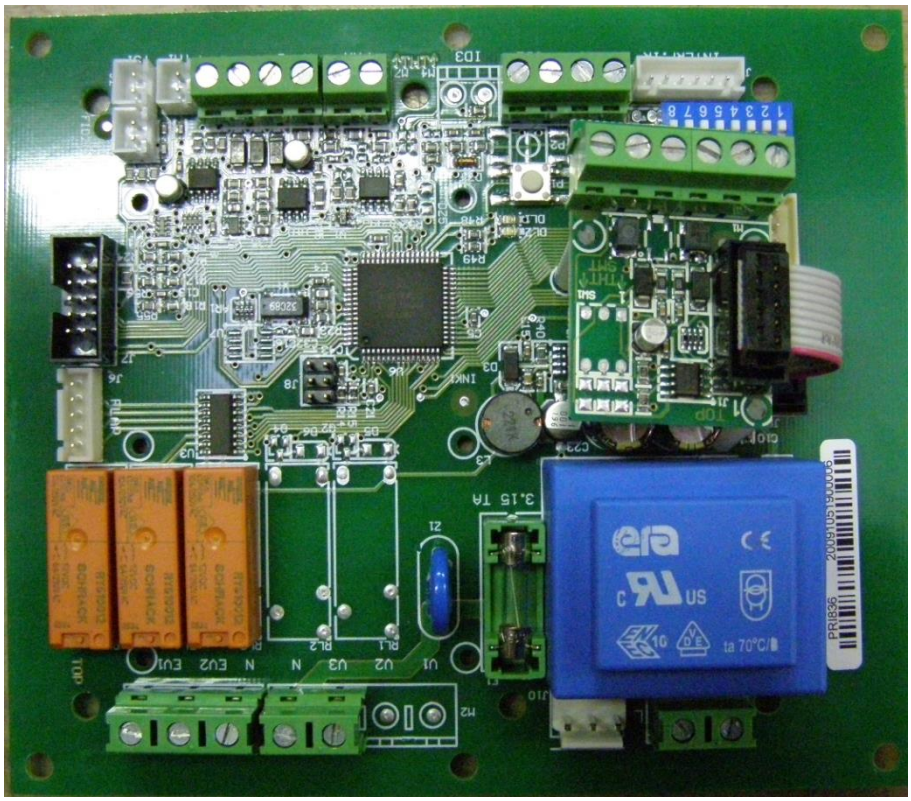
BMS INTERFACE MANUAL
(i)HB CONTROLLER



Sede legale: via L. Seitz, 47 - 31100 Treviso - Italia
Seda amm.va: via Sarson, 57/c - 36061 Bassano del Grappa (VI)
Tel. (+39) 0424 509500 - Fax (+39) 0424 509509

Capitale sociale € 10.000.000,00 i.v. - R.E.A. N. 302989/TREVISO
Codice fiscale e partita IVA 02603430139

The products described in this manual require qualification/configuration/commissioning in relation to their advanced level of technology, in order to ensure their optimal performance for the specific application. Omission of this stage of design, as indicated in the manual, can result in malfunctioning of the final products for which CLIMAVENETA cannot be held responsible.
Only qualified personnel may install the product and carry out technical assistance operations.

The following symbols are used in parts of this publication

⚠ **ATTENTION =** for measures that require particular care and appropriate knowledge and skills

Electrical expert
Person with in-depth knowledge and experience and able, therefore, to identify the risks and dangers associated that can be associated with electricity

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1. Introduction

This document describes all the parameters relating to the connection of the controllers (hereafter referred to as devices) for the fancoils described further on (see table 1) to a BMS system via the Modbus RTU communication protocol.

The devices of reference for this document are:

Code	Description
C50011597A	HB "LIFE" POWER BOARD
C50011598A	"I-LIFE" 100 IHB POWER BOARD
C50011599A	"I-LIFE" 200 IHB POWER BOARD
C50011600A	"I-LIFE" 300 IHB POWER BOARD
C50011601A	"I-LIFE" 400 IHB POWER BOARD
C50011602A	"I-LIFE" 500 IHB POWER BOARD
C50011603A	"I-LIFE" 600 IHB POWER BOARD
7349051500	HB LIFE POWER BOARD KIT
7349051600	I-LIFE 100 IHB POWER BOARD KIT
7349051700	I-LIFE 200 IHB POWER BOARD KIT
7349051800	I-LIFE 300 IHB POWER BOARD KIT
7349051900	I-LIFE 400 IHB POWER BOARD KIT
7349052000	I-LIFE 500 IHB POWER BOARD KIT
7349052100	I-LIFE 600 IHB POWER BOARD KIT

Table 1

Use of the following code is also required to connect the device to a BMS system:

Code	Description
C90080014A	LIFE RS485 EXPANSION ASS
7349050900	LIFE RS485 EXPANSION KIT

Table 2

The expansions in table 2 can be used to adapt the TTL serial port of the device to the RS485 network.
To connect the expansions, refer to the instruction sheets of the boards.

2. RS485 bus connections

⚠ Connect and install the RS485 bus according to the EN50174 standard for data transmission systems.

⚠ Use a two-core twisted and shielded cable with a cross-section of 0.5mm², plus braid (Belden cable, model 8762, with PVC shielding, 2 conductors plus braid, 20 AWG, nominal capacitance between the wires 89pF, nominal capacitance between a wire and the shielding 161pF).
Particular care must be taken when separating the transmission circuits from the power lines.

⚠ The length of the RS-485 network that can be connected directly to the device is 1200m with a maximum of 32 instruments.
The length of the network and the number of instruments per channel can be increased using appropriate repeater modules.

⚠ ALWAYS insert the 120 Ω, 0.25 W resistor between the "+" and "-" terminals of the last instrument on the network.

3. Supported functions

The device supports the Modbus protocol with remote terminal unit using the following 'function codes':

3.1Read Holding Register (function code 0x03)

Permits reading of one or more holding registers at the specified address. Sending of this function can generate the following exceptions:

Code	Description
0x02	*ILLEGAL DATA ADDRESS* The data address for the read operation is not allowable
0x03	*ILLEGAL DATA VALUE* The number of registers required is zero or above 125
0x04	*SLAVE DEVICE FAILURE* One or more registers could not be read (reading not permitted)

Table 3

3.2Write Single Register (function code 0x06)

Permits writing of a holding register at the specified address. Sending of this function can generate the following exceptions:

Code	Description
0x02	*ILLEGAL DATA ADDRESS* The data address for the write operation is not allowable
0x03	*ILLEGAL DATA VALUE* The value for the write operation is not allowable for the indicated register.
0x04	*SLAVE DEVICE FAILURE* The register could not be written (writing not permitted)

Table 4

3.3Write Multiple Registers (function code 0x10)

Permits writing of one or more holding registers at consecutive addresses. Sending of this function can generate the following exceptions:

Code	Description
0x02	*ILLEGAL DATA ADDRESS* At least one data address for the write operation is not allowable
0x03	*ILLEGAL DATA VALUE* The value for the write operation is not allowable for the indicated register. The number of registers for the write operation is zero or above 125
0x04	*SLAVE DEVICE FAILURE* One or more registers could not be written (writing not permitted)

Table 5

4. Communication parameters

The parameters for serial communication can be modified by writing appropriate Modbus registers.
The address of the device can be configured by writing a specific Modbus register.

Register	Bit	R/W	Description	Value	Default
90	15…8	R/W	Parity	0= No parity 1= Even parity 2= Uneven parity	1
	7…0	R/W	Baud Rate	0= 1200 baud 1= 2400 baud 2= 4800 baud 3= 9600 baud 4= 19200 baud	3
91	15…0	R/W	Device address	1...247	1

Table 6

If these communication parameters are modified, the response to the write message is sent according to the parameters in use and only then does the device reconfigure the communication interface according to the new parameters.

⚠ **WARNING:** It is advisable, however, to reset the device by unplugging it from the mains.

The default communication parameters of the device are as follows:

COM parameter	Value	Device parameter
Baud Rate	9600	90 bit 7…0
Data Bit	*8*	Fixed, not modifiable
Stop Bit	*1*	Fixed, not modifiable
Parity	EVEN	90 bit 15…8
Device address	1	91

Table 7

5. Device monitor

The operating status of the device can be checked by reading a series of registers

Register	Bit	R/W	Description	Value	Default	Conv[1]
150	15...0	R	Adjustment air temperature	-990 / +990	-	0.1°C
151	15...0	R	Local sensor air temperature	-990 / +990 40152 on modscan	-	0.1°C
152	15...0	R	TS1 probe water temperature	-990 / +990	-	0.1°C
153	15...0	R	TS2 probe water temperature	-990 / +990	-	0.1°C
154	15...0	R	REQUESTED operation mode	0= INVALID REQUESTED MODE 1= COOL 2= HEAT 4= FAN 8= AUTO	-	-
155	15…0	R	ACTUAL operation mode	0= COOL 1= HEAT 2= FAN 4= AUTO 6= OFF 7= DEAD ZONE	-	-
156	15…0	R	REQUESTED fan speed	1= Speed V1 2= Speed V2 4= Speed V3 8= Speed V4 16= Speed V5 32= Speed V6 64= Speed AUTO	-	-
161	15...0	R	Command status			-
	0	R	Valve 1 command	0= Not active 1= Active	-	-
	1	R	Valve 2 command	0= Not active 1= Active	-	-
	2	R	Speed V1 command	0= Not active 1= Active	-	-
	3	R	Speed V2 command	0= Not active 1= Active	-	-
	4	R	Speed V3 command	0= Not active 1= Active	-	-
	5	R	Resistor request status	0= Not active 1= Active	-	-
	6	R	Heat adjustment request status	0= No request for adjustment 1= Request for adjustment	-	-
	7	R	Water temperature not suitable for adjustment	0= Correct water temperature 1= Unsuitable water temperature	-	-
	15…7	R	Not defined	0		-

Table 8

[1] The 'Conv' column defines the conversion value for determining the value in the current unit of measurement (i.e. Conv=0.1°C - P100= 220 → P100=22 °C

Register	Bit	R/W	Description	Value	Default	Conv[2]
167	15…0	R	Step fan requested value	0…3	-	
168	15…0	R	Linear fan requested value	0…100	-	
169	15…0	R	Modulating valve 1 outlet	0…100	-	%
170	15…0	R	Modulating valve 2 outlet	0…100	-	%
171	15…0	R	3 points modulating valve 1 opening time	0…255	-	Sec
172	15…0	R	3 points modulating valve 2 opening time	0…255	-	Sec
175	15…0	R	Adjustment setpoint value	-990 / +990	-	0.1°C

[2] The 'Conv' column defines the conversion value for determining the value in the current unit of measurement (i.e. Conv=0.1°C - P100= 220 → P100=22 °C

6. Remote control of the device

The device can be operated remotely by writing appropriate values in some registers.

Register	Bit	R/W	Description	Value	Default	Conv[3]
92	15…0	R/W	Air temperature validity timer	0…65535	1200	1 sec
100	15…0	R/W	System setpoint	0…500		0.1°C
101[4]	15…0	R/W	Local setpoint delta	0…255	20	0.1°C
102[5]	15…0	R/W	Virtual air temperature	-100…500	-	0.1°C
103[6]	7…0	R/W	Allowable operating modes	1= COOL 2= HEAT 4= FAN 8= AUTO	15	-
	15…8	R	Not defined	0	-	-
104	7…0	R/W	Allowable auxiliary modes	1= Forced OFF 2= Forced ON 3= Allowed ON - OFF 4= ECO forced OFF 8= ECO forced ON 12= ECO controlled by ID1 contact 64= SLEEP forced OFF 128= SLEEP forced ON 192= SLEEP controlled by ID1 contact	255	-
	15…8	R	Not defined	0	-	-
105[7]	7…0	R/W	Allowable fan speeds	1= V1 allowed 2= V2 allowed 4= V3 allowed 8= V4 allowed 16= V5 allowed 32= V6 allowed 64= AUTO allowed	127	-
	15…8	R	Not defined	0	-	-

Table 9

[3] The 'Conv' column defines the conversion value for determining the value in the current unit of measurement (i.e. Conv=0.1°C - P100= 220 → P100=22 °C
[4] This parameter defines the maximum variation from the current setpoint. See chapter 8
[5] Refer to chapter 7 for a more detailed description of use of this parameter
[6] Refer to chapter 9 for a more detailed description of use of this parameter
[7] This parameter must always be written in full. Refer to chapter 10 for a more detailed description of use of this parameter

7. Remote control of the air temperature

It is possible to operate the device with a 'virtual' air temperature, i.e. an air temperature communicated via Modbus.
The temperature value must be written in register 102

Register	Bit	R/W	Description	Value	Default	Conv
102	15…0	R/W	Virtual air temperature	-100…500	-	0.1°C

Table 10

Pay attention to the format of the value sent, taking into account the conversion factor in the 'Conv' column.

This value is considered to be valid for a time equal to parameter 92 from the moment the value is written in register 102.

Register	Bit	R/W	Description	Value	Default	Conv
92	15…0	R/W	Air temperature validity timer	0…65535	1200	1 sec

Table 11

When this time elapses, the command automatically uses the value read by the air temperature probes. This prevents the problem of the Modbus network not sending updated temperatures to the command (i.e. loss of communication with the supervisor).

8. Remote control of the setpoint

The temperature adjustment setpoint can be defined by writing registers 100 and 101.

Register	Bit	R/W	Description	Value	Default	Conv
100	15…0	R/W	System setpoint	0…500	-	0.1°C
101	15…0	R/W	Local setpoint delta	0…500	-	0.1°C

Table 12

Pay attention to the format of the value sent, taking into account the conversion factor in the 'Conv' column.

Register 101 defines the maximum permitted deviation of the user from the setpoint defined in register 100.
If no limit is required, write the maximum allowable value of 500.

9. Remote control of the operating mode

The operating mode can be defined via Modbus by writing register 103.
Activating a single bit establishes a single operating mode. Activating a set of bits allows the user to choose between different operating modes.

Register	Bit	R/W	Description	Value	Default	Conv
103	7…0	R/W	Allowable operating modes	1= COOL 2= HEAT 4= FAN 8= AUTO	15	-
	15…8	R	Not defined	0	-	-

Table 13

⚠ **ATTENTION =** To temporarily "force" an operating mode, write a single bit and then "release" all the modes by writing in full.
In order not to impose the operating mode, leave all the defined bits and write the default value "15".

All the possible values can be added to obtain different allowable combinations of operating modes.

9.1Example of remote control of the operating mode

The device is to be **locked** in FAN mode.
Write register 103 to send value "4".
When it receives the command, the device enters FAN mode and the user is not allowed to change the operating mode locally. Only the supervisor may change the operating mode.

The device is to be **set** in FAN mode.
Write register 103 to send value "4" and then write it again to send value "15".
When it receives the command, the device enters FAN mode and the user is allowed to change the operating mode locally.

The user is to be **allowed** to select only COOL and HEAT.
Write register 103 to send value "3" (1 COOL + 2 HEAT).
When it receives the command, the device enters the last set mode and the user is allowed to change the operating mode locally by choosing between COOL and HEAT.

10. Remote control of fan speed

The fan speed can be defined via Modbus by writing register 105.
Activating a single bit establishes a single fan speed. Activating a set of bits allows the user to choose between different fan speeds.

Register	Bit	R/W	Description	Value	Default	Conv
105	7…0	R/W	Allowable fan speeds	1= V1 allowed 2= V2 allowed 4= V3 allowed 8= V4 allowed 16= V5 allowed 32= V6 allowed 64= AUTO allowed	127	-
	15…8	R	Not defined	0	-	-

Table 14

⚠ **ATTENTION =** To temporarily "force" a fan speed, write a single bit and then "release" all the speeds by writing in full.
All the possible values can be added to obtain different allowable combinations of fan speeds.
In order not to impose the fan speed, leave all the defined bits and write the default value "127".

If using an HB[8] type device, only the speeds V1, V3, V6 are available.

10.1 Example of remote control of fan speed

The device is to be **locked** with fan speed V3.
Write register 105 to send value "4".
When it receives the command, the device is set with speed V3 and the user is not allowed to change the fan speed locally. Only the supervisor may change it.

The device is to be **set** with fan speed V3.
Write register 105 to send value "4" and then write it again to send value "127".
When it receives the command, the device is set with speed V3 and the user is allowed to change the fan speed locally.

The user is to be **allowed** to select only speeds V1, V3 and V6.
Write register 105 to send the value "37" (1 V1 + 4 V3 + 32 V6).
When it receives the command, the device is set with the new fan speed and the user is allowed to change the speed locally by choosing between V1, V3 and V6.

[8] Refer to chapter 1 for the codes

11. Remote control of the allowable auxiliary modes

Some auxiliary modes (ON/OFF, ECO, SLEEP) can be defined via Modbus by writing register 104. Activating a single bit establishes a single auxiliary mode. Activating a set of bits allows the user to choose between different auxiliary modes.

Register	Bit	R/W	Description	Value	Default	Conv
104	7…0	R/W	Allowable auxiliary modes	1= Forced OFF 2= Forced ON 3= Allowed ON - OFF 4= ECO forced OFF 8= ECO forced ON 12= ECO controlled by ID1 contact 64= SLEEP forced OFF 128= SLEEP forced ON 192= SLEEP controlled by ID1 contact	255	-
	15…8	R	Not defined	0	-	-

Table 15

⚠ **ATTENTION =** To temporarily "force" an auxiliary mode, write a single bit and then "release" all the modes by writing in full.
All the possible values can be added to obtain different allowable combinations of auxiliary modes.
In order not to impose any auxiliary mode, leave all the defined bits and write the default value "255".

11.1 Example of remote control of the operating mode

The device is to be **locked** in OFF mode.
Write register 104 to send value "1".
When it receives the command, the device is set with the operating mode OFF and the user is not allowed to change the mode locally. Only the supervisor may change it.

The device is to be **set** with fan speed OFF.
Write register 104 to send value "1" and then write it again to send value "255".
When it receives the command, the device is set with the mode OFF and the user is allowed to change the mode locally.

To **allow** the user to only select some auxiliary modes, simply add the values of the single bits.