



# Modbus RTU (EIA-485) Interface for Panasonic Air to Water systems

Compatible with Panasonic Aquarea H/J generation models

## USER MANUAL

Issue date: 09/2024 r1.6 ENGLISH



Modbus RTU (EIA-485) Interface for Panasonic Air to Water systems  
Compatible with Panasonic Aquarea H/J generation models

| ORDER CODE      | LEGACY ORDER CODE |
|-----------------|-------------------|
| INMBSPAN001A000 | PA-AW2-MBS-1      |

## Important User Information

### Disclaimer

The information in this document is for informational purposes only. Please inform HMS Industrial Networks of any inaccuracies or omissions found in this document. HMS Industrial Networks disclaims any responsibility or liability for any errors that may appear in this document.

HMS Industrial Networks reserves the right to modify its products in line with its policy of continuous product development. The information in this document shall therefore not be construed as a commitment on the part of HMS Industrial Networks and is subject to change without notice. HMS Industrial Networks makes no commitment to update or keep current the information in this document.

The data, examples and illustrations found in this document are included for illustrative purposes and are only intended to help improve understanding of the functionality and handling of the product. In view of the wide range of possible applications of the product, and because of the many variables and requirements associated with any particular implementation, HMS Industrial Networks cannot assume responsibility or liability for actual use based on the data, examples or illustrations included in this document nor for any damages incurred during installation of the product. Those responsible for the use of the product must acquire sufficient knowledge in order to ensure that the product is used correctly in their specific application and that the application meets all performance and safety requirements including any applicable laws, regulations, codes and standards. Further, HMS Industrial Networks will under no circumstances assume liability or responsibility for any problems that may arise as a result from the use of undocumented features or functional side effects found outside the documented scope of the product. The effects caused by any direct or indirect use of such aspects of the product are undefined and may include e.g. compatibility issues and stability issues.

## INDEX

|       |  |    |
|-------|--|----|
| 1.    | Presentation .....   | 5  |
| 2.    | Connection .....   | 6  |
| 2.1   | Connection to the Hydro unit .....                                       | 6  |
| 2.2   | Connection to the EIA-485 bus .....                                      | 6  |
| 3.    | Quick Start Guide .....  | 7  |
| 4.    | Modbus Interface Specification .....                                     | 8  |
| 4.1   | Modbus physical layer .....  | 8  |
| 4.2   | Modbus Registers .....   | 8  |
| 4.2.1 | General System Control .....   | 8  |
| 4.2.2 | Zones .....  | 9  |
| 4.2.3 | Tank Configuration .....   | 10 |
| 4.2.4 | Consumption .....  | 11 |
| 4.2.5 | Maintenance .....  | 11 |
| 4.2.6 | Unit Configuration .....   | 11 |
| 4.2.7 | Device registers .....   | 12 |
| 4.2.8 | Considerations on Temperature Registers .....                            | 12 |
| 4.2.9 | Zones .....  | 13 |
| 4.3   | DIP-switch Configuration Interface .....                                 | 13 |
| 4.4   | Implemented Functions .....  | 17 |
| 4.5   | Device LED indicator .....   | 17 |
| 4.6   | EIA-485 bus. Termination resistors and Fail-Safe Biasing mechanism ..... | 18 |
| 5.    | Electrical and Mechanical features .....                                 | 19 |
| 6.    | List of supported Hydro Unit Types .....                                 | 20 |
| 7.    | Error Codes .....  | 21 |

## 1. Presentation

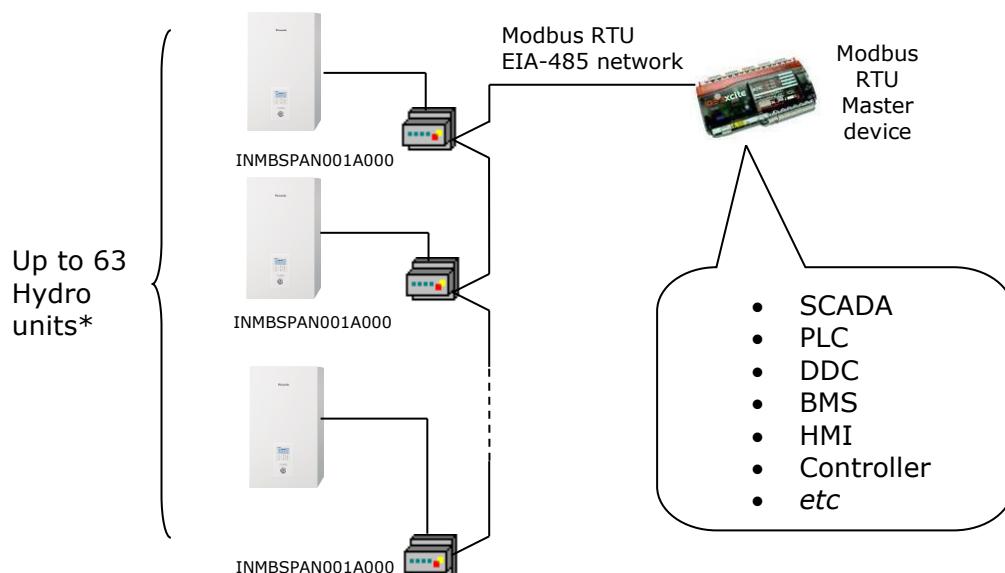


The INMBSPAN001A000 interface allows a complete and natural integration of **Panasonic Air-to-Water Systems** into Modbus RTU (EIA-485) networks.

Compatible with Aquarea H/J models from Panasonic.

Reduced dimensions. 93 x 53 x 58 mm  
3.7" x 2.1" x 2.3"

- Quick and easy installation.  
*Mountable on DIN rail, wall, or even inside the Hydro unit.*
- External power not required.
- Direct connection to Modbus RTU (EIA-485) networks. Up to 63 INMBSPAN001A000 devices can be connected in the same network.  
*INMBSPAN001A000 is a Modbus slave device.*
- Direct connection to the Hydro unit. Up to 1 Hydro unit can be connected to INMBSPAN001A000. *The cable for this connection is also supplied.*
- Configuration from both on-board DIP-switches and Modbus RTU.
- Total Control and Supervision.
- Real states of the Hydro unit's internal variables.
- Allows simultaneous use of the remote controls of the Hydro unit and Modbus RTU.



\*Up to 63 Intesis devices can be installed in the same Modbus RTU bus. However, depending on the configured speed, the installation of Modbus Repeaters may be required.

## 2. Connection

The interface comes with a specific cable and connector to establish direct connection with the Aquarea H/J Generation's system. It comes as well with a plug-in terminal block of 2 poles to establish direct connection with the Modbus RTU EIA-485 network.

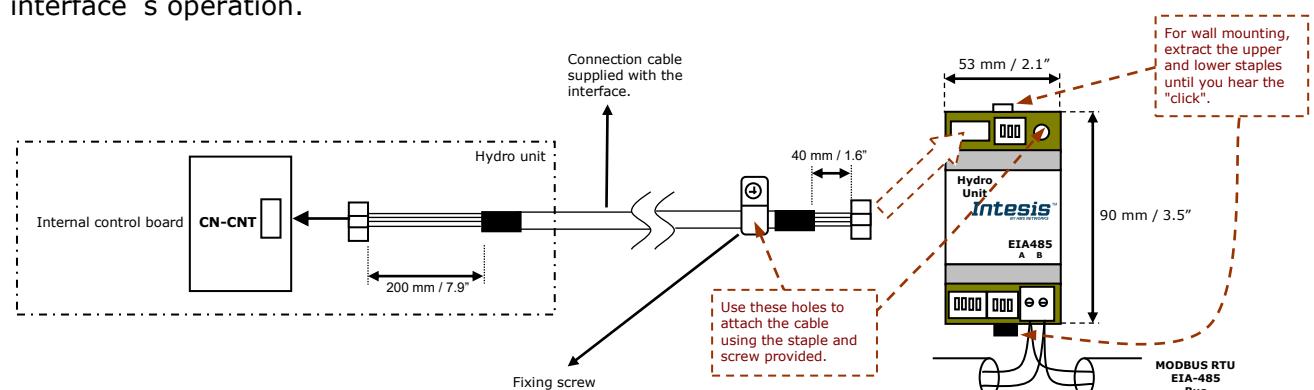
### 2.1 Connection to the Hydro unit

To connect the INMBSPAN001A000 interface with the Hydro unit, these steps must be followed:

Disconnect Mains Power from the Hydro unit. Open the front cover of the Hydro unit to have access to the electronic circuit. Once the electronic circuit is reached, locate the socket connector marked as **CN-CNT**.

Take the cable that comes with the interface, insert one of its connectors (the one installed in the shortest uncovered part) into the socket of the INMBSPAN001A000, and the other connector (the one installed in the largest uncovered part) to the socket **CN-CNT** of the Hydro unit's electronic circuit. You can place the INMBSPAN001A000 inside or outside the Hydro unit depending on your needs. Remember that the INMBSPAN001A000 must also be connected to the Modbus RTU EIA-485 network. Close the Hydro unit's front cover again to finish the connection.

Do not modify the length of the cable supplied with the interface, it may affect the correct interface's operation.



**Figure 2.1** INMBSPAN001A000 connection diagram

### 2.2 Connection to the EIA-485 bus

Connect the EIA-485 bus wires to the plug-in terminal block of INMBSPAN001A000 and keep the polarity on this connection (A+ and B-). Make sure that the maximum distance to the bus is 1,200 meters (3,937 ft). Loop or star typologies are not allowed in the case of the EIA-485 bus. A terminator resistor of  $120\Omega$  must be present at each end of the bus to avoid signal reflections. The bus needs a fail-safe biasing mechanism (see section 4.6 for more details).

### 3. Quick Start Guide

1. Disconnect the Hydro unit from the Mains Power.
2. Attach the interface next to the Hydro unit (wall mounting) following the instructions of the diagram above or install it inside the Hydro unit (respect the safety instructions given by Panasonic).
3. Connect the provided cable of the Panasonic interface between the Hydro unit and the Intesis interface following the instructions of the diagram above.
4. Connect the EIA-485 bus to the connector *EIA485* of the interface.
5. Close the Hydro indoor unit.
6. Check the DIP-Switch configuration of the Intesis interface and make sure it matches the current installation's parameters (see section 4.3).

By default, the interface is set to:

- Modbus Slave Address → 1
- Modbus baud rate → 9600 bps



These parameters can be modified from SW4 and SW3 DIP-Switches.

All other switch positions are set at low level (Off position  ) by default.

**NOTE:** All changes on the DIP-Switch configuration require a system power cycle to be applied.

7. Connect the Hydro unit system to Mains Power.

**IMPORTANT:** The Intesis interface requires to be connected to the Hydro unit (powered) to start communicating.

## 4. Modbus Interface Specification

### 4.1 Modbus physical layer

INMBSPAN001A000 implements a Modbus RTU (Slave) interface, to be connected to an EIA-485 line. It performs 8N2 communication (8 data bits, no parity and 2 stop bit) with several available baud rates (2400 bps, 4800 bps, 9600 bps -default-, 19200 bps, 38400 bps, 57600 bps, 76800 bps and 115200 bps). It also supports 8N1 communication (8 data bits, no parity and 1 stop bit).

**NOTE:** The gateway automatically detects the communication type (8N2 or 8N1) and sets itself accordingly. No action is needed.

### 4.2 Modbus Registers

All registers are type "16-bit unsigned Holding Register" and they use the standard *Modbus big endian* notation.

#### 4.2.1 General System Control

| Register Address<br>(protocol address) | Register Address<br>(PLC address) | R/W | Description   |
|--|-----------------------------------|-----|---|
| 0                                      | 1                                 | R/W | System On/Off <ul style="list-style-type: none"> <li>▪ 0: Off</li> <li>▪ 1: On (Default)</li> </ul>   |
| 1                                      | 2                                 | R   | Outdoor temperature <sup>1,2</sup> <ul style="list-style-type: none"> <li>▪ -127..127°C (°C/x10°C)</li> <li>▪ -260.6..260.6°F</li> </ul>  |
| 2                                      | 3                                 | R   | Outlet water temperature <sup>1,2</sup> <ul style="list-style-type: none"> <li>▪ 0..127°C (°C/x10°C)</li> <li>▪ 32..260.6°F</li> </ul>  |
| 3                                      | 4                                 | R   | Inlet water temperature <sup>1,2</sup> <ul style="list-style-type: none"> <li>▪ 0..127°C (°C/x10°C)</li> <li>▪ 32..260.6°F</li> </ul>   |
| 4                                      | 5                                 | R/W | Operating mode <ul style="list-style-type: none"> <li>▪ 1: Heat</li> <li>▪ 2: Heat Tank</li> <li>▪ 3: Tank</li> <li>▪ 4: Cool Tank</li> <li>▪ 5: Cool</li> <li>▪ 6: Auto (Default)</li> </ul> |
|  |                                   | R   | <ul style="list-style-type: none"> <li>▪ 7: Auto Tank</li> <li>▪ 8: Auto Heat</li> <li>▪ 9: Auto Heat Tank</li> <li>▪ 10: Auto Cool</li> <li>▪ 11: Auto Cool Tank</li> </ul>                  |
| 5                                      | 6                                 | R/W | Heat mode water temp. setting method <ul style="list-style-type: none"> <li>▪ 1: Compensation curve</li> <li>▪ 2: Direct (Default)</li> </ul>   |
| 6                                      | 7                                 | R/W | Cool mode water temp. setting method <ul style="list-style-type: none"> <li>▪ 1: Compensation curve</li> <li>▪ 2: Direct (Default)</li> </ul>   |

<sup>1</sup> Magnitude for this register can be adjusted to Celsius x 1°C, Celsius x 10°C (default) or Fahrenheit.

<sup>2</sup> It is not possible turn to x10 the value shown in Fahrenheit.

## 4.2.2 Zones

| Register Address<br>(protocol address) | Register Address<br>(PLC address) | R/W | Description   |
|--|-----------------------------------|-----|---|
| 9                                      | 10                                | R/W | Zone 1/Zone 2 On/Off <sup>3</sup> <ul style="list-style-type: none"> <li>▪ 1: On/Off</li> <li>▪ 2: Off/On</li> <li>▪ 3: On/On</li> </ul>  |
| 10                                     | 11                                | R   | Zone 1 sensors <sup>3,4</sup> <ul style="list-style-type: none"> <li>▪ 1: Water temperature</li> <li>▪ 2: External room sensor</li> <li>▪ 3: Internal room sensor</li> <li>▪ 4: Room thermistor</li> <li>▪ 5: Pool Sensor</li> </ul>  |
| 11                                     | 12                                | R   | Zone 2 sensors <sup>3,4</sup> <ul style="list-style-type: none"> <li>▪ 1: Water temperature</li> <li>▪ 2: External room sensor</li> <li>▪ 3: Internal room sensor</li> <li>▪ 4: Room thermistor</li> <li>▪ 5: Pool Sensor</li> </ul>  |
| 12                                     | 13                                | R/W | Zone 1 setpoint temperature <sup>3,4</sup> <ul style="list-style-type: none"> <li>▪ <b>COOL</b> <ul style="list-style-type: none"> <li>▪ <b>Water shift</b><br/>-5..5°C (°C/x10°C) // -41..41°F</li> <li>▪ <b>Water</b><br/>5..20°C (°C/x10°C) // 41..68°F</li> <li>▪ <b>Room</b><br/>18..35°C (°C/x10°C) // 64.4..95°F</li> </ul> </li> <li>▪ <b>HEAT</b> <ul style="list-style-type: none"> <li>▪ <b>Water shift</b><br/>-5..5°C (°C/x10°C) // -41..41°F</li> <li>▪ <b>Water</b><br/>20..55/65°C (°C/x10°C) // 68..131/149°F</li> <li>▪ <b>Room</b><br/>10..30°C (°C/x10°C) // 50..86°F</li> <li>▪ <b>Pool</b><br/>15..35°C (°C/x10°C) // 59..95°F</li> </ul> </li> </ul>     |
| 13                                     | 14                                | R/W | Zone 2 setpoint temperature <sup>1,2,3,4</sup> <ul style="list-style-type: none"> <li>▪ <b>COOL</b> <ul style="list-style-type: none"> <li>▪ <b>Water shift</b><br/>-5..5°C (°C/x10°C) // -41..41°F</li> <li>▪ <b>Water</b><br/>5..20°C (°C/x10°C) // 41..68°F</li> <li>▪ <b>Room</b><br/>18..35°C (°C/x10°C) // 64.4..95°F</li> </ul> </li> <li>▪ <b>HEAT</b> <ul style="list-style-type: none"> <li>▪ <b>Water shift</b><br/>-5..5°C (°C/x10°C) // -41..41°F</li> <li>▪ <b>Water</b><br/>20..55/65°C (°C/x10°C) // 68..131/149°F</li> <li>▪ <b>Room</b><br/>10..30°C (°C/x10°C) // 50..86°F</li> <li>▪ <b>Pool</b><br/>15..35°C (°C/x10°C) // 59..95°F</li> </ul> </li> </ul> |

<sup>3</sup> More information about zone 1 and zone 2 on Section 4.2.9

<sup>4</sup> See Section 4.2.8 to understand the options available

| Register Address<br>(protocol address) | Register Address<br>(PLC address) | R/W | Description   |
|--|-----------------------------------|-----|---|
| 14                                     | 15                                | R   | Zone 1 current temperature <sup>1,2,3,4</sup><br>Water outlet/room/pool<br>▪ -127..127°C (°C/x10°C)<br>▪ -260.6..260.6°F                                      |
| 15                                     | 16                                | R   | Zone 2 current temperature <sup>1,2,3,4</sup><br>Water outlet/room/pool<br>▪ -127..127°C (°C/x10°C)<br>▪ -260.6..260.6°F                                      |
| 16                                     | 17                                | R   | Zone 1 temperature setting mode <sup>3,4</sup><br>▪ 1: Room temperature<br>▪ 2: Compensation curve (Water Temp)<br>▪ 3: Direct (Water Temp)<br>▪ 4: Pool Temp |
| 17                                     | 18                                | R   | Zone 2 temperature setting mode <sup>3,4</sup><br>▪ 1: Room temperature<br>▪ 2: Compensation curve (Water Temp)<br>▪ 3: Direct (Water Temp)<br>▪ 4: Pool Temp |
| 18                                     | 19                                | R   | Zone 1 min Setpoint temperature <sup>1,3</sup><br>▪ Any (°C/x10°C)  |
| 19                                     | 20                                | R   | Zone 1 max Setpoint temperature <sup>1,3</sup><br>▪ Any (°C/x10°C)  |
| 20                                     | 21                                | R   | Zone 2 min Setpoint temperature <sup>1,3</sup><br>▪ Any (°C/x10°C)  |
| 21                                     | 22                                | R   | Zone 2 max Setpoint temperature <sup>1,3</sup><br>▪ Any (°C/x10°C)  |

#### 4.2.3 Tank Configuration

| Register Address<br>(protocol address) | Register Address<br>(PLC address) | R/W | Description  |
|--|-----------------------------------|-----|--|
| 30                                     | 31                                | R/W | Tank On/Off <sup>4</sup><br>▪ 0: Off<br>▪ 1: On  |
| 32                                     | 33                                | R   | Tank current water temperature <sup>1,2</sup><br>▪ -127..127°C (°C/x10°C)<br>▪ -260.6..260.6°F   |
| 33                                     | 34                                | R/W | Tank water setpoint temperature <sup>1,2</sup><br>▪ 40..66/75°C (°C/x10°C)<br>▪ 104..150.8/167°F |
| 34                                     | 35                                | R   | Tank heater <sup>4</sup><br>▪ 1: Internal<br>▪ 2: External                                       |
| 35                                     | 36                                | R   | Tank min water setpoint temperature <sup>1,2,4</sup><br>▪ Any (°C/x10°C/F°)                      |
| 36                                     | 37                                | R   | Tank max water setpoint temperature <sup>1,2,4</sup><br>▪ Any (°C/x10°C/F°)                      |

#### 4.2.4 Consumption

| Register Address<br>(protocol address) | Register Address<br>(PLC address) | R/W | Description   |
|--|-----------------------------------|-----|---|
| 45                                     | 46                                | R   | Tank mode energy consumption <sup>4</sup> <ul style="list-style-type: none"> <li>▪ 0..50.800 W</li> </ul> |
| 46                                     | 47                                | R   | Heat mode energy consumption <ul style="list-style-type: none"> <li>▪ 0..50.800 W</li> </ul>              |
| 47                                     | 48                                | R   | Cool mode energy consumption <ul style="list-style-type: none"> <li>▪ 0..50.800 W</li> </ul>              |

#### 4.2.5 Maintenance

| Register Address<br>(protocol address) | Register Address<br>(PLC address) | R/W | Description  |
|--|-----------------------------------|-----|--|
| 52                                     | 53                                | R   | Error Code <sup>5</sup> <ul style="list-style-type: none"> <li>▪ 0: No Error</li> <li>▪ 0xxx: U+err</li> <li>▪ 1xxx: H+err</li> <li>▪ 2xxx: F+err</li> </ul> |
| 64                                     | 65                                | R   | Device Status <ul style="list-style-type: none"> <li>▪ 0: Off</li> <li>▪ 1: On</li> </ul>  |
| 70                                     | 71                                | R   | Current error status <ul style="list-style-type: none"> <li>▪ 0: No error</li> <li>▪ 1: Error</li> </ul>   |

#### 4.2.6 Unit Configuration

| Register Address<br>(protocol address) | Register Address<br>(PLC address) | R/W | Description  |
|--|-----------------------------------|-----|--|
| 81                                     | 82                                | R   | Tank connection <sup>4</sup> <ul style="list-style-type: none"> <li>▪ 0: No</li> <li>▪ 1: Yes</li> </ul>         |
| 82                                     | 83                                | R   | Number of zones <sup>3</sup> <ul style="list-style-type: none"> <li>▪ 1: 1 zone</li> <li>▪ 2: 2 zones</li> </ul> |
| 83                                     | 84                                | R   | Zone 1 setup <sup>3,4</sup> <ul style="list-style-type: none"> <li>▪ 1: Room</li> <li>▪ 2: Pool</li> </ul>       |
| 84                                     | 85                                | R   | Zone 2 setup <sup>3,4</sup> <ul style="list-style-type: none"> <li>▪ 1: Room</li> <li>▪ 2: Pool</li> </ul>       |
| 85                                     | 86                                | R   | Direction <ul style="list-style-type: none"> <li>▪ 1: Room</li> <li>▪ 2: Tank</li> </ul>                         |
| 86                                     | 87                                | R   | Outdoor type <ul style="list-style-type: none"> <li>▪ 1: STD</li> <li>▪ 2: TCAP</li> <li>▪ 3: HWT</li> </ul>     |

<sup>5</sup> See section 7 for possible error codes and their explanation

#### 4.2.7 Device registers

| Register Address<br>(protocol address) | Register Address<br>(PLC address) | R/W | Description       |
|--|-----------------------------------|-----|-------------------|
| 49                                     | 50                                | R   | Device ID: 0x0D00 |
| 50                                     | 51                                | R   | Software version  |

#### 4.2.8 Considerations on Temperature Registers

Setpoint temperature may be controlled from 4 different internal parameters of the Hydro Unit: *Water shift*, *Water*, *Room* and *Pool*.

All these parameters depend on the configuration of the *Zone setup*, *Zone temp. setting mode* and *Operation Mode*.

Find below the correspondence of this configuration to know which internal parameter is modified when we are controlling registers 12 and 13 (Modbus Protocol Address), corresponding to **Zone 1 setpoint temperature** and **Zone 2 setpoint temperature** respectively.

| Zone x setup        | Zone x temp. set. mode | Operation Mode<br>(Prot Addr 4) | Zone x set. temp. | Zone x current temp |
|---------------------|------------------------|---------------------------------|-------------------|---------------------|
| Zone1 (Prot Add 83) | Zone1 (Prot Add 16)    | Zone1 (Prot Add 12)             |                   | Zone1 (Prot Add 14) |
| Zone2 (Prot Add 84) | Zone2 (Prot Add 17)    | Zone2 (Prot Add 13)             |                   | Zone2 (Prot Add 15) |
| 1: Room             | 1: Room temperature    | 1: Heat                         | Room              | Room                |
|                     | 2: Compensation Curve  | 2: Heat Tank                    | Water Shift       | Water               |
|                     | 3: Direct              | 3: Tank                         | Water             |                     |
| 2: Pool             | 4: Pool Temp           | 4: Cool Tank                    | Pool              | Pool                |
|                     |                        | 5: Cool                         |                   |                     |

Notice that temperature's values temperature registers are expressed according to the temperature's format configured through its onboard DIP-Switches (See "4.3 - DIP-switch Configuration Interface"). These following formats are possible:

- **Celsius value:** Value in Modbus register is the temperature value in Celsius (i.e. a value "22" in the Modbus register must be interpreted as 22°C)
- **Decicelsius value:** Value in Modbus register is the temperature value in decicelsius (i.e. a value "220" in the Modbus register must be interpreted as 22.0°C)
- **Fahrenheit value:** Value in Modbus register is the temperature value in Fahrenheit (i.e. a value "72" in the Modbus register must be interpreted as 72°F (~22°C)).

#### 4.2.9 Zones

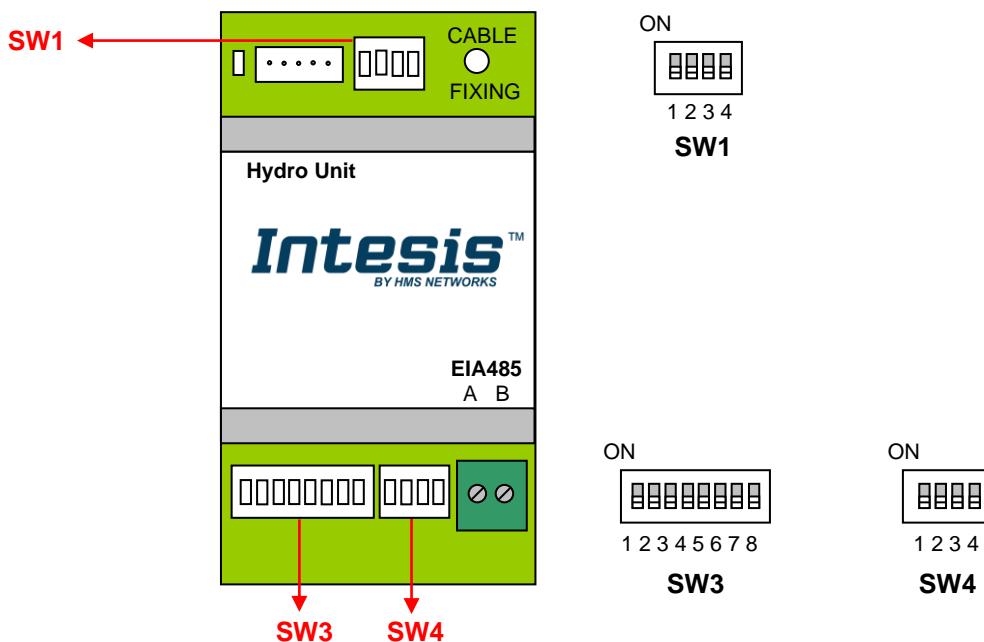
Aquarea H/J Generation includes the possibility to control up to 2 different zones. The register 82 (Modbus protocol address) indicates the number of zones configured in the Hydro unit: 1 or 2 zones.

Taking this information into account and only in case that Hydro unit is controlling 2 zones, the register address 9 (Modbus protocol address) can be used to switch on/off the zones. Notice that if the Hydro unit is configured to manage a single zone, the use of the register address 9 (Modbus protocol address) doesn't have any effect.

Please, check the Hydro Unit User's Manual for more information about the zones' configuration and their options.

### 4.3 DIP-switch Configuration Interface

All the configuration values on INMBSPAN001A000 can be written and read from the Modbus interface. Otherwise, some of them can also be set up from its onboard DIP-switch interface. The device has DIP-switches SW1, SW3 and SW4 on the following locations:



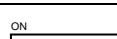
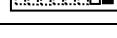
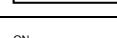
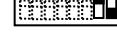
The following tables apply to the interface's configuration through DIP switches:

### SW1 – Hydro unit's features

| SW1-P1..4   | Description   |
|---|---|
| ON<br> | Set point limits are the maximum ones allowed by the manufacturer, not considering the specific Aquarea H/J Generation Unit's limits (Default value). |
| ON<br> | Set point limits are defined by the configuration of Aquarea H/J Generation Unit.   |
| ON<br> | Reserved, not used (Default value)  |
| ON<br> | Reserved, not used  |
| ON<br> | Reserved, not used (Default value)  |
| ON<br> | Reserved, not used  |
| ON<br> | Reserved, not used (Default value)  |
| ON<br> | Reserved, not used  |

**Table 4.1** SW1: Hydro unit's features

### SW3/SW4 – Baud rate configuration

| SW3-P7..8   | SW4-P3  | Description             |
|---|---|-------------------------|
| ON<br> | ON<br> | 2400bps                 |
| ON<br> | ON<br> | 4800bps                 |
| ON<br> | ON<br> | 9600bps (Default value) |
| ON<br> | ON<br> | 19200bps                |
| ON<br> | ON<br> | 38400bps                |
| ON<br> | ON<br> | 57600bps                |
| ON<br> | ON<br> | 76800bps                |
| ON<br> | ON<br> | 115200bps               |

**Table 4.2** SW3-SW4: Modbus baud rate

**SW4** – Degrees/Decidegrees (x10), temperature magnitude (°C/°F) and EIA-485 termination resistor.

| SW4-P1..2..4  | Description  |
|---|--|
| ON<br> | Temperature values in Modbus register are represented in degrees (x1) (Default value)    |
| ON<br> | Temperature values in Modbus register are represented in decidegrees (x10)               |
| ON<br> | Temperature values in Modbus register are represented in Celsius degrees (Default value) |
| ON<br> | Temperature values in Modbus register are represented in Fahrenheit degrees              |
| ON<br> | EIA-485 bus without termination resistor (Default value)                                 |
| ON<br> | Internal termination resistor of 120Ω connected to EIA-485 bus                           |

**Table 4.3** SW4: Temperature and termination resistor configuration

**SW3 – Modbus Slave address**

| Add | SW3-P1..6   | Add | SW3-P1..6   | Add | SW3-P1..6   | Add | SW3-P1..6  | Add | SW3-P1..6   |
|-----|---|-----|---|-----|---|-----|--|-----|---|
| 0   |    | 13  |    | 26  |    | 39  |    | 52  |    |
| 1   |    | 14  |    | 27  |    | 40  |    | 53  |    |
| 2   |    | 15  |    | 28  |    | 41  |    | 54  |    |
| 3   |    | 16  |    | 29  |    | 42  |    | 55  |    |
| 4   |    | 17  |    | 30  |    | 43  |    | 56  |    |
| 5   |    | 18  |    | 31  |    | 44  |    | 57  |    |
| 6   |    | 19  |    | 32  |    | 45  |    | 58  |    |
| 7   |   | 20  |   | 33  |   | 46  |   | 59  |   |
| 8   |  | 21  |  | 34  |  | 47  |  | 60  |  |
| 9   |  | 22  |  | 35  |  | 48  |  | 61  |  |
| 10  |  | 23  |  | 36  |  | 49  |  | 62  |  |
| 11  |  | 24  |  | 37  |  | 50  |  | 63  |  |
| 12  |  | 25  |  | 38  |  | 51  |  |     |   |

**Table 4.4** SW3: Modbus slave address

## 4.4 Implemented Functions

INMBSPAN001A000 implements the following standard Modbus functions:

- *3: Read Holding Registers*
- *4: Read Input Registers*
- *6: Write Single Register*
- *16: Write Multiple Registers* (Although this function is allowed, the interface does not allow to write operations on more than 1 register with the same request, this means that length field should always be 1 when this function is being used in case of writing)

## 4.5 Device LED indicator

The device includes two LED indicators to show all the possible operational states. In the following table there are written the indicators which can be performed and their meaning.

### L1 (yellow LED)

| Device status               | LED indication | ON / OFF Period       | Description  |
|-----------------------------|----------------|-----------------------|--|
| During not normal operation | LED blinking   | 500ms ON / 500ms OFF  | Communication error                                |
| During normal operation     | LED flashing   | 100ms ON / 1900ms OFF | Normal operation (configured and working properly) |

### L1 (green LED) & L2 (red LED)

| Device status               | LED indication             | ON / OFF Period      | Description     |
|-----------------------------|----------------------------|----------------------|-----------------|
| During normal operation     | LED Pulse                  | 5sec ON / --- OFF    | Device Start-up |
| During not normal operation | LED alternatively blinking | 500ms ON / 500ms OFF | EEPROM failure  |

## 4.6 EIA-485 bus. Termination resistors and Fail-Safe Biasing mechanism

EIA-485 bus requires a  $120\Omega$  terminator resistor at each end of the bus to avoid signal reflections.

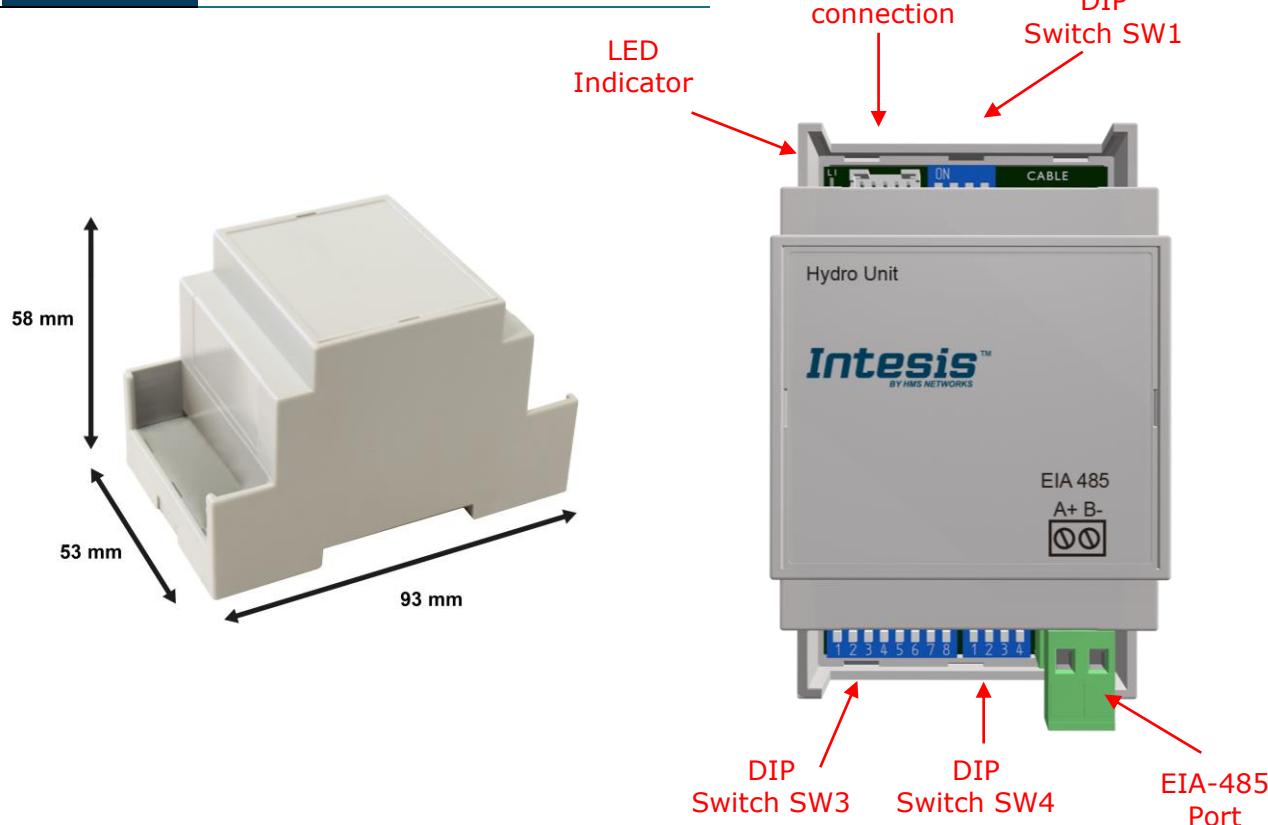
In order to prevent fail status detected by the receivers, which are "*listening*" the bus, when all the transmitters' outputs are in three-state (high impedance), it is also required a fail-safe biasing mechanism. This mechanism provides a safe status (a correct voltage level) in the bus when all the transmitters' outputs are in three-state. This mechanism must be supplied by the Modbus Master.

The INMBSPAN001A000 device includes an on-board terminator resistor of  $120\Omega$  that can be connected to the EIA-485 bus by using DIP-switch SW4.

Some Modbus RTU EIA-485 Master devices can provide also internal  $120\Omega$  terminator resistor and/or fail-safe biasing mechanism (Check the technical documentation of the Master device connected to the EIA-485 network in each case).

## 5. Electrical and Mechanical features

|   |  |                       |                                      |
|---|--|-----------------------|--------------------------------------|
| Housing                                   | Plastic, type PC (UL 94 V-0)<br>Net dimensions (hxwdx):<br>93 x 53 x 58 mm / 3.7" x 2.1" x 2.3"<br>Color: Light Grey. RAL 7035   | Operation Temperature | 0°C to +60°C                         |
| Weight                                    | 85 g   | Stock Temperature     | -20°C to +85°C                       |
| Mounting                                  | Wall<br>DIN rail EN60715 TH35  | Operational Humidity  | <95% RH, non-condensing              |
| Terminal Wiring (for low-voltage signals) | For terminal: solid wires or stranded wires (twisted or with ferrule)<br>One core: 0.2 mm <sup>2</sup> .. 2.5 mm <sup>2</sup><br>Two cores: 0.2 mm <sup>2</sup> .. 1.5 mm <sup>2</sup><br>Three cores: Not permitted | Stock Humidity        | <95% RH, non-condensing              |
| Modbus RTU port                           | 1 x Serial EIA485 Plug-in screw terminal block (2 poles):<br>A, B<br>Compatible with Modbus RTU EIA-485 networks   | Isolation voltage     | 1500 VDC                             |
| Hydro unit port                           | 1 x Specific connector<br>Specific cable included  | Isolation resistance  | 1000 MΩ                              |
| Switch 1 (SW1)                            | 1 x DIP-Switch for Hydro Unit features   | Protection            | IP20 (IEC60529)                      |
| Switch 3 (SW3)                            | 1 x DIP-Switch for Modbus RTU settings   | LED indicators        | 1 x Onboard LED - Operational status |
| Switch 4 (SW4)                            | 1 x DIP-Switch for extra functions   |                       |                                      |



## 6. List of supported Hydro Unit Types

A list of Panasonic Hydro unit model's references compatible with INMBSPAN001A000 and their available features can be found in the [Intesis Panasonic Air to Water \(Aquarea H/J\) Compatibility list](#).

## 7. Error Codes

| Error Code Modbus | Error in Remote Controller | Error Description  |
|-------------------|----------------------------|--|
| 0                 | H00                        | No abnormality detected                                  |
| 112               | H12                        | Indoor/Outdoor capacity unmatched                        |
| 115               | H15                        | Outdoor compressor temperature sensor abnormality        |
| 120               | H20                        | Water pump abnormality                                   |
| 123               | H23                        | Indoor refrigerant liquid temperature sensor abnormality |
| 127               | H27                        | Service valve error                                      |
| 128               | H28                        | Abnormal solar sensor                                    |
| 131               | H31                        | Abnormal swimming pool sensor                            |
| 136               | H36                        | Abnormal buffer tank sensor                              |
| 138               | H38                        | Brand code mismatch                                      |
| 142               | H42                        | Compressor low pressure abnormality                      |
| 143               | H43                        | Abnormal Zone 1 sensor                                   |
| 144               | H44                        | Abnormal Zone 2 sensor                                   |
| 162               | H62                        | Water flow switch abnormality                            |
| 163               | H63                        | Refrigerant low pressure abnormality                     |
| 164               | H64                        | Refrigerant high pressure abnormality                    |
| 165               | H65                        | Deice circulation error                                  |
| 167               | H67                        | Abnormal External Thermistor 1                           |
| 168               | H68                        | Abnormal External Thermistor 2                           |
| 170               | H70                        | Back-up heater OLP abnormality                           |
| 172               | H72                        | Tank sensor abnormal                                     |
| 174               | H74                        | PCB communication error                                  |
| 175               | H75                        | Low water temperature control                            |
| 176               | H76                        | Indoor - control panel communication abnormality         |
| 190               | H90                        | Indoor/outdoor abnormal communication                    |
| 191               | H91                        | Tank heater OLP abnormality                              |
| 195               | H95                        | Indoor/Outdoor wrong connection                          |
| 198               | H98                        | Outdoor high pressure overload protection                |
| 199               | H99                        | Indoor heat exchanger freeze prevention                  |
| 212               | F12                        | Pressure switch activate                                 |
| 214               | F14                        | Outdoor compressor abnormal revolution                   |
| 215               | F15                        | Outdoor fan motor lock abnormality                       |
| 216               | F16                        | Total running current protection                         |
| 220               | F20                        | Outdoor compressor overheating protection                |
| 222               | F22                        | IPM (power transistor) overheating protection            |
| 223               | F23                        | Outdoor Direct Current (DC) peak detection               |
| 224               | F24                        | Refrigeration cycle abnormality                          |
| 225               | F25                        | Cooling/Heating cycle changeover abnormality             |
| 227               | F27                        | Pressure switch abnormality                              |
| 229               | F29                        | Low Discharge Superheat                                  |
| 230               | F30                        | Water outlet sensor 2 abnormality                        |
| 232               | F32                        | Abnormal Internal Thermostat                             |
| 236               | F36                        | Outdoor air temperature sensor abnormality               |
| 237               | F37                        | Indoor water inlet temperature sensor abnormality        |
| 240               | F40                        | Outdoor discharge pipe temperature sensor abnormality    |
| 241               | F41                        | PFC control  |
| 242               | F42                        | Outdoor heat exchanger temperature sensor abnormality    |
| 243               | F43                        | Outdoor defrost sensor abnormality                       |
| 245               | F45                        | Indoor water outlet temperature sensor abnormality       |
| 246               | F46                        | Outdoor Current Transformer open circuit                 |
| 248               | F48                        | Outdoor EVA outlet temperature sensor abnormality        |

| Error Code Modbus | Error in Remote Controller | Error Description                                    |
|-------------------|----------------------------|--|
| 249               | F49                        | Outdoor bypass outlet temperature sensor abnormality |
| 295               | F95                        | Cooling high pressure overload protection            |

If you detect an error code that is not listed, contact your nearest Panasonic technical support service.