Foreword

What is Modbus?

Modbus is an industrial protocol standard that was created by Modicon, now Schneider Electric, in the late 1970's for communication among programmable logic controllers (PLCs). Modbus remains the most widely available protocol for connecting industrial devices. The Modbus protocol specification is openly published and use of the protocol is royalty-free.

Modbus protocol is defined as a master/slave protocol, meaning a device operating as a master will poll one or more devices operating as a slave. This means a slave device cannot volunteer information; it must wait to be asked for it. The master will write data to a slave device's registers, and read data from a slave device's registers. A register address or register reference is always in the context of the slave's registers.

The most commonly used form of Modbus protocol is RTU over RS-485. Modbus RTU is a relatively simple serial protocol that can be transmitted via traditional UART technology. Data is transmitted in 8-bit bytes, one bit at a time, at baud rates ranging from 1200 bits per second (baud) to 115200 bits per second. The majority of Modbus RTU devices only support speeds up to 38400 bits per second.

Modbus register types

The types of registers referenced in Modbus devices include the following:
• Coil (Discrete Output)
• Discrete Input (or Status Input)
• Input Register
• Holding Register

Modbus commands

Function	OPCODE	Start register Address
Read Coil	0x01	1000
Read Discret Input	0x02	1000
Read Holding Register	0x03	0
Read Input Register	0x04	1000
Write single Coil	0x05	1000
Write single Register	0x06	0
Write multiple Coil	0x0F	1000
Write multiple Register	0x10	0

Modbus config

Modbus config	Possible value
Baud Rate	9600, 19200, 38400, 57600, 76800, 115200
Data bits	8 or 7
stop bits	1, 2
parity	none, odd, even

Software revision

This documentation is to valid for the followi ng software revision:
- IER software rev: > 3.x
- GUI softwarer rev.: > 3.x

Discrete inputs binary

Register Address	Data value	Data name	Vector	Description
1000	1/0	ON_STATUS	IER status	Asserted when unit is set on.
1001	1/0	NO_FACTORY_SETTING_STATUS		Asserted When no Factory setting is set in the unit. The unit will no start until proper factory setting are set
1002	1/0	STEAM_ON_STATUS		Asserted when unit is ready to produce steam, waiting for demand > 0
1003	1/0	DRAIN_CYCLE_STATUS		Asserted when a drain cycle is requested by the user. It will remain asserted for the entire cycle
1004	1/0	DRAINING_STATUS		Asserted when the unit is draining (pump is activate).
1005	1/0	ADD_WATER_STATUS		Asserted when the unit is adding water. Can happen when in add_water_state or in steam_on_state.
1006	1/0	DEBUG_STATUS		Asserted when in debug mode
1007	1/0	SERVICE_STATUS		Asserted when in Service state
1008	1/0	HEATING_STATUS		Asserted when the unit is heating
1009	1/0	AUTO_DILUTION_STATUS		Asserted when in auto dilution cycle
1010	1/0	SBX_ON_STATUS		Asserted when Sbx fan is running
1011	1/0	HEATING_STEAM_NEEDED_STATUS		Asserted when unit needed steam when in on/off mode
1012	1/0	ANTI_FREEZE_STATUS		Asserted when in anti freeze loop
1013	1/0	SCREEN_CONTROL_STATUS		Asserted when local (7 inch display) control
1014	1/0	BMS_CONTROL_STATUS		Asserted when in BMS override control
1015	1/0	DISIFECTION_STATUS		Asserted when in disinfecition loop
1016	1/0	ET_SENSOR_DEF_AL	IER Alarms level 1 (latched)	Enclosure Temperature sensor defect
1017	1/0	ET_TEMP_TOO_HOT		Enclosure Temperature to hot
1018	1/0	WL_SENSOR_DEF_AL		water level sensor defectif
1019	1/0	ADD_WATER_STATUS		water level sensor data error
1020	1/0	WL_TOO_HIGH_AL		water level too high alarm
1021	1/0	WT_SENSOR_DEF_AL		Water temperature sensor defect
1022	1/0	WT_SENSOR_ERR_AL		water temperature data error
1023	1/0	FOAM_DET_AL		foam detected
1024	1/0	HIGH_RH_IN_DUCT_AL		Hi RH% in supply duct is detected
1025	1/0	AIR_FLOW_ERR_AL		No air flow is detected
1026	1/0	ENABLE_SWITCH_AL		enable switch alarm
1027	1/0	WATER_FEED_ERR_AL		Water Feed Error
1028	1/0	DRAIN_PUMP_ERR_AL		Drain pump error. The pump do not drain properly.
1029	1/0	CRITICAL_TANK_FREEZING_AL		Critical Tank Freezing
1030	1/0	CRITICAL_ET_FREEZING_AL		Critical Enclosure Freezing
1031	1/0	WT_TOO_HIGH_AL		Water level too high alarm

Discrete inputs binary (follow'd)

Register Address	Data value	Data name	vector	Description
1032	1/0	WL_TOO_LOW_AL		Water Level Low
1033	1/0	Reserved		
1034	1/0	TANK_FREEZING_HAZARD_AL		Tank freezing hazard (start the anti-freeze cycle)
1035	1/0	ET_FREEZING_HAZARD_AL		enclosure freezing hazard (start the anti-freeze cycle)
1036	1/0	WATER_INLET_FLOW_AL		water inlet flow alarm, flow is too low
1037	1/0	ET_HOT_AL	IER Alarms Level 2	Enclosure is hot
1038	1/0	HIGH_TEMP_SSW_AL		High Temperature switch on
1039	1/0	POWER_SHUTDOWN_AL		Power Shutdown
1040	1/0	ELECTRIC_SUPPLY_AL		Electrical supply issue, check heating element
1041	1/0	NO_CTL_CONNECTED_AL		No Control Connected (or rh sensor)
1042	1/0	SERVICE_AL		Service is required
1043	1/0	IER_NOT_HEATING		Unit not heating
1044	1/0	Reserved		
1045	1/0	Reserved		
1046	1/0	Reserved		
1047	1/0	ALL_ALARMS2_AL		One of the alarm level 2 is activated

Coils binary

Register Address	Data value	Data name	Vector type	Description
1000	1/0	IER_ON_REQ		Write 1 at this address to put the unit on (armed state)
1001	1/0	IER_OFF_REQ		Write 1 at this address to put the unit off (standby state)
1002	1/0	Reserved		
1003	1/0	Reserved		
1004	1/0	DRAIN_CYCLE_REQ		Write 1 at this address to start a drain
1005	1/0	CLEAR_ALARM1_REQ		Write 1 at this address to clear latched alarm
1006	1/0	SERVICE_REQ		Write 1 at this address to start a service
1007	1/0	Reserved	IER request	
1008	1/0	Reserved		
1009	1/0	Reserved		
1010	1/0	BMS_CONTROL_REQ		Write 1 at this address to get complete BMS override control over all parameter. (Otherwise you will only be able to access read only data and to change to setpoint)
1011	1/0	Reserved		
1012	1/0	Reserved		
1013	1/0	Reserved		
1014	1/0	DISIFECTION_REQ		Write 1 at this address to start the disinfection cycle (if in disinfection mode)
1015	1/0	DISIFECTIONCANCEL_REQ		Write 1 at this address to cancel the disinfection cycle (if in disinfection mode)

Coils binary (follw'd)

Register Address	Data value	Data name	Vector type	Description
1016	1/0	INACTIVITY_DRAIN_CONFIG	IER Config	Inactivity Drain Configuration on/off
1017	1/0	DRAIN_CONFIG		Drain frequency on/off
1018	1/0	AUTO_DILUTION_CONFIG		auto dilution config on/off
1019	1/0	DRAIN_COOLING_CONFIG		Drain cooling on/off
1020	1/0	PREHEAT_CONFIG		Water pre-heat on/off
1021	1/0	EXT_SBX_CONFIG		External Fan prensent = 1, External Fan not present = 0
1022	1/0	ANTI_FREEZE_CONFIG		Antifreeze option on/off
1023	1/0	SERVICE_AUTOOFF_CONFIG		Stop unit if service is needed

Input registers (read only)

Register address	Data type	Data name	Description	Value	Unit
1000	uint16_t	Output SSR	0-100 % output SSR (raw energy used) Note: not humidity output!	0-100	%
1001	Reserved	Reserved	Reserved		
1002	uint16_t	water temperature low byte	IEEE 754 float Water Temperature	0 to 150	Degree C
1003	uint16_t	water temperature high byte			
1004	uint16_t	Humidity low byte	IEEE 754 float Humidity	0 to 100	%
1005	uint16_t	Humidity high byte			
1006	uint16_t	IER State	The unit is in standby waiting to be enable	STANDBY_STATE = 0,	nil
			The unit is running and waiting for a demand	ARMED_STATE =1	
			The unit is producing steam	STEAM_ON_STATE =2	
			The unit is in Draining (partially or completely depending of the configuration)	DRAINCYCLE_STATE = 3	
			The unit is adding water	ADD_WATER_STATE = 4	
			The unit is in preheat cycle	PRE_HEAT_STATE = 5	
			The unit is in Alarm state	ALARMS_STATE = 6	
			The unit is in debug mode	DEBUG_STATE = 7	
			The unit is servicing	SERVICE_STATE = 8	
			The unit is in factory state waiting for factory settings	FACTORY_STATE = 9	
			The unit is in the anti freeze cycle (the unit will heat the water to avoid water freezing)	ANTI_FREEZE_STATE =10	

Input register (follow'd)

Register address	Data type	Data name	Description	Value	Unit
1007	uint16_t	water level	Cylinder water lever in %	0 to 100	%
1008	uint16_t	water temperature	Cylinder water temperature	0 to 150	Degree C
1009	uint16_t	Room Humidity	RH reading from RH analog port	0 to 100	%
1010	uint16_t	Duct Humidity	Reading of the proportionnal high limit when using proportionnal hi limit	0 to 100	%
1011	uint16_t	Steam output	steam output (water temperature > 95)	0 to 100	%
1012	uint16_t	Reserved	Reserved	Reserved	Reserved
1013	uint16_t	Demand	Humidifier module demand (this demand is compute by the IER and not directly injected by the BMS)	0 to 100	%
1014	uint16_t	Drain Frequency time stamp	Number of hour since last drain	50 to 2000	hr
1015	uint16_t	Service timer time stamp	Number of hour since last service	50 to 2000	hr
1016	uint16_t	Microcontroller tempereature	Microcontroller tempereature	0-150	Degree C
1017	uint16_t	Enclosure Temperature	Outside enclosure temperature (PT1000)	0-150	Degree C
1018	uint16_t	Number of hour of operation (noh) low value	Number of hours of operation while producing steam	0 – 4294967295	hr
1019	uint16_t	Number of hour of operation (noh) high value			
1020	uint16_t	Firmware revision & update	current Firmware revision for steam generator 1 : 0.0 to 255.255 encode in table MSB.LSB	from 0.0 to 255.255 Ex : 1.168	v
1021	uint16_t	Disinfection time stamp	Remaining time to disinfection loop	15-240	min
1022	uint16_t	Disinfection state	Internal state for disinfection loop		
1023	uint16_t	Drain cycle internal state	The unit is draining and water temperature > 60C	S_DRAIN1	nil
			The unit is filling with water to cool the cylinder	S_TANK_COOLING	
			The unit is draining for the last time	S_DRAIN2	

Holding register

Register Address	Data type	Data name	Description	Value \ Label	Unit
0	uint16_t	control source	Unit Control source	Analog demand ext. (AI1) = 0	nil
				RH% signal ext (AI2) = 1	
				Temp. signal ext (AI2) = 2	
				On/off Contact (DI1) = 3	
				Remote Com. = 4	
				Disinfection cycle = 5	
1	uint16_t	Analogue demand type	Analogue demand type of signal (AI1 range)	0-10Vdc = 0	nil
				0-5Vdc = 1	
				1-5Vdc = 2	
				2-10Vdc = 3	
				4-20mA =4	
2	uint16_t	RH/temp signal type	RH/temp type of signal (AI2 range)	0-10Vdc = 0	nil
				0-5Vdc = 1	
				1-5Vdc = 2	
				2-10Vdc = 3	
				4-20mA =4	
3	uint16_t	AI2 P gain	Demand Proportional Gain	0-100	%
4	uint16_t	Reserved	Reserved		
5	uint16_t	AI2 I gain	Demand Integral Gain	0-100	%
6	uint16_t	Reserved	Reserved		
7	uint16_t	AI2 D gain low byte	Demand Derivative Gain	0-100	%
8	uint16_t	Reserved	Reserved		
9	uint16_t	AI2 PID Proportional Band	Value of Ai1 PID proportionnal band	0 to 100	%
10	uint16_t	AI2 PID Dead Band	Value of AI1 PID deadband	0 to 100	%
11	uint16_t	Setpoint Source	Setpoint source	External (AI3) = 0	
				Internal = 1	
				Remote Com = 2	
12	uint16_t	Setpoint signal type	setpoint type of signal	0-10Vdc = 0	
				0-5Vdc = 1	
				1-5Vdc = 2	
				2-10Vdc = 3	
				4-20mA =4	

Holding register (follow'd)

Register Address	Data type	Data name	Description	Value \ Label	Unit
13	uint16_t	Setpoint Value	Setpoint value if setpoint source = Internal	0 to 100 %	
14	uint16_t	RH % Hi limit Signal source	RH % Hi limit Signal source	Digital (on/off) (DI2) = 0	
				Analog (propor) (AI4) =1	
				Both = 2	
15	uint16_t	RH % Hi limit signal type	RH % Hi limit Signal type (AI4 range)	0-10Vdc = 0	
				0-5Vdc = 1	
				1-5Vdc = 2	
				2-10Vdc = 3	
				4-20mA =4	
16	uint16_t	AI4 P gain low byte	High limit Proportional gain	0-100	%
17	uint16_t	Reserved	Reserved		
18	uint16_t	AI4 I gain low byte	High limit Integral gain	0-100	%
19	uint16_t	Reserved			
20	uint16_t	AI4 D gain low byte	High limit Derivative Gain	0-100	%
21	uint16_t	Reserved			
22	uint16_t	AI4 PID Proportional Band	Value of Ai1 PID proportionnal band	0 to 100	%
23	uint16_t	AI4 PID Dead Band	Value of AI1 PID deadband	0 to 100	%
24	uint16_t	Output signal type	Output signal type	0-10Vdc = 0	
				0-5Vdc = 1	
				1-5Vdc = 2	
				2-10Vdc = 3	
				4-20mA =4	
25	uint16_t	Output Capacity Reduction	Rescale the maximum output demand of the unit	20 to 100	%
26	uint16_t	Pre heat water temperature	water temperature of pre heat setting	60 to 90	Degree C
27	uint16_t	water temperature offset slave 1	Water temperature offset calibration error	0 to 15 (0 = -10 and 15 = 10)	Degree C
28	uint16_t	Reserved	Reserved	Reserved	
29	uint16_t	Reserved	Reserved	Reserved	
30	uint16_t	Reserved	Reserved	Reserved	
31	uint16_t	Drain Frequency	Drain Frequency value in hour	1 to 24	hr

Holding register (follow'd)

Register Address	Data type	Data name	Description	Value \ Label	Unit
32	uint16_t	Inactivity Drain time	Number of inactivity hour allowed before drain when the unit is armed again	1 to 96	hr
33	uint16_t	Proportional High limit value	This is the setpoint when using proportionnal high limit	4 to 60	min
34	uint16_t	Service frequency	Number of hour before service is needed	50 to 2000	hr
35	uint16_t	External fan timer	fan delay in sec	10 to 60	s
36	uint16_t	Bacnet Demand	Bacnet external demand	0 t 100	%
37	uint16_t	Reserved	Reserved	Reserved	
38	uint16_t	BMS communication type	BMS communication type	None = 0	nil
				Modbus = 1	
				BACnet IP = 2	
				Ethernet = 3	
39	uint16_t	Modbus parameters: slave adress	if Modbus is selected as BMS communication on the screen	1 to 247	
40	uint16_t	Modbus parameters: parity	if Modbus is selected as BMS communication the user can select the modbus parity for BMS communication	None = 0	nil
				even = 1	
				odd = 2	
41	uint16_t	Modbus parameters: Baudrate	if Modbus is selected as BMS communication the user can select the modbus baudrate for BMS communication	9600 = 0	nil
				19200 = 1	
				38400 = 2	
				57600 = 3	
				76800 = 4	
				115200 = 5	
42	uint16_t	BAcnet parameters: MAC address	MAC address	0 to 127	
43	uint16_t	BAcnet parameters: instance	Device instance	0 to 65535	
44	uint16_t	BACnet parameters: parity	if Bacnet is selected as BMS communication the user can select the Bacnet parity for BMS communication	None = 0	
				even = 1	
				odd = 2	
45	uint16_t	BACnet parameters: Baudrate	if Bacnet is selected as BMS communication the user can select the Bacnet baudrate for BMS communication	9600 = 0	
				19200 = 1	
				38400 = 2	
				57600 = 3	
				76800 = 4	
				115200 = 5	

Holding register (follow'd)

Register Address	Data type	Data name	Description	Value \ Label	Unit
46	uint16_t	Reserved	Reserved		
47	uint16_t	Reserved	Reserved		
48	uint16_t	Reserved	Reserved		
49	uint16_t	Reserved	Reserved		
50	uint16_t	Reserved	Reserved		
51	uint16_t	Reserved	Reserved		
52	uint16_t	Reserved	Reserved		
53	uint16_t	Reserved	Reserved		
54	uint16_t	Reserved	Reserved		
55	uint16_t	Reserved	Reserved		
56	uint16_t	Reserved	Reserved		
57	uint16_t	Reserved	Reserved		
58	uint16_t	Reserved	Reserved		
59	uint16_t	Reserved	Reserved		
60	uint16_t	Reserved	Reserved		
61	uint16_t	disinfection_temp	disinfection temperature	0-100	c
62	uint16_t	disinfection_delay	disinfection delay	0-120	min

Information contained in this manual is subject to change without notice.
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