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i n d u s t r i a l

Heat pump user manual for Commercial Direct-Heating (ECDH) Air Source Heat Pump

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Change Forecast

The document format and contents have been approved and will not change.

Operations manual Cover Page

**Enerflow Commercial Direct-Heating (ECDH)
Air Source Heat Pump**

User Manual

Revision 2



**PLEASE READ THIS MANUAL BEFORE OPERATING OR
INSTALLING THE HEAT PUMP**

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Important Safety Precautions and Warnings

	Warning: It is the responsibility of the user to operate and use the heat pump according to the instructions detailed in this manual. The user shall ensure that the health and safety of any other person in the area or site near where the heat pump is installed, is not endangered by his/her conduct or activities when operating the heat pump.
	Warning: This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
	Warning: Children should be supervised to ensure that they do not play with the appliance.
	Warning: Ensure that the electricity installation complies with local standards and regulations. This appliance must be installed in accordance with the South African wiring regulations as contained in SANS 10142.
	Caution: Installation and maintenance must only be performed by qualified personnel who are familiar with local codes and regulations.
	Warning: Ensure that the electricity/power supply is switched off before any installation work begins. Note that electric shock is dangerous and can cause death.
	Warning: Do not turn off main power supply to the heat pump during a vacation or if not in use. The heat pump must have electricity in order to protect itself during cold climate conditions. It is recommended that the target temperature be set to 25°C in order to save electricity during prolonged periods of non-use.
	Warning: Do not turn the unit off and immediately on again. Allow 30 seconds for the refrigerant pressure to equalize.
	Caution: There are some sharp edges within the unit that may cause injury.
	Caution: Note that the unit contains a rotating fan that may cause injury if the protective grid is removed. Ensure not to touch or work on the unit while in operation.

1. Introduction and general overview

1.1 Product Overview

Enerflow Commercial Direct-Heating (ECDH) air source heat pumps transfer heat from the surrounding air to water, providing hot water up to 60°C.

The heating capacity of these heat pumps range between 18 kW and 87 kW. The ECDH-MT units are also equipped with water regulating valves to ensure a constant outlet temperature of 60°C can be obtained. The units are equipped with automatic defrosting which enables the units to continue heating the water even when the air temperature is below 0°C.

1.2 Features & Benefits of Enerflow heat pumps

- (a) Low running costs and high efficiency.
 - 50 – 70 % energy saved on the amount of energy required to heat the water, compared to a conventional electrical boiler.
- (b) Availability
 - Heat pumps can heat the water all day every day, including days when it is overcast or rainy.
 - Heat pumps can operate during the night as it still harvests energy from its surroundings.
 - Heat pumps can operate and give a saving in the winter when air temperatures are below 0°C
- (c) High comfort levels.
 - The heat pumps store the water at high temperature inside the vessel ensuring an enjoyable hot water experience.
- (d) Heat pumps are safe
 - With heat pumps there are no potential danger with regards to flammables, gas poisoning, explosion and fire.
 - Heat pumps have multiple safeties ensuring water is not heated above 65°C, where it becomes a scalding hazard.
- (e) Heat pumps have low maintenance requirements.
 - Heat pumps have a long life expectancy with its corrosion resistant composite cabinet that can withstand severe climate conditions. The heat pump safeties keep it from overheating extending the life expectancy of the waterside components.
 - Only high quality Copeland compressors are used within the Enerflow ECDH heat pumps. These compressors require no maintenance during its lifespan.
 - Separately isolated electrical compartment protects the heat pump from damage by rodents and other animals.

2. Heat pump operating instructions

2.1 LCD user-friendly interface controller

2.1.1 General instruction

The operation panel features:

- (a) Capacitive touch keys for higher operating sensitivity and unlimited key operations.
- (b) Minimal electromagnetic sensitivity and interference.
- (c) Stylish appearance for easy viewing purposes.
- (d) Dust- and waterproof.
- (e) Can be installed in a convenient location.
- (f) Automatic key lock (AKL) function.

3. Controller panel

3.1 Operating controller

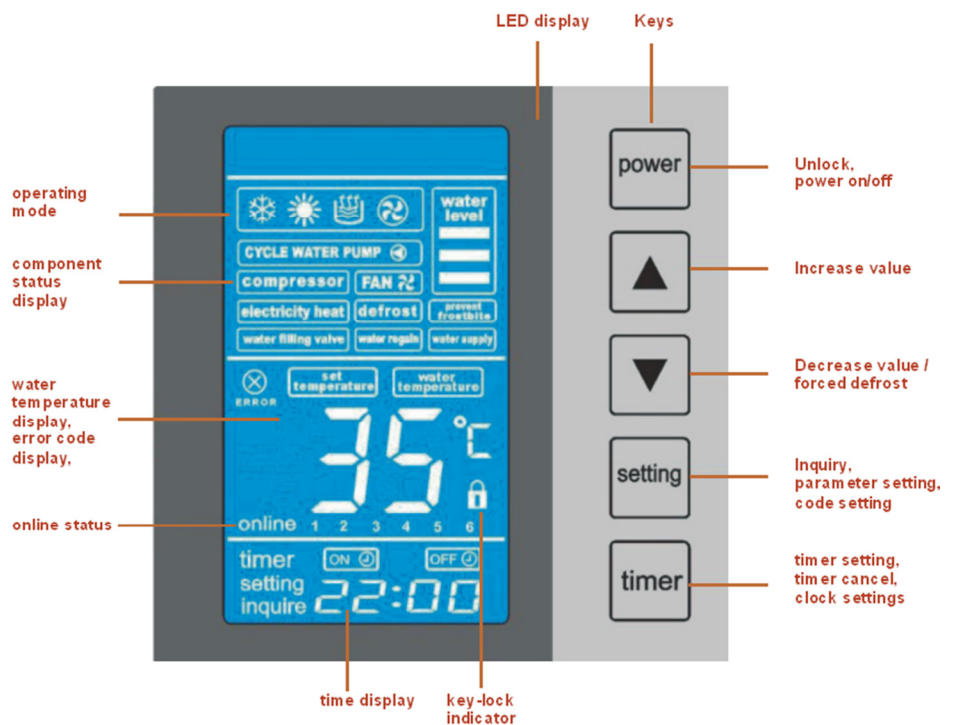
Operation guide

When the power supply to the heat pump is switched on, the controller emits an audible tone.

The LCD will be in the locked mode with the back light dimmed.

Keys explanation

Unlocking keys: To unlock the LCD press and hold the "power" key for 3 seconds until an audible tone is heard. The backlight of the LCD display will eliminate and the key pad will unlock with no "key-lock" being displayed. The keypad will automatically lock after 60 seconds, displaying the "key-lock" symbol.



"Power" key:	The "power" key, switches between ON or STANDBY mode.
"▲" and "▼" keys:	Press to increase or decrease values/ set temperature.
"setting" key:	Press for inquiry, parameter and password setting.
"timer" key:	Press for timer setting, timer eliminate and clock setting.

3.2 Controller setup

Temperature setting

Ensure that keypad is unlocked. Press the "▲" or "▼" key for "Temperature setting". The set temperature will be flashing.

Press the "▲" or "▼" key again to increase or decrease the set temperature to the desired value.

The inlet water temperature range can be set from 20°C to 60°C (default = 50°C).

*Note: This setting doesn't change the direct heating discharge temperature which is set using the flow control valve. (Default = 60°C)



It is recommended to use the default settings to ensure client satisfaction.

Note: Any changes you would like to make from the default settings must be communicated to M-

Adjusting the direct heating valve without written consent may void the warranty on the heat pump.

Tech Industrial to ensure the effects of these changes are communicated and understood.

3.3 Clock setting

While the LCD controller is unlocked, press and hold the "timer" key for 8 seconds until an audible tone is heard and the "timer" symbol disappears. The hour value will be flashing and can be adjusted by pressing the "▲" or "▼" key. Press the "timer" key once quickly for minute adjustment and repeat the process. Press the "timer" key again to exit.

Note: The clock setting can be used only when the timer setting function is closed.



3.4 Timer setting

The control consists of two separate adjustable timers. Timer 01 and 02 can be used to switch the heat pump between ON/STANDBY modes automatically within a 24 hour period.

Heat pump ON/OFF timers:

Press the "timer" key and enter timer 01 **ON** time. Set the **ON** time as described in the **Clock Setting** section. Press "timer" key again to set timer 01 **OFF** time. Set the **OFF** time as described in the **Clock Setting** section. Repeat sequence for the second time zone.

If, however, a timer is not used, set ON and OFF times to 00:00.

After completing all timer settings, the controller will display the following:

To **cancel** all timers, press the "timer" key for more than 3 seconds until an audible tone is heard, then release key. Timer is now cancelled.

Timer 03 and 04 is used to switch the water pump ON/OFF within 24 hour period. This enables the water pump to run independent of the heat pump;

NOTE: This function shall not be used in a heat pump that is fitted with the direct heating valve.

All ECDH heat pumps are fitted with direct heating valves as a standard.



3.5 System status display values

Ensure that the keypad is unlocked. Press the "setting" key and enter into the inquiry panel with "inquire" symbol on display.

With heat pump running, press the "setting" key, an audible tone will be heard and the LCD will enter into the status panel. The next parameter can be viewed by pressing the "setting" key again.

The different parameters that can be viewed can be seen in the table below. The status parameters are not required for the general heat pump operation.

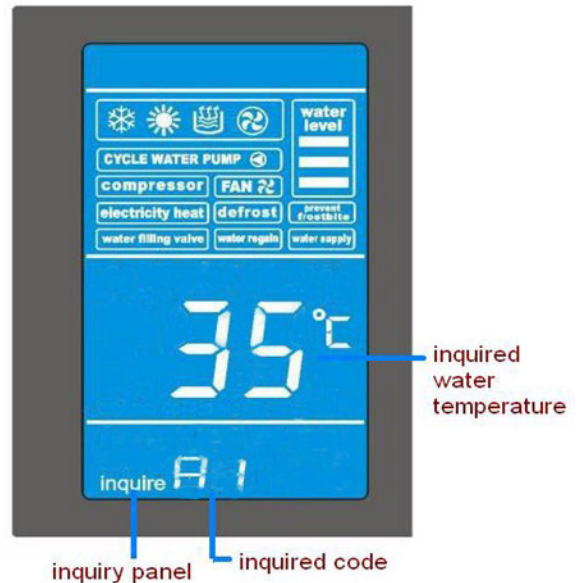


Table 1: System status display parameter settings

Single system heat pump	System B
A1: Coil pipe temperature.	b1: Coil pipe temperature 2.
A2: Compressor suction temperature.	b2: Compressor suction temperature 2.
A3: Compressor discharge temperature.	b3: Compressor discharge temperature 2.
A4: Ambient temperature.	b4: Ambient temperature.
A5: Water outlet temperature.	b5: Water outlet temperature.
A6: Spare.	b6: Spare.
A7: 00.	b7: 00.
A8: Compressor current.	b8: Compressor current 2.
A9: Electrical expansion valve opening degree 1.	b9: Electrical expansion valve opening degree 2.
Er: Error code.	Er: Error code.

For a single heat pump system (ECDH20MT), the inquiry codes range from A1 to A9 only. To exit the inquiry panel, press the "setting" key once after the last inquiry code (Er) is reached.

3.6 Parameter setting

***Note:** THESE SETTINGS ARE PRE-SET ACCORDING TO THE MANUFACTURER'S SPECIFICATION FOR SAFE HEAT PUMP OPERATIONS. ANY CHANGE TO THESE SETTINGS SHALL VOID THE WARRANTY AS IT WILL INFLUENCE THE SAFE OPERATION OF THE HEAT PUMP.

While the LCD controller is unlocked, place the heat pump in STANDBY mode. To inspect and change the parameters, press the "setting" key for more than 3 seconds until an audible tone is. To move to the next parameter press the "setting" key sequentially.

The value of each parameter can be adjusted by pressing the "▲" and "▼" keys. To exit the setting panel, press the "setting" key once after the last setting code (P6) is reached.

Note: These values should only be adjusted back to the factory default settings in the adverse event that they are not set to the factory defaults.

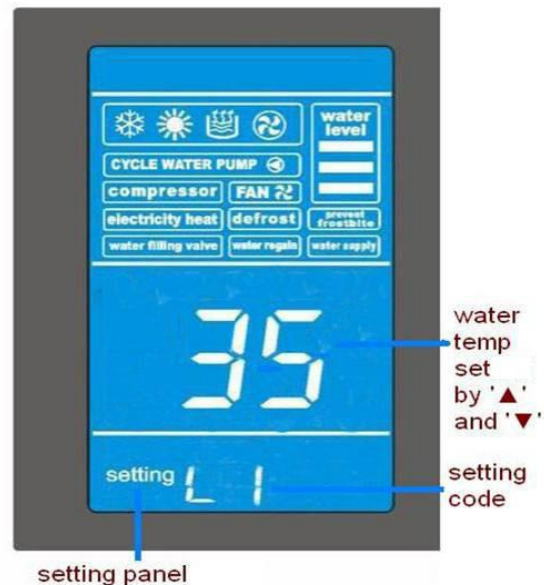


Table 2: System status display parameter values

Code	Name	Range	Default
	Water temperature set point	20-60 °C	50°C
L1	Tank temperature sensor calibration/correction	0-15 °C	2 °C
L2	Heat pump restart temperature deviation	3-18 °C	5 °C
L3	Outlet water temperature setting	35-99 °C	45 °C
L4	Desired water tank water temperature limit	30-99 °C	55 °C
L5	Assisted electric heating ambient temperature	0-35 °C	7 °C
L6	Return water temperature	30-65 °C	45 °C
L7	Allowed water supplement temperature	20-60 °C	45 °C
L8	Compressor current overload	0-33A	0A
L9	High ambient temperature fan cut out	10 – 45°C	60°C
H1	Defrosting interval	20-99 minutes	45 minutes
H2	Defrosting start temperature	0-15°C	-1
H3	Defrosting time	5-20 minutes	8 minutes
H4	Defrosting exit temperature	1-40°C	15°C
P1	Electronic expansion valve regulation cycle	20-180 Seconds	60 seconds
P2	Degree of superheat	-8-15°C	0°C
P3	Allowed discharge temperature	70-135°C	92°C
P4	Expansion valve opening during defrosting	6-55°	32°C
P5	Expansion valve minimum opening	6-30°	15°
P6	Super heat compensation	0-12	4

Details are shown as follows:



- L1** - Setting is used to compensate/calibrate for the difference between displayed water temperature and the actual measured water tank water temperature. Ensure a high quality thermometer is used to determine the actual water temperature (range 0-15 °C, default 2 °C).
- L2** - Heat pump restart temperature deviation. This value determines at which temperature difference from the setpoint the heat pump will start reheating (range 3-18 °C, default 5 °C).
For example: If the desired water temperature is set to 50°C, the heat pump will remain in standby until the tank water temperature is 5°C lower than the set point (45°C) before restarting.
- L3** - Outlet water temperature setting (range 35-99 °C, default 45 °C).
- L4** - Desired water temperature set point limit (range 30-99 °C, default 55 °C).
- L5** - Assisted electric heating ambient temperature. This is the ambient temperature at which the heat pump will engage the back-up heating system to assist in colder winter conditions (range 0-35 °C , default 7 °C).
Note: 0 means no assisted electric heating.
- L6** - Return water temperature (range 30-65 °C, default: 60 °C).
- L7** - Allowed water supplement temperature (20-60 °C, default: 45 °C).
- L8** - Compressor current overload is the current at which the heat pump should shut down for self-protection (range 0-33 A, default: 0 A).
The South African regulations require the installation of an adequately sized breaker. This functionality is therefore no longer required in the ECDH range.
Note: 0 A means no current inspection.
- L9** - The high ambient temperature fan cut out is the air temperature at which the heat pump will cut the power to the fans due to the large amount of energy in the air. To ensure the heat pump doesn't overheat the fans are stopped as the heat pump will be able to heat the water without the fans running (range 10-45 °C, default: 45 °C).
- H1** - The defrosting interval determines the amount of time that needs to pass between each defrosting cycle (range 20-99 minutes, default: 45 minutes).
- H2** - The defrosting start temperature is used to determine if a defrosting cycle will be required at the defrosting interval (range 0-15°C, default: -1 °C).
- H3** - The defrosting time determines the length of each defrosting cycle (range 5-20 minutes, default: 8 minutes).
- H4** - If the defrosting exit temperature will be reached in the event that the evaporator was successfully defrosted before the defrosting time is reached. The defrosting cycle will be disengaged before the defrosting time was reached (range 1-40 °C, default: 15 °C).
- P1** - Electronic expansion valve regulation cycle (range 20-180 seconds, default: 60 seconds).
- P2** - Degree of super heat (range -8 - +15 °C , default: 0 °C).
- P3** - Allowed discharge temperature (range 70-135 °C , default: 92 °C).
- P4** - Expansion valve opening during defrosting (range 6-30 °C, default: 15 °C).
- P5** - Expansion valve minimum opening (range 6-30°, default: 15°).
- P6** - Super heat compensation (range 0-12, default: 4).

Note: If electronic expansion valve is not controlled by controller (dip 3 in the number side), there will be no indication of P1 - P6 while changing parameter settings.

3.7 General operating guide

3.7.1 Re-start check list

- (a) Ensure that there is no water near any electrical connections.
- (b) Turn the power to the heat pump on (if it is switched off).
- (c) Ensure the valves are open and there are no leaks.
- (d) Check the water system for sufficient water pressure and remove any air that may be trapped.
- (e) Start up the heat pump and ensure the water pump starts up first and the fan starts within 2 minutes thereafter. Ensure that the compressor starts up within 5 minutes from the original start up.
- (f) Running checks:
Perform the following checks after the unit has been running in a normal state for 10 minutes:
 - Water temp is rising on the outlet of the heat pump.
 - No errors are showing on the LCD display.



CAUTION - Refrain from using this heat pump if any electrical components have been in contact with water. Immediately call a qualified service technician to inspect the heat pump if any electrical components have come in contact with water.



CAUTION - **Keep** all objects clear above the heat pump. Blocking air flow could damage the unit and may void the warranty.

3.8 Safety Precautions:

- Ensure that the installation is done by the agent or specialized installation company accredited by M-Tech Industrial.
- When installing or using the unit, please ensure that the power supply voltage corresponds with the unit power requirements and rating.
- The installation should be electrically certified by a qualified electrician with an electrical Certificate of Conformance
- The main power isolator for the heat pump should be installed at a height of 1.4 meter above the ground. The main isolator shall also be installed within 3 meters and within eye sight of the heat pump.
- Take care as the heat pump heats the water to a temperature of 60°C. Water heated to a temperature higher than 52°C can cause burns.
- Do not insert any object into the grid at the back or near the fan as this might cause damage to the heat pump or injury to people close to the heat pump.
- Do not use the heat pump if the grid over the fan is not in place.
- To avoid electric shock or fire or explosion, do not store or use oil, paint, petrol or any combustible gas or liquid near the unit. Do not spray the heat pump with high pressure water or service it while it is wetted by rain.

- Do not adjust any valve or settings. Only trained service personnel are allowed to make adjustments to the heat pump. Please contact your service provider if you are unhappy with the performance or function of the heat pump.
- If an error message occurs frequently please contact the installer to ensure the unit is repaired before it becomes damaged.

4. Back-Up heating system

The heat pump is equipped with a fault signal that can engage a back-up heating system in the adverse event of a failure. This signal cannot directly power the back-up heating system and should only be used to supply an activation signal to the back-up system. The back-up heating system will engage if any of the following Fault codes are displayed on the LCD controller

The following error codes for the heat pump units (single and dual systems) may be displayed on the controller panel in the adverse event of a failure.

5. Heat pump system error codes

Table 3: Common error codes

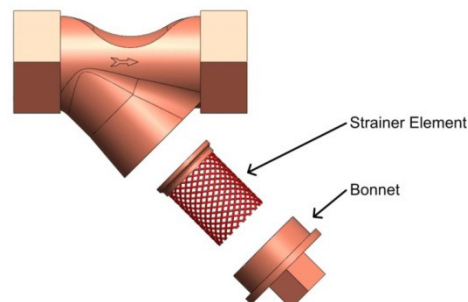
CODE	NAME	CODE	NAME
01E	Phase rotation.	17E	Faulty evaporator sensor 2.
02E	Absent phase.	18E	Abnormal compressor discharge temperature and/or faulty compressor discharge temperature sensor 1.
03E	Water flow switch.	19E	Abnormal compressor discharge temperature and/or faulty compressor discharge temperature sensor 2.
05E	Compressor high pressure.	21E	Ambient temperature too low and/or faulty ambient temperature sensor.
06E	Compressor low pressure.	22E	Faulty return water temperature sensor.
07E	Compressor high pressure.	25E	Faulty water level switch and/or water level low.
08E	Compressor low pressure.	27E	Faulty water outlet temperature sensor 1.
09E	Controller communication.	28E	Faulty water outlet temperature sensor 2.
11E	Installer password control.	29E	Faulty compressor suction temperature sensor 1.
12E	Compressor high discharge temperature 1.	30E	Faulty compressor suction temperature sensor 2.
13E	Compressor high discharge temperature 2.	31E	Faulty water pressure switch.
15E	Faulty water tank inlet temperature sensor.	35E	Compressor 1 over current.
16E	Faulty evaporator sensor 1.	36E	Compressor 2 over current.

***Note: If the error code can't be resolved by following the steps in section 6 the error codes must be resolved by a trained, qualified and competent person.**

6. Owner inspection

It is recommended that inspections on heat pumps are done frequently, especially after abnormal weather conditions. The following basic guidelines are suggested for the owner/user's inspection:

- (a) Make sure the front of the unit is accessible for future service.
- (b) Keep the top and surrounding areas of the heat pump clear of all debris.
- (c) Keep all plants and shrubs trimmed and away from the heat pump, especially the area above the fan.
- (d) Lawn sprinklers should be kept from spraying water on the heat pump, to prevent corrosion and damage.
- (e) All the safety protection devices have been set up - please refrain from changing these settings. If any changes are needed, please contact the authorized installer/agent.
- (f) If the heat pump is installed under a roof without a gutter, ensure that all measures are taken to prevent excessive water from flooding the unit.
- (g) Do not use this heat pump if any electrical part has been in contact with water. Contact an authorized installer/agent.
- (h) Please turn off the heat pump and disconnect it from the mains power supply, when not in use for a prolonged period of time.
- (i) The filter strainer located on the inlet pipe of the heat pump must be maintained on a regular basis in order to ensure the water flow to the heat pump doesn't decrease to the point that it causes an error code.
 - i. Close the outlet and inlet ball valves at the heat pump.
 - ii. Remove the Bonnet of the strainer by turning it counter-clockwise by using the correct size spanner.
 - iii. Remove the strainer element or Sieve.
 - iv. Rinse and clean the strainer element under running water by slightly opening the inlet ball valve.
 - v. Reinsert the strainer and close the Bonnet hand tight only in a clockwise direction.
 - vi. Open the outlet ball valve slightly to allow any air that may have entered into the heat pump to be released through the strainer.
 - vii. Close the bonnet completely now by using the correct size spanner again (do not over-tighten).
 - viii. Open the ball valves to the full open position.



7. Customer Service

If you have questions about ordering Enerflow Commercial Direct-Heating air source heat pump replacement parts and products, please use the following contact information:

7.1 Installer contact information

Business: _____
Office hours: _____
Phone: _____
Email: _____

7.2 Manufacturer contact information

Business: _____ M-Tech Industrial (Pty) Ltd
Office hours: _____ 07:00 - 16:00
Phone: _____ (018) 293-2530
Email: _____ heatpump@enerflow.co.za

Website

Visit www.mtechindustrial.com or www.enerflow.co.za for more information about our products.