Technical Manual for Efficient Flow AC Controller

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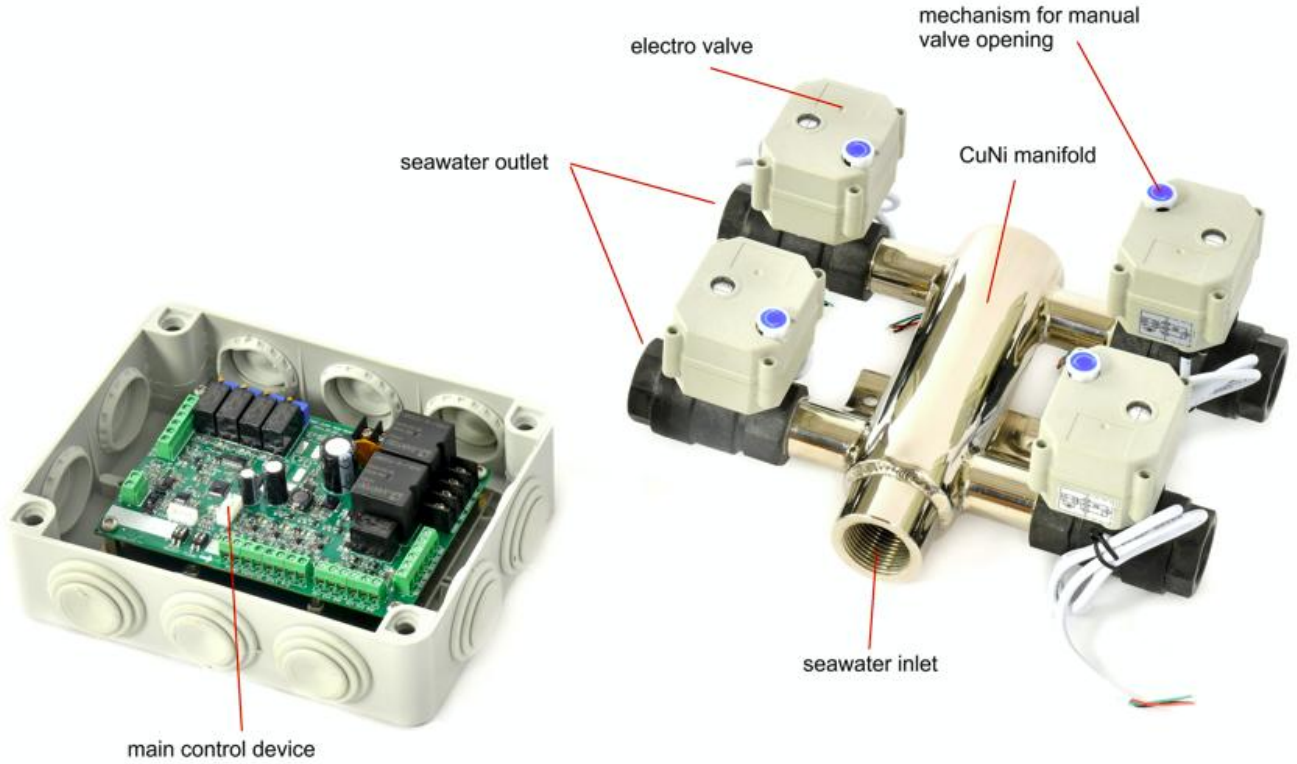
1. Introduction

The Efficient Flow AC Controller is designed to efficiently manage water cooling flow within air-conditioning systems, enhancing energy savings and extending equipment lifespan. The controller consists of a cupronickel manifold, four electro valves, and a PCB control device capable of managing up to two variable-speed pumps and up to four electro valves. It can be powered by 12VDC, 24VDC, or 48VDC, making it suitable for a wide range of installations.

Figure 1: control device PCB, Manifold with electro valves, variable-speed pumps

2. Components, drawings and schematics



- Cupronickel Manifold
- Electro valves (up to 4)
- PCB Control Device
- Variable-Speed Pumps (up to 2)

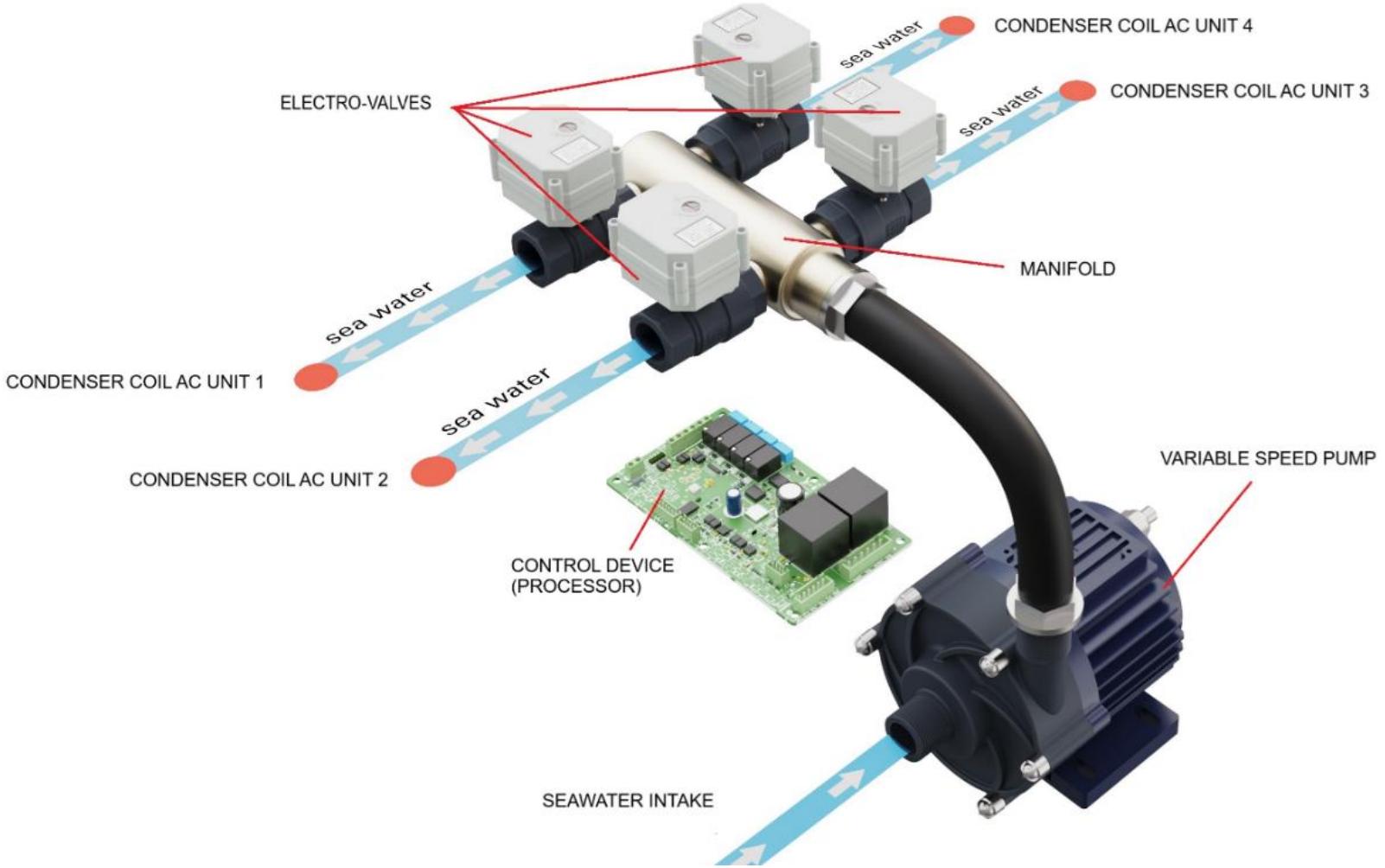


Figure 2: Efficient Flow AC controller assembly

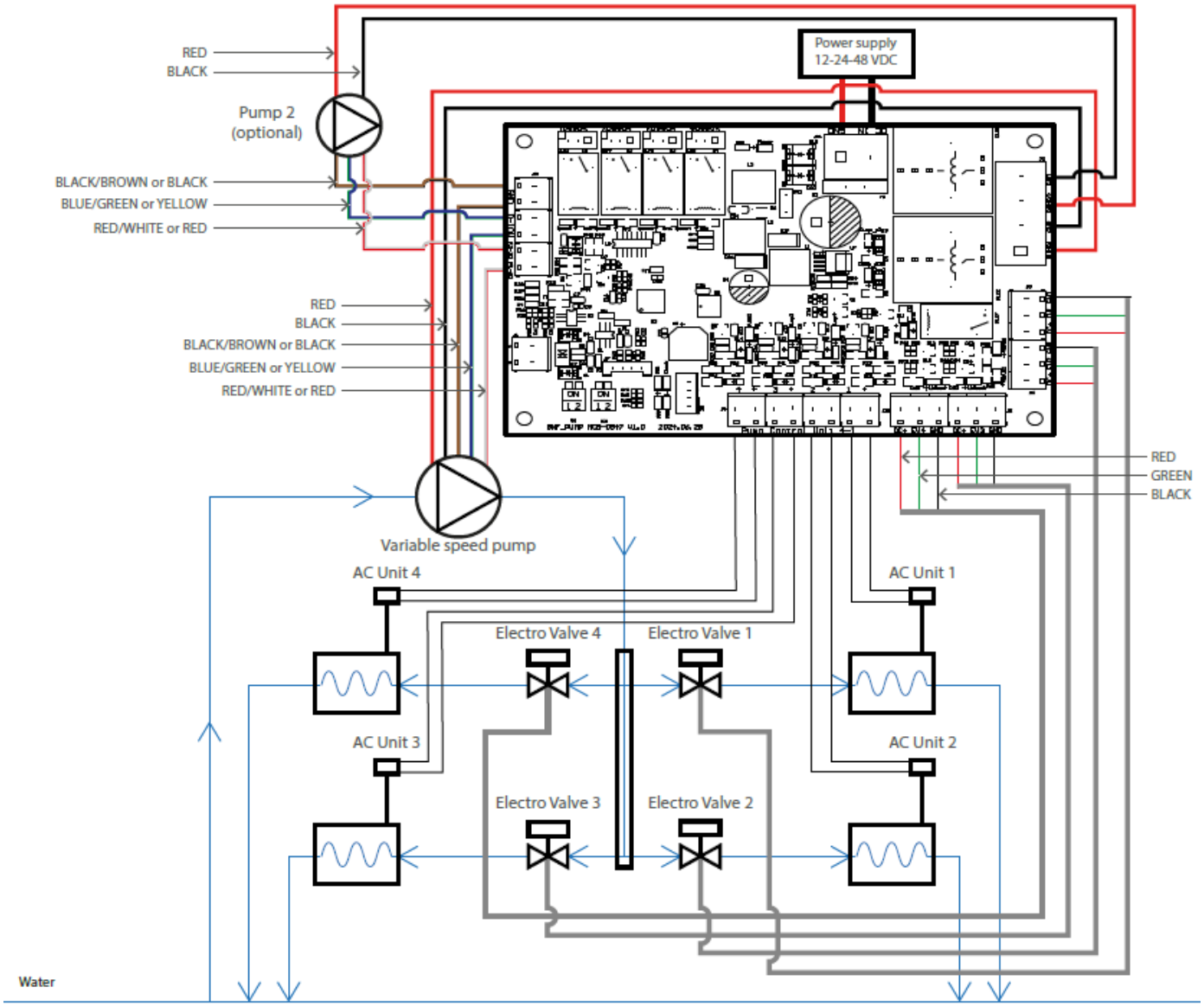


Figure 3: Efficient Flow AC controller, hydraulic and electric schematic

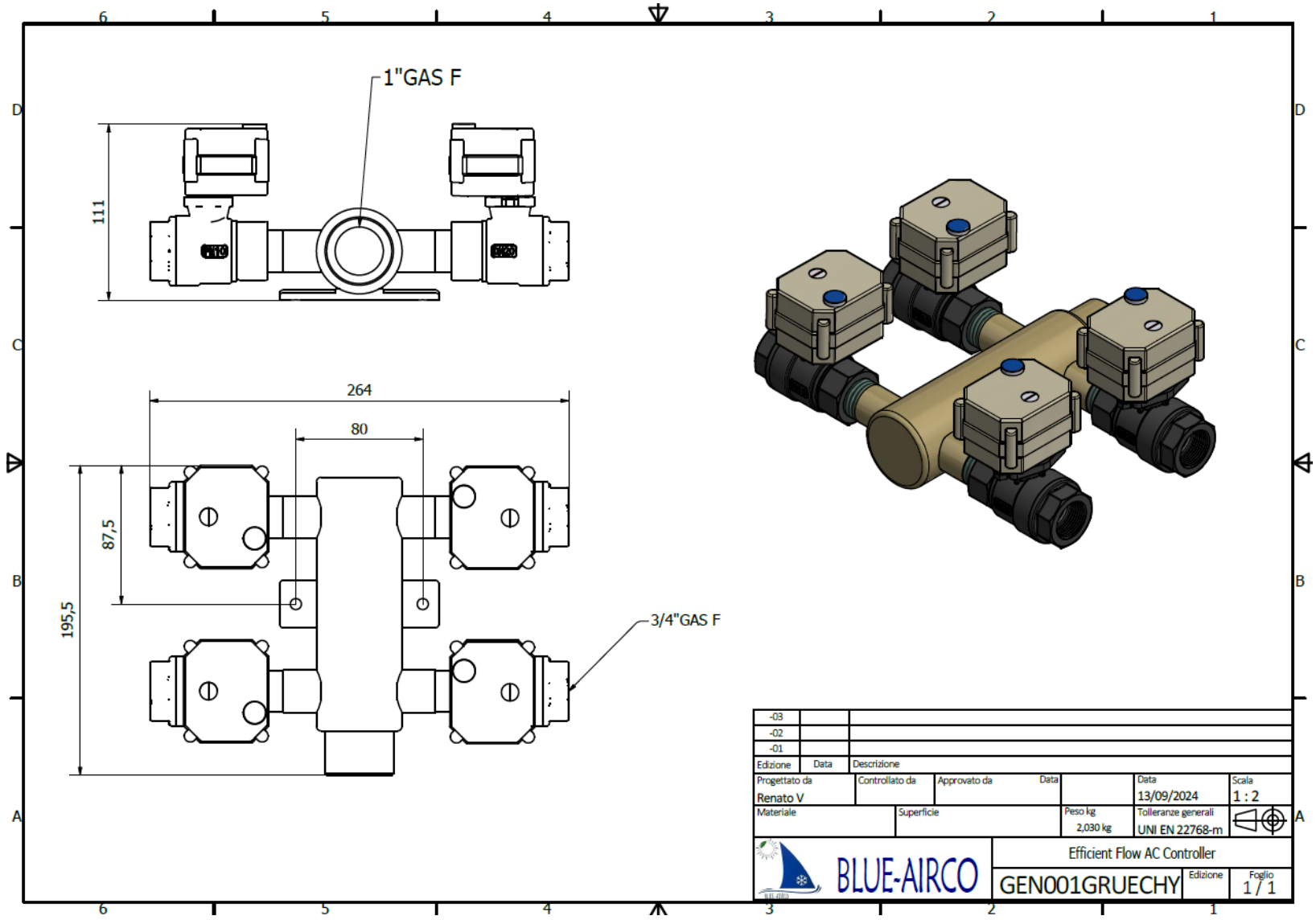


Figure 4: Cu-Ni 90/10 manifold dimensions

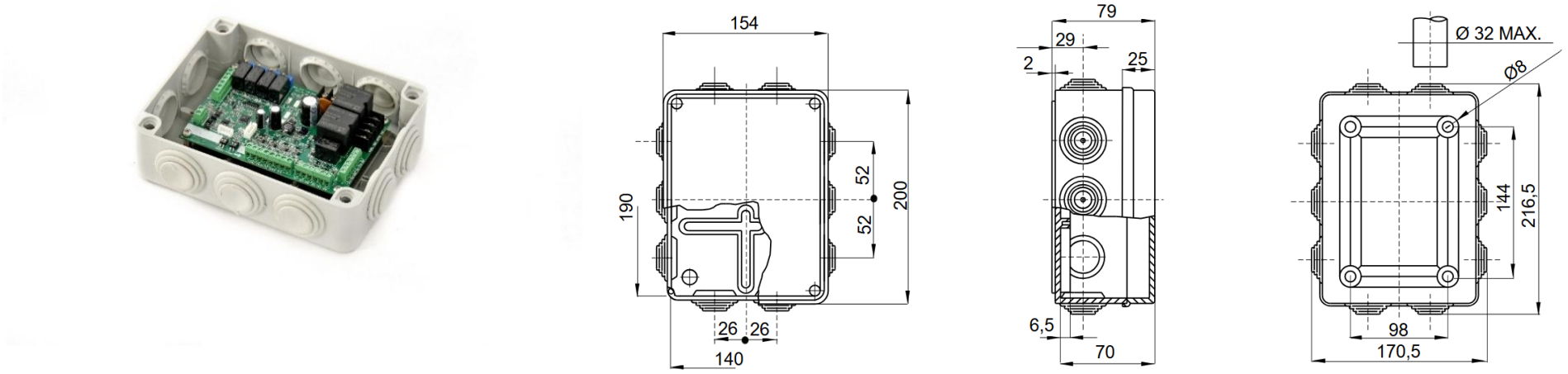


Figure 5: electric box (control device PCB) dimensions 154 x 200 x 80 mm

3. Power Supply

The system can be powered with the following nominal voltage values:

- 12VDC
- 24VDC
- 48VDC

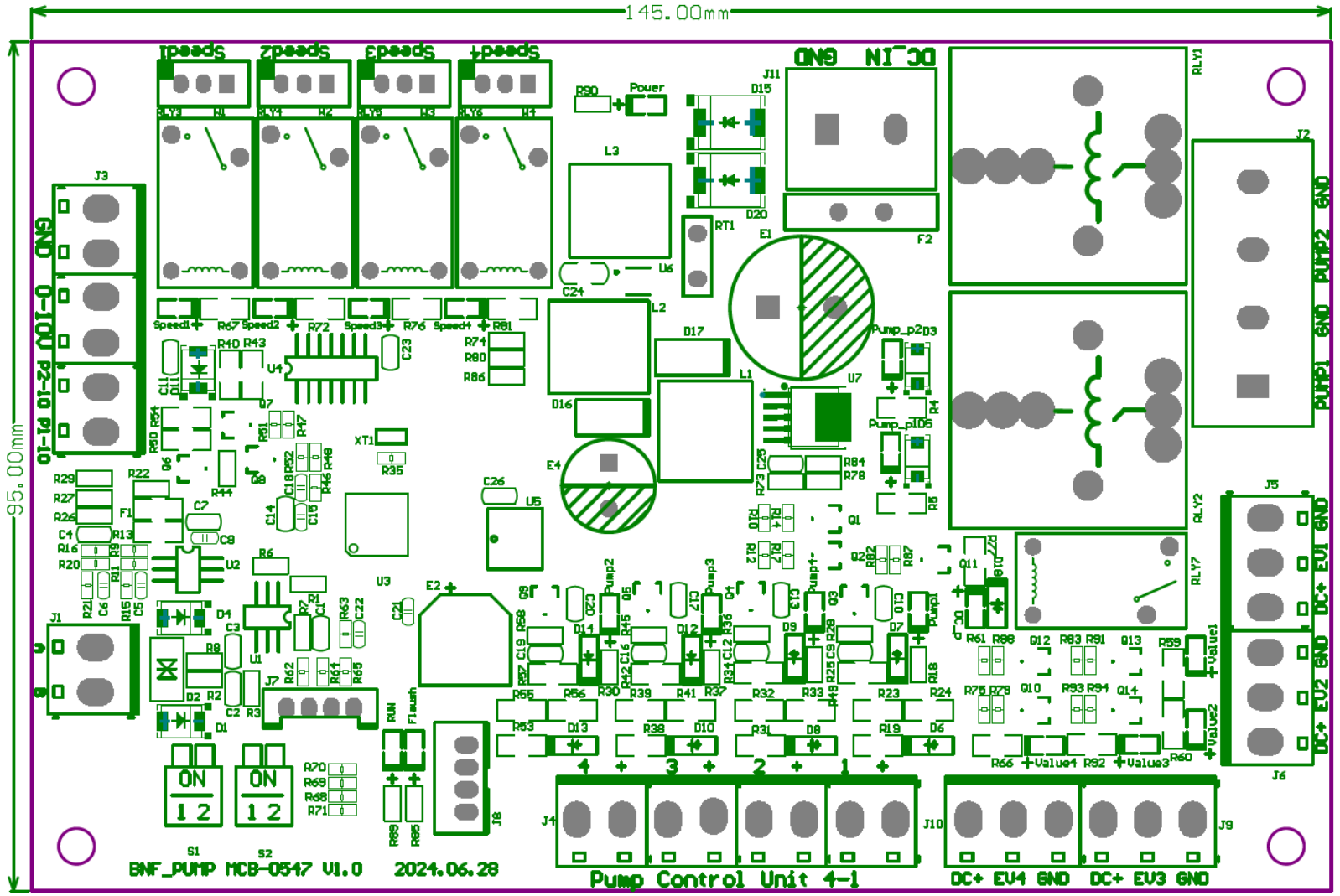


Figure 6: control device PCB

4. Pump Connection to PCB Control Device

The Efficient Flow AC Controller is equipped with terminals on the PCB control device to connect and manage two pumps. Follow the wiring instructions below for both power and speed control connections.

4.1 Pump Power Connection

1. Pump 1:
    - Connect the pump's + wire to the PUMP 1 terminal on the PCB.
    - Connect the pump's – wire to the GND terminal on the PCB.
2. Pump 2:
    - Connect the pump's + wire to the PUMP 2 terminal on the PCB.
    - Connect the pump's – wire to the GND terminal on the PCB.

4.2 Pump Speed Control Connection

1. GND Terminal:
    - Connect the GND terminal on the PCB to pump wire 1 (black-brown for IP65 or black for IP68 pumps).
2. 0-10V Terminal:
    - Connect the 0-10V terminal on the PCB to pump wire 2 (blue-green for IP65 or yellow for IP68 pumps).
3. P1/P2 -10 Terminal:
    - Connect the P1/P2 -10 terminal on the PCB to pump wire 3 (red-white for IP65 or red for IP68 pumps).

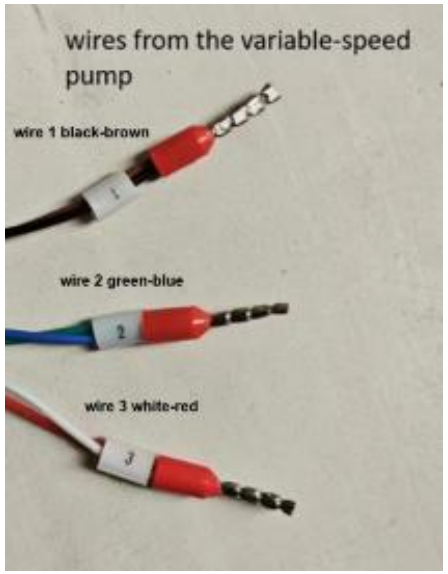


Figure 7a: IP65 pumps (007001PUMOP12, GEN001PUMOP24, GEN001PUMOP48) speed control wires

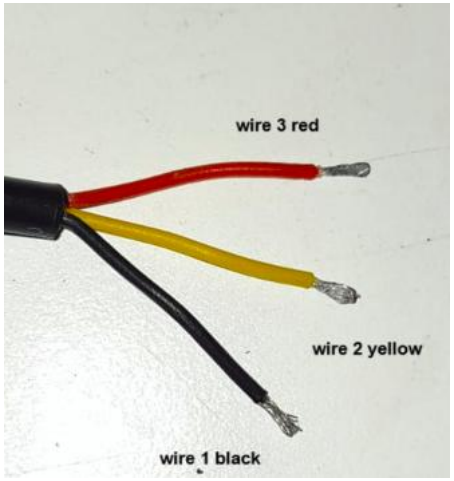


*Figure 7b: IP68 pumps (GEN004PUMOP***, GEN005PUMOP***) speed control wires*

5. Electro valve Connection

Each of the four electro valves should be connected to the PCB using three wires as follows:

- DC+
- EV
- GND

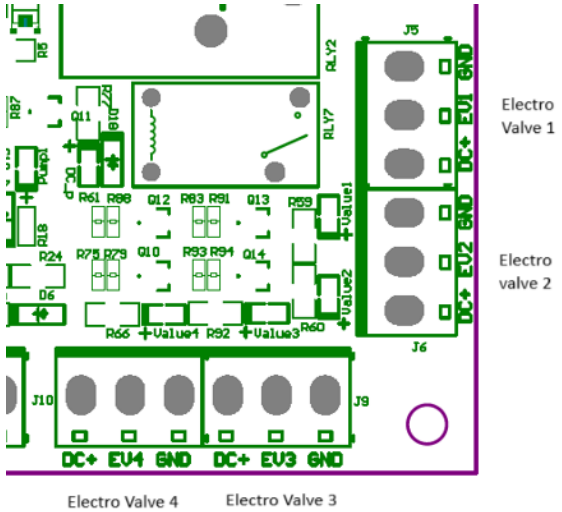


Figure 8: electro valve connection to PCB (control device)

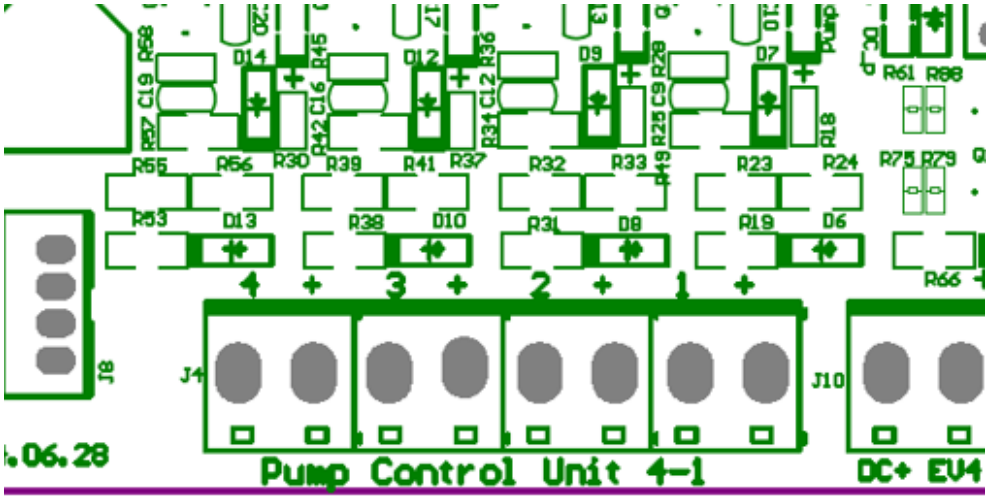
Refer to the labels on the PCB for accurate wiring. Ensure that each electro valve is connected properly to avoid any malfunction.

6. Pump Activation via AC Unit Dry Contact

Each AC unit is normally equipped with a dry contact (pump activation PC) on its terminal board that is used to activate the pump whenever the AC unit is requested to start in cooling or heating mode (for heat pumps).

- The PCB must be connected to each AC unit's terminal board dry contact via the terminals labelled "Pump Control Unit 4-1" on the PCB.
- When the AC unit enters cooling or heating mode, the dry contact closes, signalling the control device to activate the corresponding pump.

Ensure that the wiring between the PCB and the AC unit's dry contact is secure and correctly connected to allow automatic pump activation when needed.



pump activation (dry contacts from AC units 4-3-2-1

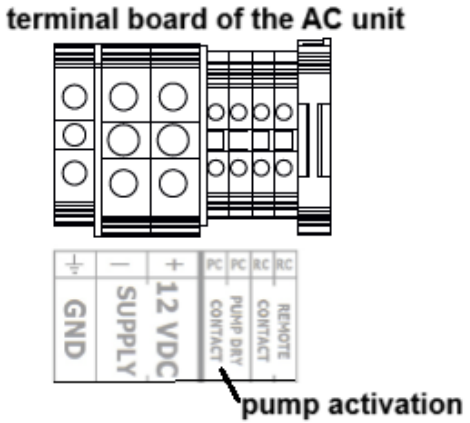


Figure 9: PCB (control device) connection to every AC unit (dry contact for pump activation)

7. LED Indicators

The Efficient Flow AC Controller includes LED indicators for monitoring pump and valve activation, as well as pump speed. Below is the functionality for each LED:

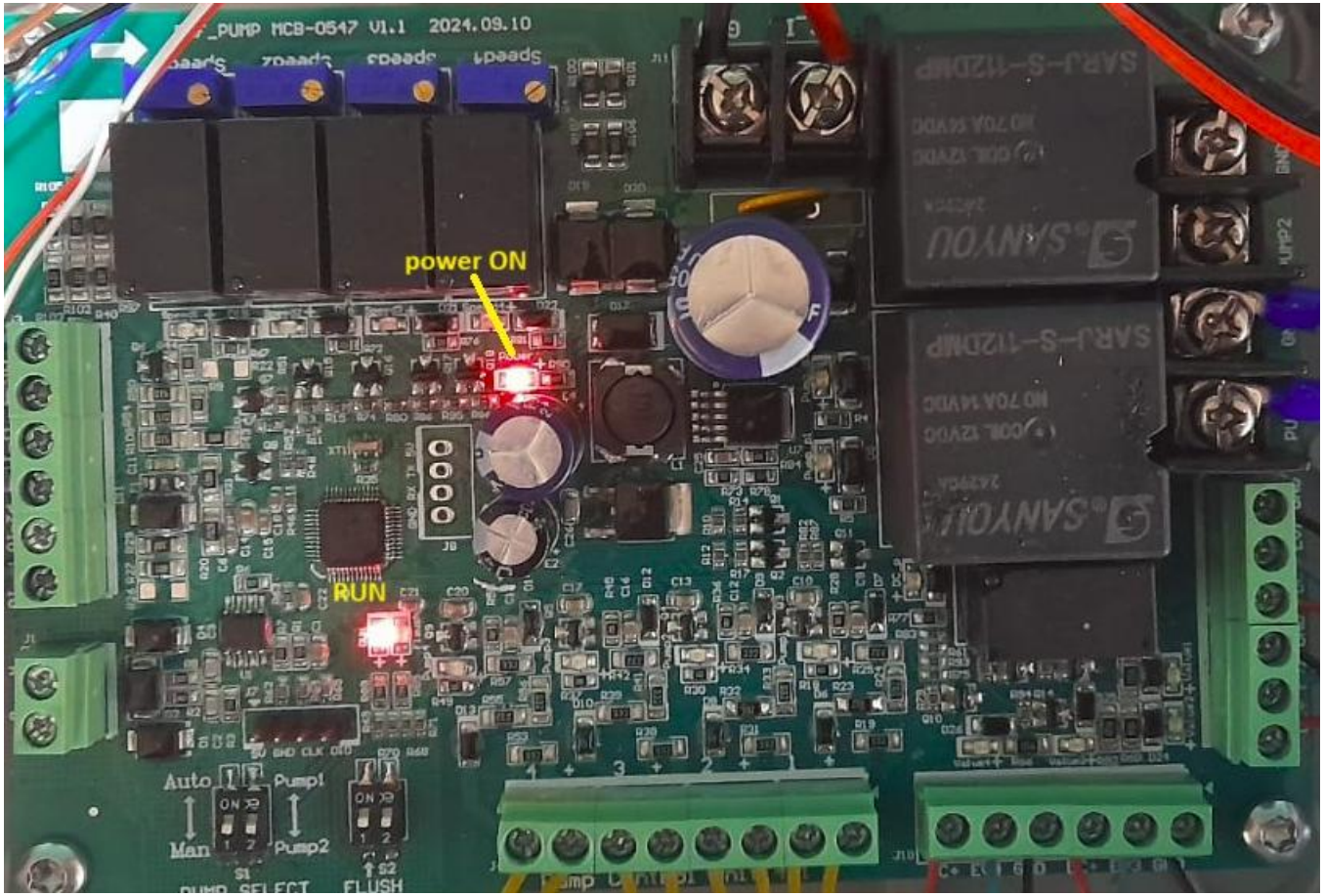


Figure 10: PCB (control device) stand by

- Speed 1: Indicates pump speed level 1 activation. At this speed, only one AC unit operates.
- Speed 2: Indicates pump speed level 2 activation. This speed supports two AC units working simultaneously.
- Speed 3: Indicates pump speed level 3 activation. At this speed, three AC units are active.
- Speed 4: Indicates pump speed level 4 activation. This speed enables all four AC units to operate concurrently.
- Pump 1 – Activation request from AC unit 1.
- Pump 2 – Activation request from AC unit 2.
- Pump 3 – Activation request from AC unit 3.
- Pump 4 – Activation request from AC unit 4.
- Valve 1 – Activation of Electro valve 1.
- Valve 2 – Activation of Electro valve 2.
- Valve 3 – Activation of Electro valve 3.
- Valve 4 – Activation of Electro valve 4.
- RUN – Power supply status (blinking)
- Pump_p1 – Activation of Pump 1.
- Pump_p2 – Activation of Pump 2.
- Power – Main control PCB power status.
- +DC_P – Power supply to pump status.

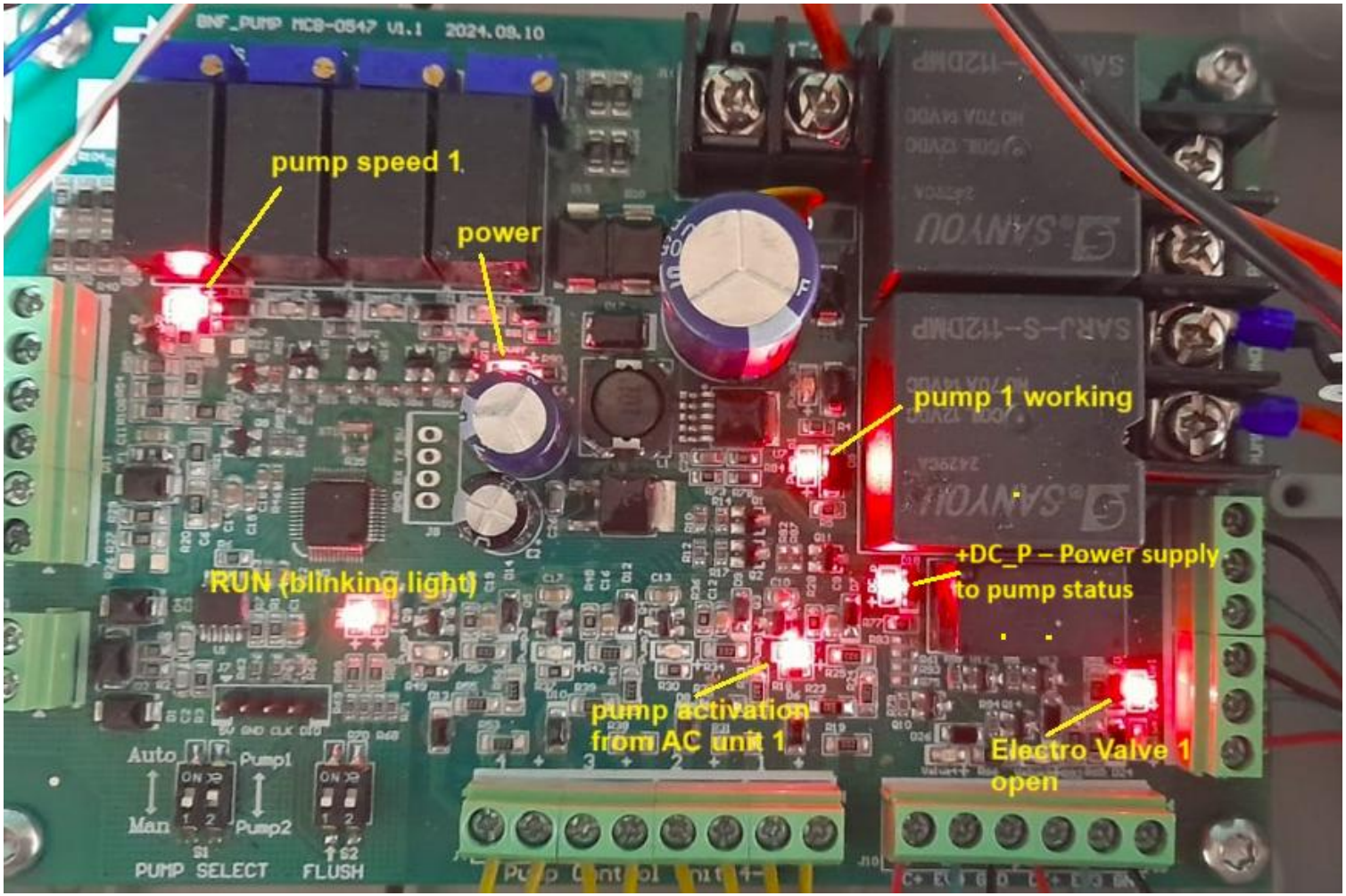


Figure 11: The PCB (control device) shows pump 1 operating at speed 1. This is because only AC unit 1 is currently active

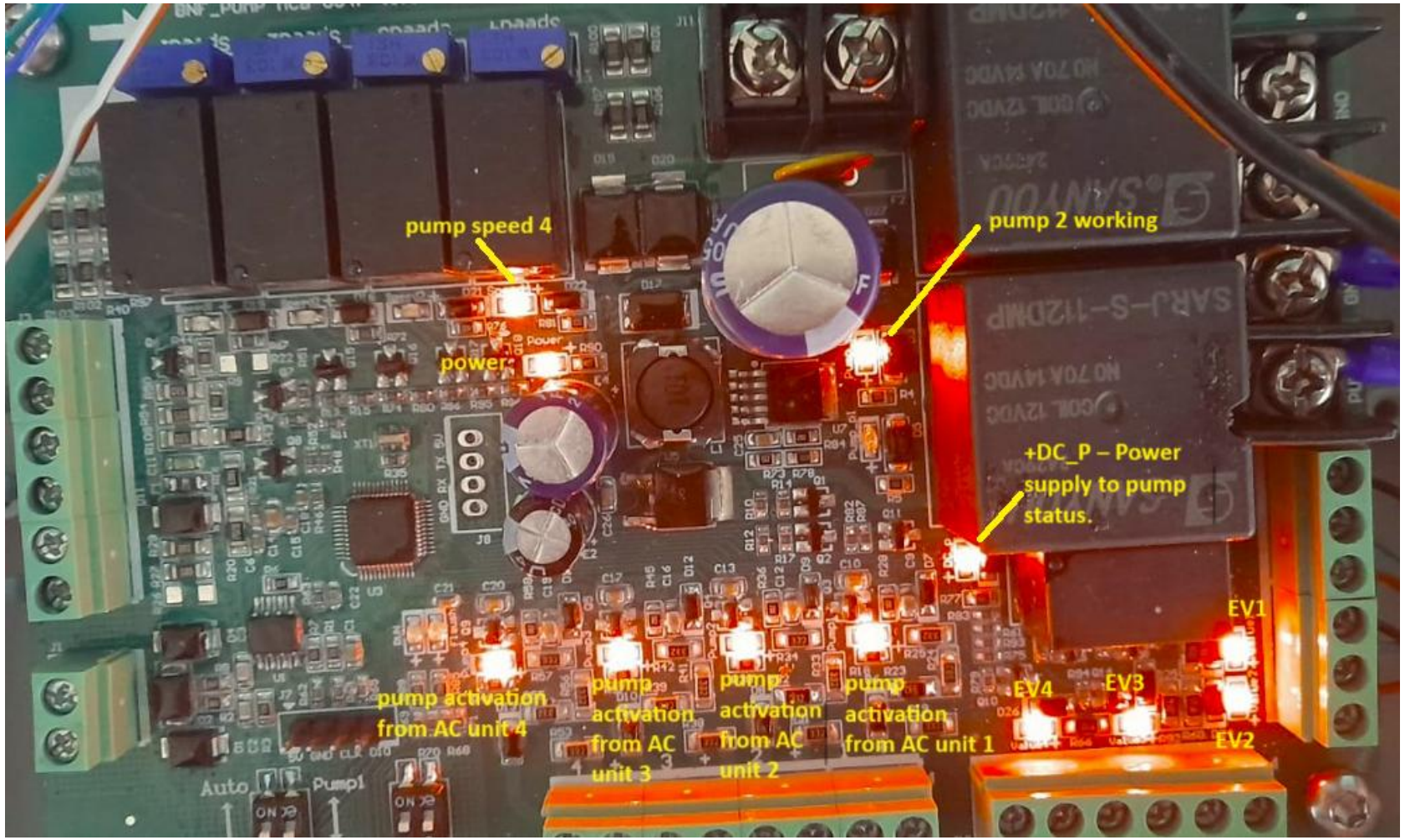


Figure 12: The PCB (control device) shows pump 2 operating at speed 4. This is because all AC units are active.

8.1 DIP Switch S1: Pump Operation Modes

The S1 switch sets the operation modes for the pumps:

S1 Switch	Mode Description
AUTO, PUMP 1	Pumps 1 and 2 alternate operation automatically, starting with Pump 1
AUTO, PUMP 2	Pumps 2 and 1 alternate operation automatically, starting with Pump 2
MAN, PUMP 1	Normal operation with only Pump 1 running, if requested
MAN, PUMP 2	Normal operation with only Pump 2 running, if requested

8.2 DIP Switch S2: Flush Mode Settings

The S2 switch configures the flush mode settings. The second switch (S2.2) is disabled and has no effect:

S2 Switch	Mode Description
1 OFF	Normal operation, no flush mode activated.
1 ON	The selected pump from S1 runs at maximum speed in flush mode (all electro valves open).
AUTO (S1)	If AUTO is selected in S1, Pumps 1 and 2 alternate every 3 minutes at maximum speed in flush mode (all electro valves open).

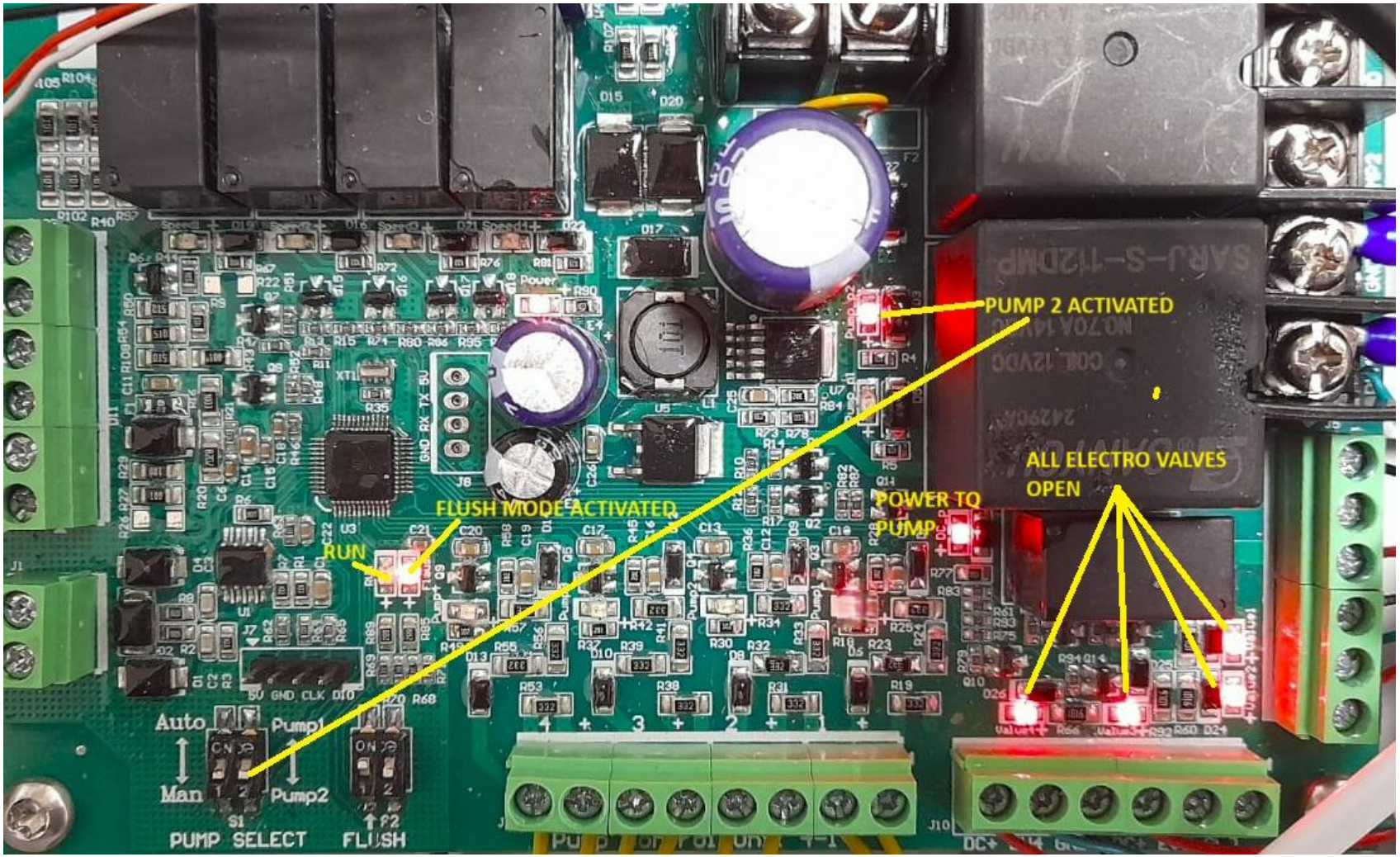


Figure 13: The PCB (control device) indicates Pump 2 operating with all Electro Valves open in FLUSH MODE

9. System Operation

1. Start-up: After connecting the power supply, pumps, and electro valves, configure the DIP switches according to the desired operation mode.
2. Monitoring: Use the LED indicators to monitor the activation of pumps, electro valves, and pump speed levels.
3. Flush Mode: Activate flush mode when required by adjusting the DIP switches (S2) to the appropriate settings.
4. Alternating Pumps: To balance wear and extend pump life, use the alternating operation mode via DIP switch S1.

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10. Troubleshooting

- Issue: Pump not activating
  - Check the power connections (PUMP 1/GND or PUMP 2/GND).
  - Ensure the AC unit is sending an activation request.
  - Verify DIP switch settings for correct operation mode.
- Issue: Electro valve not functioning
  - Inspect the wiring between the electro valve and the PCB (DC+, EV, GND).
  - Verify that the correct LED indicator is lighting up when activation is requested.
- Issue: System not responding
  - Check the main power supply to the PCB and ensure voltage is correct (12VDC, 24VDC, or 48VDC).
  - Review DIP switch configuration and reset if necessary.

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11. Maintenance

- Regularly inspect the connections to pumps and electro valves to ensure no wires are loose or damaged.
- Clean the manifold periodically to prevent any blockages that could reduce efficiency.
- Check the DIP switches to ensure the settings are correct for the system's current operating conditions.

This technical manual provides detailed instructions for installation, operation, and troubleshooting of the Efficient Flow AC Controller. For additional support, please contact the manufacturer's customer service team (www.blue-airco.com, info@blue-airco.com).