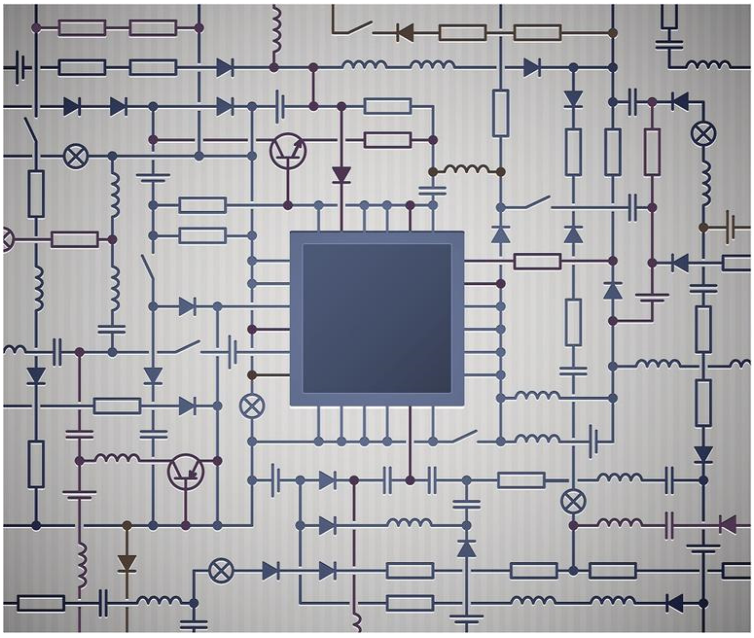
Entro-V Controls

Part No: 90001308/90001299

BASIC CONTROLLER, DIGITAL CONTROLLER AND OTHER CONTROL OPTIONS

User manual



Contents

PART I – GENERAL DEFINITIONS

1. General Information

1.1. Introduction

Lately, most of the people's life is spent indoors (at home, office, etc) and indoor air quality has become a very important topic. To help reducing the indoor air pollution, heat recovery units have been designed. Mechanical Ventilation with Heat Recovery (MVHR) ensures that the stale air is extracted from the indoor environment, heat is recovered within the plate heat exchanger, and fresh filtered air is supplied indoors being warmed-up within the heat recovery core at a requested temperature. Many design building projects include heat recovery units being requested by the users. The biggest challenge in using these units is the controller. The main difference between basic heating-cooling systems (fan-coil, duct type fan, duct type indoor units, etc.) and ventilation units is that the ventilation units have two fans to control (supply and extract fans). Both fans must be controlled separately in various operating conditions. For instance, in some cases it may be requested to keep the ventilated environment to a positive pressure (supply only) or a negative pressure (extraction only). In this case, it is required to set both fans at different speeds or one fan on and the other fan off. Also, it is possible to adjust the ventilation amount automatically depending on the amount of CO_2 or moisture in these units, which leads to saving energy, thanks to the on-demand ventilation. In addition, according to the latest building regulations, the summer by-pass function is a requirement (the fresh air is bypassing the plate heat exchanger, being supplied indoors directly). Thanks to the HRU Controller developed by our company, all functions and safety requirements expected from a heat recovery unit can be met. Different working scenarios have been created for customer's demands and control of different ancillaries to be used with the units.

1.2. Functions

Function	Definition

Fan Speed Control	• Manual: 3 steps fan speed control for EC or AC fans
	  ○ Single fan mode
	  ○ Individual speed control of the fans
	• Automatic
	  ○ With sensors (Humdity, CO_2, etc.)
	  ○ Constant volume or Constant pressure

Boost Function	It is used for increasing fan speed if necessary • Manual: Boost button on Control panel • Automatic: Dry contact on control board
Filter Function	It warns the user when the filters are dirty. • Alternative-1: Depends on time • Alternative-2: Pressure switch
By-Pass Function	Filtered fresh air is supplied indoor without passing through heat exchanger
Rotor Function	It controls the rotor on/off in the ventilation units with rotor type heat recovery exchanger.
Electric Heater Control Function	Electric Heater steps control.
Coil Control Function	Cooling or Heating/Cooling water coil control.
Frost Protection Function	Heat exchanger frost protection • Alternative-1: By-Pass damper • Alternative-2: Fan speed control • Alternative-3: Electric Preheater steps control
Preheater Function	Electric preheater steps control for frost protection.
Room Temperature Function	Enables selection of return air temperature or control panel temperature as room temperature.
BMS Function	It allows simple control of the unit from a central control system and monitoring of the situation. • BMS: Unit can be on/off via dry contact on control board • Run out: Information of “unit status” • Fault out: Information of “fault”
Modbus	It controls all functions of unit via PC or central control system.
Timer	Unit can be programmed to operate on certain days of the week.
Log Function	All possible working options of the unit can be recorded.
Fire Function	It is used for changing working status of the unit in case of fire.
Child-Proof Protection Function	It is used to lock the key on control panel.
Wireless Control	It provides the connection of wireless (RF) control panel and wireless room sensors to the unit.
IoT Function	It allows the features of the unit to be followed over the internet.
Service Interface	The unit provides adjustment of all operating parameters and functions.

1.3. Accessories

1.3.1. Temperature Sensor

NTC 10kΩ (@25°C) type sensor is used for air temperature measurement. The control card has been calibrated according to this sensor. It is suitable for duct type installation.

1.3.2. Humidity Sensor

This sensor is used for air humidity measurement. The control card has been calibrated according to this sensor. It is suitable for duct type installation.

1.3.3. CO_2 Sensor

This sensor is used for amount of CO_2 measurement in air. The control card has been calibrated according to this sensor. It is suitable for duct type installation.

1.3.4. Humidity & CO_2 Sensor

This sensor is used for air humididty and amount of CO_2 measurement in air. It is formed by the combination of 2 sensors (1.3.2 and 1.3.3). The control card has been calibrated according to this sensor. It is suitable for duct type installation.

1.3.5. Pressure transmitter

It is the sensor used to measure the air pressure difference. It can be used for constant flow, constant pressure functions and filter pollution measurement. The control card has been calibrated according to this sensor. It is suitable for duct type installation.

2. Controller PCB Options

2.1. Options

Fan control options

- PWM (0~10V)
- Voltage control (AC)

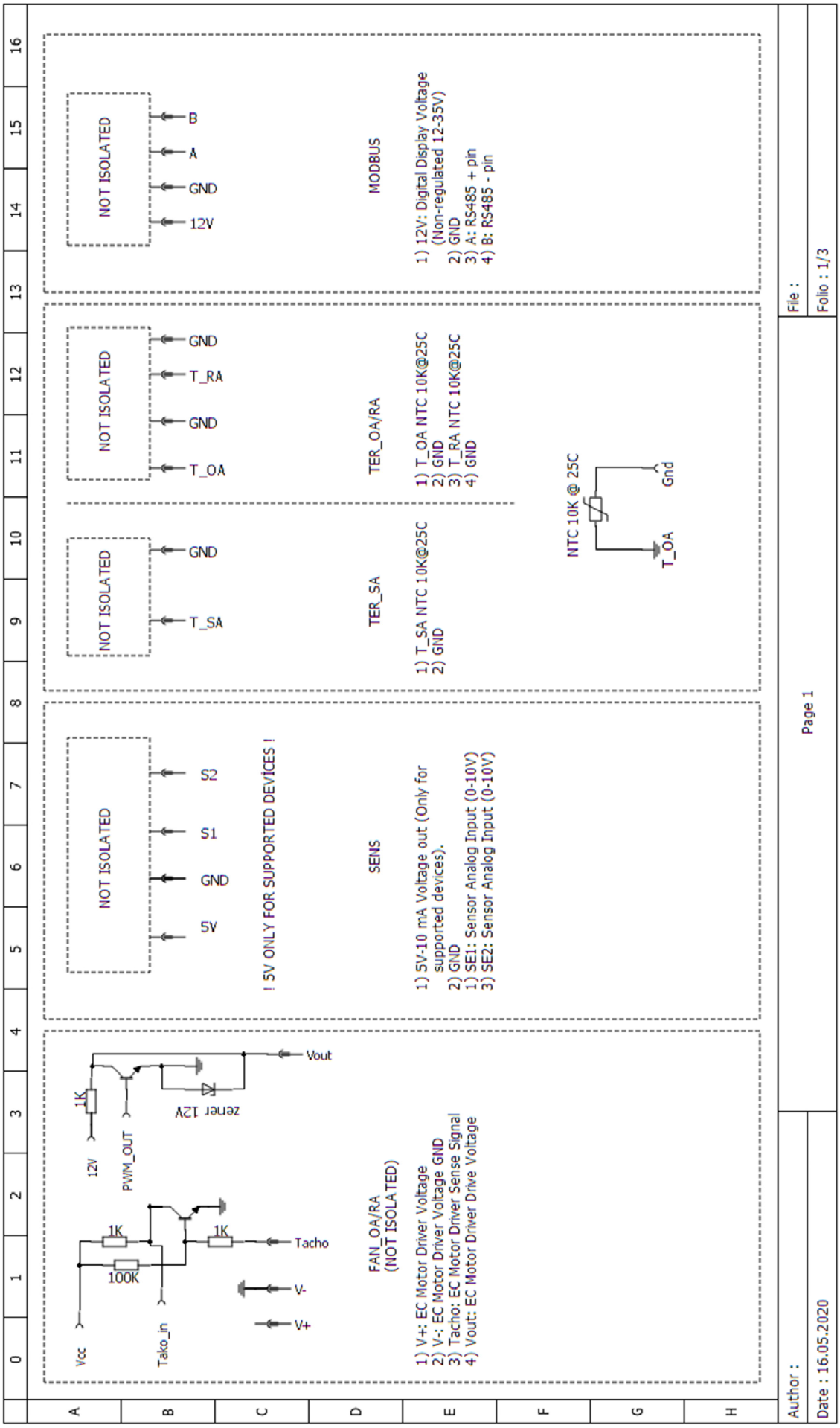
Connection type options

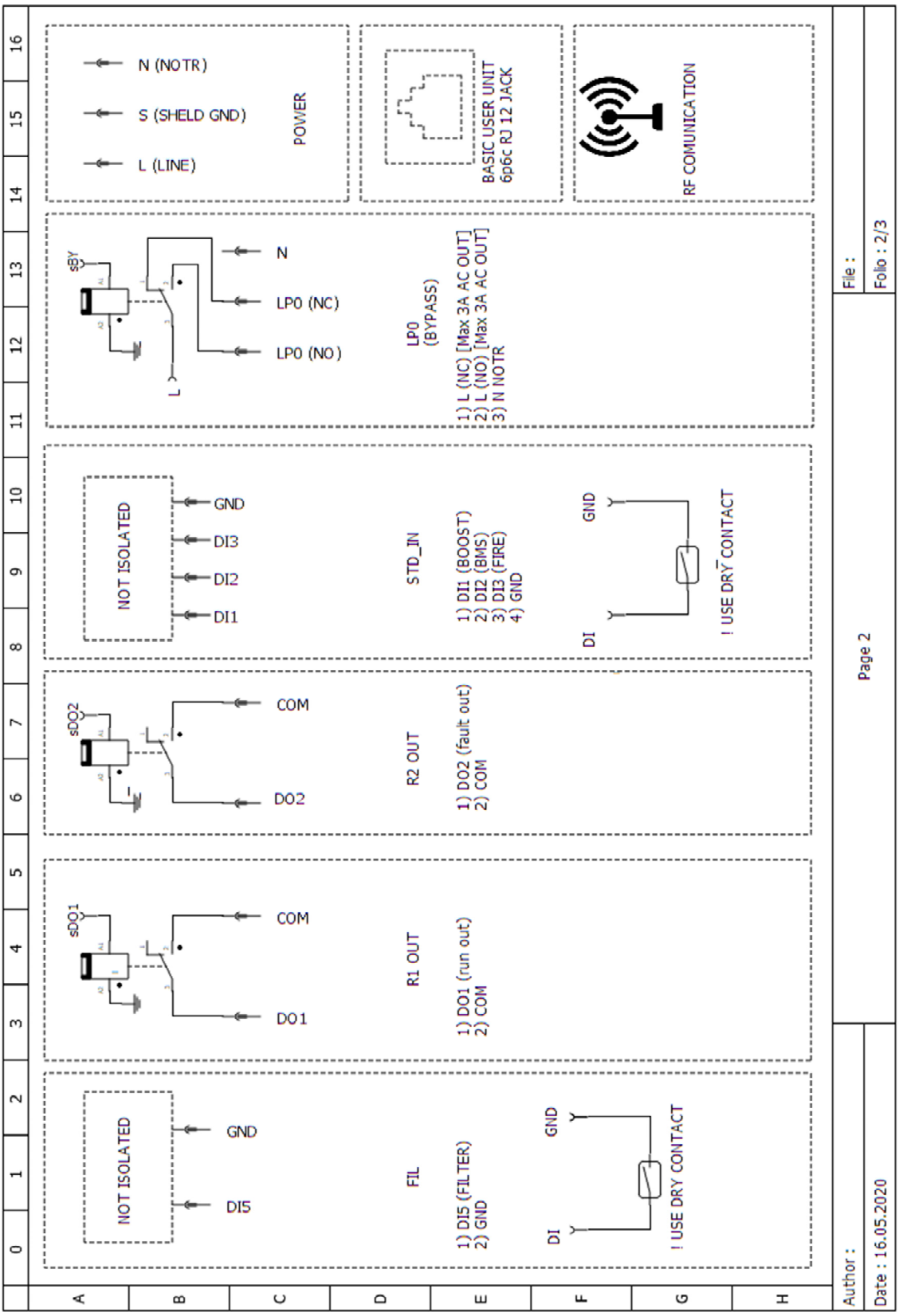
- Connector
- Socket

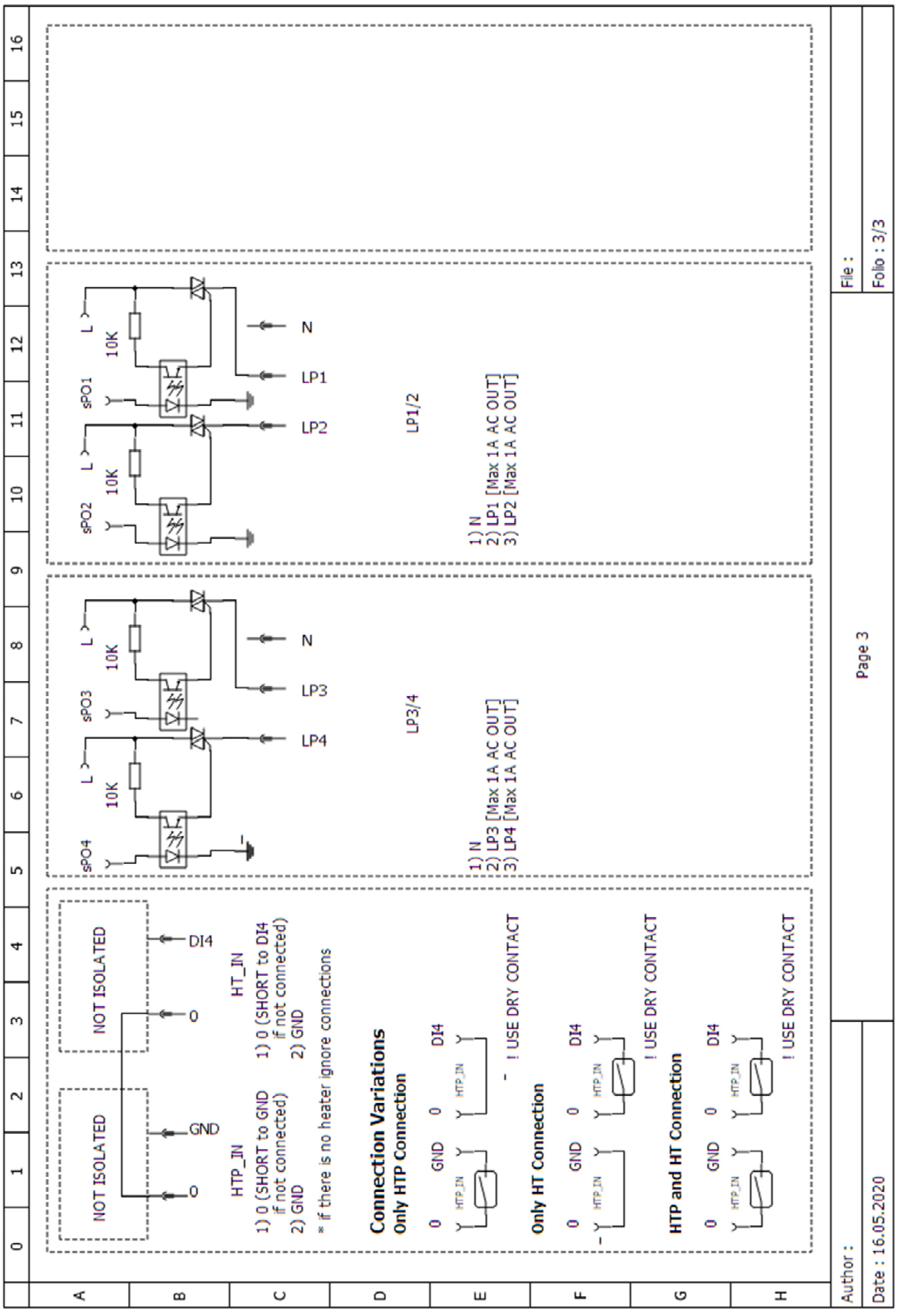
RF control options

- With RF control
- Without RF control

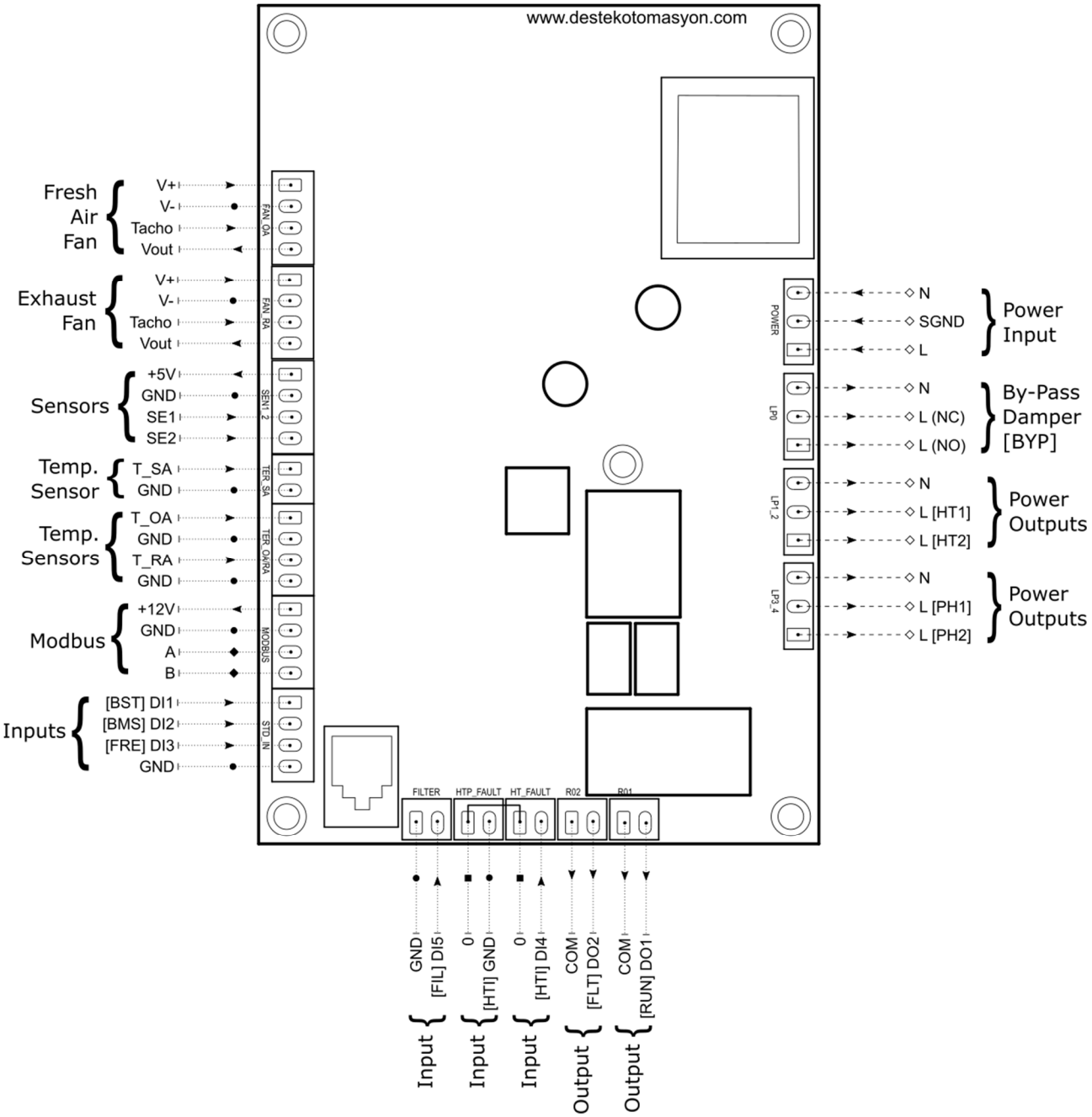
2.2. Control Board Input / Output




N (NOTR)
S (SHELD GND)
L (LINE)
POWER
BASIC USER UNIT
6p6c RJ 12 JACK
RF COMUNICATION
sBY
N
LP0 (NC)
LP0 (NO)
L
LP0
(BYPASS)
1) L (NC) [Max 3A AC OUT]
2) L (NO) [Max 3A AC OUT]
3) N NOTR
NOT ISOLATED
GND
DI3
DI2
DI1
STD_IN
1) DI1 (BOOST)
2) DI2 (BMS)
3) DI3 (FIRE)
4) GND
GND
DI
! USE DRY CONTACT
sDO2
COM
DO2
R2 OUT
1) DO2 (fault out)
2) COM
sDO1
COM
DO1
R1 OUT
1) DO1 (run out)
2) COM
NOT ISOLATED
GND
DI5
FIL
1) DI5 (FILTER)
2) GND
GND
DI
! USE DRY CONTACT
Page 2
File :
Folio : 2/3
Author :
Date : 16.05.2020

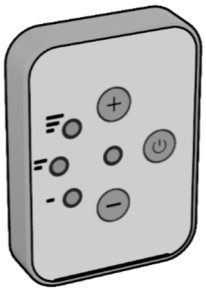

NOT ISOLATED
NOT ISOLATED
DI4
0
GND
0
HTP_IN
HT_IN
1) 0 (SHORT to GND if not connected)
2) GND
* if there is no heater ignore connections
1) 0 (SHORT to DI4 if not connected)
2) GND
Connection Variations
Only HTP Connection
0 GND 0 DI4
HTP_IN
HTP_IN
! USE DRY CONTACT
Only HT Connection
0 GND 0 DI4
HTP_IN
HTP_IN
! USE DRY CONTACT
HTP and HT Connection
0 GND 0 DI4
HTP_IN
HTP_IN
! USE DRY CONTACT
sPO4
sPO3
sPO2
sPO1
L
10K
N
LP1
LP2
LP3
LP4
LP1/2
LP3/4
1) N
2) LP1 [Max 1A AC OUT]
3) LP2 [Max 1A AC OUT]
1) N
2) LP3 [Max 1A AC OUT]
3) LP4 [Max 1A AC OUT]
Page 3
Author :
Date : 16.05.2020
File :
Folio : 3/3

2.3. Control Board Connection Diagram (PWM)

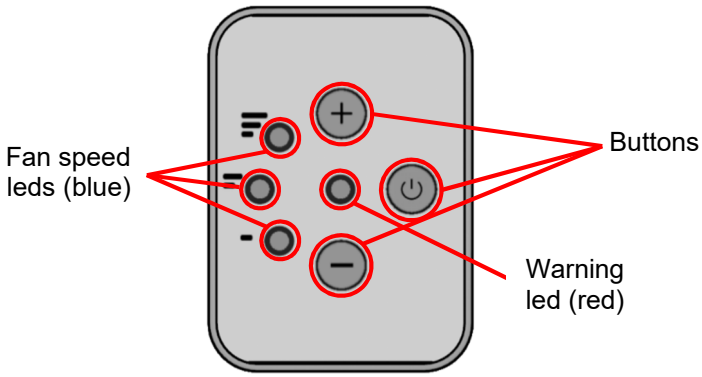


3. Controller Options

3.1. Basic Controller



The Basic Controller was designed to allow the user to simply control all the basic functions of the unit. There are 3 basic buttons and 4 leds on it.



3.1.1. Buttons

Function	Button	Activity
Unit Start / Stop [1]	⏻	Press for 3 seconds
To increase fan speed	+	Press
To decrease fan speed	−	Press
To activate “boost” function [2]	⏻	Press
To reset the unit [3]	⏻	Press for 3 seconds
To reset the duration of filter replacement depending on time [4]	⏻ −	Press for 3 seconds
To activate VOD mode [5]	+ or −	Press for 3 seconds
Child lock	+ −	Press for 3 seconds

[1] Cannot open or close if BMS (8.1) is active

[2] Cannot change the fan speed if “Boost” function is active

[3] Reset works if the unit is off

[4] Cannot work if the unit has filter sensor

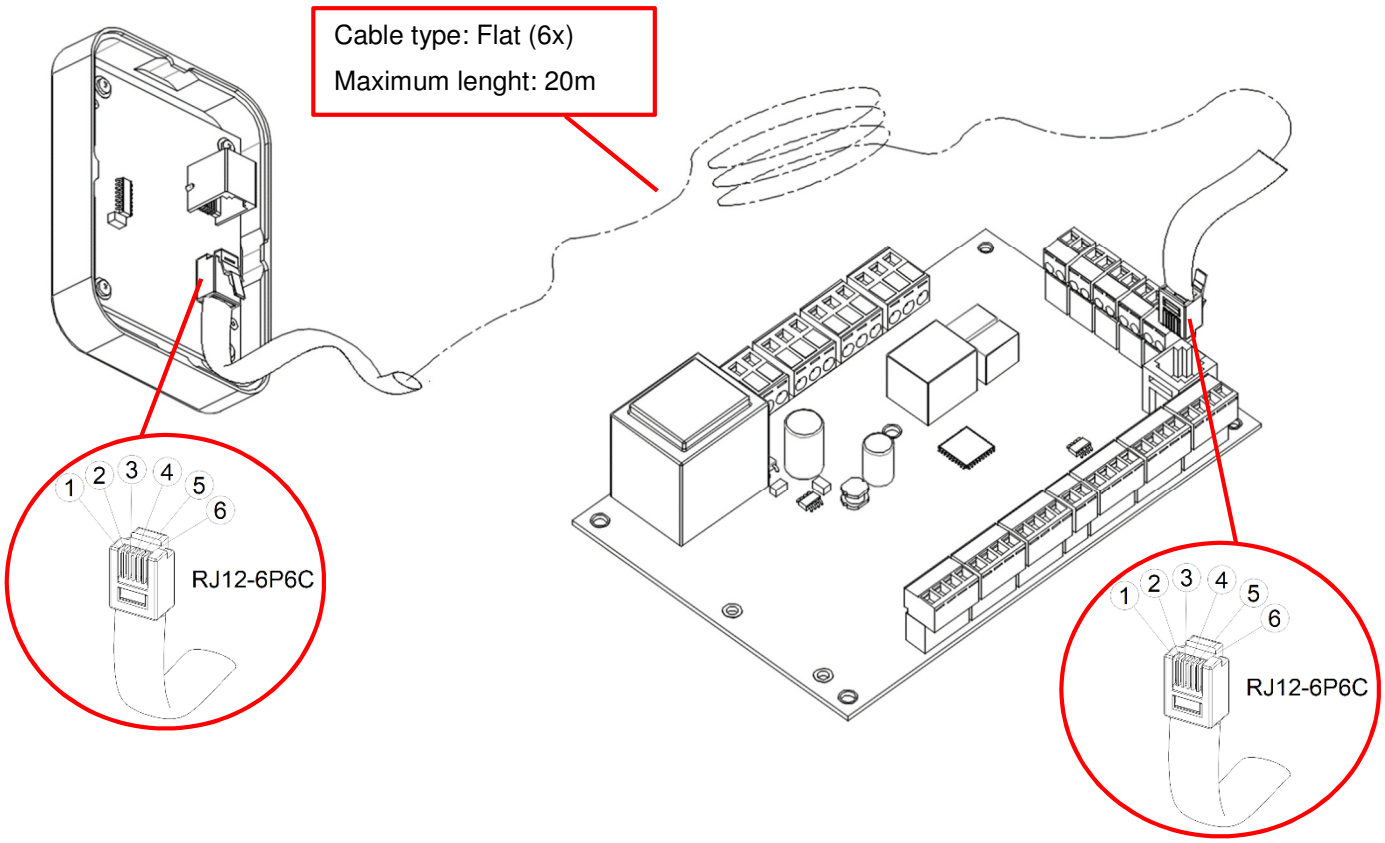
[5] If the VOD mode is active and Sensor connected

3.1.2. Leds

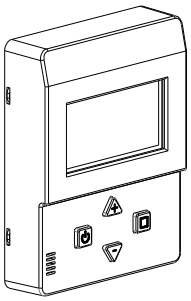
H	M	L	!	Description
○	○	○	○	Unit off
●	○	○	○	Fan speed is “high”.
○	●	○	○	Fan speed is “mid”.
○	○	●	○	Fan speed is “low”.
●	●	●	○	Fan speed is “boost”.
●	○	●	○	VOD mode is active.
✳	✳	✳	●	Fire function is active.
○	○	○	●	Failure warning (see Part III).

○ Led is off ● Led is on ✳ Blink

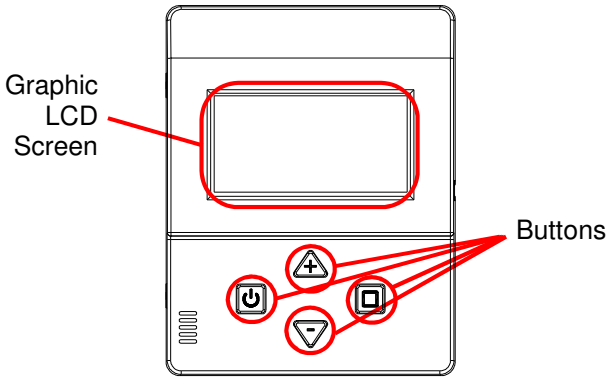
Cable connection



3.2. Digital Controller



The Digital Controller was designed to control all the functions of the unit and to change settings related to the unit. It has 4 buttons and 1 graphic display.



3.2.1. Buttons

Function	Button	Activity
Unit Start / Stop [1]	⏻	Press for 3 seconds
To switch to screens in between. (If not select anything on screen)		
Next screen	+	Press
Previous screen	−	Press
To change any value on screen (If select something on screen)	□	Press
To increase existing value	+	Press
To decrease existing value	−	Press
To exit existing menu	⏻	Press
To activate “boost” function [2]	□	Press for 3 seconds
To reset the unit [3]	⏻	Press for 3 seconds
To reset the duration of filter replacement depending on time [4]	⏻ + −	Press for 3 seconds
To adjust screen brightness and contrast	⏻ +	Press for 3 seconds
Child lock	+ −	Press for 3 seconds

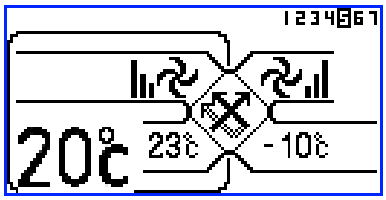
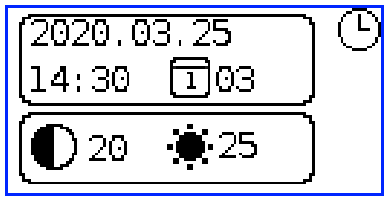
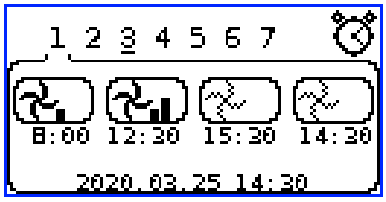
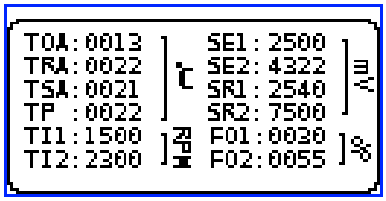
[1] Cannot open or close if BMS (8.1) is active

[2] Cannot change the fan speed if “Boost” function is active

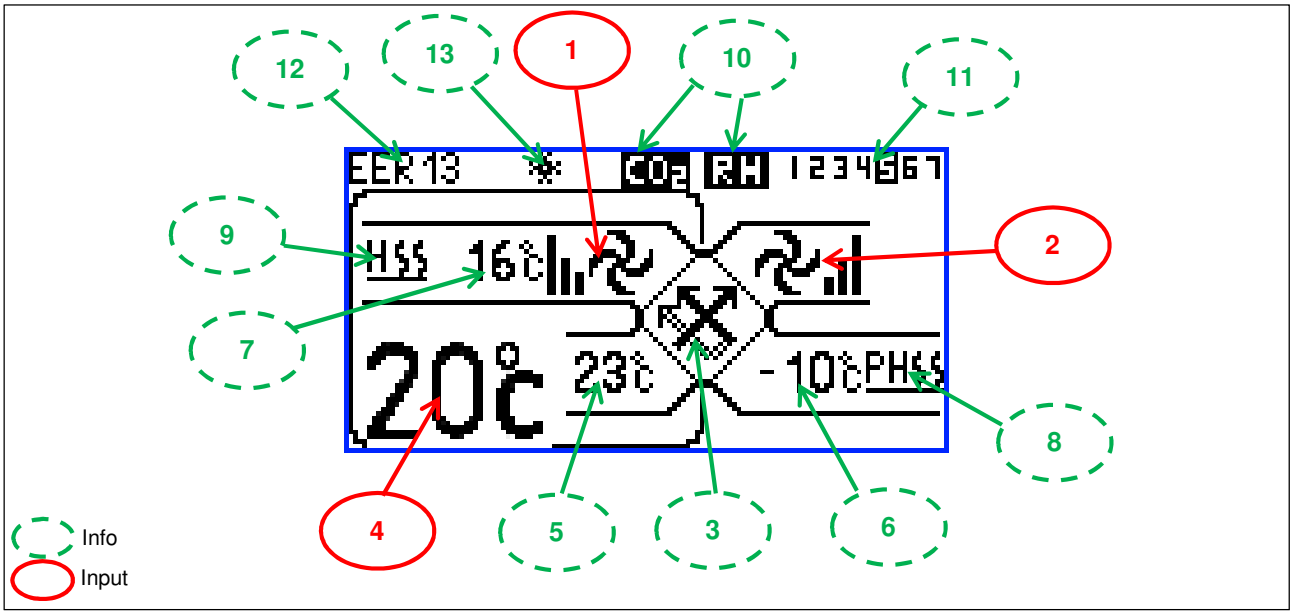
[3] Reset works if the unit is off

[4] Cannot work if the unit has filter sensor

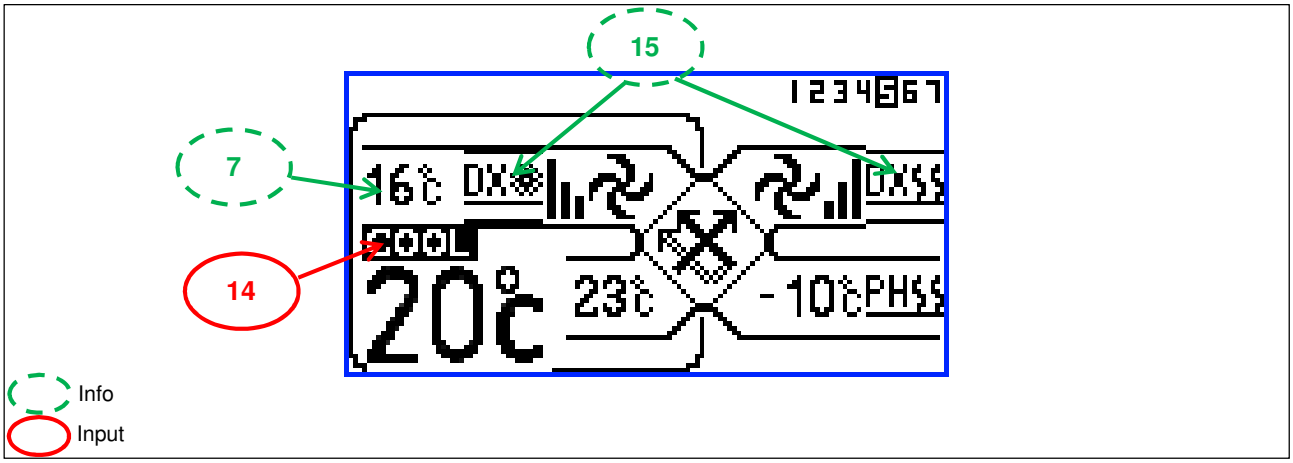
3.2.2. Screenshots

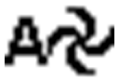
1.Screen Main Screen		**4.Screen** Adjust	
2.Screen Timer		**5.Screen** Company Logo	
3.Screen Information			

"1.Screen" Symbols: Main Screen

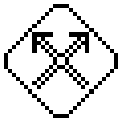
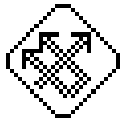
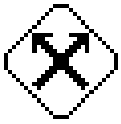
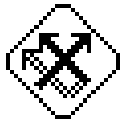
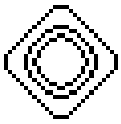
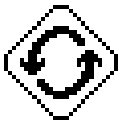


"1.Screen" Symbols: Main Screen (for DX Unit)



1.Symbol: Fresh Air Fan	
	Off
	Fan speed “low”
	Fan speed “mid”
	Fan speed “high
	Fan speed “boost”
	VOD mode is active

2.Symbol: Exhaust Fan	
	Off
	Fan speed “low”
	Fan speed “mid”
	Fan speed “high
	Fan speed “boost”
	VOD mode is active

3.Symbol: Heat exchanger (Plate or Rotor) & By-Pass damper			
	Exchanger: Plate type By-Pass: not available Unit: Off		Exchanger: Plate type By-Pass: Available / Closed Unit: Off
	Exchanger: Plate type By-Pass: not available Unit: Working		Exchanger: Plate type By-Pass: Available / Closed Unit: Working
	Exchanger: Rotor type By-Pass: not available Unit: Off		Exchanger: Plate type By-Pass: Available / Open Unit: Working
	Exchanger: Rotor type By-Pass: not available Unit: Working		

4.Symbol	Air temprerature on Panel (T_PA). Temperature set value when selected.
5.Symbol	Return air temperature (T_RA)
6.Symbol	Outdoor air temperature (T_OA)
7.Symbol	Supply air temperature (T_SA). (if sensor is available)

8.Symbol: Preheater	
	Not available
PH	Type: Preheater Status: Closed
PHSS	Type: Preheater Status: Open

9.Symbol: Symbol for post heater and cooling coil			
	Not available	CH	Type: Water coil Status: Closed
H	Type: Heater Status: Closed	CH	Type: Water coil Status: Open / Cooling mode
HSS	Type: Heater Status: Open	CHSS	Type: Water coil Status: Open / Heating mode
C	Type: Water cooling coil Status: Closed		
C	Type: Water cooling coil Status: Open		

10.Symbol: Sensor	
CO_2	CO_2 sensor is available (1.3.3)
RH	Humidity sensor is available (1.3.2)
SEN	Sensor supplied by the user

11.Symbol: Timer	
1234567	The day of the week
BMS	BMS is active

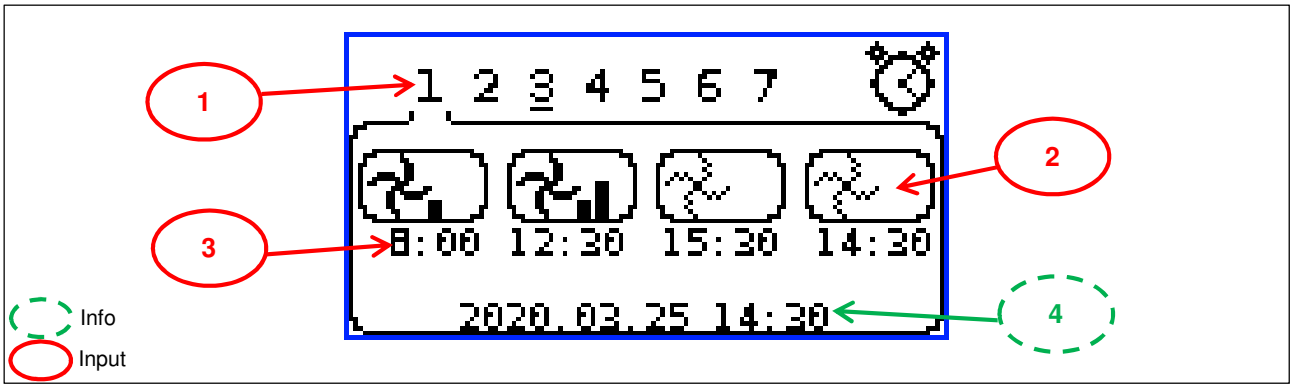
12.Symbol	Fault code

13.Symbol: Defrost	
	Frost protection is active
	Frost protection is active for DX system

14.Symbol: DX System	
COOL	DX system is working in “cooling” mode.
HEAT	DX system is working in “heating” mode.
AUTO	DX system is working in “auto” mode.
FAN	DX system is closed. Ventilation mode is active.

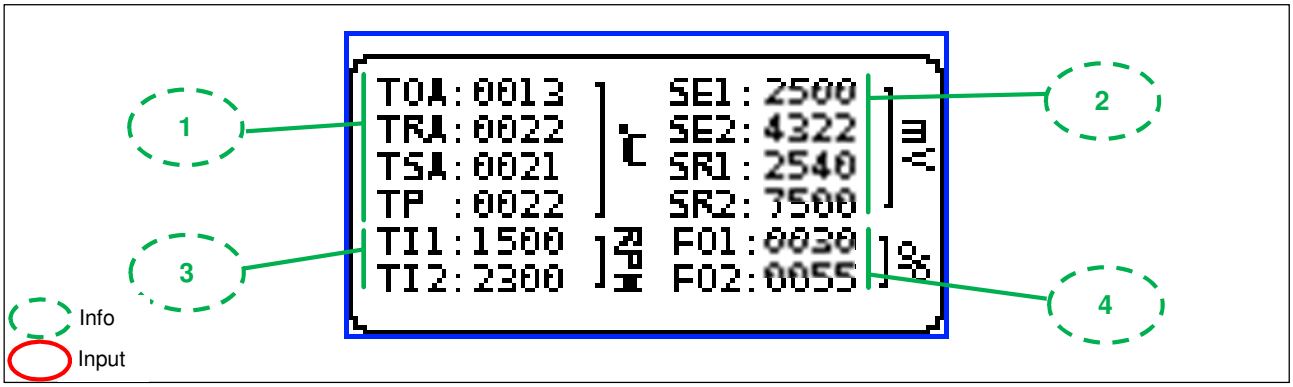
15.Symbol: DX Coil	
DX	DX coil: DX system is closed.
DX	DX coil: it works as an evaporator.
DXSS	DX coil: it works as a condenser.

“2.Screen” Symbols: Timer



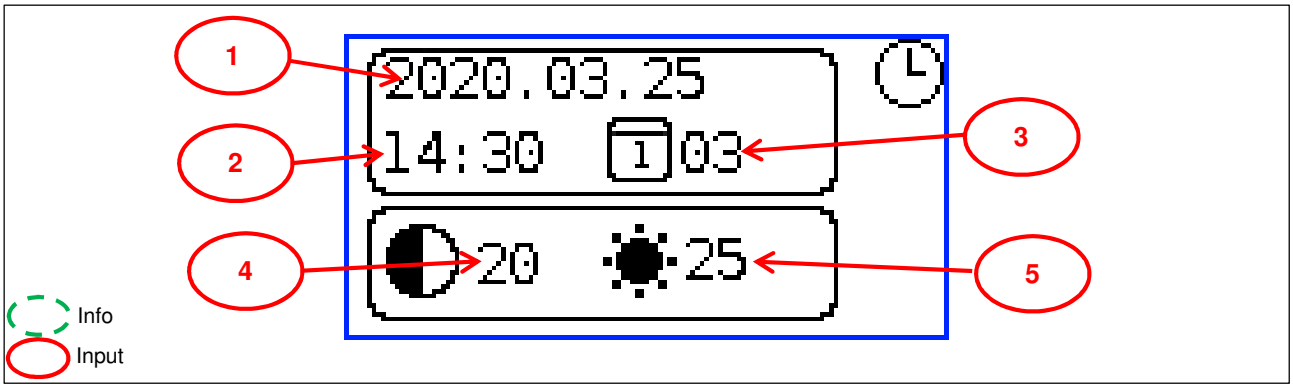
1.Field	Day of the week selection
2.Field	Fan mode selection
3.Field	Clock selection
4.Field	System time information

“3.Screen” Symbols: Information

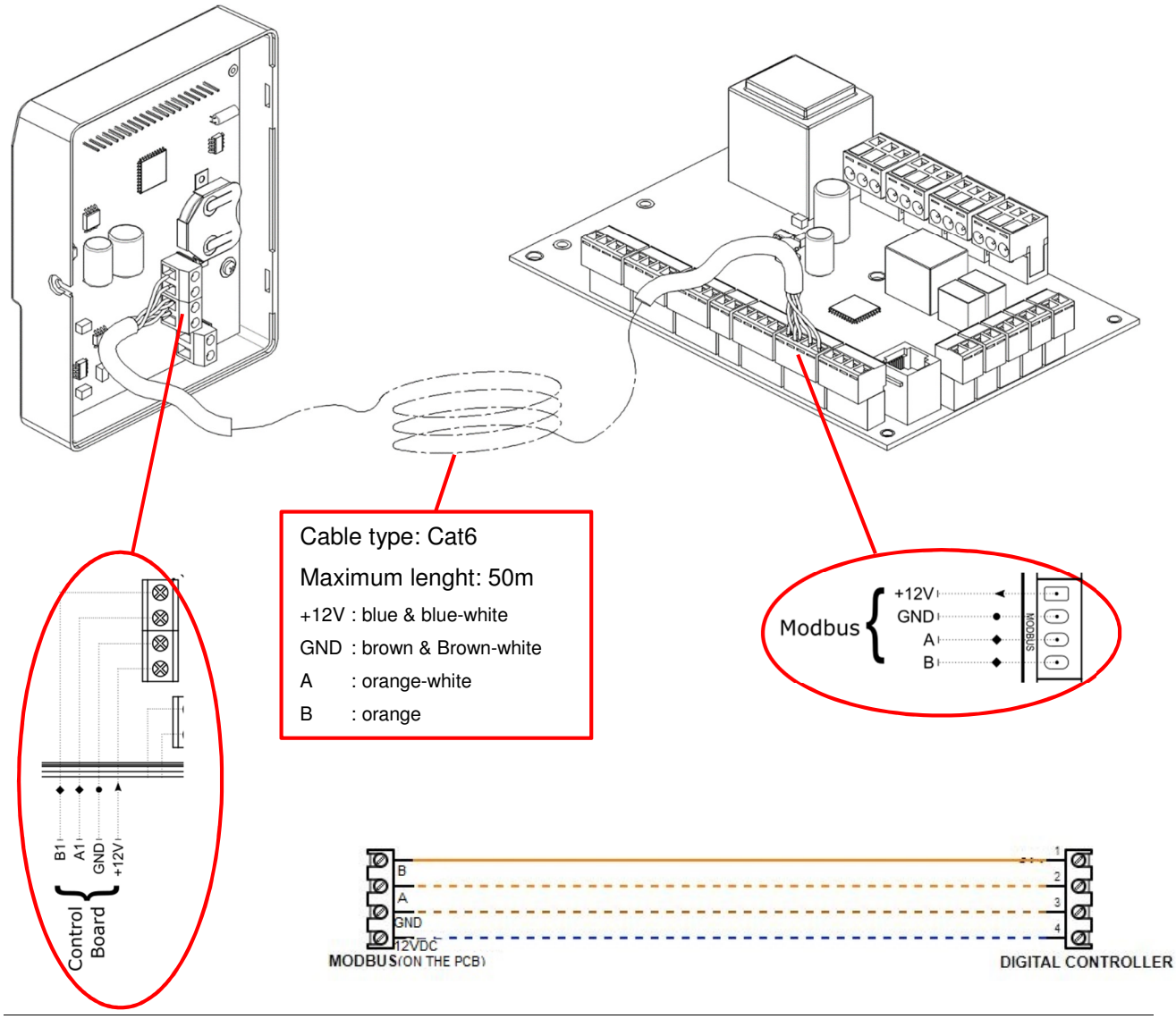


1.Field	Temperature sensor values [°C]
2.Field	Sensor values [mV]
3.Field	Fan speed values [rpm] (if fan tacho connection is available)
4.Field	Fan speed values [%]

"4.Screen" Symbols: Settings



1.Field	Date setting [YYYY.MM.DD]
2.Field	Clock setting [HH:MM]
3.Field	1st day of the week selection. For example, if the 1st day of the week is Monday and today is Wednesday, the entry value should be 3, if the 1st day of the week is Sunday and today is Wednesday, the entry value should be 4
4.Field	Screen contrast value
5.Field	Screen brightness value



PART II – WORKING SCENARIO

1. Fan Speed Control

I/O	FAN_OA, FAN_RA	
Default values	Fresh air fan “low” speed value Fresh air fan “high” speed value Fresh air fan failure data entry method Exhaust air fan “low” speed value Exhaust air fan “high” speed value Exhaust air fan failure data entry method	%30 %80 “tacho” %30 %80 “tacho”

It is the function of controlling the speed of the fresh air and exhaust fans on the device. There are 3 speed levels (L, M, H) and 1 "boost" speed, in total 4 speed levels. Control board medium speed "M"; is calculated from the arithmetic mean of the low “L” and high “H” speeds. Depending on the type of controller used to control the ventilation unit, these speed step values can be changed.
Fan failure information is set to "tacho" as standard.

Alternatives such as the following are available in fan speed control.

- Alternative-1: Manual control
  - Single fan mode. Operating only fresh air or exhaust fan (except Basic Controller)
  - Separate speed control of 2 fans (except Basic Controller)
- Alternative-2: Automatic
  - VOD mode with humidity, CO_2 or different sensors
  - Constant flow / Constant pressure

2. Boost Function

I/O	[BST] & Control Panels	
Default values	Boost speed value for control panel Boost duration value for control panel Boost speed value for control board Boost duration value for control board	%100 15 min. %80 1 min.

If necessary, the fan speed of the device is set to the fastest position temporarily.

- Manual: By pressing the button on the panel. The fans of the device operate at the highest speed (boost speed) for a certain period of time. It then continues at normal operating speed.
- Automatic: Fans will run at Boost speed when a signal is received from input [BST]. It then the fans run at Boost speed for a certain time, then continue at normal operating speed.

3. Filter Control

I/O	[FIL] & Control Board	
Default values	Filter contamination time	2000 h

Filters on the device must be cleaned at certain times. It is the function that indicates the time of cleaning.

- Alternative-1: Device operating time is monitored and the controller displays a warning to clean the filter when the set time has expired (default).
- Alternative-2: The filter can be controlled mechanically. The function is activated with the differential pressure switch (NC) to be connected to the control card [FIL] input. Thus, when the filter is dirty, the controller displays a warning to clean the filter. When this function is active, the filter's time control is disabled.

4. By-Pass & Rotor Control

4.1. By-Pass Control

I/O	[BYP]	
Default values		

It is better not to use the heat exchanger in terms of energy saving and comfort during the transition seasons such as summer to autumn or spring to summer, when the temperature of the outdoor air changes suddenly and the indoor air can get overheated. In these cases, the fresh air can be passed directly to the indoor environment by passing the heat recovery exchanger. Depending on the outside temperature, set temperature and indoor temperature, the control card decides whether to bypass the by-pass.
It has on/off control feature.

4.2. Rotor Control

I/O	[RTR]	
Default values		

It is used to control the rotor on/off in ventilation devices with rotor type heat recovery exchanger. In the transition seasons, it is better not to use the heat recovery rotor in terms of energy saving and comfort when the temperature of the outdoor air drops down suddenly during autumn or spring nights or the temperature of the outdoor air rises very quickly in the afternoons. In these cases, the rotor is stopped and fresh air can be delivered directly to the interior. Depending on the outside temperature, set temperature and indoor temperature, the control card decides whether the rotor will operate or not.

5. Heating & Cooling Control

It provides control of the additional heater and/or cooler used to ensure that the fresh air supplied from the heat recovery device is in the requested parameters These heaters/coolers can be controlled depending on room or return air temperature, or depending on the supply air temperature.

5.1. Electric Heater or Water Heater Control

I/O	[HT1], [HT2], [HT3], [HTI]	
Default values	Cooling time when equipment is off	60 s

It is the stage control of the electric post heater used to increase the blowing air temperature to the comfort temperature or the water heater battery valve control (on/off) function. It can be operated according to room temperature or supply air temperature.
There is a fault input for the electric heater (dry contact NC). If this connection is made; A malfunction in the electric heater will be shown on the control panel and will disable the electric heater.

5.2. Water Heating & Cooling Coil Control

I/O	[CHW]	
Default values		

The water coil (for heating & cooling) used to ensure that the blowing air reaches the comfort temperature is the valve control (on/off) function. It can be operated according to room temperature or supply air temperature.

5.3. Water Cooling Coil Control

I/O	[CCW]	
Default values		

It is the valve control (on/off) function of the water cooler coil used to reduce the blowing air to the comfort temperature. It can be operated according to room temperature or supply air temperature.

6. Frost Protection

I/O	[FRZ], [BYP], [PH1], [PH2], [HTI]	
Default values	Frost temperature Frost protection scenario selection Frost protection scenario control time Frost protection scenario runtime	0°C 1 15 min. %25

In cases where the outside temperature is low; It is a function that prevents damage to the heat exchanger as a result of freezing of the condensed water in the heat recovery heat exchanger.

- Alternative-1: By-Pass damper method (default).
- Alternative-2: Fan speed change method: Fresh air fan will run at low speed "L" and exhaust fan will operate at high speed "H".
- Alternative-3: Fan speed change method: Fresh air fan off, exhaust fan will continue at operating speed.
- Pre-heater method: If a pre-heater is monted on fresh air duct, it will be activated. There is a fault input for the electric heater (dry contact NC). If this connection is made; A malfunction in the electric heater will be shown on the control panel and will disable the electric heater.

7. Room Temperature Function

Control board; it needs to measure the room temperature to operate many functions. The following alternatives can be used for this measurement.

- Alternative-1: Return air temperature.
- Alternative-2: Room control panel temperature (Basic Controller).

8. BMS Function

These are the inputs and outputs used to easily control some simple functions of the Control Board.

8.1. External on/off control [BMS]

I/O	[BMS]	
Default values		

It is the function that enables the control card to be opened and closed with a dry contact to be connected from the outside. When this function is activated; the device will turn on and off according to the signal at the BMS input. The device will not be able to open and close from any control panel (Basic Controller, Digital Controller, Touch Panel, etc.). The Time Function will be disabled.

8.2. Status info (Run out) [RUN]

I/O	[RUN]	
Default values		

It is the output of information indicating whether the device is working (dry contact).

8.3. Fault info (Fault out) [FLT]

I/O	[FLT]	
Default values		

It is the information output (dry contact) indicating the device's malfunction.

9. Modbus Function

It is the function that controls all the functions and settings of the device through the Building Management System.

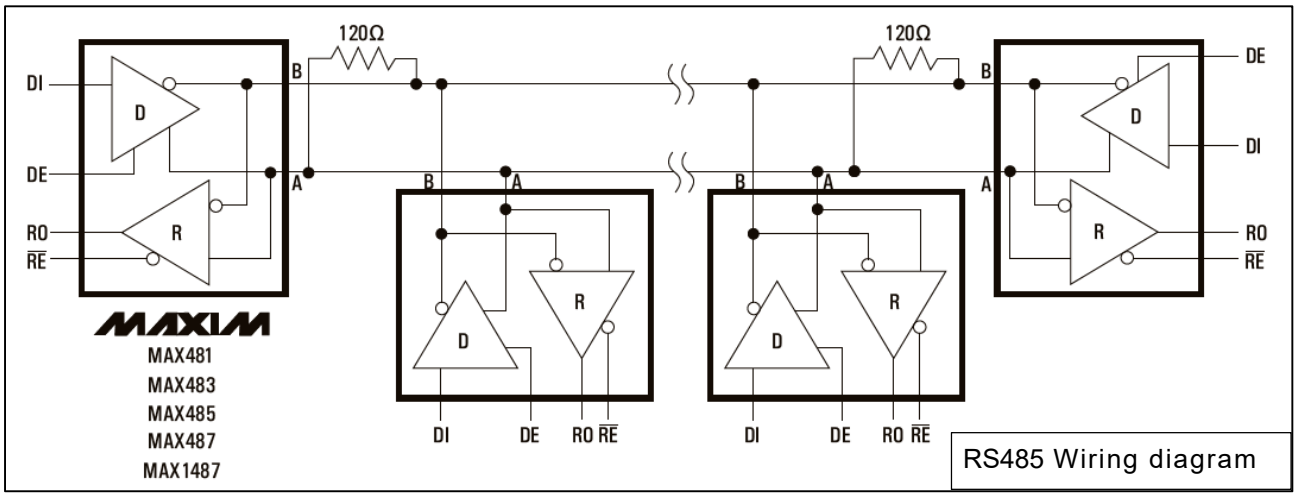
9.1. Properties

Control board uses Modbus RTU protocol via RS485 connection. The unit works as Slave and the information can be taken from an external Master module.

Connection information of the unit	
Connection type	Modbus RTU Slave
Standatd address	1
Link speed	9600
Party	None
Data bits	8
Stop bit	1

9.2. Physical Connection

Communication network is showed below. Control board can be connected to RS485 on which is connected more than one unit. Address conflicts on this line should be removed and necessary software settings should be done for data communication.



RS485 Wiring diagram

If the line is too long or if any communication problem occurs, 120 Ohm resistance should be added at the beginning and end of the line as shown on schema.

9.3. Modbus Function

Communication package (below table) is the same for each function. First address information of relevant module is sent on package. After added information type, CRC code which is a failure code that evaluates accuracy of package is sent.

Modbus Package Type:

Address Information	Function Code	Data	Failure Control (CRC16)

Control board supports only two of standard functions of Modbus. These codes are 03 register reading and 06 register writing (below table). In the example below, master wants to know the 16 bit data on 2nd register. Corresponding response value of control board is shown on the table below. In the second example, master wants to write the 16 bit data on 2nd register and it is reported to control board that the data was written.

Function 03 Transfer Package Example:

Master Transfer				
Address Information	Function Code	Register ID	Data Lenght	Failure Control
0x01	0x03	0x00,0x02	0x00,0x01	0x25,0xCA
Response of Control Board				
Address Information	Function Code	Register ID	Data Lenght	Failure Control
0x01	0x03	0x00	0x07,0xFF	0xFA,0x34

Function 03 Transfer Package Example:

Master Transfer				
Address Information	Function Code	Register ID	Written Data	Failure Control
0x01	0x06	0x00,0x02	0x0C,0x00	0x2D,0x0A
Response of Control Board				
Address Information	Function Code	Register ID	Written Data	Failure Control
0x01	0x06	0x00,0x02	0x0C,0x00	0x2D,0x0A

9.4. Modbus Register List

ID	Description	Multiplier	Acces	Unit	Limit	Default	Explanation
0	Version of program	1	r	-	-	-	Versiyon of installed program [MMYY]
1	Unit ON / Off	1	rw	-	[0,1]	0	0-Stop / 1-Start
2	Alarm Code	1	r	-	-	0	Failure code
3	Fresh air fan speed	1	r	rpm	-	-	-
4	Exhaust air fan speed	1	r	rpm	-	-	-
5	PWM value of fresh air fan	1	r	%	[0,100]	-	-
6	PWM value of exhaust air fan	1	r	%	[0,100]	-	-
20	Outdoor air temperature	0,1	r	°C	[-40,80]	-	T_OA
21	Return ait temperature	0,1	r	°C	[-40,80]	-	T_RA
22	Supply air temperature	0,1	r	°C	[-40,80]	-	T_SA
23	Panel temperature	0,1	rw	°C	[-40,80]	-	T_PA
24	1.Sensor value	0,01	r	V	-	-	Voltage value of SE1
25	2.Sensor value	0,01	r	V	-	-	Voltage value of SE2
26	RF 1.Sensor value	0,01	r	V	-	-	Voltage value of SR1
27	RF 2.Sensor value	0,01	r	V	-	-	Voltage value of SR1
29	Relative Humidity value (RH)	0,1	r	%	-	-	Processed data of the value from the sensor
30	CO_2 value	0,1	r	ppm	-	-	Processed data of the value from the sensor
31	Pressure value	0,1	r	hPa	-	-	Processed data of the value from the sensor
60	DO1 Output info [RUN]	1	r	-	[0,1]	-	0-Closed / 1-Run
61	DO2 Output info [FLT]	1	r	-	[0,1]	-	0-Closed / 1-Run
62	LP0 Output info [BYP]	1	r	-	[0,1]	-	0-Closed / 1-Run
63	LP1 Output info [HT1]	1	r	-	[0,1]	-	0-Closed / 1-Run
64	LP2 Output info [HT2]	1	r	-	[0,1]	-	0-Closed / 1-Run
65	LP3 Output info [PH1]	1	r	-	[0,1]	-	0-Closed / 1-Run
66	LP4 Output info [PH2]	1	r	-	[0,1]	-	0-Closed / 1-Run
80	DI1 Input info [BST]	1	r	-	[0,1]	-	0-Closed / 1-Run
81	DI2 Input info [BMS]	1	r	-	[0,1]	-	0-Closed / 1-Run
82	DI3 Input info [FRE]	1	r	-	[0,1]	-	0-Closed / 1-Run
83	DI4 Input info [HTI]	1	r	-	[0,1]	-	0-Closed / 1-Run
84	DI5 Input info [FIL]	1	r	-	[0,1]	-	0-Closed / 1-Run
100	Mode selection	1	rw	-	[0,1]	0	0- Standard fan speed / 1- VOD
101	Fresh air fan speed stage	1	rw	-	[0,3]	0	0-Low / 1-Mid / 2-High / 3-Stop
102	Exhaust air fan speed stage	1	rw	-	[0,3]	0	0-Low / 1-Mid / 2-High / 3-Stop
128	Set temperature	1	rw	°C	[18,28]	22	-

10. Timer Function

It is the function where the work program of the device is made weekly for certain days. 4 different operating modes can be selected for each day of the week. The device regulates the operation according to the set mode at the specified day and time and continues to work in this mode until the next set time.

11. Fire Scenario [FRE]

I/O	[FRE]	
Default values	Fire scenario selection	1

It is the function that determines the working position of the device in case of fire. When a signal is received from the FRE input (dry contact) of the control board, it will operate depending on one of the following scenarios.

- Alternative-1: The unit will shut down (default).
- Alternative-2: Fresh air fan high speed “H”, exhaust fan high speed “H”
- Alternative-3: Fresh air fan high speed “H”, exhaust fan off
- Alternative-4: Fresh air fan off, exhaust fan high speed “H”

12. Child Proof Protection Function

I/O	Control Board	
Default values	Child Proof Protection Function	Manual

It is the function that prevents the control panel from being accessed especially by children. When the function is activated, the keys are locked and not functional.

- Alternative-1: Manual: Optionally, the function can be activated and deactivated by pressing the key combination on the control panel.
- Alternative-2: Time dependent: When this function is activated; The function is activated when the keys are not pressed for a certain period of time.

13. Unit Status When Power On

I/O		
Default values	Unit Status When Power On	1

Decides what to do when the device is powered.

- Alternative-1: The device will be active with the last operating position (default).
- Alternative-2: The device will be active in “off” state.
- Alternative-3: The device will be active in the “on” position.

PART III – ALARM (Failure)

1. Fault Info (Fault out) [FLT]

The device displays a warning in case of a malfunction in any of its components. The control card decides whether to continue operating according to the severity of the fault. Fault information is transmitted to the user as a fault code on the controller's display (Digital Controller, Touch Panel, etc.) and warning led in the Basic Controller. In addition, the device mechanically (dry contact) exports the fault information from the "Fault out" output.

2. Fault Code List

Screen Code	Description	Register Value	Basic Panel[1]	Unit Status[2]	Reset[5]	Fan	BYP / RTR	PH	HT / CCW / CHW	DX / FWV
---	Unit run normaly	0	---	-	-	√	√	√	√	√
ERR 1	Fire alarm[FRE]	1	0001	√[3]	√	√	X	X	X	X
ERR 2	Elecrtric heater failure [HTI]	2	0010	√	-	√	√	X	X	X
ERR 3	Fresh air fan failure (FAN_OA)	3	0011	X	√	X	X	X	X	X
ERR 4	Exhaust air fan failure (FAN_RA)	4	0100	X	√	X	X	X	X	X
ERR 5	Outdoor air temperature sensor failure (T_OA)	5	0101	X	-	X	X	X	X	X
ERR 6	Return air temperature sensor failure (T_RA)	6	0110	√	-	√	X[7]	√	X[7]	X[7]
ERR 7	Panel temperature sensor failure (T_PA)	7	0111	√	-	√	X[8]	√	X[8]	X[8]
ERR 8	Supply air temperature sensor failure (T_SA)	8	1000	√	-	√	X[9]	√	X[9]	X
ERR 9	Sensor-1 failure [SE1]	9	1001	√[4]	-	√	√	√	√	√
ERR 10	Sensor-2 failure [SE2]	10	1010	√[4]	-	√	√	√	√	√
ERR 11	Freon pressure failure [DXH] [DXL]	11	1011	√	√[6]	√	√	√	√	X
ERR 12	Filter dirty alarm [FIL]	12	1100	√	-	√	√	√	√	√
ERR 13	Clock malfunction	13	1101	√	-	√	√	√	√	√
ERR 14	RF communication failure	14	1110	√	-	√	√	√	√	√
ERR 15	Digital Controller communication failure	15	1111	√	-	√	√	√	√	√
ERR 16	Constatnt flow maximum limit failure	16	---	√	-	√	√	√	√	√

[1] Basic Controller warning led fault indicator: Led flash time 0 short, 1 long. For example: for 0010 → short - short - long - short / break / short - short - long - short / break /…

[2] Equipment to be stopped is indicated on the right columns.

[3] Depending on the fire scenario

[4] Fans continue to run at normal speed

[5] In case of marked faults, reset is required.

[6] No reset is possible in the 3rd failure, it is necessary to contact the service.

[7] If the return air temperature sensor is set for room temperature measurement and the equipment is operated with this sensor

[8] If the panel temperature sensor is set for room temperature measurement and the equipment is operated with this sensor

[9] If the equipment is operated with this sensor

Annex.A – SERVICE OPERATIONS

1. Basic Controller

BUTTONS

Function	Button	Activity
Service operation	(+) (⏻) (−)	Press for 3 seconds
By-Pass function on/off [BYP]	(+)	Press for 3 seconds
Equipments function on/off (Heater, preheater) [HTI]	(⏻)	Press for 3 seconds
BMS function on/off [BMS]	(−)	Press for 3 seconds
Exit	(+) (⏻) (−)	Press for 3 seconds or Wait 10 seconds

LEDS

Led		Status		Status	Function
H	●	On	☀	Off	By-Pass function [BYP]
M	●	On	☀	Off	Equipments function (Heater, preheater) [HTI]
L	●	On	☀	Off	BMS function [BMS]

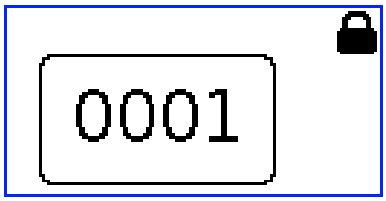
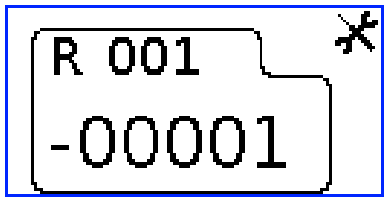
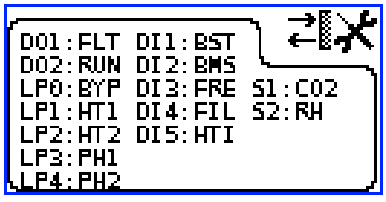
○ Led is off ● Led is on ☀ Blink

2. Digital Controller

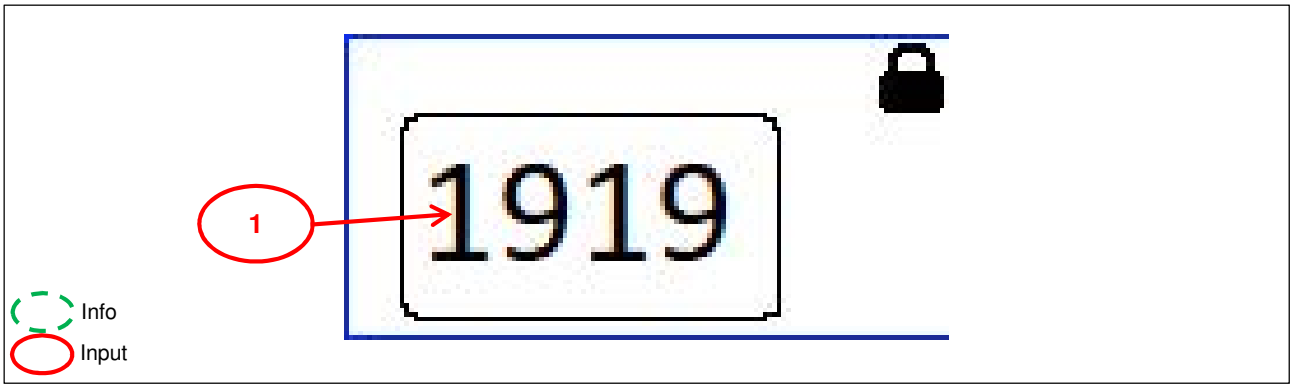
BUTTONS

Function	Button	Activity
Service operation input	(⏻) (□)	Press for 3 seconds

SCREENSHOTS

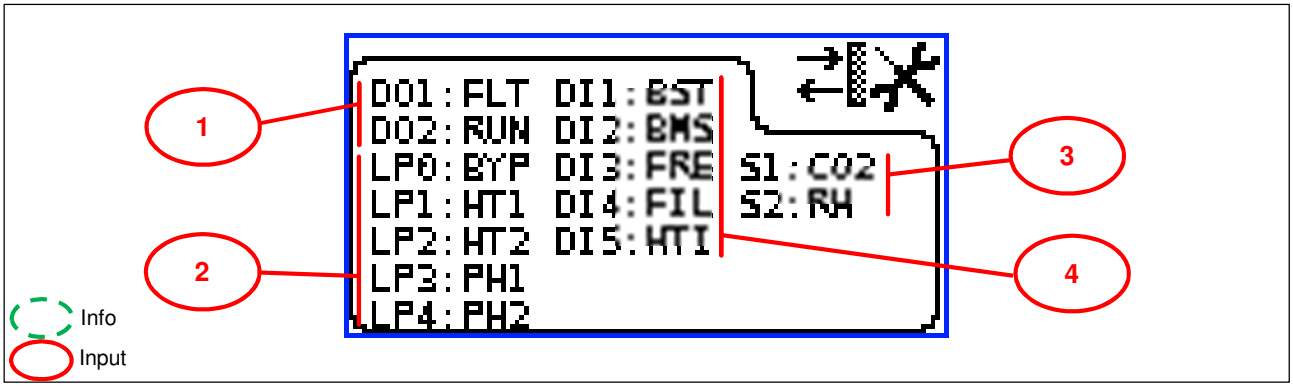
6.Screen Password screen		**8.Screen** Service screen	
7.Screen I/O adjust			

"6.Screen" Symbols: Password screen



1.Field	Password entry

"7.Screen" Symbols: I/O adjust

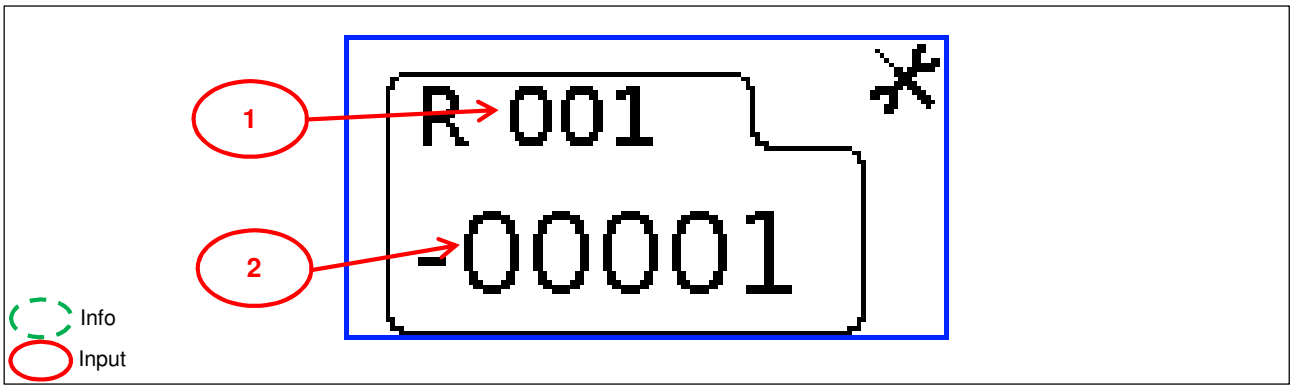


1.Field	Outputs selection (dry contact) (DO)
2.Field	Power oputput selection
3.Field	Inputs selection (dry contact) (DI)
4.Field	Inputs selection (sensor) (AI)

Inputs Code List (DI)			
Code	**Description**	**Code**	**Description**
---	Not connected	HTI	Heater failure info (Part II – 5.1 and 6)
BST	Boost function (Part II – 2)	FIL	Filter mechanical info (Part II – 3)
BMS	BMS unit on/off (BMS in) (Part II – 8.1)	DXH	Freon system pressure failure info (Part III …)
FRE	Fire info (Part II – 11)	DXL	Freon system pressure failure info (Part III …)

Outputs Code List (DO)			
Code	**Description**	**Code**	**Description**
---	Not connected	RTR	Rotor heat exchanger (Part II – 4.2)
RUN	Unit run out info (Run out) (Part II – 8.2)	CCW	Water coil (cooling) (Part II – 5.3)
FLT	Failure info (Fault out) (Part II – 8.3)	CHW	Water coil (cooling & heating) (Part II – 5.2)
BYP	By-Pass (Part II – 4.1)	DX1	Freon system 1.stage (Part II …)
HT1	Electric Heater 1.stage (Part II – 5.1)	DX2	Freon system 2.stage (Part II …)
HT2	Electric Heater 2.stage (Part II – 5.1)	FWV	Freon system four-way valve (Part II …)
HT3	Electric Heater 3.stage (Part II – 5.1)	FRZ	Frost protection info (Part II – 6)
PH1	Electric preheater 1.stage (Part II – 6)		
PH2	Electric preheater 2.stage (Part II – 6)		

"8.Screen" Symbol: Service operation



1.Field	Register number
2.Field	Register value

3. Register List

Modbus	Service	Log	ID	Description	Multiplier	Access	Unit	Limit	Default	Explanation
X	X		0	Version of program	1	r	-	-	-	Versiyon of installed program [MMYY]
X		X	1	Unit ON / Off	1	rw	-	[0,1]	0	0-Stop / 1-Start
X		X	2	Alarm Code	1	r	-	-	0	Failure code
X			3	Fresh air fan speed	1	r	rpm	-	-	-
X			4	Exhaust air fan speed	1	r	rpm	-	-	-
X			5	PWM value of fresh air fan	1	r	%	[0,100]	-	-
X			6	PWM value of exhaust air fan	1	r	%	[0,100]	-	-
			10	PWM value (low) of fresh air fan	1	r	%	-	-	-
			11	PWM value (mid) of fresh air fan	1	r	%	-	-	-

Modbus	Service	Log	ID	Description	Multiplier	Access	Unit	Limit	Default	Explanation
			12	PWM value (high) of fresh air fan	1	r	%	-	-	-
			13	PWM value (low) of exhaust air fan	1	r	%	-	-	-
			14	PWM value (mid) of exhaust air fan	1	r	%	-	-	-
			15	PWM value (high) of exhaust air fan	1	r	%	-	-	-
	X		17	Countdown for fan failure control	1	rw	s	-	-	-
	X		18	Countdown for boost panel	1	rw	s	-	-	Countdown starts when the algorithm is activated, otherwise it is "0"
	X		19	Countdown for boost control board	1	rw	s	-	-	Countdown starts when the algorithm is activated, otherwise it is "0"
X			20	Outdoor air temperature	0,1	r	°C	[-40,80]	-	T_OA
X			21	Return ait temperature	0,1	r	°C	[-40,80]	-	T_RA
X			22	Supply air temperature	0,1	r	°C	[-40,80]	-	T_SA
X			23	Panel temperature	0,1	rw	°C	[-40,80]	-	T_PA
X			24	1.Sensor value	0,01	r	V	-	-	Voltage value of SE1
X			25	2.Sensor value	0,01	r	V	-	-	Voltage value of SE2
X			26	RF 1.Sensor value	0,01	r	V	-	-	Voltage value of SR1
X			27	RF 2.Sensor value	0,01	r	V	-	-	Voltage value of SR1
X	X		29	Relative Humidity value (RH)	0,1	r	%	-	-	Processed data of the value from the sensor
X	X		30	CO_2 value	0,1	r	ppm	-	-	Processed data of the value from the sensor
X	X		31	Pressure value	0,1	r	hPa	-	-	Processed data of the value from the sensor
	X		33	Countdown for By-Pass position change	1	r	s	-	-	Time is expected to be 0 for By-Pass position change
	X		35	Filtre Sensor	1	r	-	[0,1]	-	Indicates whether the mechanical filter sensor is connected
	X		36	Countdown for electric heater cooling time	1	r	s	-	-	Countdown starts when the algorithm is activated, otherwise it is "0"
	X		37	Countdown for electric heater position change	1	r	s	-	-	Time is expected to be 0 for electric heater position change
	X		40	Countdown for frost protection function	1	r	s	-	-	Countdown starts when the algorithm is activated, otherwise it is "0"
			42	Run out info [RUN]	1	r	-	[0,1]	-	0-Closed / 1-Run
			43	Fault out info [FLT]	1	r	-	[0,1]	-	0-No fault / 1-There is a fault
			44	By-Pass info [BYP]	1	r	-	[0,1]	-	0-Closed / 1-Run
			45	Electric heater 1.stage info [HT1]	1	r	-	[0,1]	-	0-Closed / 1-Run
			46	Electric heater 2.stage info [HT2]	1	r	-	[0,1]	-	0-Closed / 1-Run
			47	Electric heater 3.stage info [HT3]	1	r	-	[0,1]	-	0-Closed / 1-Run
			48	Electric preheater 1.stage info [PH1]	1	r	-	[0,1]	-	0-Closed / 1-Run
			49	Electric preheater 2.stage info [PH2]	1	r	-	[0,1]	-	0-Closed / 1-Run
			50	Rotor info [RTR]	1	r	-	[0,1]	-	0-Closed / 1-Run
			51	Water coil (cooling) info [CCW]	1	r	-	[0,1]	-	0-Closed / 1-Run
			52	Water coil (heating & cooling) info [CHW]	1	r	-	[0,1]	-	0-Closed / 1-Run

Modbus	Service	Log	ID	Description	Multiplier	Access	Unit	Limit	Default	Explanation
			53	Freon system 1.stage info [DX1]	1	r	-	[0,1]	-	0-Closed / 1-Run
			54	Freon system 2.stage info [DX2]	1	r	-	[0,1]	-	0-Closed / 1-Run
			55	Freon syste four way valve info [FWV]	1	r	-	[0,1]	-	0-Closed / 1-Run
		X	56	Frost protection scenario info [FRZ]	1	r	-	[0,1]	-	0-Closed / 1-Run
X		X	60	DO1 Output info [RUN]	1	r	-	[0,1]	-	0-Closed / 1-Run
X		X	61	DO2 Output info [FLT]	1	r	-	[0,1]	-	0-Closed / 1-Run
X		X	62	LP0 Output info [BYP]	1	r	-	[0,1]	-	0-Closed / 1-Run
X		X	63	LP1 Output info [HT1]	1	r	-	[0,1]	-	0-Closed / 1-Run
X		X	64	LP2 Output info [HT2]	1	r	-	[0,1]	-	0-Closed / 1-Run
X		X	65	LP3 Output info [PH1]	1	r	-	[0,1]	-	0-Closed / 1-Run
X		X	66	LP4 Output info [PH2]	1	r	-	[0,1]	-	0-Closed / 1-Run
			70	Boost input info [BST]	1	r	-	[0,1]	-	0-Closed / 1-Run
			71	BMS in info [BMS]	1	r	-	[0,1]	-	0-Closed / 1-Run
			72	Fire input info [FRE]	1	r	-	[0,1]	-	0-Closed / 1-Run
			73	Heater failure info [HTI]	1	r	-	[0,1]	-	0-Closed / 1-Run
			74	Filter alarm input info [FIL]	1	r	-	[0,1]	-	0-Closed / 1-Run
			75	Freon system pressure alarm input info [DXH]	1	r	-	[0,1]	-	0-Closed / 1-Run
			76	Freon system pressure alarm input info [DXL]	1	r	-	[0,1]	-	0-Closed / 1-Run
	X		77	Tacho info for fresh air fan [TI1]	1	r	-	[0,1]	-	-
	X		78	Tacho info for exhaust air fan [TI1]	1	r	-	[0,1]	-	-
X		X	80	DI1 Input info [BST]	1	r	-	[0,1]	-	0-Closed / 1-Run
X		X	81	DI2 Input info [BMS]	1	r	-	[0,1]	-	0-Closed / 1-Run
X		X	82	DI3 Input info [FRE]	1	r	-	[0,1]	-	0-Closed / 1-Run
X		X	83	DI4 Input info [HTI]	1	r	-	[0,1]	-	0-Closed / 1-Run
X		X	84	DI5 Input info [FIL]	1	r	-	[0,1]	-	0-Closed / 1-Run
	X		90	Panel Child proof protection	1	rw	-	-	-	
	X		91	Basic Controller status	1	rw	-	-	-	Buttons info
			92	Basic Controller simulation	1	rw	-	-	-	-
			95	RF Panel simulation	1	rw	-	-	-	-
X		X	100	Mode selection	1	rw	-	[0,1]	0	0- Standard fan speed / 1-VOD
X		X	101	Fresh air fan speed stage	1	rw	-	[0,3]	0	0-Low / 1-Mid / 2-High / 3-Stop
X		X	102	Exhaust air fan speed stage	1	rw	-	[0,3]	0	0-Low / 1-Mid / 2-High / 3-Stop
	X		103	Alarm type selection for fresh air fan	1	rw	-	[0,2]	0	0-Tacho / 1-NC / 2-NO
	X		104	Alarm type selection for fresh air fan	1	rw	-	[0,2]	0	0-Tacho / 1-NC / 2-NO
	X		105	Fault detection time for fan	1	rw	s	[5,60]	10	The period during which the failure is not detected when fan start or position change
	X		106	PWM reference value (low) for fresh air fan	1	rw	%	[20,High]	30	-
	X		107	PWM reference value (high) for fresh air fan	1	rw	%	[20,100]	80	-
	X		108	PWM reference value (low) for exhaust air fan	1	rw	%	[20,High]	30	-
	X		109	PWM reference value (high) for exhaust air fan	1	rw	%	[20,100]	80	-

Modbus	Service	Log	ID	Description	Multiplier	Access	Unit	Limit	Default	Explanation
	X		115	Boost Panel status	1	rw	-	[0,1]	0	0-Passive / 1-Active
	X		116	PWM value (boost) for Panel	1	rw	%	[50,100]	100	-
	X		117	Boost duration for Panel	1	rw	dk	[1,30]	15	-
	X		118	PWM value (boost) for Control Board [BST]	1	rw	%	[50,100]	80	-
	X		119	Boost duration for Control Board [BST]	1	rw	dk	[1,30]	1	-
	X		122	VOD Status	1	rw	-	-	0	0-Passive / 1-Active
	X		123	Sensor lower limit value	0,01	rw	V	[0,1000]	50	-
	X		124	Sensor higher limit value	0,01	rw	V	[0,1000]	270	-
	X		125	Double sensor algoritma	1	rw	-	[0,2]	0	0-Maximum / 1-Minimum / 2-Difference
X		X	128	Set temperature	1	rw	°C	[18,28]	22	-
	X		129	2.stage temperature difference	1	rw	°C	[1,10]	3	-
	X		130	Room temperature sensor selection	1	rw	-	[0,1]	0	0-Return air temperature sensor (T_RA) 1-Panel temperature sensor (T_PA)
	X		131	By-Pass Aktifliği	1	rw	-	[0,1]	1	0-Passive / 1-Active
	X		132	By-Pass position change waiting time reference	1	rw	s	[0,3000]	30	-
	X		135	Filter fouling time reference	1	rw	H	[200,6000]	3000	When the working time exceeds this value, it gives filter dirty failure
	X		137	Heater status	1	rw	-	[0,1]	0	0-Passive / 1-Active
	X		138	Prehater status	1	rw	-	[0,1]	0	0-Passive / 1-Active
	X		139	Electric heater cooling time reference	1	rw	s	[20,600]	30	-
	X		140	Temperature sensor selection for eelectric heater	1	rw	-	[0,1]	0	0-Room temperature (Register 130) 1-Supply air temperature (T_SA)
	X		145	Frost protection status	1	rw	-	[0,1]	0	0-Passive / 1-Active
	X		146	Frost temperature	1	rw	°C	[-10,10]	0	-
	X		147	Frost protection scenario runtime	1	rw	%	[5,50]	25	-
	X		149	Child proof protection method selection	1	rw	-	[0,1]	0	0-Manual / 1-Automatic
	X		150	Unit status when power on	1	rw	-	[0,1]	1	0-Passive / 1-Active
	X		151	Unit start when power on	1	rw	-	[0,1]	1	0-Passive / 1-Active
	X		153	Modbus Address (Control Board)	1	rw	-	[1,254]	1	-
	X		154	Modbus link speed	1	rw	-	[0,254]	0	0-9600
	X		155	Modbus connection type	1	rw	-	[0,254]	0	0-N81 RTU
			157	DO1 Selection	1	rw	-	[0,15]	1	0:---, 1:RUN, 2:FLT, 3:BYP, 4:HT1, 5:HT2, 6:HT3, 7:PH1, 8:PH2, 9:RTR, 10:CCW, 11:CHW, 13:DX1, 14:DX2, 15:FWV, 16:FRZ
			158	DO2 Selection	1	rw	-	[0,15]	2	0:---, 1:RUN, 2:FLT, 3:BYP, 4:HT1, 5:HT2, 6:HT3, 7:PH1, 8:PH2, 9:RTR, 10:CCW, 11:CHW, 13:DX1, 14:DX2, 15:FWV, 16:FRZ
			159	LP0 Selection	1	rw	-	[0,15]	3	0:---, 1:RUN, 2:FLT, 3:BYP, 4:HT1, 5:HT2, 6:HT3, 7:PH1, 8:PH2, 9:RTR, 10:CCW, 11:CHW, 13:DX1, 14:DX2, 15:FWV, 16:FRZ
			160	LP1 Selection	1	rw	-	[0,15]	4	0:---, 1:RUN, 2:FLT, 3:BYP, 4:HT1, 5:HT2, 6:HT3, 7:PH1,

Modbus	Service	Log	ID	Description	Multiplier	Access	Unit	Limit	Default	Explanation
										8:PH2, 9:RTR, 10:CCW, 11:CHW, 13:DX1, 14:DX2, 15:FWV, 16:FRZ
			161	LP2 Selection	1	rw	-	[0,15]	5	0:---, 1:RUN, 2:FLT, 3:BYP, 4:HT1, 5:HT2, 6:HT3, 7:PH1, 8:PH2, 9:RTR, 10:CCW, 11:CHW, 13:DX1, 14:DX2, 15:FWV, 16:FRZ
			162	LP3 Selection	1	rw	-	[0,15]	7	0:---, 1:RUN, 2:FLT, 3:BYP, 4:HT1, 5:HT2, 6:HT3, 7:PH1, 8:PH2, 9:RTR, 10:CCW, 11:CHW, 13:DX1, 14:DX2, 15:FWV, 16:FRZ
			163	LP4 Selection	1	rw	-	[0,15]	8	0:---, 1:RUN, 2:FLT, 3:BYP, 4:HT1, 5:HT2, 6:HT3, 7:PH1, 8:PH2, 9:RTR, 10:CCW, 11:CHW, 13:DX1, 14:DX2, 15:FWV, 16:FRZ
			170	DI1 Selection	1	rw	-	[0,7]	1	0:---, 1:BST, 2:BMS, 3:FRE, 4:HTI, 5:FIL, 6:DXH, 7:DXL
			171	DI2 Selection	1	rw	-	[0,7]	2	0:---, 1:BST, 2:BMS, 3:FRE, 4:HTI, 5:FIL, 6:DXH, 7:DXL
			172	DI3 Selection	1	rw	-	[0,7]	3	0:---, 1:BST, 2:BMS, 3:FRE, 4:HTI, 5:FIL, 6:DXH, 7:DXL
			173	DI4 Selection	1	rw	-	[0,7]	4	0:---, 1:BST, 2:BMS, 3:FRE, 4:HTI, 5:FIL, 6:DXH, 7:DXL
			174	DI5 Selection	1	rw	-	[0,7]	5	0:---, 1:BST, 2:BMS, 3:FRE, 4:HTI, 5:FIL, 6:DXH, 7:DXL
	X		180	BMS in status	1	rw	-	[0,1]	0	0-Passive / 1-Active
	X		182	Fire scenario selection	1	rw	-	[0,3]	0	-
			185	SE1 Sensor selection	1	rw	-	[0,4]	0	0-"---" / 1-RH / 2-CO_2 / 3-PRE / 4-SEN (kullanıcı sensörü)
			186	SE1 Sensor selection	1	rw	-	[0,4]	0	0-"---" / 1-RH / 2-CO_2 / 3-PRE / 4-SEN (kullanıcı sensörü)
	X		187	SR1 RF Sensor selection	1	rw	-	[0,2]	0	0-"---" / 1-RH / 2-CO_2
	X		188	SR2 RF Sensor selection	1	rw	-	[0,2]	0	0-"---" / 1-RH / 2-CO_2
	X		196	Working time count for filter	1	rw	h	[0,6000]	-	
	X		197	Unit latest statu info	1	r	-	[0,1]	0	When unit power on, it starts working from this situation
			210	UTC Clock Date L 16B	1	rw	-	[0,1]	0	-
			211	UTC Clock Date H 16B	1	rw	-	[0,1]	0	-
			212	Auxiliary clock series	1	r	-	[0,1]	0	-
			213	Auxiliary date series	1	r	-	[0,1]	0	-
	X		230	Screen logo selection	1	rw	-	[0,0]	0	-
			231	1st day of the week reference	1	rw	-	[0,6]	0	-
			232	Screen contrast value	1	r	%	[0,100]	40	-
			233	Screen brightness value	1	r	%	[0,100]	60	-
	X		235	Control board Modbus address for Panel	1	rw	-	[1,255]	255	-
	X		236	Panel Modbus address 2	1	rw	-	[1,254]	1	-
	X		238	Service password for 8.screen	1	rw	-	[0,9999]	1919	-
	X		239	Service password for 7.screen	1	rw	-	[0,9999]	2020	-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