Galletti
AIR CONDITIONING

EN **TECHNICAL MANUAL**

FM

HIGH WALL-MOUNTED FAN COIL UNITS WITH BLDC MOTOR AND INCORPORATED VALVE

2,0 kW - 3,7 kW

CE

EUROVENT CERTIFIED PERFORMANCE
www.eurovent-certification.com

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OPERATING LIMITS

Minimum inlet water temperature = 7°C
Maximum Inlet water temperature = 70°C
Maximum air intake temperature = 35°C
Maximum wet bulb air intake temperature = 24°C
Supply voltage = 230 Vac

The technical and dimensional data provided herein may undergo changes in connection with product improvements.

- For any further information, contact the manufacturer: info@galletti.it
- To get the weight of the unit, refer to the User Manual, Rated technical data table.

1 GENERALITIES

High wall-mounted FM fan coil units are available in 3 models with cooling capacities ranging from 2,1 to 3,7 kW, complete with electronically controlled inverter motor (BLDC, 2 or 3-way ON/OFF solenoid valve and infrared remote control.

DECLARATION OF CONFORMITY

Galletti S.p.A. hereby declares, under its sole responsibility, that the high wall-mounted fan coil units belonging to the FM series, have been designed, built and tested in conformity with the specifications of European Directives: 2006/42/CE, 2004/108/CE, 2006/95/CE

Bentivoglio, 08/01/2014
Galletti S.p.A.
Luca Galletti

CE

EUROVENT CERTIFIED PERFORMANCE www.eurovent-certification.com

The performance features of FM fan coil units are certified by EUROVENT which guarantees the reliability of the data shown on this documentation.

2 CONSTRUCTIVE FEATURES

CABINET

The ABS cabinet features attractive design, rounded shape, for every type of environment.
The integrated air outlet is equipped with a motor driven flap that can sweep automatically or be positioned manually, and adjustable fins for a uniform distribution of air in the room.

The front panel is complete with display to show all the functions of the unit and the room temperature.

HEAT EXCHANGER

Uprated heat exchanger made with copper piping and high efficiency aluminium fins with hydrophilic surface treatment, complete with air vent valve and facilitated emptying valve.

ON/OFF SOLENOID VALVE ASSEMBLY

All units are equipped with 2 or 3-way solenoid valve with electrothermal ON/OFF actuator (230 V) directly installed on the heat exchanger inside the unit and controlled by the microprocessor controller. Hoses for the connection to the system facilitate the installation operations.

FM high wall-mounted

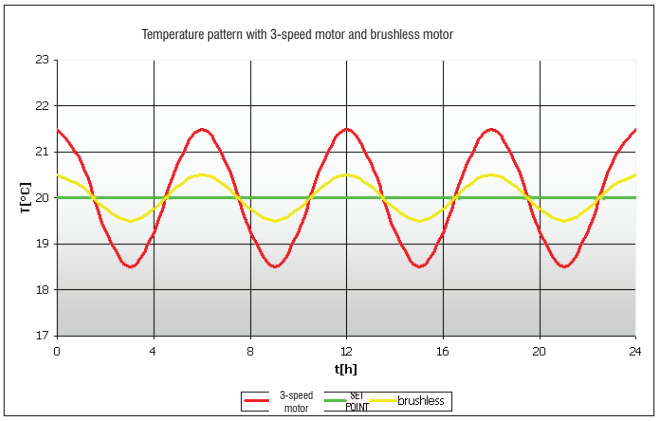
1	2	3	4	5	6	7	8	9	10	11
S	K	A	F	M	0	3	2	T	0	0

	Revision	Name of series	Size	No. of valves	Control included	Motor	Other

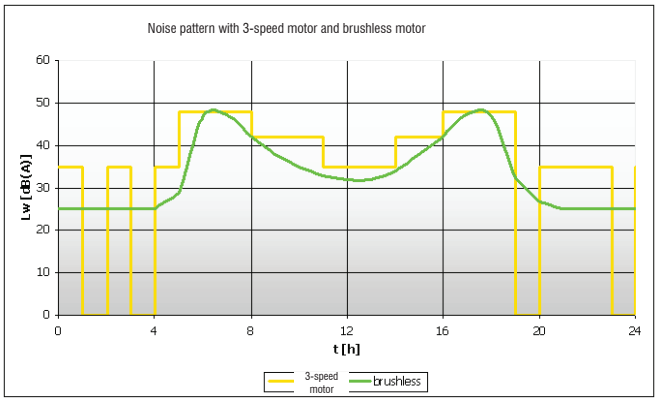
2 CONSTRUCTIVE FEATURES

FAN-DRIVE ASSEMBLY

Tangential fan directly coupled to an electronically controlled electric motor of synchronous brushless type (BLDC) controlled by inverter.
The great advantage of brushless motors is the significant reduction in power consumption, which reaches up to a 2/3 of that of asynchronous motors with the corresponding reduction in CO2 emissions. The DC Inverter technology allows to continuously adjust the air flow and heating capacity to the actual needs of the environment by considerably reducing the fluctuations in room temperature that are typical of step-by-step adjustments.



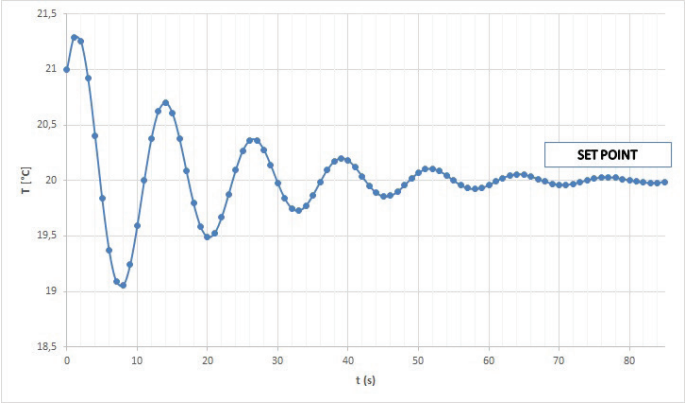
The direct consequence is the reduction in the noise emission of the fan coil, which is proportional to the demands of the environment.



CONTROL SYSTEM

The microprocessor control system with infrared user interface enables the automatic control of the fan coil unit.
The main control specifications are:

- Selection of the cooling, heating, dehumidification mode or the automatic mode.
- PID control algorithm to regulate the BLDC fan: the control logic adapts the fan rpm to the difference between measured temperature and set temperature, integrate over time the deviation measured and adapt the rpm accordingly. The derivative logic analyzes the change speed thus assuring little variations.



- Water temperature reading and definition of minimum working temperatures
- Auxiliary contacts for signalling of heating or cooling mode
- Inlet contact for remote on/off operation ((for instance signalling of room occupied)
- Serial port for the implementation of master/slave networks
- Autorestart after power cut.

REMOTE CONTROL

Infrared remote control with LCD display, to set all the functions of the fan coil:

- Switching on and off
- Temperature Set point
- Operating mode (cooling-dehumidification-ventilation-heating-automatic)
- Ventilation (automatic-maximum-medium-minimum)
- Switching on and off via Timer
- Air outlet flap sweep
- Clock

When, in a maser/slave system, the fan coil with remote control is the master unit, the settings are automatically sent to the slave units.
The flap sweep function is not applicable.

AIR FILTER

The filter is washable and can be easily removed for cleaning operations, by lifting the front panel of the cabinet.

3 ACCESSORIES

available as an option is a wired wallpad with a large display, which can be used to control and set all the functions of each individual fan coil unit in master/slave systems.
WALLPAD supplied with cable for the connection to the fan coil unit.

4 RATED TECHNICAL DATA

Model		22 / 23			32 / 33			42 / 43		
Fan speed		min	med	max	min	med	max	min	med	max
Total cooling capacity (1) (E)	kW	1,37	1,64	2,07	1,87	2,48	3,03	2,67	3,28	3,74
Sensible cooling capacity (1) (E)	kW	1,00	1,20	1,52	1,35	1,81	2,22	1,94	2,40	2,74
Water flow(1)	l/h	236	282	356	322	427	521	459	564	643
Water pressure drop (1) (E)	kPa	12	19	29	16	28	39	28	40	50
2/3-way valve pressure drop	kPa	2	3	5	5	6	11	11	17	22
Heating capacity (2) (E)	kW	1,72	2,08	2,64	2,34	3,14	3,85	3,37	4,17	4,77
Water pressure drop (2) (E)	kPa	11	15	22	14	25	35	25	36	45
2/3-way valve pressure drop	kPa	2	3	5	5	6	11	11	16	21
Air flow	m^3/h	290	370	500	370	445	645	570	740	876
Power input (E)	W	10	13	18	10	15	22	13	20	30
Sound power level (3) (E)	dB/A	35	40	48	40	43	54	46	53	58
Water content	dm3	0,43			0,86			0,86		
Water connections (female gas)	"	1/2			1/2			1/2		
Condensate drainage connection	" (mm)	5/8 (16)			5/8 (16)			5/8 (16)		
Dimensions H x L x P	mm	876/228/300			876/228/300			876/228/300		
Net weight	kg	8			9			10		

(1) Water temperature 7 / 12°C, air temperature D.B. 27°C, W.B. 19°C (47% relative humidity)
(2) Inlet water temperature 50°C, water flow rate same as in cooling mode, air temperature 20°C
(3) Sound power measured according to standards ISO 3741 and ISO 3742
(E) EUROVENT certified data
Power supply 230-1-50 or 220-1-60 (V-ph-Hz)

5 PERFORMANCES

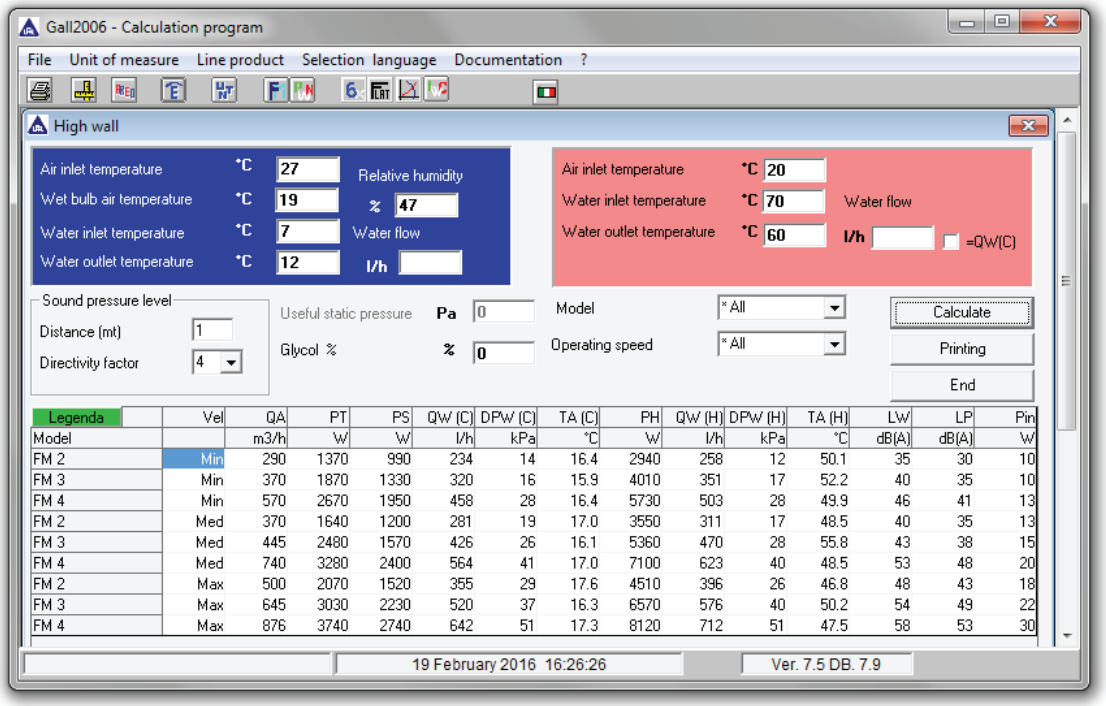
In order to define the performances of FM subject to conditions different from rated conditions, a computer program for the correct choice of the units is provided by Galletti SpA.

With a few input data it will be possible to get information on the behaviour of an FM referring to the desired operating conditions.

It will be sufficient to enter the following data:
- Dry bulb inlet air temperature
- Wet bulb inlet air temperature or alternatively the relative humidity
- Inlet water temperature
- Outlet water temperature or alternatively the water flow
- Ethylene glycol percentage (default 0)
- Fan speed
- Available static head (default 0)
- Directivity factor and distance

Output data
- Air flow rate
- Total cooling / heating capacity
- Sensible cooling capacity
- Water flow
- Pressure drop, water side
- Outlet air temperature
- Sound power level
- Sound pressure level under the specified conditions
- Power input

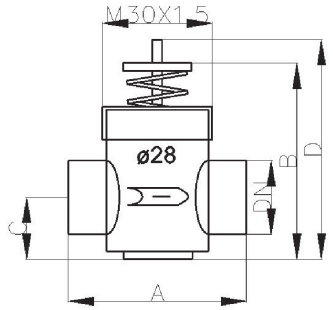
The selection report generated by the software includes the drawing with overall dimensions and description of the unit.



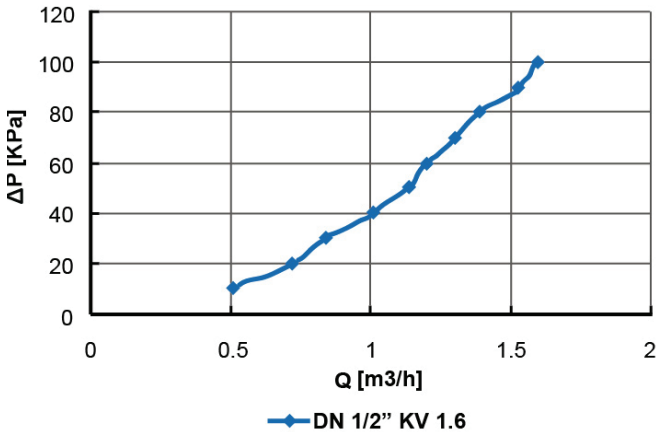
5 PERFORMANCES

5.1 VALVE INFORMATION

2 Way Valve Body

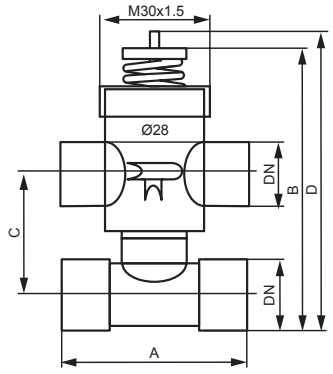


Differential pressure Chart

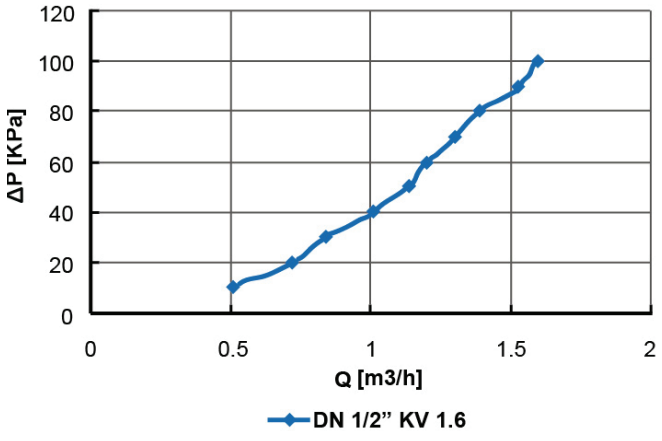


Valve Dimensions (mm)				
DN	A	B	C	D
D15 (G1/2")	52	47	19.5	63

3 Way / 4 Outlet



Differential pressure Chart



Valve Dimensions (mm)					
Valve Model	DN	A	B	C	D
DFPS-HWS-007b	D15 (G1/2")	52	70	35	86

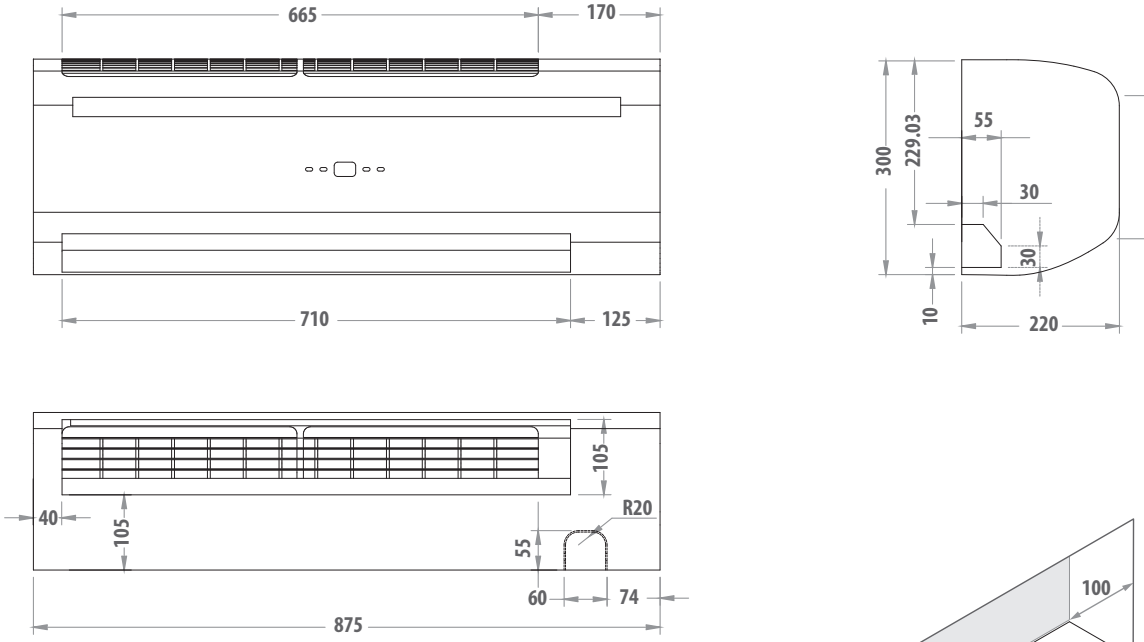
5 PERFORMANCES

5.2 SOUND LEVELS

LpA Total sound pressure level, weighted A, measured at a distance of 1 m, with a directivity factor of 2.
Lw Sound power level by octave band, not weighted
LwA Total sound power level, weighted A
Vr Fan speed

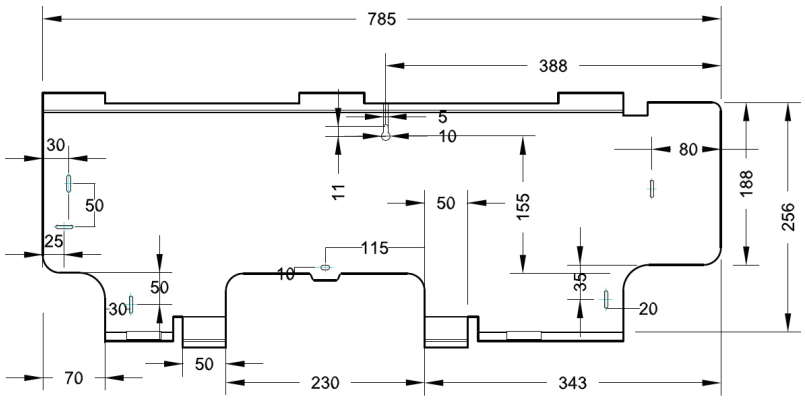
FM	Vr	Lw								
		125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	LwA	LpA
		dB	dB	dB	dB	dB	dB	dB	dB/A	dB/A
FM 22 / FM 23	1	32,5	34,8	33,9	31,0	22,6	11,8	5,7	35	30
	2	39,1	41,1	39,7	34,6	25,8	18,6	19,6	40	35
	3	49,6	50,0	47,3	41,7	35,0	30,6	32,5	48	43
FM 32 / FM 33	1	38,8	40,5	38,1	36,0	28,9	19,6	9,1	40	35
	2	41,8	44,2	42,7	37,7	28,9	20,6	19,3	43	38
	3	53,5	55,0	53,7	48,7	40,1	33,6	33,3	54	49
FM 42 / FM 43	1	43,6	44,6	42,5	43,1	36,3	26,9	15,6	46	41
	2	50,2	51,6	51,0	49,7	42,1	31,9	21,9	53	48
	3	55,9	57,3	57,0	54,2	45,4	34,7	31,5	58	53

6 OVERALL DIMENSIONS



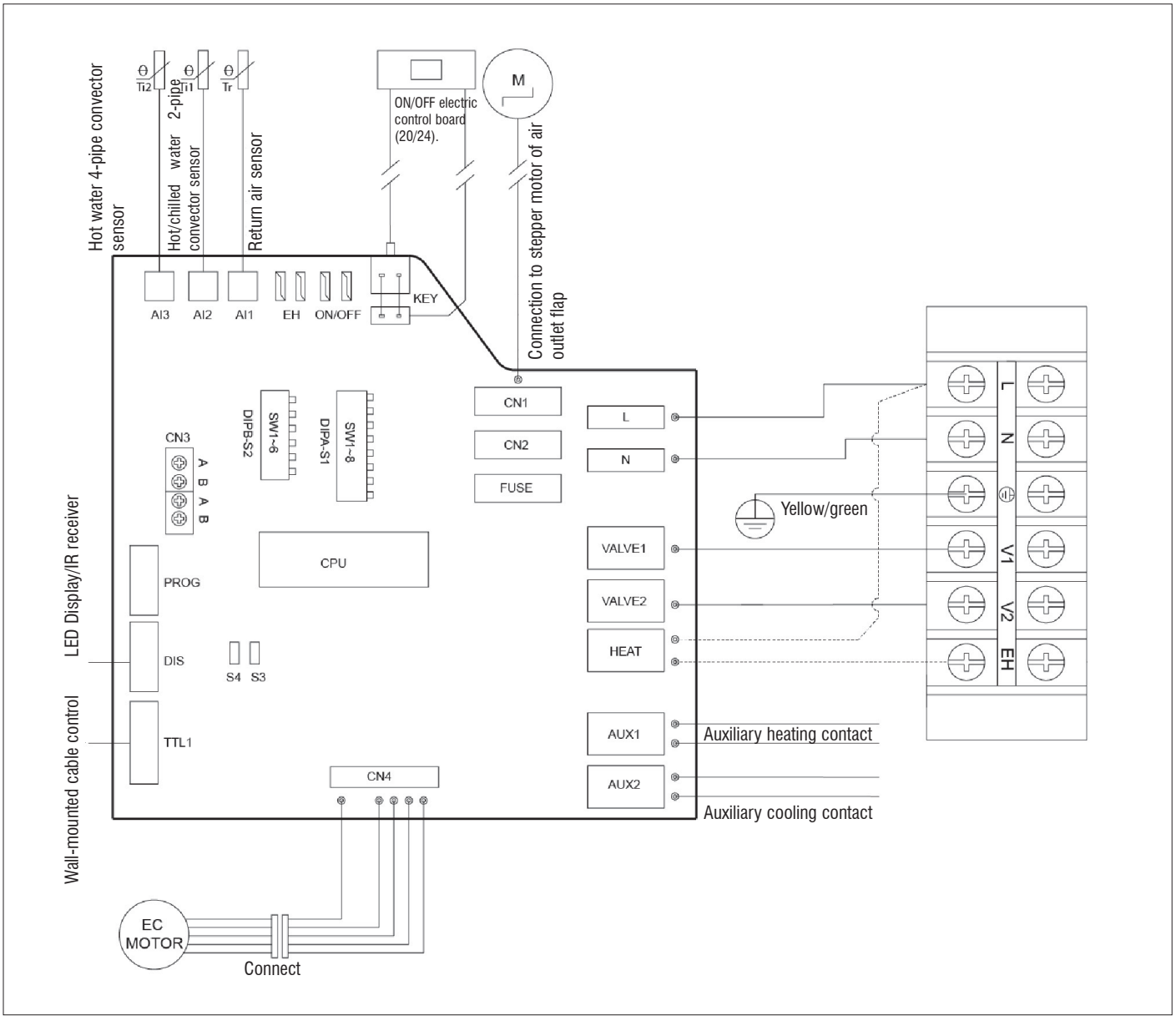
PLUMBING CONNECTIONS	
Heat exchanger water connections	1/2”
Condensate drainage	16 mm

6.1 MOUNTING PLATE DIMENSIONS



7 WIRING DIAGRAMS

Make the electrical connections with the power supply disconnected, in accordance with current safety regulations.
Check that the mains electricity supply is compatible with the voltage shown on the unit rating plate.
Each fan coil requires an individual electric socket and a switch with a suitable safety fuse.
--------- Factory wiring
- - - - - Field wiring
Each fan coil requires an omnipolar main switch classified as overvoltage category III to be mounted on the power supply line.



7 WIRING DIAGRAMS

ABBREVIATIONS
Ts = set temperature
Tr = Room temperature
Ti1 = convector chilled water temperature
Ti2 = convector hot water temperature
AUX1 = hot water free contact
AUX2 = chilled water free contact
MTV1 = cooled motor driven valve

--------- Factory wiring
- - - - - Field wiring

DIPA-S1
SW1-5: unit address setting.
SW6: unit type setting: Master or slave.

Mode Configuration:

SW7=0; SW8=0; unit working in cooling/heating mode.
SW7=1; SW8=0; unit working in cooling mode only.

DIPB-S2
SW1: Occupation contact setting
SW2: Unit configuration setting:
0= 2-pipe system
SW3: On/Off valve configuration
0=w/o valve
1=with valve
SW4: Pre-heating setting:
0=36 °C
1=28 °C
SW5, SW6, S3 (by-pass jumper): Fan speed configuration.

I/O contacts:
L/N: Power supply: 230 Vac
Valve 1: Valve output On/Off -230 Vac.
(2 pipes: cooling/heating)
Valve 2: Valve output On/Off -230 Vac.
(4 pipes: heating only)
HEATING: Electric heater input/output - 230 Vac.
AI1: Return air temperature sensor - 1 (Tr).
AI2: Internal convector temperature sensor - 1 (Ti1).
AI3: Internal convector temperature sensor - 2 (Ti2).
AUX1: No-voltage contacts; ON: unit in heating mode.
AUX2: No-voltage contacts; ON: unit in cooling mode.
ON/OFF: digital input available with external connector. Occupation contact with a delay time of 10 minutes before shut off
CN1~2: Stepper motor rate.
CN3: Serial BUS contacts.
CN4: Fan speed output - 230 Vac.
KEY: On/Off switch. The 20/24 type uses an electric control board
MTV2 = motor driven hot valve

8 MASTER / SLAVE NETWORKS

The FM fan coil units are equipped with a PCB suitable for the implementation of master/slave networks with up to 32 units.
Depending on the control panel used on the master unit it is possible to implement two different types of master/slave control.

Global control communication
Master unit with IR remote control or a wired WALLPAD.
The master unit will transmit the settings to all slave units. During normal operation the slave units can receive data from the wireless remote control or the wall-mounted control.
After receiving the global commands from the master unit, all slave unit settings will be replaced by the master settings.
In case of global control communication it is not possible to set different settings on slave units, which will all work in the same manner.

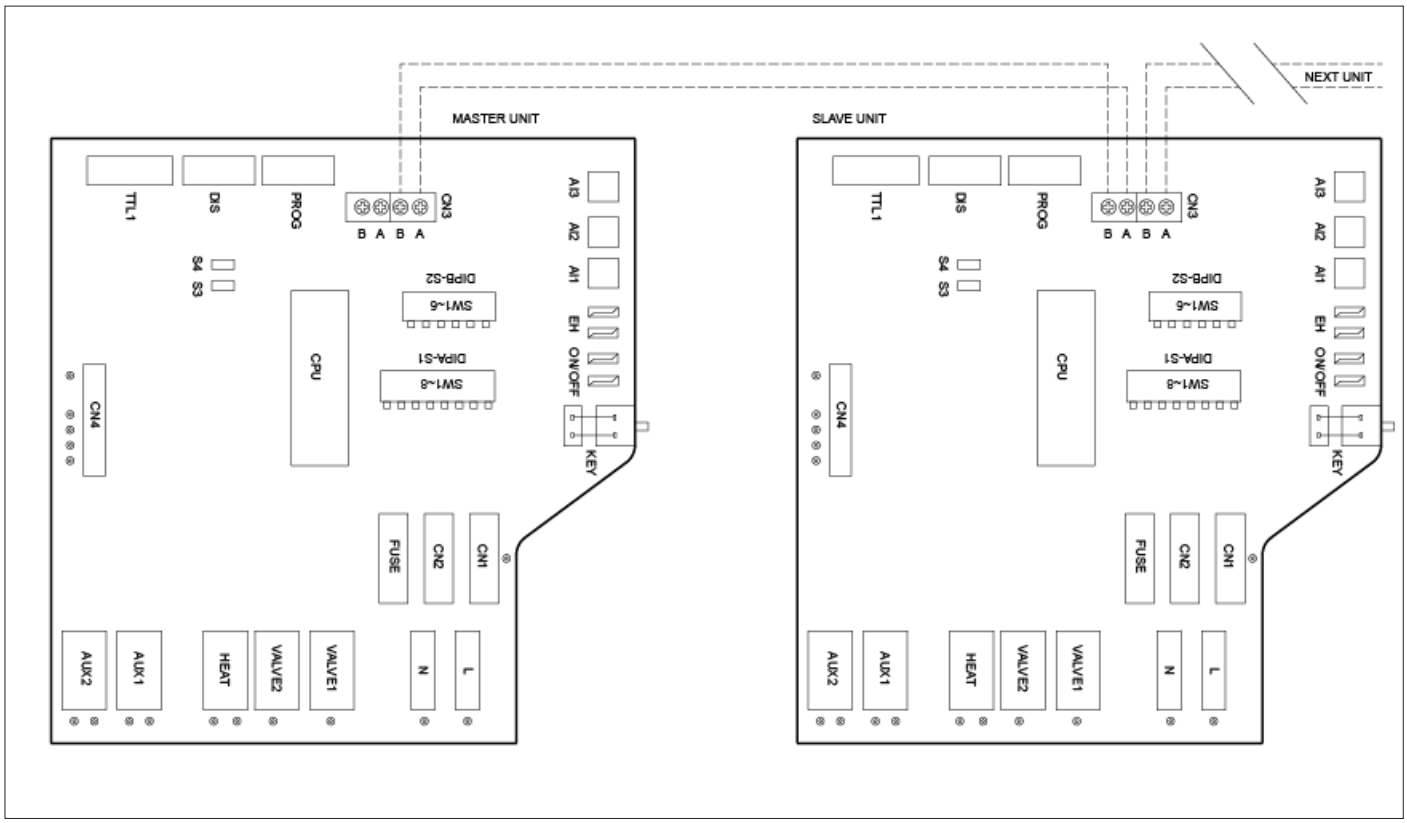
Addressable communications
The master controller must be a wired wallpad.
The slave unit parameters are set as usual. After receiving the control commands from the master unit, the addressed slave unit settings will be replaced by the master settings
In that case using the WALLPAD it is possible to send customized instructions to each of the units connected to the network.

Master unit function
The master unit sends the data referring to its settings to the slave unit.
The settings of the Master unit are: Unit On / Off, Mode, Fan Speed, Timer, Clock, Temperature selection, sweep function and sleep function for use from remote control.
The settings of the Master unit are: Unit On / Off, Mode, Fan Speed, Timer, Clock, Temperature selection, sweep function and sleep function for use from wall-mounted control.

8 MASTER / SLAVE NETWORKS

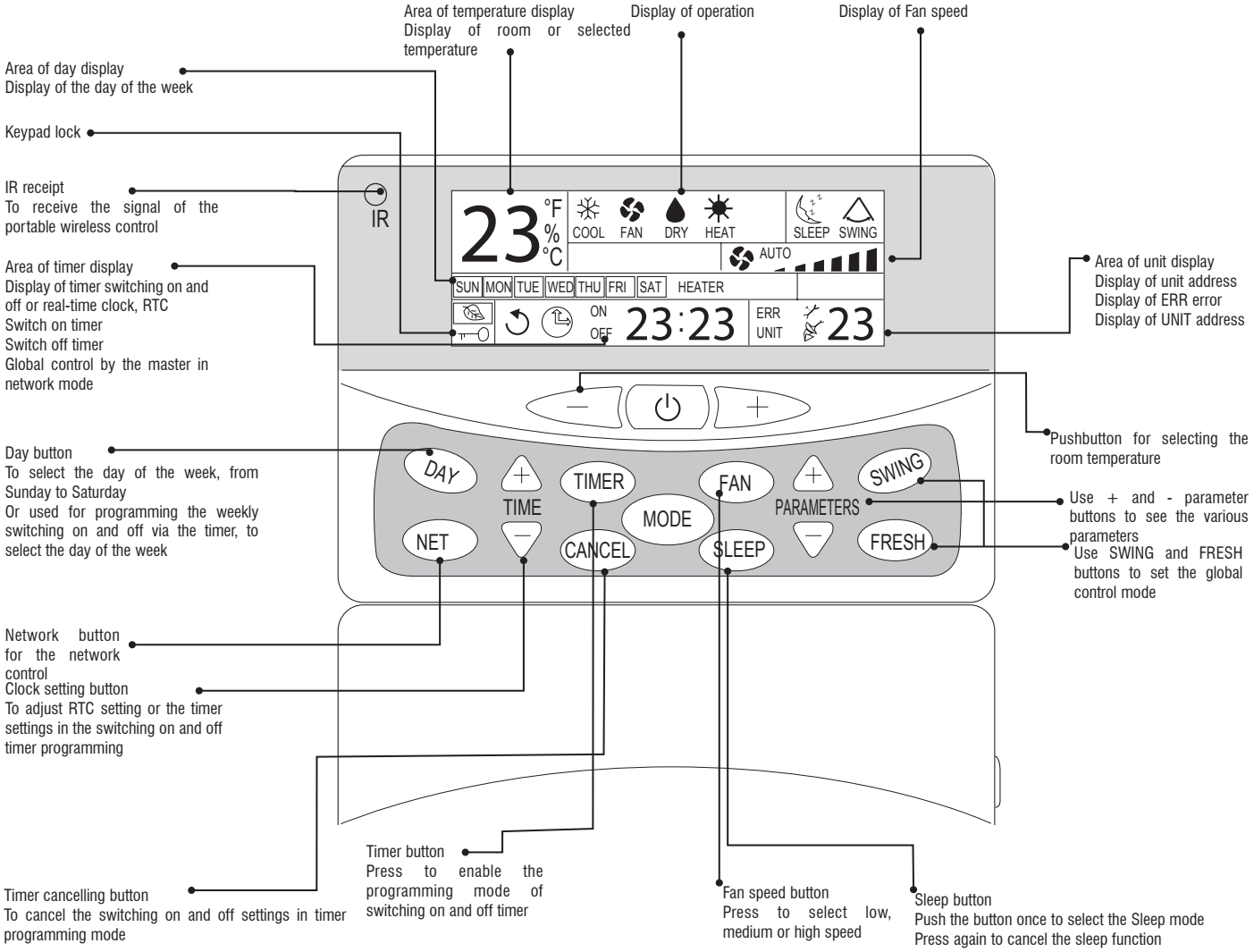
Slave unit function

The slave unit receives data referring to its settings from the master unit.
The slave unit can be set locally on a desired setting by means of the local controller, provided there are no subsequent changes to the settings of the master unit.
The slave units can be set individually for switching on and off via the timer using the remote control or the wall-mounted control. The remote control cannot change the clock and timer settings set via the wall-mounted control.



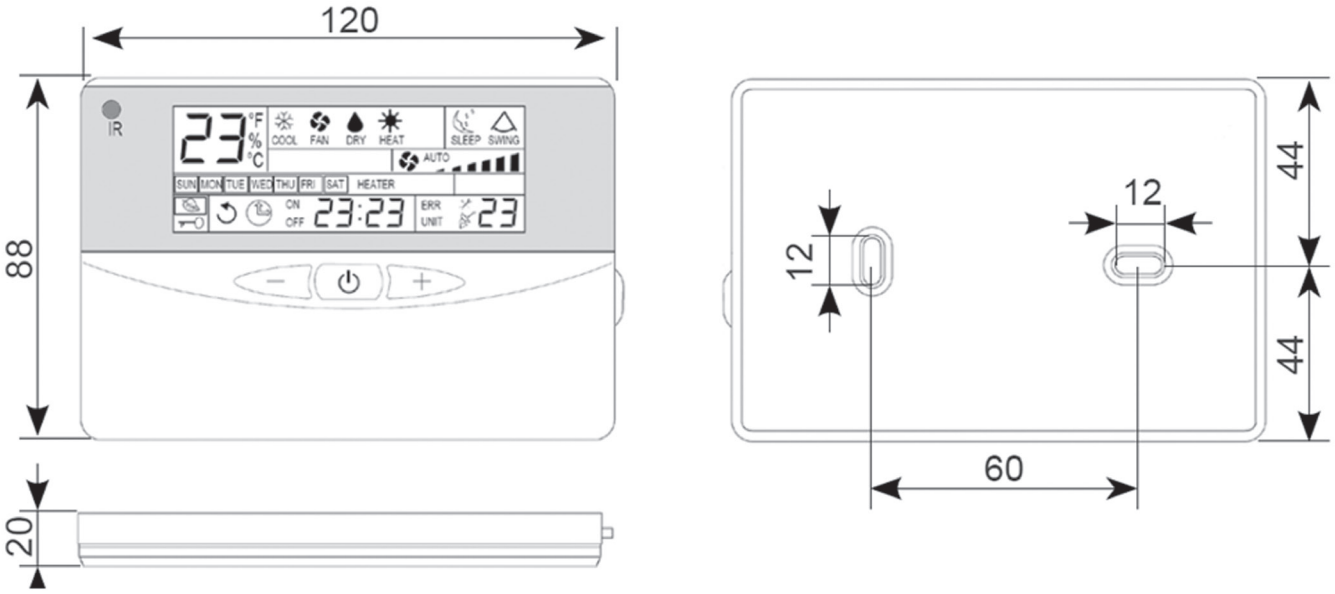
9 WALLPAD

Wall-mounted cable control equipped with a large display to show all the functions and to control each fan coil unit of a master/slave system.
WALLPAD is supplied with cable for the connection to the fan coil unit.



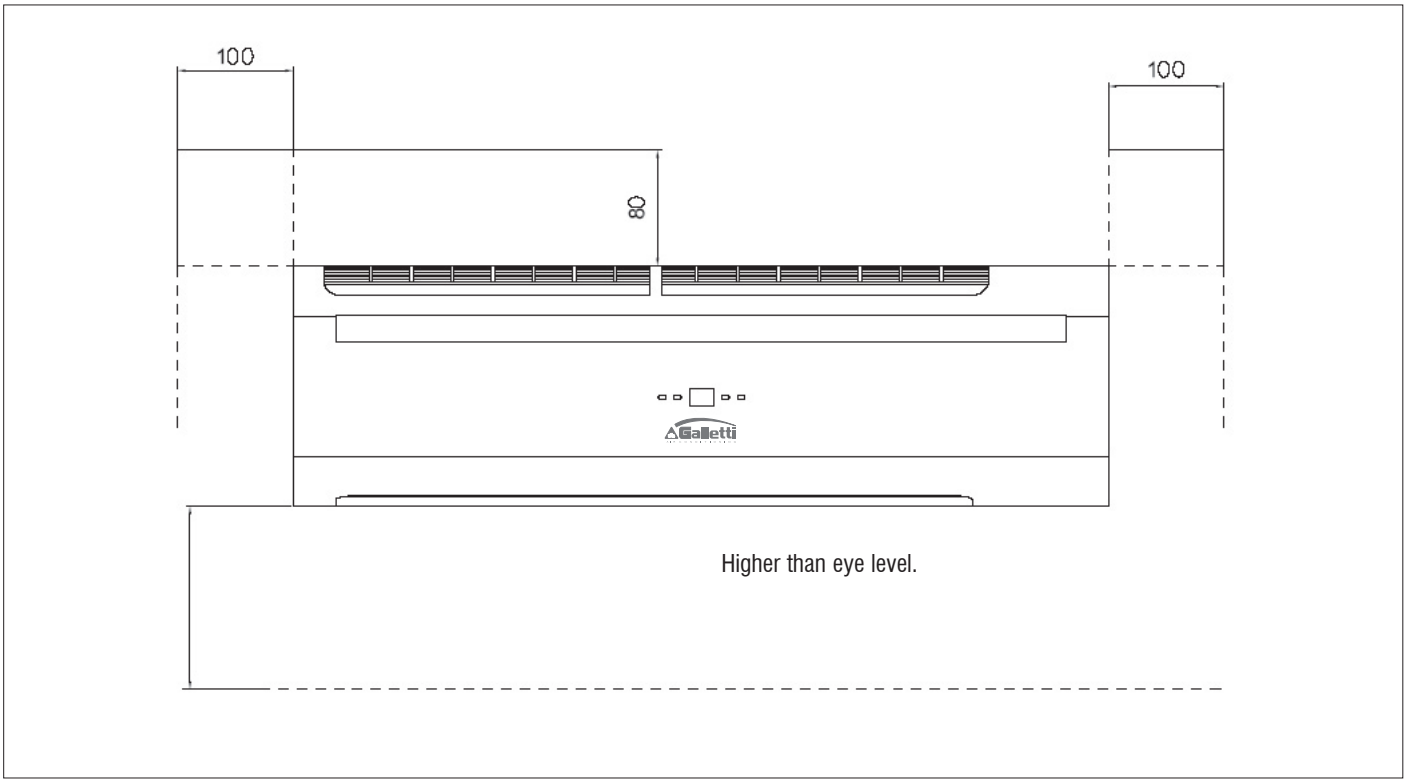
9 WALLPAD

THE OVERALL DIMENSIONS ARE SHOWN BELOW



10 INSTALLATION REQUIREMENTS

Select the position of the high wall-mounted unit based on the following considerations:
The air inlet and outlet front part must be free of obstructions. The air should flow freely.
The wall the unit is mounted on must be sufficiently rigid so as not to resonate and produce noise.
The position should permit easy access for installing the connecting water pipes and in a convenient place for drainage.
Make sure that the opening on both sides of the fan coil unit is as shown in the following drawing.
The position above the floor should be higher than eye level.
Avoid positions directly exposed to sunlight.

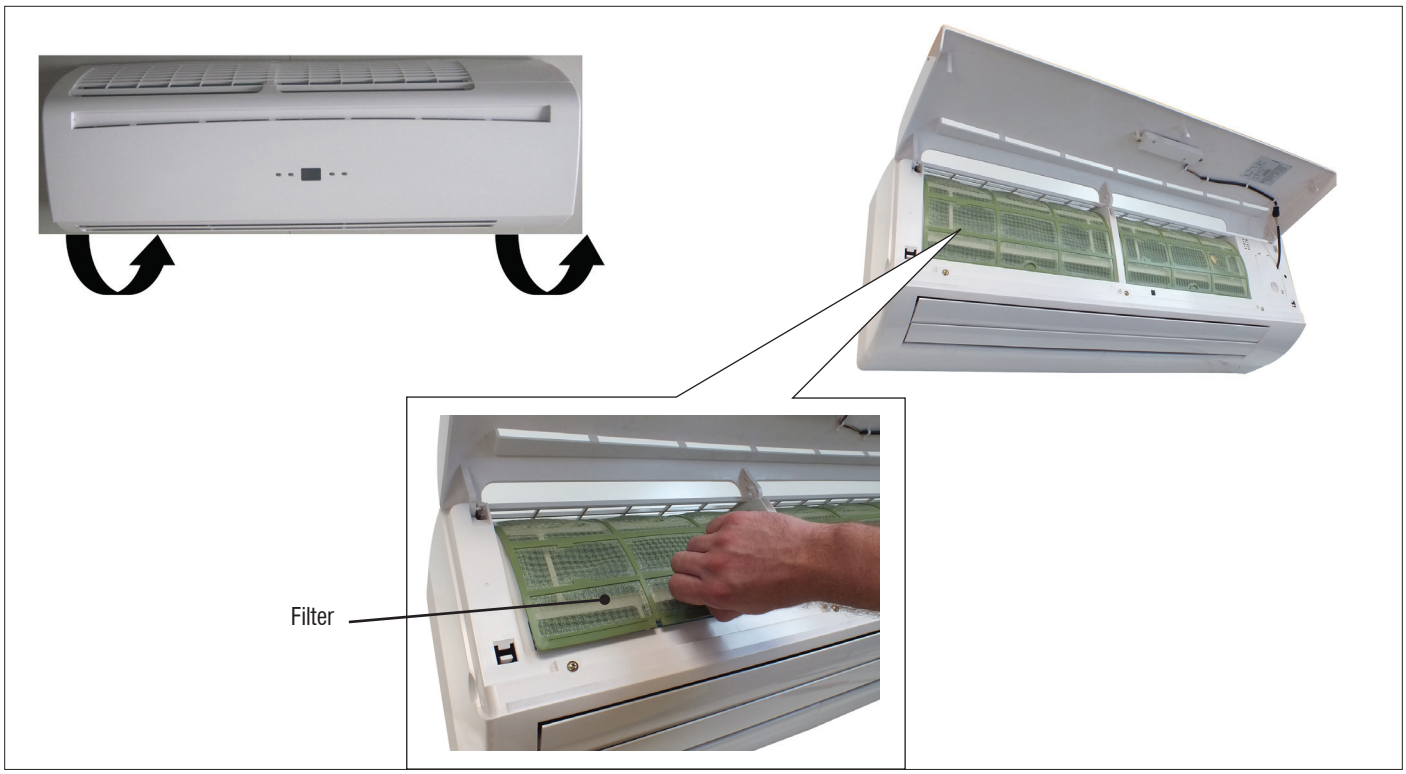


10 INSTALLATION REQUIREMENTS

Clearance for maintenance and repairing is shown above
** All dimensions are in mm.
The signal receiver on the unit must be kept as far away as possible from any source of high frequency emissions.
Keep the unit away from fluorescent lamps which can affect the control system.
To avoid electric or magnetic interference of the control system, make sure that the control cables are installed separately from 220-240 Vac electric cables.
Where electromagnetic waves are present, use shielded cables for the sensors.
Install a filter if harmful interferences are present in the power supply.

11 ROUTINE MAINTENANCE

The material must undergo maintenance in order to retain its characteristics over time. Lack of maintenance may have the effect of voiding the product warranty.
We recommend cleaning it once a month, but the frequency depends on operating conditions.
To remove the filter Open the grill by lifting it from the lower position indicated by the arrow.
Remove the filter from the grille.
Use a vacuum cleaner to remove dust. If dust is glued to the filter, remove it with clean or soapy water, rinse the filter with clean water and dry it.
Put the filter back into its housing in the grill.
Close the liftable grill by pressing both sides down, into the position indicated by the arrow.



12 MODBUS

The protocol implemented on the fan coil is Modbus RTU (9600,N,8,1) on RS485.

IMPLEMENTED FUNCTIONS

Function Code	Function Description
01(01H)	Read Coils Status
02(02H)	Read Input Status
03(03H)	Read Holding Registers
04(04H)	Read Input Registers
05(05H)	Write Single Coil
06(06H)	Write Single Register
15(0FH)	Write Multiple Coils
16(10H)	Write Multiple Registers
255(FFH)	Extended Commands which is used to test

IMPLEMENTED EXCEPTIONS

Error code	Description	Definition
01 (01H)	Invalid commands	Received commands beyond valid commands
02 (02H)	Invalid data address	Data addresses beyond valid data address
03 (03H)	Invalid data	Data beyond definition range
04 (04H)	Write data not succeed	Write data not succeed

INPUT COILS

Description	Address	Type
Unit ON/OFF	100000	R/W
Sleep mode	100001	R/W
Louver swing	100002	R/W

STATUS COILS

Description	Address	Type	Remark
MTV1	200000	R	
MTV2	200001	R	
AUX1	200002	R	
AUX2	200003	R	
Condensate pump	200004	R	
Electrical Heater	200005	R	
Wired wall pad	200006	R	
PRO	200007	R	
Float switch	200008	R	
Reserved	200009	R	
EH protection switch	2000010	R	
Internal actually running and unit ON/OFF	2000011	R	Testing purpose only.

12 MODBUS

HOLDING REGISTERS

Description	Address	Type	Remark
Mode setting	300000	R/W	Cooling mode= 01(H) Humidify mode= 02(H) Fan mode= 04(H) Heating mode= 08(H) Auto mode= 10(H)
Fan speed setting	300001	R/W	Low speed= 04(H) Medium speed= 02(H) High speed= 01(H) Auto fan speed= 07(H)
Louver swing setting	300002	R/W	Position 1= 01(H) Position 2= 02(H) Position 3= 03(H) Position 4= 04(H) Auto= 0F(H) Stop= 00(H)
Setting temperature	300003	R/W	16~30 degree C (actual*10 format)
Address setting	300004	R	Set by dip-switch, reading only
Reset	300005	W	= 0x33 reset error
Week	300006	W	Calibration wired wall pad and set timer function
Hour	300007	W	Calibration wired wall pad and set timer function
Minute	300008	W	Calibration wired wall pad and set timer function
Second	300009	W	Calibration wired wall pad and set timer function
Hours in Timer on	300010	R/W	Timer ON
Minute in Timer on	300011	R/W	Timer ON
Hours in Timer on	300012	R/W	Timer OFF
Minute in Timer on	300013	R/W	Timer OFF
Icon of Timer ON or OFF	300014	R/W	BIT0= Icon of Timer ON BIT1= Icon of Timer OFF 1= enable 0= disable
Super low speed rpm	310000	R/W	200~1500
Low speed rpm	310001	R/W	200~1500
Medium speed rpm	310002	R/W	200~1500
High speed rpm	310003	R/W	200~1500
RPM setting	310004	R/W	200~2000 (used to test, 0=disable)
Temperature sampling time	310005	R/W	2~100, default:5S
Factor of auto fan speed	310006	R/W	2~150, default:20
Factor of modulating valve	310007	R/W	2~250, default:150

12 MODBUS

INPUT REGISTERS

Description	Address	Type	Remark
Dip switch 1 status	400000	R	
Dip switch 2 status	400001	R	
Room temperature sensor	400002	R	
Ti1 temperature sensor	400003	R	
Ti2 temperature sensor	400004	R	
Error code	400005	R	Bit0= Room temperature sensor error Bit1= Ti1 temperature sensor error Bit2= Ti2 temperature sensor error Bit3= Float switch error Bit4= Indoor coil low temperature protection Bit5= Indoor coil over heat protection Bit6= Reserved Bit7= Electrical heater failure Bit8= Motor1 error Bit9= Motor2 error Bit10= System parameters error Bit11= Reserved Bit12= Reserved Bit13= Reserved Bit14= Reserved Bit15= Reserved
Fan speed status	400006	R	Low=04(H) Medium= 02(H) High= 01(H)
Mode status	400007	R	Cooling mode= 01(H) Dehumidify mode= 02(H) Fan mode= 04(H) Heating= 08(H)
Setting temperature status	400008	R	Testing only
Room temperature in wall pad status	400009	R	
Room temperature in main PCB status	400010	R	
Unit type	400011	R	4-pipe= 03, 2-pipe= 02 This setting is configured by dip switch
EC motor 1#RPM	400012	R	
EC motor 2#RPM	400013	R	

Galletti
AIR CONDITIONING

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