

User Guide

Modbus protocol for Athena, Genesis platform

Version 17.1



The English language is used for the original instructions.
Other languages are a translation of the original instructions.
(Directive 2006/42/EC)

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1 Connecting Modbus

1.1 Connecting Modbus

The heat pump supports two Modbus protocols:

- Modbus RTU (connect to the BM-card (Port: MBe) located in the electrical cabinet)
- Modbus TCP/IP (connect to the RJ45 connection located on the display unit)

The settings for Modbus parameters can be found under Settings / BMS in the display.

For Modbus TCP/IP, if you have secondary units, you will need a network switch or router since the primary/secondary interface uses the same RJ45 connector for its communication. Make sure that you are not using the same port as the Primary uses to communicate to its secondaries.

2 Scale, function, negative numbers & MSB/LSB

2.1 Scale, function, negative numbers & MSB/LSB

Scale	
1	No conversion factor
10	Conversion factor 10, i.e. the transmitted value is a tenfold larger
100	Conversion factor 100, i.e. the transmitted value is a tenfold larger

Function	Function	Description
1	Read Coil Status	Read one or more consecutive boolean registers
2	Read Input Status	Read one or more consecutive boolean registers
3	Read Holding Registers	Read one or more consecutive analog registers
4	Read Input Registers	Read one or more consecutive analog registers
5	Force Single Coil	Write to one boolean register
6	Preset Single Holding Register	Write to one analog register
15	Force Multiple Coils	Write one or more consecutive boolean registers
16	Preset Multiple Holding Registers	Write one or more consecutive analog registers

Negative numbers

Negative numbers are represented by the upper half of each 16 bit register.

```

100 = 100
...
2 = 2
1 = 1
0 = 0
-1 = 65535
-2 = 65534
-3 = 65533
...
-100 = 65436
etc.

```

Example: if "Brine out low alarm limit" register is set to -5 °C then, since the register has a scale of 100, the value read on Modbus should be 65036, representing -500.

Observe that not all variables are signed, i.e. "Compressor operating hours (LSB)" is a strict positive number between 0 to 65535.

MSB/LSB

Some variables has potential to surpass their maximum value, for instance the variable "Compressor operating hours" can become larger than 65535.

For these specific variables, that might be affected by this, there are two registers, MSB (Most Significant Bit) and LSB (Least Significant Bit) that can be combined in order to get a 32 bit number representation of the value.

i.e. "Compressor operating hours" is separated in to "Compressor operating hours (MSB)" and "Compressor operating hours (LSB)". The LSB register is counting up by 1 for each hour that the compressor has been running and when it reaches 65535 then it will add 1 to the MSB register and reset the LSB register.

In order to obtain the total Compressor operating hours then the two registers are combined into a 32 bit register where the MSB address represents the upper 16 bits and LSB represents the lower 16 bits.

Example:

Compressor operating hours (MSB) = 2
 Compressor operating hours (LSB) = 2345
 Total Compressor operating hours = 2×65536 (MSB) + 2345 (LSB) = 133417 hours

2.2 Addressing

A "De Facto-standard" have come to be with the purpose of simpler integration. Addressing is done as follows:

First variable of	Is addressed	Typical function(s)
COIL STATUS	00001	1, 5 (5=write)
INPUT STATUS	10001	2
HOLDING REGISTERS	40001	3, 6 (6=write)
INPUT REGISTERS	30001	4

Observe that some systems cannot handle aforementioned addressing system. Commonly a combination of function and absolute reference to 0 is used. The address table shows both alternatives.

2.3 Factory default

Parameter	Factory	Range
Speed	19200 bps	19200 (2400,4800,9600, 14400, 19200, 28800, 38400, 57600, 115200)
Parity	Even	Even, none, odd
Address	1	1-247, not implemented on Modbus TCP/IP, the heat pump will respond to each address on its specific IP-address using the designated modbus port
Start bit	1	1
Stop bit	1	1 stop bit when Even or Odd Parity and optional when Parity None is chosen
Data bit	8	Data bits can only be 8 bits
Port	502	1-65535
Modbus mode	RTU	RTU, TCP/IP

2.4 Table key

Reference to	
1	Heating system
2	Hot water
3	TWC
4	WCS
5	Cooling
6	Pool
7	Distribution circuit
8	Buffer tank
9	Electric meter
10	Internal heat pump

3 Address list

3.1 Read/Write Digital Registers

COILS - Function codes: 1=read coils, 5=write single coil, 15=write multiple coils						
Position number	Refers to	Address	De facto address	Scale	Unit	Description
		3	4	1	on/off	Reset all alarms
		5	6	1	on/off	Enable external additional heater
	1	9	10	1	on/off	Enable heat
	5	10	11	1	on/off	Enable active cooling
107	7	11	12	1	on/off	Enable mix valve 1
	6	28	29	1	on/off	Enable pool (EM)
	6	31	32	1	on/off	Enable external additional heater for pool (EM)
		41	42	1	on/off	Enable fixed system supply set point allows defacto address 40117
		59	60	1	on/off	Enable continuous operation mode for condenser pump.

*5) Should always be set to 1 i auto mode

3.2 Read Digital Registers

DISCRETE INPUTS - Function codes: 2=read discrete inputs						
Position number	Refers to	Ad-dress	De facto ad-dress	Scale	Unit	Description
		0	10001	1	on/off	Alarm active, Class: A
		1	10002	1	on/off	Alarm active, Class: B
		2	10003	1	on/off	Alarm active, Class: C
		66	10067	1	on/off	Sum alarm (EM)
	6	77	10078	1	on/off	External stop for pool, read only (EM)
	10	199	10200	1	on/off	Compressor control signal
		201	10202	1	on/off	Smart Grid 1, EVU input, read only
		202	10203	1	on/off	External alarm input
		204	10205	1	on/off	Smart Grid 2, read only
117	1	206	10207	1	on/off	External additional heater control signal
109	7	209	10210	1	on/off	Mix valve 1 circulation pump control signal (EM)
370		210	10211	1	on/off	Secondary circuit pump (with intermediate changer)
36	1	211	10212	1	on/off	System circulation pump control signal
176	1	219	10220	1	on/off	External heater circulation pump control signal
	1	220	10221	1	on/off	Heating season (winter) active
	10	225	10226	1	on/off	Heat pump OK to start
101	6	235	10236	1	on/off	Pool directional valve position (EM)
312		243	10244	1	on/off	Reversing valve Bypass
		257	10258	1	on/off	Outdoor unit 1 has a class A alarm
		258	10259	1	on/off	Outdoor unit 2 has a class A alarm
		259	10260	1	on/off	Outdoor unit 3 has a class A alarm
		260	10261	1	on/off	Outdoor unit 4 has a class A alarm
		261	10262	1	on/off	Outdoor unit 1 has a class B alarm

DISCRETE INPUTS - Function codes: 2=read discrete inputs						
Position number	Refers to	Ad- dress	De facto ad- dress	Scale	Unit	Description
		262	10263	1	on/off	Outdoor unit 2 has a class B alarm
		263	10264	1	on/off	Outdoor unit 3 has a class B alarm
		264	10265	1	on/off	Outdoor unit 4 has a class B alarm
		266	10267	1	on/off	No communication to outdoor unit 1
		267	10268	1	on/off	No communication to outdoor unit 2
		268	10269	1	on/off	No communication to outdoor unit 3
		269	10270	1	on/off	No communication to outdoor unit 4

3.3 Read Analog Registers

INPUT REGISTERS - Function codes: 4=read input registers						
Position number	Refers to	Ad- dress	De facto ad- dress	Scale	Unit	Description
		2	30003	1	bitfield	Currently running: Bit registers that shows the all the current running demands according to 6*
	10	5	30006	1	rpm	Compressor speed
117	1	6	30007	100	%	External additional heater: Current demand (EM)
	10	7	30008	10	°C	Discharge pipe temperature
405	10	8	30009	100	°C	Return line temperature (N/A for Athena Standard)
411		9	30010	100	°C	Supply line temperature (N/A for Athena Standard)
51	1	12	30013	100	°C	System supply line temperature (EM)
50		13	30014	100	°C	Outdoor temperature
55	2	15	30016	100	°C	Tap water top temperature
53	2	16	30017	100	°C	Tap water lower temperature
53/55	2	17	30018	100	°C	Tap water weighted temperature
51	1	18	30019	100	°C	System supply line calculated set point
51	1	19	30020	100	°C	Selected heat curve, (system) supply line
51	1	20	30021	100	°C	Heat curve, X-coordinate 1 (highest outdoor temperature)
51	1	21	30022	100	°C	Heat curve, X-coordinate 2
51	1	22	30023	100	°C	Heat curve, X-coordinate 3
51	1	23	30024	100	°C	Heat curve, X-coordinate 4
51	1	24	30025	100	°C	Heat curve, X-coordinate 5
51	1	25	30026	100	°C	Heat curve, X-coordinate 6
51	1	26	30027	100	°C	Heat curve, X-coordinate 7 (lowest outdoor temperature)
52		27	30028	100	°C	System return line temperature (only available for Athena Standard)
	10	30	30031	100		Calculated demand (heat)
	5	36	30037	1	degmin	Cooling season integral value
308	10	39	30040	100	%	Condenser circulation pump speed (N/A for Athena Standard)
108	7	40	30041	100	°C	Mix valve 1 supply line temperature (EM)
402/136	8	41	30042	100	°C	Volume tank/EQ-tank/buffer tank temperature (EM)
107	7	43	30044	100	%	Mix valve 1 position (EM)
77	2	47	30048	1	%	Hot water directional valve position
	10	48	30049	1	h	Compressor operating hours (MSB)

INPUT REGISTERS - Function codes: 4=read input registers						
Position number	Refers to	Ad-dress	De facto ad-dress	Scale	Unit	Description
	10	49	30050	1	h	Compressor operating hours (LSB)
	2	50	30051	1	h	Tap water operating hours (MSB)
	2	51	30052	1	h	Tap water operating hours (LSB)
117	1	52	30053	1	h	External additional heater operating hours (MSB)
117	1	53	30054	1	h	External additional heater operating hours (LSB)
	10	54	30055	100	%	Compressor speed percent
	10	60	30061	1	seconds	Compressor temporarily blocked, (start restriction timer)
	10	61	30062	100	gear	Compressor current gear
317		67	30068	1	step	Active step indoor immersion heater
	9	69	30070	100	A	Electric meter L1 current
	9	70	30071	100	A	Electric meter L2 current
	9	71	30072	100	A	Electric meter L3 current
	9	72	30073	100	V	Electric meter L1-N voltage
	9	73	30074	100	V	Electric meter L2-N voltage
	9	74	30075	100	V	Electric meter L3-N voltage
	9	75	30076	10	V	Electric meter L1-L2 voltage
	9	76	30077	10	V	Electric meter L2-L3 voltage
	9	77	30078	10	V	Electric meter L3-L1 voltage
	9	78	30079	1	W	Electric meter L1 power
	9	79	30080	1	W	Electric meter L2 power
	9	80	30081	1	W	Electric meter L3 power
	9	81	30082	1	kWh	Electric meter - meter value
		82	30083	1	enum	Comfort mode *4
	9	83	30084	10	kWh	Electric meter kWh total (LSB)
	9	84	30085	10	kWh	Electric meter kWh total (MSB)
317		317	30318	1	step	Active step outdoor immersion heater
183	6	119	30120	100	°C	Pool supply line temperature (EM)
60	6	120	30121	100	°C	Pool return line temperature (EM)
62		121	30122	10	°C	Room temperature, Modbus room sensor Regin RC C3
62		121	30122	100	°C	Room temperature, PT1000 sensor
	10	122	30123	100	°C	Bubble point, high pressure temperature
	10	123	30124	100	°C	Dew point, high pressure temperature
	10	124	30125	100	°C	Dew point, low pressure temperature
	10	125	30126	100	K	Superheat temperature
	10	126	30127	100	K	Sub cooling temperature
	10	127	30128	100	bar(g)	Low pressure side, pressure
	10	128	30129	100	bar(g)	High pressure side, pressure
	10	129	30130	10	°C	Liquid line temperature (Ref 1)
	10	130	30131	10	°C	Suction gas temperature
	1	131	30132	1	degmin	Heating season integral value
	2	139	30140	1	gear	Desired gear for tap water
	1	140	30141	1	gear	Desired gear for heating
	5	141	30142	1	gear	Desired gear for cooling
	6	142	30143	1	gear	Desired gear for pool
108	7	147	30148	100	°C	Desired temperature distribution circuit Mix valve 1

INPUT REGISTERS - Function codes: 4=read input registers						
Position number	Refers to	Ad- dress	De facto ad- dress	Scale	Unit	Description
		311	30312	1	-	Software version: Major
		312	30313	1	-	Software version: Minor
		313	30314	1	-	Software version: Build
		315	30316	100	%	Expansion valve opening degree
311		320	30321	1	on/off	4-way-valve
71		321	30322	10	l/min	Flow rate
305		322	30323	1	rpm	Outdoor fan
304		323	30324	100	%	Circulation pump
422		324	30325	1	on/off	Dewpoint sensor triggered
503		325	30326	10	°C	Air out temperature
508		326	30327	10	°C	Ambient temperature at outdoor unit
419		327	30328	10	°C	Evaporator out temperature
506		328	30329	10	°C	Condenser out temperature
		329	30330	1	enum	Outdoor unit message code
507		412	30413	10	°C	Condenser in temperature

3.4 Read/Write Analog Registers

HOLDING REGISTERS - Function codes: 3=read holding registers, 6=write single register, 16=write multiple registers						
Position number	Refers to	Ad- dress	De facto ad- dress	Scale	Unit	Description
		0	40001	1	enum	Operational mode *2
51	1	3	40004	100	°C	Max limitation, set point curve radiator
51	1	4	40005	100	°C	Min limitation, set point curve radiator
		5	40006	100	°C	Comfort wheel setting
51	1	6	40007	100	°C	Set point heat curve, Y-coordinate 1 (highest outdoor temperature)
51	1	7	40008	100	°C	Set point heat curve, Y-coordinate 2
51	1	8	40009	100	°C	Set point heat curve, Y-coordinate 3
51	1	9	40010	100	°C	Set point heat curve, Y-coordinate 4
51	1	10	40011	100	°C	Set point heat curve, Y-coordinate 5
51	1	11	40012	100	°C	Set point heat curve, Y-coordinate 6
51	1	12	40013	100	°C	Set point heat curve, Y-coordinate 7 (lowest outdoor temperature)
50	1	16	40017	100	°C	Heating season stop temperature
53/55	2	22	40023	100	°C	Start temperature tap water (For Normal mode)
53/55	2	23	40024	100	°C	Stop temperature tap water (For Normal mode)
	1	26	40027	1	gear	Minimum allowed gear in heating *3
	1	27	40028	1	gear	Maximum allowed gear in heating *3
183	6	58	40059	100	%	Pool charge set point (EM)
117	1	75	40076	1	PIDsum	External additional heater start (PID sum)
	10	76	40077	100	%	Condenser pump lowest allowed speed
117	1	78	40079	100	PIDsum	External additional heater stop (PID sum)
	10	79	40080	100	%	Condenser pump highest allowed speed
	10	81	40082	100	%	Condenser pump standby speed

HOLDING REGISTERS - Function codes: 3=read holding registers, 6=write single register, 16=write multiple registers						
Position number	Refers to	Ad-dress	De facto ad-dress	Scale	Unit	Description
	6	105	40106	100	°C	Start temp for cooling
	6	106	40107	100	°C	Stop temp for cooling
108	7	107	40108	100	°C	Min limitation Set point curve radiator Mix valve 1
108	7	108	40109	100	°C	Max limitation Set point curve radiator Mix valve 1
108	7	109	40110	100	°C	Set point curve, Y-coordinate 1 Mix valve 1 (highest outdoor temperature)
108	7	110	40111	100	°C	Set point curve, Y-coordinate 2 Mix valve 1
108	7	111	40112	100	°C	Set point curve, Y-coordinate 3 Mix valve 1
108	7	112	40113	100	°C	Set point curve, Y-coordinate 4 Mix valve 1
108	7	113	40114	100	°C	Set point curve, Y-coordinate 5 Mix valve 1
108	7	114	40115	100	°C	Set point curve, Y-coordinate 6 Mix valve 1
108	7	115	40116	100	°C	Set point curve, Y-coordinate 7 Mix valve 1 (lowest outdoor temperature)
51		116	40117	100	°C	Fixed system supply set point, requires de facto address 42 to be enabled
		117	40118	1	enum	Outdoor temperature source, is an enumeration where 0 = designated PT1000 sensor located on BM-card. 1 = BMS register 40119 (De Facto). When the source is BMS the outdoor temperature alarm is automatically removed when the sensor data is valid. If no valid sensor data is present the heat pump will use its designated PT1000 sensor and if that sensor is missing the heat pump will use 0 degrees C as a fallback value.
		118	40119	100	°C	Outdoor temperature sensor, this register will be the source of the outdoor temperature given that BMS-address 40118 is set to 1. The valid range of the temperature is between -50 to 200 degrees C. If this register is not updated with a new temperature within 12 hours or the value is outside the valid range, the fallback logic will be triggered stated in description of BMS register 40118. This signal is automatically filtered in the heat pump.
	enum		124	40125	1	Desired Power Consumption Control, control mode. Controlled by BMS, may be overridden by the Digital input for Smart grid. In SG-Ready mode 0=Normal, 1=Load-Up, 2=EVU,3=Boost. When in PL/LU mode 0=Normal, 1=Power Limit(defacto address 40126), 2=Load-Up, 3=Power Limit(defacto address 40126)
	kW		125	40126	10	Input power limit during Power Limitation (defacto 40125), NOTE: If the power limitation is set too low, the compressor will be unable to run.
	6	299	40300	10	°C	Set point return temp from pool to heat exchanger (EM)
	6	300	40301	10	K	Set point pool hysteresis (EM)
	5	303	40304	100	°C	Set point minimum outdoor temp when cooling is permitted
	1	304	40305	100	°C	External heater outdoor temp limit

Footnotes:

*1) 1: Manual operation, 2: Defrost, 3: Hot water, 4: Heat, 5: Active Cooling, 6: Pool, 7: Anti legionella, 8: Passive Cooling 98: Standby 99: No demand 100: OFF

*2) 1: OFF, 2: Standby, 3: ON/Auto

*3) Different heat pumps have different number of available gears.

For instance: Commercial can have 10, while domestic can have 9 gears.

*4) These applies to Smart grid function. 1: EVU, 4: Normal, 5: Comfort, 6: Boost

*5) Should always be set to 1 i auto mode

*6) Bit 0: Manual operation Bit 1: Defrost, Bit 2: Hot water, Bit 3: Heat, Bit 4: Active Cooling, Bit 5: Pool, Bit 6: Anti legionella, Bit 7: Passive Cooling, Bit 8: Reserved, Bit 9: Standby, Bit 10: No demand, Bit 11: OFF

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