



# OPERATING MANUAL

## pCO5/pAD DIGITAL CONTROLLER

HEAT PUMPS  
AirMaster  
AquaMaster  
AquaMaster Inverter  
BoxAir  
BoxAir Inverter  
EasyMaster



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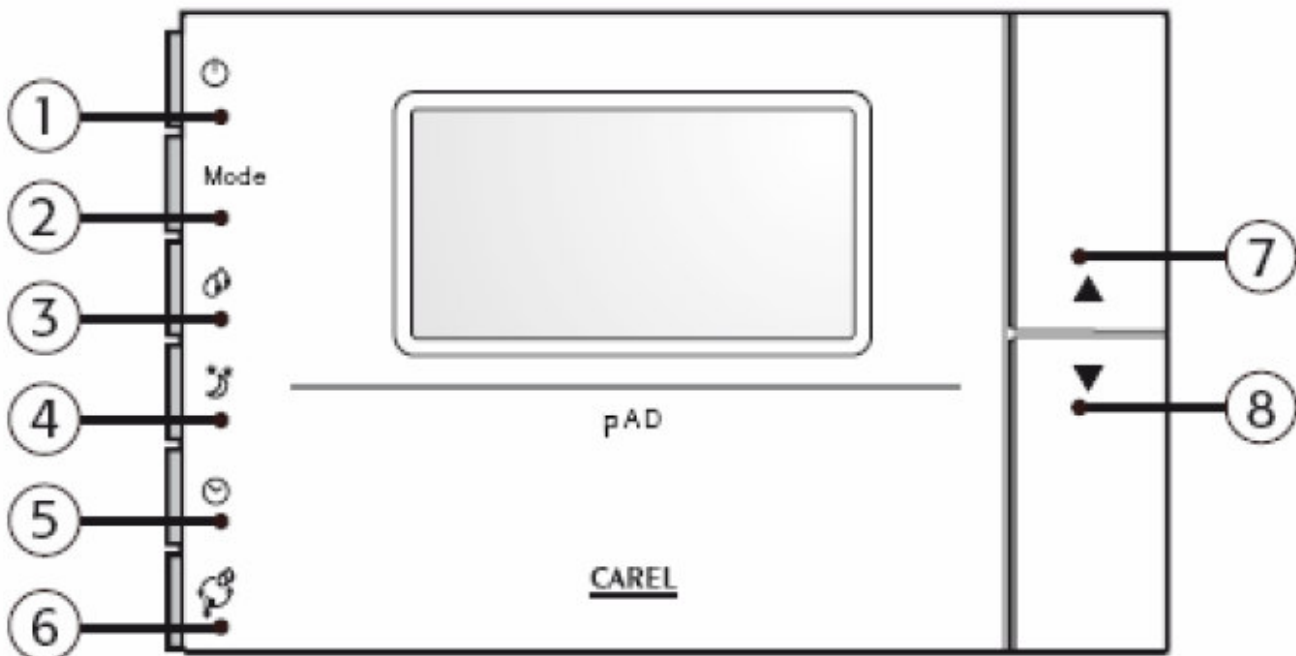
## 1 Introduction

The pCO<sup>5</sup> electronic controller is a programmable controller enabling the control of heat pumps. In the range of heat pumps supplied by MasterTherm CZ, the air/water and ground/water heat pumps are equipped with these controllers.

## 2 Display Unit



You can communicate with the controller by means of a display unit with a digital display, keyboard, and indicators. You can use the keyboard for executing the basic controls of the heat pump, such as:

- Setting the operating mode
- Setting the required temperature in the heated / cooled room
- Resolving emergency conditions
- Checking the status of the heat pump



1. Key ON/OFF, for switching unit ON or OFF
2. Mode selection key
3. Key to list relative humidity (active only for optional pAD with humidity probe)
4. Key is not used
5. Key for clock setting and time programs setting
6. Reset alarms key
7. Key „UP“ for increasing parameters
8. Key „DOWN“ decreasing parameters






1. Icon heating mode
2. Icon cooling mode (optional mode)
3. Icon **AUTO** no function, icon  showing active auxiliary heater
4. Icon with no function
5. Icon with no function
6. Icon „fan“, no function
7. Icon  showing active compressor

**°C°F** temperature units

**%rH** relative humidity units

8. Value of the „MAIN DISPLAY“
9. Weekdays
10. Value of the „SMALL DISPLAY“
11. Icon for setting of time programs
12. Icon

 showing activation of the auxiliary heater safety switch, manual reset inside the heat pump is required, see pGD manual for reset procedure

 - icon „house“ showing lower electricity tariff (some countries only)  
 - icon „human“ showing active Sanitary Hot Water mode

13. Icon „keys locked“, no communication between pAD and heat pump
14. Icon of active alarm together with alarm code on main display

## 2.1 Main display

This is a display with 3 alphanumeric characters. In the normal mode, the display indicates the current temperature in the room. In the value setting mode, the set required value is displayed. In the programming mode (BoxAir only), the value of the edited parameter is displayed.

## 2.2 Secondary display

The secondary display normally shows the set value of the temperature in the room / space. If the pAD display is equipped with the “real time” - option, the secondary display shows the current time.

## 2.3 UP and DOWN keys

These keys are used to change the edited value. The UP key increases the edited value; the DOWN key decreases the value.

In the normal operation mode, when the main display shows the current temperature in the room, after the pressing of UP/DOWN, the current required temperature in the room will change. The changed value will remain displayed for approx. 3 seconds after pressing the UP/DOWN keys.

## 2.4 ON/OFF key

By pressing this key you will switch the heat pump on/off. If the heat pump is off, the “OFF” text lights up on the main display.

## 2.5 Mode selection key

With the use of this key you can select between the HEATING and COOLING modes.

Each time you press this key the mode will change. You will find more information about individual modes in the next section.

## 2.6 Key drop

Pressing the key will show relative air humidity in %. This function is available only for optional pAD version with humidity probe.

## 2.7 Key moon

Pressing this key enables „night mode“ for programmable time up to 8 hours. „Night Mode“ setpoint is possible to set via pGD display only, please see the pGD manual.

## 2.8 Clock and time programme setting key

With this key you can set the pAD clock and you can also activate - programme the attenuation time zones. This function is only active for units equipped with “real time”.

## 2.9 Alarm reset key

Press this key for alarm reset,

## 3 Operating Modes

### 3.1 HEATING – SUN icon





When this mode is activated, the “SUN” symbol lights up on the display. In this mode the heat pump heats the room on the basis of the set required value. The heating water is weather compensation controlled, in accordance with the outdoor temperature. This control is combined with the function of a thermostat with adjustable hysteresis and compensation of the heating water temperature.

### 3.2 COOLING – SNOW icon

In this mode, the heat pump cools the space in accordance with the set required value. This function can only be permitted via a parameter in the main controller of the heat pump, the setting of which may only be performed by a heat pump expert - an installation company or service technician. With a conventional heating system, such as heating elements (radiators) or floor heating, you cannot use the cooling function. For this purpose, special cooling systems are installed. The cooling mode is indicated on the display with the “SNOWFLAKE” icon.

## 4 Clock setting

Following procedure leads to the clock setting:

- press key  for 5s, display shows „rtc“ and flashing actual time
- adjust hours value using keys ↑↓
- press key 
- adjust minutes value using keys ↑↓
- press key , display shows „dAy“
- adjust day using keys ↑↓
- press key  and clock setting is finished

## 5 Time programs setting

### ATTENTION:

**ACCORDING TO OUR LONG TERM EXPERIENCE WE DO NOT RECOMMEND TO USE TIME PROGRAMS FOR HIGH TEMPERATURE DECREASE. ESPECIALLY FOR AIR/WATER HEAT PUMPS, TIME PROGRAMS ARE NOT REDUCING OPERATING COST AND WITH OUTDOOR AIR TEMPERATURES BELOW 0°C THE OPERATIONAL COST COULD INCREASE DUE TO TIME PROGRAMS !!!**

### 5.1 Time program possibilities

Following options are available:



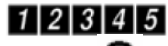




- 2 timezones for weekdays 1 – 5 (Mo to Fr)
- 2 timezones for weekdays 6 – 7 (Sa and Su)
- temperature setting is possible, or On/Off

### 5.2 Setting sequence procedure

- timezone 1, hour for weekday 1-5
- timezone 1, minute for weekday 1-51-5
- timezone 1, action setting (On/Off/temperature) for weekday 1-5
- timezone 2, hour for weekday 1-5
- timezone 2, minute for weekday 1-5
- timezone 2, action setting (On/Off/temperature) for weekday 1-5
- timezone 1, hour for weekday 6-7
- timezone 1, minute for weekday 6-7
- timezone 1, action setting (On/Off/temperature) for weekday 6-7
- timezone 2, hour for weekday 6-7
- timezone 2, minute for weekday 6-7
- timezone 2, action setting (On/Off/temperature) for weekday 6-7



### 5.3 Program setting procedure

Setting flow:

- press key  for 3s, until following symbol is on the display  
- ↑↓ set requested hour of begin timezone 1 (0-23) nad confirm key 
- ↑↓ set requested minute of begin timezone 1 (0-59) and confirm key 
- ↑↓ set requested operation using keys ↑↓ :
  - OFF, at set time unit switches OFF\*
  - ON, at set time unit switches ON
  - setting requested temperature 8 – 32°C, room temperature setpoint
- confirm key  and continue for timezone 2 and follow days 

\* although the unit is switched OFF, antifreeze function using auxiliary heater is active. From this reason we recommend using directly the requested room temperature higher than 15°C.

## 5.4 Time program activation

Activate the time programs short pressing key  , symbol  on the display with actual timezone number.

Pressing key again  will deactivate time programs.

## 6 Alarms

During the operation of the unit, alarms may occur. The control is designed in such a way as to allow automatic restoration of operations. However, more serious problems require a manual reset.

### 6.1 Alarm types

If an alarm condition occurs, the “BELL” symbol lights up, and the alarm code flashes.

Displayed Alarm Text (pGD)	Alarm Code (pAD)	Alarm description	Reset
Low Pressure	AL01	compressor low suction pressure	aut.<3/hrs
High Pressure PT	AL02	compressor high discharge pressure from pressure transducer	aut.<3/hrs
High Discharge Temp.	AL03	high compressor discharge gas temperature	aut.<3/hrs
High Condensing Temp.	AL04	too high refrigerant condensing temperature	aut.<3/hrs
Low Evaporating Temp.	AL05	too low evaporating temperature	aut.<3/hrs
Antifreeze	AL06	low water temperature with risk of freezing	aut.<3/hrs
Fan Thermal	AL07	fan overheating, or circuit breaker activation brine pump overheating or circuit breaker activation	aut.<3/hrs
Compressor Thermal	AL08	compressor overheating, or circuit breaker activation	aut.<3/hrs
Flow	AL09	inufficient or no flow of water thru heat pump	aut.<3/hrs
Probes	AL10	one of the important temperature sensor malfunction	automatic
High Pressure Switch	AL11	compressor high discharge pressure from pressure high pressure switch	aut.<3/hrs
Low Pressure HP side	AL12	too low pressure on high pressure side of the refrigerant circuit	aut.<3/hrs
DC Drive Alarm	AL13	alarm of the compressor drive for inverter units	aut.<3/hrs
EVD Evo	AL14	alarm of the Electronic Expansion Valve driver	aut.<3/hrs

### 6.2 Alarm reset

All alarms are reset automatically, when the number of alarms of one type does not exceed 3, per 1 hour of the operation of the compressor.

### 6.3 Manual reset

You can perform a manual reset by pressing the “Alarm Reset” button (key 6).

## 7 Troubleshooting

### 7.1 Water/Water, Brine/Water Heat Pumps

The following chart lists alarms and activities of the operator to rectify the error state.

CODE	Meaning	Control action	Reason	Before you call service
AL01	Low pressure	Switches off compressor and brine circulator	Low closed loop temperature, evaporator freezing, brine circulator malfunction, full closed loop strainer	Switch off unit, clean closed loop strainer, check brine pressure of the closed loop, repeated problem - call service
AL02	High pressure PT	Switches off compressor and brine circulator	Too high water temperature, full water strainer, water circulator malfunction	Decrease requested water temperature, check deaerating and water filling, clean water strainer, repeated problem - call service
AL03	High Discharge Temperature	Switches off compressor and brine circulator	Too high water temperature, full water strainer, water circulator malfunction. Could be caused also from slight refrigerant leaking, or temperature probe problem (AL10)	Decrease requested water temperature, check deaerating and water filling, clean water strainer, repeated problem - call service
AL04	High Condensing Temperature in heating/cooling mode	Switches off compressor and brine circulator	Too high water/brine temperature, full water/brine strainer, water/brine circulator malfunction	Decrease requested water temperature, check deaerating and water/brine filling, clean water/brine strainer, repeated problem - call service
AL05	Low Evaporating Temperature heating/cooling mode	Switches off compressor and brine circulator	Low closed loop/cooling water temperature, evaporator freezing, brine/water circulator malfunction, full closed loop/water strainer	Switch off unit, clean closed loop/water strainer, check brine/water pressure, repeated problem - call service
AL06	Antifreeze water protection	Switches off compressor and brine circulator	Low heating/cooling water temperature	Could be caused during long electricity supply problem, or by low water temperature in cooling mode. Wait for heating of the water by auxiliary heater, increase requested water temperature if cooling mode.
AL07	Brine Pump Malfunction (AQ120.2, 150.2, 180.2 only)	Switches off compressor and brine circulator	Brine circulator motor overheating problem, or circuit breaker activation.	Call service

CODE	Meaning	Control action	Reason	Before you call service
AL08	Compressor Thermal Protection	Switches off compressor and brine circulator	Too high water temperature, power supply problem - missing phase, compressor motor malfunction	Switch on compressor circuit breaker, call service, if problem returns.
AL09	Low cooling/heating water flow	Switches off compressor and brine circulator	Circulator malfunction, full strainer cooling/heating water	Switch unit off, check water strainer. Repeated problem - call service
AL10	Temperature probe problem	Switches off compressor and brine circulator	Probe malfunction	Call service
AL11	High Pressure Switch	See AL01, AL02	See AL01, AL02	See AL01, AL02
AL12	Low Pressure HP Side	See AL01, AL02	See AL01, AL02	See AL01, AL02
AL13	DC Drive Alarm, Inverter units only	Switches off compressor and brine circulator	Compressor DC Drive Error	Restart unit power supply, if problem returns, please call service
AL14	EVD Evo Alarm	Switches off compressor and brine circulator	Malfunction of EVD Evo module	Restart unit power supply, if problem returns, please call service

## 7.2 Air/Water Heat Pumps

The following chart lists alarms and activities of the operator to rectify the error state.

CODE	Meaning	Control action	Reason	Before you call service
AL 01	Low pressure	Switches off the compressor and fan	Extremely low temperature of the outdoor air (below -20 °C), freezing of the evaporator, operating failure of the fan	Wait for the error status to come to an end, in the case of the freezing of the evaporator, wait for the starting of the unit and perform a manual defrost; if the error occurs repeatedly, contact the installation company
AL 02	High pressure PT	Switches off the compressor and fan	Too high a temperature of the heating water	Reduce the required heating water temperature, check the bleeding and filling of the system, and check and clean the heating water filter; report the error to the installation company if it occurs repeatedly
AL 03	High Discharge Temperature	Switches off the compressor and fan	This error may be caused by insufficient coolant filling or its minor leaks; it may also be caused by a high temperature of the heating water or an extremely low outdoor air temperature. This error also occurs in the case of a sensor failure (AL 10)	Reduce the required heating water temperature, check the bleeding and filling of the system, and check and clean the heating water filter; report the error to the installation company if it occurs repeatedly
AL 04	High Condensing Temperature in heating/cooling mode	Switches off the compressor and fan	In the thawing mode, too high a temperature has been set for the end of thawing; in the cooling mode, a failure of the fan	Check the outdoor unit, and perform a manual reset; the installation company must be contacted
AL 05	Low Evaporating Temperature heating/cooling mode	Switches off the compressor and fan	Extremely low temperature of the outdoor air (below -20 °C), freezing of the evaporator, operation failure of the fan	Wait for the error status to come to an end; in the case of the freezing of the evaporator, wait for the starting of the unit and perform a manual thawing; if the error occurs repeatedly, contact the installation company

<b>CODE</b>	<b>Meaning</b>	<b>Control action</b>	<b>Reason</b>	<b>Before you call service</b>
AL 06	Antifreeze water protection	Switches off the compressor and fan	Low temperature of the heating water	Check the circuit-breaker of the built-in electric boiler; check whether the cooling mode has not been activated by mistake
AL 07	Fan Thermal Protection	Switches off the compressor and fan	Fan overloading, faulty fan	Check the outdoor unit, and perform a manual reset; the installation company must be contacted
AL 08	Compressor Thermal Protection	Switches off the compressor	Too high a temperature of the heating water, incorrect setting of the heat protection of the compressor, faulty compressor	Reset the circuit-breaker of the compressor; contact the installation company
AL 09	Low cooling/heating water flow	Switches off the compressor and fan	Circulation pump error, clogged heating water filter	Check and clean the heating water filter. If the error occurs repeatedly, contact the installation company
AL 10	Temperature probe problem	Switches off the compressor and fan	Faulty sensor	Contact the installation company.
AL11	High Pressure Switch	See AL01, AL02	See AL01, AL02	See AL01, AL02, always call service
AL12	Low Pressure HP Side	See AL08	See AL08	See AL08
AL13	DC Drive Alarm, Inverter units only	Switches off compressor and fan	Pressure transducer malfunction	Call service
AL14	EVD Evo Alarm	Switches off compressor and fan	Malfunction of EVD400 module	Call service

## **8 pAD in the pDG display**

All functions of pAD is possible to change also from menu of the pGD display.  
Please check the pGD/pCO<sub>5</sub> manual for detailed menu description.

## **9 Revision history**

10:  
First pCO<sub>5</sub> controller manual description.





