	W	I00	Probes connected	1=Probe 1 and SH 2=Probes S1 + S2 and SH 3= S1 probe 4= S1 and S2 probes	1	2	4
331	N	W	I10	Configuration of digital input 1	0 = Desactivada 1 = Door contact 2 = External alarm 3 = Severe external alarm 4 = Temp. selector / temp. + moist. 5 = Low pressure switch 6 = Remote Stand-by	0	In1 / In2	6
332	N	W	I11	Polarity of digital input 1	0 = Activates on closing contact 1 = Activates on opening contac	0	In1 / In2	1
333	N	W	I20	Configuration of digital input 2	0 = Desactivada 1 = Door contact 2 = External alarm 3 = Severe external alarm 4 = Temp. selector / temp. + moist. 5 = Hot Gas high pressure switch 6 = Remote Stand-by	0	In1 / In2	6
334	N	W	I21	Polarity of digital input 2	0 = Activates on closing contact 1 = Activates on opening contac	0	In1 / In2	1
335	N	W	I30	Configuration of digital input 3	0 = Desactivada 1 = Door contact 2 = External alarm 3 = Severe external alarm 4 = Temp. selector / temp. + moist. 5 = Log temperature 6 = Product temperature 7= Standby remote activation 8=High pressure switch	0	In1 / In2	8
336	N	W	I31	Polarity of digital input 3	0 = Activates on closing contact 1 = Activates on opening contac	0	In1 / In2	1
337	N	W	o00	AUX1 relay configuration	0 = Deactivated 1 = Compressor / Crankcase resistor 2 = Light 3 = Virtual control 4 = Same COOL relay status 5 = Same unit status	0	In1 / In2	5

Register	Type	Access	Parameter	Description	Range	Min.	Def.	Max.
338	N	W	o10	AUX2 relay configuration	0 = Deactivated 1 = Alarm 2 = Light 3 = Virtual control 4 = Hot Gas solenoid	0	In1 / In2	4
339	N	W	o20	AUX3 relay configuration	0 = Deactivated 1 = Heat resistor 2 = Dehumidifier	0	In1 / In2	2
340	N	W	o80	DEF relay configuration	0=Deactivated 1=Extractor fan 2=Defrost	0	In1 / In2	2
341	N	W	o81	HUMID. relay configuration	0=Deactivated 1=Extractor fan 2=Humidifier	0	In1 / In2	2
342	N	W	o90	Analogue output type (AN. OUT)	0=4-20 mA 1=0-10 V	0	0	1
343	N	W	o91	P proportional constant of analogue output	1 - 100	1	20	100
344	N	W	o92	I integral constant of analogue output	1 - 200	1	5	200

HACCP alarm (HCP)

Register	Type	Access	Parameter	Description	Range	Min.	Def.	Max.
351	Nx10	W	h1	HACCP alarm maximum temperature	0 - 990	0	990	990
352	N	W	h2	Maximum permitted time for activation of the HACCP alarm	0 - 255	0	0	255

Information (tid)

Register	Type	Access	Parameter	Description	Range	Min.	Def.	Max.
797	N	R	In1	Option chosen in the configuration wizard (Step 1)	1 - 9	1	-	9
798	N	R	In2	Option chosen in the configuration wizard (Step 2)	1 - 14	1	-	14
799	N	R	Pd	Pump down active?	0 = No; 1 = Yes	0	In1 / In2	1
801	N	R	PU	Program version				
802	N	R	Pr	Revisión de programa				
803	N	R	bU	Bootloader version				
804	N	R	br	Bootloader revision				
805	N	R	PAr	Parameter map revision				

Parameters only available with the CAMM module installed

Register	Type	Access	Parameter	Description	Range	Min.	Def.	Max.
821	N	R	L1	Log interval	0 = 1 minute 1 = 5 minutes 2 = 15 minutes 3 = 30 minutes 4 = 60 minutes	0	2	4
822	N	R	L2	Delete record and event log	0 = No; 1 = Yes	0	0	1
823	N	R	L3	Start day of the log	0 = Monday 1 = Tuesday 2 = Wednesday 3 = Thursday 4 = Friday 5 = Saturday 6 = Sunday	0	0	6
824	N	R	L4	Decimal separator in .cvs file	0 = , 1 = .	0	0	1

Unit status

Allows the user to consult the status of the unit.

Alarms

Register	Type	Access	Description	Values
1568	BITS	R	Alarms A Bit 0 = Max. alarm probe 1 (AH) Bit 1 = Min. alarm probe 1 (AL) Bit 2 = Open door alarm (AdO) Bit 3 = External alarm (AE) Bit 4 = Severe external alarm (AES) Bit 5 = Error in probe 1 alarm (E1) Bit 6 = Error in probe 2 alarm (E2) Bit 7 = Error in probe 3 alarm (E3) Bit 8 = Not in use Bit 9 = Moisture entry in probe 2 alarm (E2) Bit 10 = Not in use Bit 11 = HACCP alarm (HCP) Bit 12 = Error in moisture probe alarm (EH) Bit 13 = Maximum moisture alarm (AHH) Bit 14 = Minimum moisture alarm (ALH) Bit 15 = Not in use	0 = Inactive; 1 = Active
1574	BITS	R	Alerts A Bit 0 = Defrost ended by time alert (Adt) Bit 1 = Error in pump down alert (Stop) (Pd) Bit 2 = Error in pump down alert (Start-up) (LP) Bit 3 = HACCP alert due to power supply failure (HCP/PF) Bit 4 = HACCP alert (HCP) Bit 5 to 15= Not in use	0 = Inactive; 1 = Active

Reading of inputs and outputs

1584	N	R	Displays the effective temperature of the Set Point, after applying the possible variables (set point change function, continuous cycle, etc.).	
1000	Nx10	R	Reading of temperature in probe 1	
1001	Nx10	R	Reading of temperature in probe 2	
1002	Nx10	R	Reading of temperature in probe 3	
1003	Nx10	R	Reading of the input 4-20 mA	
1004	N	R	Reading of digital input 1	0 = Inactive; 1 = Active
1005	N	R	Reading of digital input 2	0 = Inactive; 1 = Active
1006	N	R	Reading of digital input 3	0 = Inactive; 1 = Active
1009	N	R	COOL relay status	0 = Inactive; 1 = Active
1010	N	R	DEFROST relay status	0 = Inactive; 1 = Active
1011	N	R	FAN relay status	0 = Inactive; 1 = Active
1012	N	R	HUMID. relay status	0 = Inactive; 1 = Active
1013	N	R	AUX 1 relay status	0 = Inactive; 1 = Active
1014	N	R	AUX 2 relay status	0 = Inactive; 1 = Active
1015	N	R	AUX 3 relay status	0 = Inactive; 1 = Active

Keyboard

Register	Type	Access	Description	Values
20000	BITS	W	Activation of functions Bit 0 = Activation of Stand by Bit 1 = Not in use Bit 2 = Activation of the defrost Bit 3 = Not in use Bit 4 = Activation of the light Bit 5 = Activation of the mute Bit 6 = Not in use Bit 7 = Activation of AUX 1 relay (If o00=3) Bit 8 = Activation of AUX 2 relay (If o10=3) Bit 9 = Not in use Bit 10 = Activation air extraction	0 = Inactive; 1 = Active
20001	BITS	R	Function status Bit 0 = Stand by Bit 1 = Not in use Bit 2 = Defrost Bit 3 = Not in use Bit 4 = Light Bit 5 = Mute Bit 6 = Not in use Bit 7 = AUX 1 relay (If o00=3) Bit 8 = AUX 2 relay (If o10=3) Bit 9 = Not in use Bit 10 = Air extraction	0 = Inactive; 1 = Active
20002	BITS	R	Pending functions (Request made and pending execution) Bit 0 = Stand by Bit 1 = Not in use Bit 2 = Defrost Bit 3 = Not in use Bit 4 = Light Bit 5 = Mute Bit 6 = Not in use Bit 7 = AUX 1 relay (If o00=3) Bit 8 = AUX 2 relay (If o10=3) Bit 9 = Not in use Bit 10 = Air extraction	0 = Inactive; 1 = Active

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