

## AIR-COOLED CONDENSING UNITS WITH AXIAL FAN AND VERTICAL DISCHARGE



Split-system  
R-410A refrigerant  
Outdoor unit with axial fan  
Configuration flexibility

# 38ZS/ZF

Cooling capacity 21-138 kW  
Heating capacity 23-148 kW

The **38ZS/ZF** range are air-cooled condensing units designed for installation outdoors. They can be connected on-site with one direct expansion exchanger (or two in case of models 200 to 360).

Two options are available:

- **38ZS series: non reversible** units.
- **38ZF series: reversible** units.

They are equipped axial fan(s) with free vertical discharge, hermetic scroll-type compressor(s) and electric panel with electronic control with optimized components for the refrigerant R-410A

A vast number of options meet numerous operating demands.

All of the units are tested and checked in the factory

### Range

- 1 cooling circuit, 1 compressor:
  - Models: 90 / 100 / 120 / 160 / 180 / 182
- 2 cooling circuits, 2 compressors:
  - Models: 200 / 240 / 320 / 360 / 420 / 485 / 540 / 600

## OPERATING LIMITS

Inlet air conditions		Cooling	Heating
Refrigerant ①	Minimum	-6 °C	40 °C
	Maximum	10 °C	52 °C
Inlet air	Minimum	12 °C ②	-10 °C WB
	Maximum	48 °C	15 °C WB

① For connection with a direct expansion exchanger.

② With control of operation condensation pressure activated up to -10°C.

## UNIT COMPONENTS

- Casing made of galvanised steel metal with polyester paint, grey graphite colour RAL 7024 and white RAL 7035. Self-supporting frame.

### Air circuit

- Axial 2-speed fan(s) directly coupled to the motor (models 90 to 182 wired to high speed). Watertight motor class F, IP54 and internal thermal protection. Dynamically balanced propellers and outdoor protective grille.
- Coil(s) with copper pipes and aluminium fins. Two designs:
  - Models 90 to 320: Coil in U
  - Models 360 to 600: Coils in V
- Condensates drain pan (in models 360 to 600).

### Cooling circuit

- Hermetic scroll-type compressor(s) with sound insulation, assembled over shock absorbers. Control of phase equilibrium and the direction of rotation.
- Crankcase heater.
- Thermostatic expansion valve(s) with external equalisation (heat pump units).
- Four-way cycle reversing valve(s) (heat pump units).
- Particle separator(s), anti-acid dehydrating filter(s) and liquid receiver(s).
- Cooling connections for welding.
- Maximum equivalent length of the cooling line 50 metres (for longer distances, it is necessary to use an oil separator).

### Protections

- High and low pressure pressostats.
- Compressor discharge temperature control.
- Non-return valve built into the compressor.
- Main door switch.
- Magnetothermic protection switches for the compressor(s) and fan(s) motor power line.
- Automatic switch in the control circuit.

### Electric panel

- Complete and fully wired electrical panel. Insulated panel cover to prevent condensation. Protection IP55.
- Transformer for power supply without neutral included in the electrical panel.
- Main ground connection.
- Compressor(s) and fan(s) motor contacts.

## COMPLIANCE

- Machinery Directive 2006/42/CE (MD)
- Electromagnetic Compatibility Directive 2014/30/EU (EMC)
- Low Voltage Directive 2014/35/EU (LVD)
- Pressure Equipment Directive 2014/68/EU (Category 2) (PED)
- RoHS Directive 2011/65/EU (RoHS)
- Harmonised Standard: EN 378-2:2012 (Refrigerating systems and heat pumps - Safety and environmental requirements).

## Optional

### Outdoor environment

#### Temperature

- Electrical heater for protection of the components of the electric panel. This is compulsory if the outdoor temperature is lower than -8°C WB. With an outdoor temperature over than -16°C WB will be compulsory a reinforced resistance.
- Compressor with protection for low temperature (supplementary crankcase heater). This is compulsory if the outdoor temperature is lower than -8°C WB.

#### Corrosion

- Coil with copper pipes and copper fins.
- INERA® coil with copper pipes and fins of an aluminium alloy, of high performance and great resistance to the corrosion.
- Coil with copper pipes and aluminium fins with polyurethane and Blygold® coating.

#### Humidity

- Tropicalised electric panel.
- Tropicalised motors and fans (please consult).

### Installation

- Antivibration mounts made of rubber.
- Service valves and refrigerant load for cooling connections (up to 7,5 meters long).
- Oil separator for cooling connections with maximum equivalent length of the cooling line greater than 50 metres.
- Air coil protection grille (in models 90 to 320).
- Condensates drain pan (in models 90 to 320).

### Electric panel

- Electrical power supply with neutral.
- Energy meter for monitoring of the power consumption of the installation (with CIATrC control).
  - Models 90 to 182: available if the unit does not incorporate electrical heaters.
  - Models 200 to 600: available with all optional.

### Energy saving

- Electronic EC axial fans that adjust their rotation speed to the installation requirements, thereby reducing electricity consumption, the sound level at partial charge and improving the average seasonal output of the unit.

## ELECTRONIC CONTROLS

### CARRIERrtc basic & medium (standard)

Available in two versions:

■ **CARRIERrtc basic:** models 90 to 182

■ **CARRIERrtc medium:** models 200 to 600

*Note: Optionally, the models 90 to 182 can incorporate the CARRIERrtc medium version.*

CARRIERrtc basic & medium control is an electronic module with microprocessor comprised of a control board and a TCO user terminal that ensures the following functions:

■ Selection of the operating mode:

- HEATING 
- COOLING 
- AUTO *Auto*
- DESHUMIDIFICATION 
- FAN (no icon).



- Modification of the set-point.
- Permanent control of the operating parameters.
- View of the values measured by the sensors.
- View of the alarms produced by means of codes.
- Timing of the compressors.
- Control of the compressor discharge temperature by probe.
- Control of the ambient temperature thanks to the probe incorporated into TCO terminal. This probe can be replaced by an return or ambient probe that would be installed in the control board.
- Operation during all seasons via the condensation and evaporation pressure control.
- Control of the outlet temperature to improve thermal **comfort level** of the installation.
  - In cooling mode this control prevents excessively significant drops in the ambient temperature.
  - In heating mode, it prevent the stratification of the hot air masses.
- The following features improve the energy management of the installation:



Defrosting management (in heat pump units). Possibility of **intelligent defrosting** that reduces energy consumption of the heat pump, by adjusting the time between defrosting operations to the actual needs of the unit.



**Compensation of the set-point** based on the outdoor temperature. This function prevents thermal "shock" between the inside and outside of the premises whilst at the same time provides significant energy savings



**Time schedule** that reduces energy consumption, adjusting the needs of air conditioning of the building TCO terminal has a schedule programmer with an intuitive graphic interface that allows 6 time slots to be chosen for each day of the week. A change in the set-point temperature or the disconnection of the unit can be scheduled in these time slots (according to the building occupancy).



### Optional functions:

If the indoor unit connected to the 38ZS/ZF unit has these options:

- Control of the auxiliary electrical heaters.
- Proportional control of a hot water auxiliary coil.
- Humidity control.
- Anti-fire safety.
- Control of the opening of the outdoor air damper.
- Management of thermal free-cooling.
- Detection of clogged filters and air flow control.
- Connection to a centralised technical management system (BMS) for supervision (please see "Optional" chapter).

### pGD1 Terminal (optional):

Optionally, this control can have a terminal for pGD1 maintenance that facilitates the initial scheduling of the unit, the modification of the operating parameters and the description of the alarms produced.



### CARRIERrtc electronic control (optional)

Electronic module with microprocessor comprised of a control board and a pGD1 graphic terminal installed over the unit electric panel and accessed using a polycarbonate collapsible window.

Optionally this terminal can be replaced by a TCO user terminal for installation inside of the premises. In this case the TCO terminal are not allowed to access parameters control and time schedule

The management of the ambient temperature is controlled via a NTC ambient probe. This probe can be replaced by 1 or 2 RS485 probes.



In addition to the functions described in CARRIERrtc basic & medium control, depending on the indoor unit connected to the 38ZS/ZF unit, this control allows controlling optional elements such as:

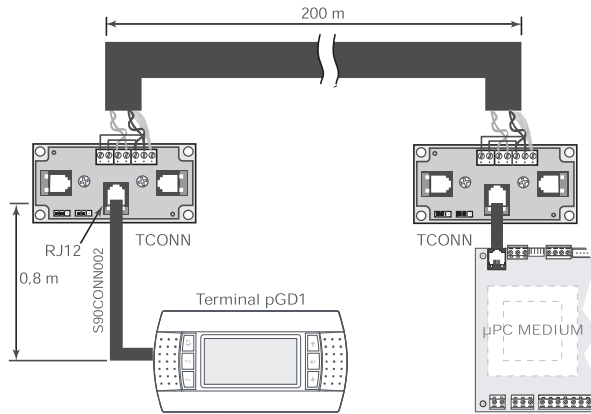
- Electronic plug-fans.
- Enthalpic or thermoenthalpic free-cooling.
- Smoke detecting station.
- Air quality probe for measuring CO<sub>2</sub> and/or volatile compounds..
- Energy meter.
- Refrigerant leak detector.

It also manages a local connection between units through a pLAN network (Local Area Network), thus allowing communication of data and information for a maximum of 15 units. This enables the reduction of the number of pGD1 terminals, since a single shared terminal can monitor all control boards. It also allows to share the reading of some probes.

## Optional for electronic controls

### CARRIERrtc basic & medium control (standard)

- pGD1 terminal for maintenance of the unit.
- Kit remote control to 200 meters with pGD1 (pGD1 terminal + 2 TCONN bypass cards).



- Return or ambient temperature probe connected to the board that replaces the ambient probe of the thermostat TCO. Return probe is required for anti-fire safety.
- Mixing temperature probe: compulsory to manage the free-cooling.

### CARRIERrtc control (optional)

- TCO user terminal, instead of pGD1 terminal.
- Control without pGD1 terminal (for units with shared terminal).
- Kit remote control to 200 meters with pGD1 terminal (pGD1 terminal + 2 TCONN bypass cards).
- Ambient temperature probe with RS485 communication. By default the control incorporates a NTC probe.  
Note: An ambient probe with RS485 communication is required for installation to more than 30 m.
- Double ambient temperature probe with RS485 communication.
- Ambient T+RH probe with RS485 (compulsory in units with enthalpic or thermoenthalpic free-cooling as optional). In this case also added outdoor air humidity probe.
- Air quality probe for installation in the environment or in duct to enable measuring CO<sub>2</sub> and/or volatile compounds.

### Communication

CARRIERrtc basic & medium controls allow the connection to a centralised technical management system by using a specific BMS card for some of the following communication protocols:

- RS485 serial cards for network communication with protocols: Carel, Modbus, LonWorks®, BACnet™ MSTP, Konnex.
- Ethernet pCO Web card for network communication with protocols: Modbus TCP/IP, BACnet™ Ethernet, TCP/IP, SNMP V1-2-3, FTP and HTTP.

### Supervision solutions

Different solutions of supervision are available according to the dimensions of the installation.

#### ■ pCO Web

It is the solution for the management and supervision of a single unit if it incorporates the Ethernet pCO Web card.

#### ■ PlantWatchPRO3

It is a solution designed for the monitoring of installations of medium - small dimensions, with ability to manage up to 30 units. Suitable for technical environments, it has no parts in movement. It's available in two versions: panel and wall. Includes: 7 " touch display, buzzer for notifications, 1 USB port and 1 SD card slot for downloading reports, charge devices models and applying service packs.

In this case, each unit needs one RS485 Carel / Modbus board.

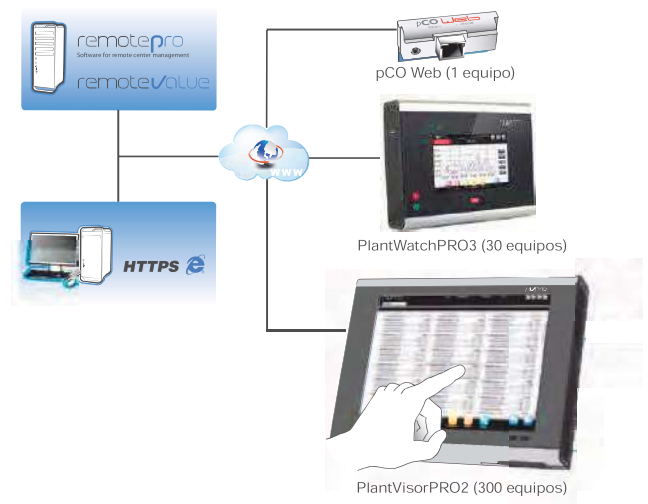
#### ■ PlantVisorPRO2

This is the solution for the management and supervision of air-conditioning installations with up to 300 units. It performs advanced monitoring and maintenance functions and enables creating areas and groups which simplify the management of the installation. It also allows the integration of energy meters for monitoring the power consumption of the installation.

PlantVisorPRO2 is available in two versions:

- **Box:** comprised of the CPU unit and, optionally, by monitor and keyboard.
- **Touch:** this includes the CPU and the touchscreen in the one device.

In this case, each unit needs one RS485 Carel / Modbus board



These systems allow the installation in remote management. Through a single connection to the Internet is accessed the information system. The Web interface, which is available for the local user, allows the monitoring and the complete configuration of the installation: from the office or any other user's current location.

For remote control of multiple sites, there are dedicated tools for centralized management as **RemotePRO** and **RemoteValue**.

## TECHNICAL CHARACTERISTICS

38ZS/ZF		90	100	120	160	180	182	200	
Cooling capacities	Cooling capacity ① (kW)	20,8	24,4	28,5	36,2	39,2	42,5	50,4	
	Power input ③ (kW)	6,3	7,7	8,3	11,8	14,2	11,8	14,7	
	EER performance	3,31	3,15	3,44	3,06	2,76	3,62	3,42	
Heating capacities	Heating capacity ② (kW)	22,6	26,6	31,0	39,2	43,1	46,6	58,1	
	Power input ③ (kW)	6,4	7,1	8,4	10,1	12,4	11,6	14,7	
	COP performance	3,55	3,76	3,68	3,87	3,48	4,01	3,94	
Outdoor circuit axial fan	Nominal air flow (m³/h)	10.000		14.200			20.000		
	Available static pressure (mm.w.c)	--							
	Number	1							
	Diameter (mm)	630			800				
	Output (kW)	0,7 / 0,4		0,8 / 0,5			2,0 / 1,3		
	Speed (r.p.m.)	875 / 650		680 / 540			895 / 705		
Compressor	Type	Scroll							
	No. compressors / No. circuits / No. stages	1 / 1 / 1						2 / 2 / 2	
	Oil type	Copeland 3MAF 32 cST, Danfoss POE 160 SZ, ICI Emkarate RL32 CF, Mobil EAL Artic 22 CC							
	Volume of oil (l)	3,0	3,3	3,3	3,3	6,2	6,2	2 x 3,3	
Cooling connections	Circuit 1: Liquid line	1/2"	1/2"	5/8"	5/8"	5/8"	5/8"	1/2"	
	Circuit 1: Gas line	7/8"	1 1/8"	1 1/8"	1 1/8"	1 1/8"	1 1/8"	1 1/8"	
	Circuit 2: Liquid line	--	--	--	--	--	--	1/2"	
	Circuit 2: Gas line	--	--	--	--	--	--	1 1/8"	
Refrigerant	Type	R-410A							
	Global warming potential (GWP) ④	2.088							
	Load up to 7,5 m (kg)	6,3	6,4	8,6	8,2	9,2	12,8	17,3	
	Environment impact (tCO <sub>2</sub> e)	13,2	13,4	18,0	17,1	19,2	26,7	36,1	
Electrical features	Mains voltage	400 V / III ph / 50 Hz (±10%)							
	Power supply	3 Wires + Ground							
Maximum absorbed current	Compressor(s) (A)	15,3	18,5	20,1	25,1	29,1	29,1	37,0	
	Fan (A)	1,3	1,3	2,2	2,2	2,2	4,3	4,3	
	Control (A)	0,9	0,9	0,9	0,9	0,9	0,9	1,8	
	Total (A)	17,5	20,7	23,2	28,2	32,2	34,3	43,1	
Dimensions	Length (mm)	1.511		1.511				1.811	
	Width (mm)	1.066		1.066				1.066	
	Height (mm)	1.088		1.413				1.763	
Weight	(kg)	275	281	317	326	368	388	490	

① Rated conditions: evaporation temperature = 5°C, outdoor air temperature = 35°C, overheating = 5°C

② Rated conditions: condensing temperature = 49°C, outdoor air temperature = 7°C, overheating = 0°C

③ Total power input by compressors and motorised fans under those conditions.

④ Climatic warming potential of a kilogram of fluorinated greenhouse gas in relation to a kilogram of carbon dioxide over a period of 100 years.

## TECHNICAL CHARACTERISTICS

38ZS/ZF		240	320	360	420	485	540	600
Cooling capacities	Cooling capacity ① (kW)	55,5	70,0	86,4	103,6	115,5	124,6	138,4
	Power input ③ (kW)	16,8	24,8	24,4	28,0	32,9	39,1	44,9
	EER performance	3,31	2,82	3,55	3,70	3,51	3,19	3,08
Heating capacities	Heating capacity ② (kW)	64,9	81,8	94,2	108,9	123,5	134,3	148,2
	Power input ③ (kW)	15,6	20,9	23,0	28,8	30,9	36,8	38,8
	COP performance	4,15	3,91	4,10	3,79	4,00	3,65	3,82
Outdoor circuit axial fan	Nominal air flow (m³/h)	20.000		39.000		37.000		
	Available static pressure (mm.w.c)	--						
	Number	1		2				
	Diameter (mm)	800						
	Output (kW)	2,0 / 1,3						
	Speed (r.p.m.)	895 / 705						
Compressor	Type	Scroll						
	No. compressors / No. circuits / No. stages	2 / 2 / 2						
	Oil type	Copeland 3MAF 32 cST, Danfoss POE 160 SZ, ICI Emkarate RL32 CF, Mobil EAL Artic 22 CC						
	Volume of oil (l)	2 x 3,3	2 x 3,3	2 x 6,2	2 x 6,2	2 x 6,2	2 x 6,2	2 x 6,2
Cooling connections	Circuit 1: Liquid line	5/8"	5/8"	5/8"	5/8"	5/8"	7/8"	7/8"
	Circuit 1: Gas line	1 1/8"	1 1/8"	1 1/8"	1 1/8"	1 1/8"	1 1/8"	1 1/8"
	Circuit 2: Liquid line	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	7/8"
	Circuit 2: Gas line	1 1/8"	1 1/8"	1 1/8"	1 1/8"	1 1/8"	1 1/8"	1 1/8"
Refrigerant	Type	R-410A						
	Global warming potential (GWP) ④	1.720						
	Load up to 7,5 m (kg)	17,4	22,2	22,7	31,4	31,4	33,4	33,6
	Environment impact (tCO2 e)	36,3	46,4	47,4	65,6	65,6	69,7	70,2
Electrical features	Mains voltage	400 V / III ph / 50 Hz (±10%)						
	Power supply	3 Wires + Ground						
Maximum absorbed current	Compressor(s) (A)	40,2	50,2	58,2	68,9	79,6	91,1	102,6
	Fan (A)	4,3	4,3	8,6	8,6	8,6	8,6	8,6
	Control (A)	1,8	1,8	1,8	1,8	1,8	1,8	1,8
	Total (A)	46,3	56,3	68,6	79,3	90,0	101,5	113,0
Dimensions	Length (mm)	1.811	1.811	2.201				
	Width (mm)	1.066	1.066	2.069				
	Height (mm)	1.763	2.063	1.966				
Weight	(kg)	492	544	974	1.024	1.029	1.078	1.127

① Rated conditions: evaporation temperature = 5°C, outdoor air temperature = 35°C, overheating = 5°C

② Rated conditions: condensing temperature = 49°C, outdoor air temperature = 7°C, overheating = 0°C

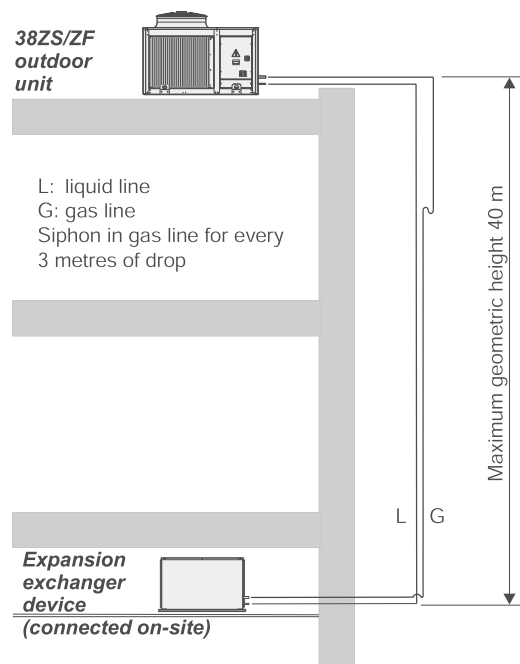
③ Total power input by compressors and motorised fans under those conditions.

④ Climatic warming potential of a kilogram of fluorinated greenhouse gas in relation to a kilogram of carbon dioxide over a period of 100 years.

## RECOMMENDATIONS FOR THE COOLING CONNECTION

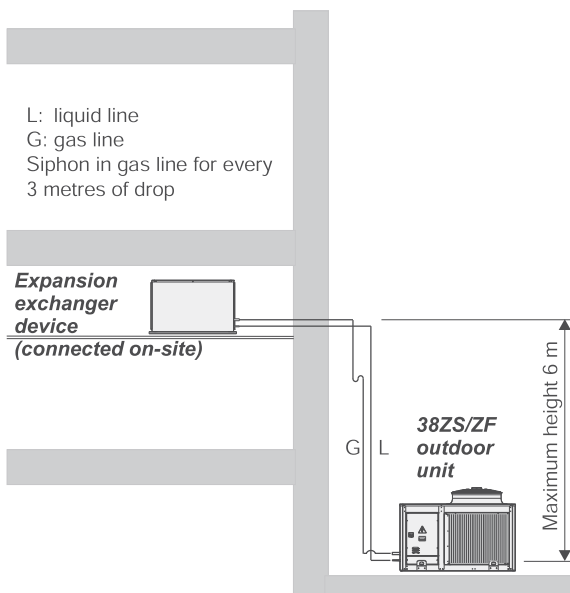
### Outdoor unit top

Maximum equivalent length of the cooling line: 50 metres  
For longer lengths an oil separator must be user



### Outdoor unit bottom

Maximum equivalent length of the cooling line: 7 metres



## ADDITIONAL LOAD OF R-410A REFRIGERANT

Additional load per linear metre of piping for equivalent maximum lengths exceeding 7 metres:

Nominal diameter (inches)	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/8"
Interior section (cm <sup>2</sup> )	0,149	0,444	0,900	1,505	2,282	3,120	4,290	5,346
Liquid line charge (g/m)	19,3	57,0	115,0	193,5	292,3	404,1	550,3	685,7
Gas line charge (g/m)	--	0,2	0,4	0,7	1,0	1,4	2,0	2,5