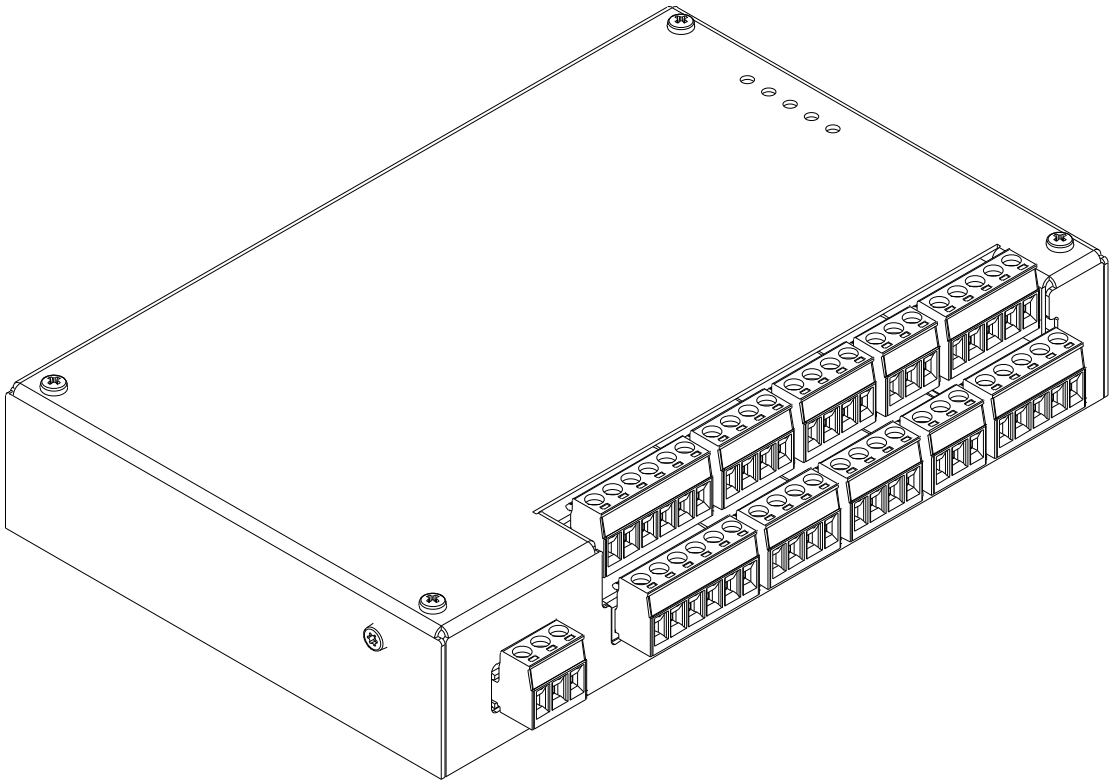
Impuls.Ing
Elektronik, Hard- & Software

Climate
Manual

Impuls.Ing GmbH

March 28, 2025



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Revision History

Revision	Date	Author(s)	Description
1.9	01.04.2025	PSC	Various corrections, release english manual
1.8	27.03.2025	SPO	Removed fan auto-on
1.7	28.02.2025	SPO	Various corrections
1.6	20.03.2024	SPO	Error feedback and software update
1.5	10.01.2024	SPO	Additional tables translated into English
1.4	15.11.2023	SPO	Updated sketch for valve with feedback
1.3	21.09.2023	SPO	Adjusted cable lengths
1.2	05.07.2023	PSC	Tables translated into English
1.1	29.06.2023	SPO	Additions to safety instructions
1.0	23.06.2023	SPO	Initial version

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Contents

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1 Introduction

The **Climate** device is a control unit designed for integration into underfloor convectors. It serves to detect one or more input signals (0–10 VDC or 24 VDC) and derive the appropriate outputs to control fans and heating or cooling valves.
Multiple **Climate** devices can also be interconnected. The connected devices then operate as a unit.

An input signal (e.g. from a wall-mounted control unit) is connected to one **Climate** device, and all connected devices will control their outputs identically.
This results in a simplified system setup with reduced wiring effort. A schematic representation is shown in Figure 1.

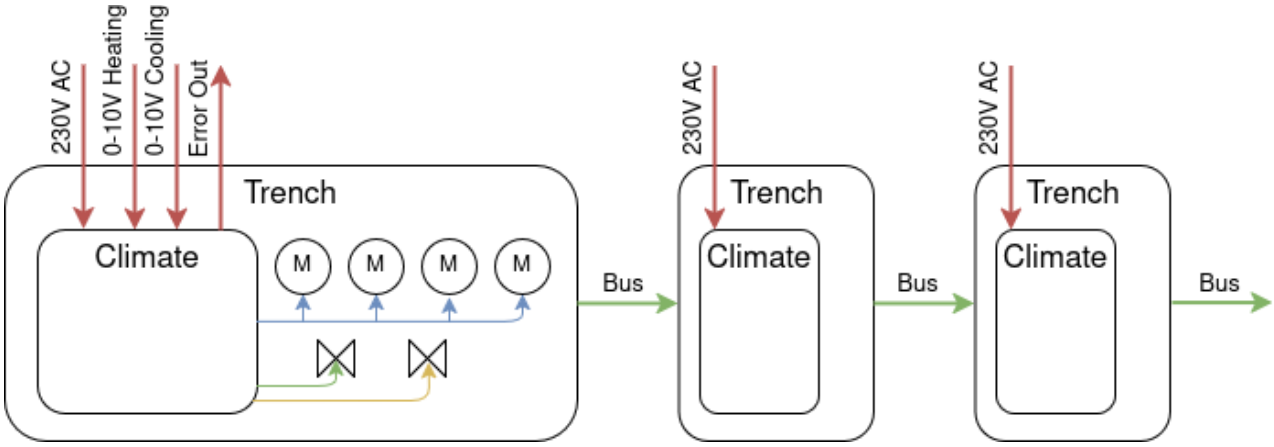

Figure 1: System architecture with three Climate devices

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2 Specification

2.1 Features

IP Protection Rating	IP20[1]
Enclosure Type	Metal enclosure for installation in OEM device
Color	Black (with white labels)
Enclosure Material	Aluminium AlMg3, Powder-coated
Enclosure Dimensions [mm]	190x132x41 (L x W x H)
Weight	670 g
Enclosure Flammability Class (UL 94)	V0

Table 2: Device Features

2.2 Operating Conditions

	MIN	MAX	UNIT
Mains Connection 230 V (50 Hz)	90	260	VAC
Cumulative Output Power	-	75	W
Number of Climate Devices Connected per BUS	-	50	Units
Cumulative BUS Cable Length	-	300	m
Power / Fan / Valve / IO Cable Lengths	-	3	m
I/O Connection: Heating-/ Cooling-/ Fan Input Voltage	0	28	VDC
I/O Connection: Error Output Current[2]	-20	0.1	mA
I/O Connection: 24 V Current	0	1	A
Fan Connection: Continuous Output Current	0	40	mA
Fan Connection: Tacho Input Voltage	0	28	V
Fan Connection: 24 V Current	0	1	A
Valve Connection[3]: Continuous Output Current	0	40	mA
Valve Connection[3]: Continuous Input Voltage	0	28	V
Valve Connection[3]: Digital Output Current	0	250	mA
Valve Connection[3]: 24V Current	0	1	A
Ambient Temperature	-20	55	°C

Table 3: System Operating Conditions

[1] This only applies when all plugs are mounted on the device.
[2] This is an open drain output with 10 kΩ pull-up.

☞ Operating outside these specifications can damage the device.

2.3 Electrical Characteristics

	MIN	MAX	UNIT
I/O Connection: Heating-/ Cooling-/ Fan Input Impedance	9	10	kΩ
I/O Connection: Error Output Impedance (Source)	9	11	kΩ
I/O Connection: Error Output Impedance (Sink)	95	105	Ω
Fan Connection: Tacho Input Impedance	1	1.15	MΩ
Fan Connection: Continuous Output Impedance	95	105	Ω
Valve Connection[3]: Continuous Input Impedance	102	108	kΩ
Valve Connection[3]: Continuous Output Impedance	95	105	Ω
Valve Connection[3]: Digital Output Impedance	0.1	5	Ω

Table 4: Electrical Properties

2.4 Mechanical Dimensions

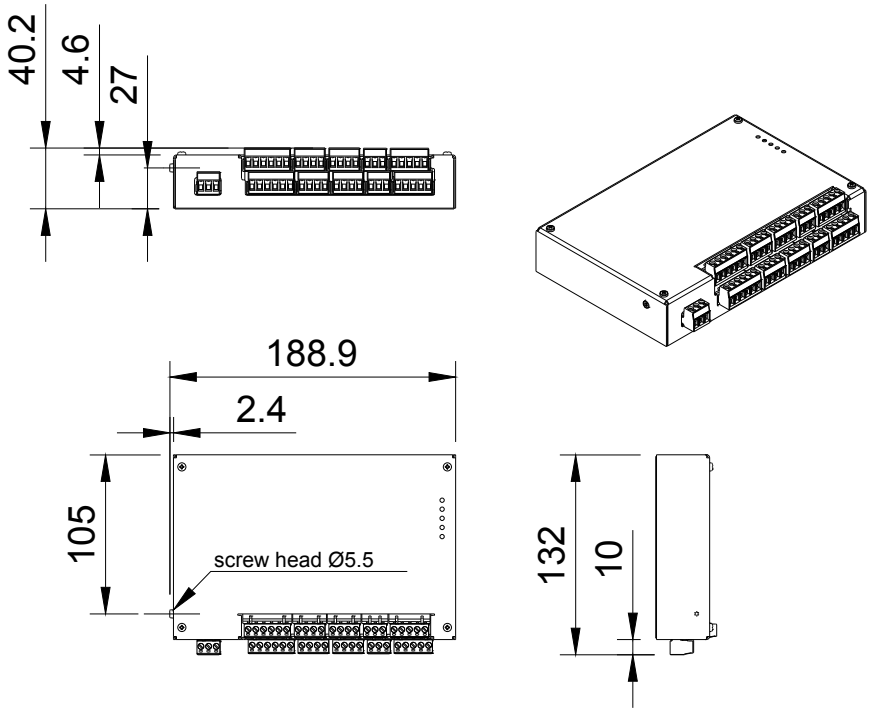

Figure 2: Device dimensions

2.5 CE Conformity

Impuls.Ing GmbH hereby declares that the product **Climate** complies with the RoHS Directive 2011/65/EU, the EMC Directive 2014/30/EU, and the Low Voltage Directive 2014/35/EU.

The full text of the Declaration of Conformity is available upon request. Please contact us at: *info@impulsing.ch*

[3]This applies to Heating and Cooling Valve connections.

3 Operating the Device

3.1 Safety

☞ Failure to follow the safety instructions below may result in explosions, injuries, burns, or even death.

- This user manual is intended to familiarize you with the functionality of this product. Keep all documentation supplied with the device in a safe place for future reference.
- Do not use this device for controlling safety-critical systems.
- Modifying or altering the product affects its safety and is therefore not permitted.
- Do not operate the device with damaged cables or connectors.
- Operate the device only when all connectors are properly plugged in.
- Have damaged cables and connectors repaired only by qualified personnel.
- This device is not intended to be used by persons (including children) with reduced physical, sensory, or mental capabilities, or lack of experience and/or knowledge, unless they are supervised or have been instructed on the safe use of the device.
- When connecting the device, use tools with insulated handles.
- Ensure that the mains power supply is equipped with overcurrent and residual current protection in accordance with the country-specific guidelines.
- Ensure that the earth connection between the device and the installation location is guaranteed.
- Do not expose the device to fire, heat or prolonged exposure to temperatures above 50 °C.
- Do not cover the device during operation.
- Ensure adequate ventilation while the device is in operation.
- Keep the product away from moisture.
- Ensure that the device never comes into contact with water or other liquids or is even immersed. Exposure to water can lead to damage.
- Avoid strong impacts, shocks or vibrations of any kind.
- Do not disassemble the device. An improperly assembled device can lead to danger to life due to electric shock.

- Only carry out assembly, maintenance and care of the appliance when it is disconnected from the mains supply.
- For cleaning, use a dry, soft cloth moistened with a mixture of water and a very mild detergent. Never use volatile substances such as benzene, thinner, cleaning agents in spray cans, etc.
- Disconnect the appliance from the power supply immediately in the event of malfunctions.
- Only have the appliance repaired by qualified personnel.
- Disconnect the appliance from the power supply when not in use.
- When the device is not in use, store it in a dry place at room temperature and out of the reach of children.
- Specifications subject to change without notice.

3.2 Installation

☞ The following instructions must be strictly observed during installation!

- During installation, ensure that a disconnector or an equivalent means of isolation is integrated into the system.
- Hazardous electrical voltage! It can cause electric shock and burns.
- Disconnect the system and the device from the power supply before starting any work.
- Electrical devices may only be installed and assembled by a qualified electrician.
- During installation, precautions must be taken against electrostatic discharge.
- Ensure correct wiring and polarity of the power supply.
- Explosion hazard – Only disconnect the devices when the power supply has been interrupted, or when it is certain that the area of use is free of flammable concentrations.

3.3 Maintenance

The device is maintenance-free. For cleaning, use a dry, lint-free, soft cloth and moisten it with a small amount of water. For heavy contamination, use a very small amount of mild, soap-based cleaning agent in addition to water. Disconnect the power supply and unplug the device before cleaning. Allow the device to dry completely before reconnecting the power.

3.4 Repairs

For repairs, please contact Impuls.Ing GmbH.

3.5 Disposal

Dispose of used materials for recycling. Dispose of the devices in accordance with local regulations.

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4 Pin Assignment

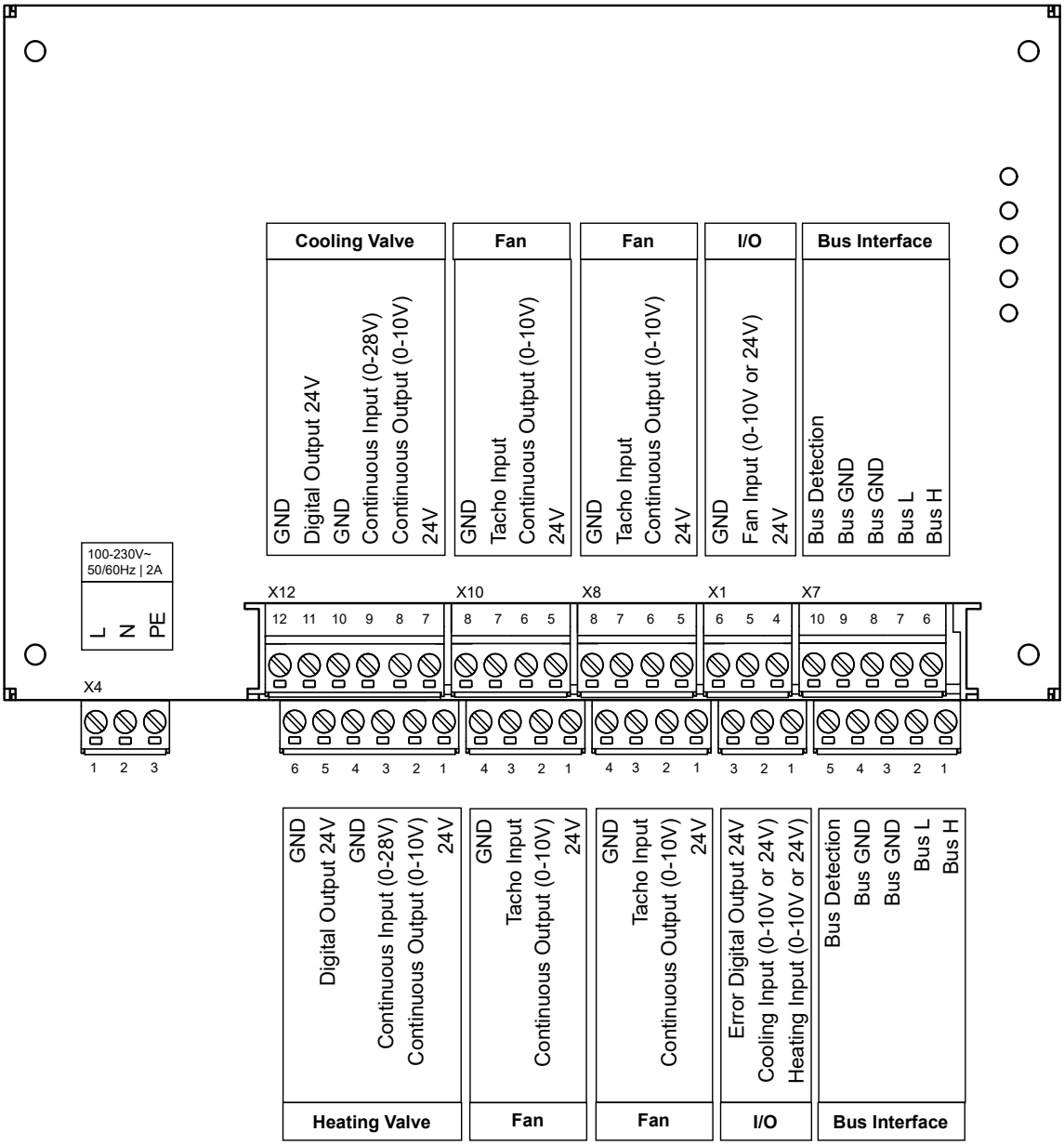

Figure 3: Pin assignment

Bus Interface	
Bus H	Bus signal high
Bus L	Bus signal low
Bus GND	Bus ground (connect to cable shield)
Bus GND	Bus ground
Bus Detection	Signal used for detecting a next device
I/O	
Heating Input	0-10V or 24V input. Controls the heating valve
Cooling Input	0-10V or 24V input. Controls the cooling valve
Error Output	Digital 24V error output. In case of failure this will be 0V
24V	24VDC voltage output. Used to supply peripheral devices (for instance temp. controller). Max. 1A
Fan Input	0-10V or 24V input. Controls the fans.
GND	0V (ground)
Fan	
24 V	Supply voltage for the fan. Max.1A
Continuous Output	0-10V output. Control signal for fan speed
Tacho Input	24V input for speed monitoring
GND	0V (ground)
Cooling- and Heating Valve	
24 V	Supply voltage for continuous valves. Max. 1 A
Continuous Output	0-10V output. Control signal for continuous valve position
Continuous Input	0-24V input for continuous valve position monitoring
GND	0V (ground)
Digital Output	24V output for two-point valve. Max. 250mA
GND	0V (ground)
230V Line	
L	Phase 230VAC 50Hz
N	Neutral
PE	Earth

Table 5: Description of the plug connectors

5 Status Indicators (LEDs)

The LEDs indicate the current operating status of the device. This allows for quick troubleshooting and commissioning of an installation with multiple Climate devices.

LED	Description
Status	Steady: Device is up and running Blinking: Software update in progress
Error	An error has occurred. See section 9 for more information. To clear the error: Turn off the device and wait until all LEDs are off. Then turn it back on.
Traffic	Blinks during active communication with other Climate modules
Bus Detection 1	Another Climate device detected on the **upper** bus interface connection
Bus Detection 2	Another Climate device detected on the **lower** bus interface connection

Table 6: Description of the LEDs

6 Functional Description

6.1 Input and Output Signals

The main function of Climate is to read the inputs from any device and then distribute them via the bus to all connected devices. Table 7 shows how Climate transfers input signals to the outputs.

In general, the table can be summarised in the following two points:

- The inputs are forwarded to the outputs.
- When using 0-10V signals for heating/cooling, then the according 2-point valve will turn on when signal > 0.5V.

6.2 Error Monitoring

Climate is capable of monitoring the speed of fans with a tachometer signal as well as the actual position of modulating valves with a position feedback signal. If a Climate device detects an error, this is indicated by the Error LED (lit continuously) and the voltage at the error output drops to 0 V.

	Inputs			Outputs				
	Fan	Heating	Cooling	Fans	Heat 0-10V	Heat 2-P	Cool 0-10V	Cool 2-P
1.	0	0	0	0	0	OFF	0	OFF
2.	0	0	A	0	0	OFF	A	ON
3.	0	A	0	0	A	ON	0	OFF
4.	A	0	0	A	0	OFF	0	OFF
5.	A	B	C	A	B	ON	C	ON

Table 7: Condition table of all inputs and outputs
A/B/C are 0-10 V values, which are applied to the inputs (and therefore will appear on the outputs respectively)

If multiple Climate devices are operating together in a group (see section 7.7), the error message is automatically transmitted to all other Climate devices. These other devices will indicate the error state with a blinking Error LED, and their error outputs will also drop to 0 V. This way, you only need to check the Error LED on one device to know if there is an error in any Climate device in the group. Additionally, the error signal can be picked up from any device to notify a building automation system, since all devices will report the error.
Figure 4 illustrates how this works.

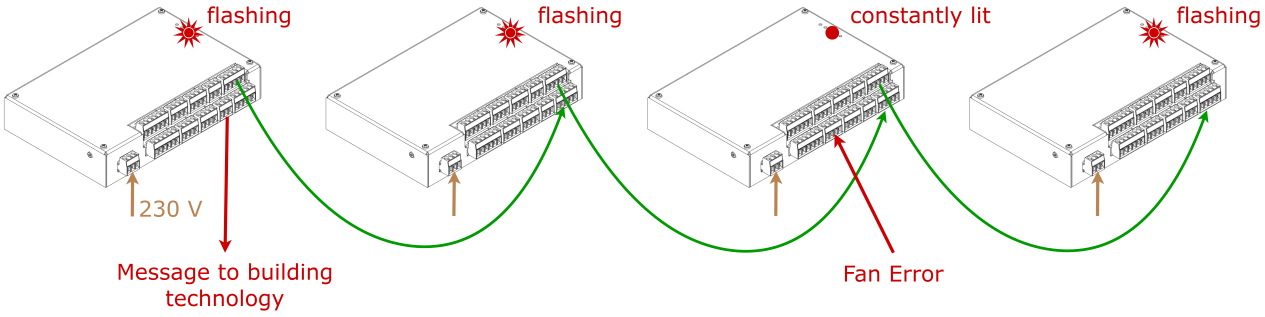

Figure 4: Error indication of a fan fault in a group of 4 devices

To use the error monitoring feature, proceed as follows:

- Ensure that fans with tachometer signal are used and connected as described in section 7.3.
- Ensure that valves with position feedback are used and connected as described in section 7.3.
- Climate automatically detects the input signals and starts monitoring.

- Fans:
  - Monitoring starts when the speed exceeds 100 rpm for at least 5 seconds.
  - An error is reported if the speed drops below 100 rpm for more than 10 seconds after monitoring has started.
- Valves:
  - Monitoring starts when the setpoint is greater than 1 V for at least 5 minutes.
  - An error is reported if the actual position deviates from the setpoint by more than 0.5 V for longer than 2 minutes.

☞ To ensure that Climate can detect the fan speed and valve position signals and start monitoring automatically, the fans and valves must initially function correctly. If a fan has never turned, Climate assumes it is a fan without speed monitoring, and no error will ever be reported. It is therefore essential to verify the proper operation of all actuators during commissioning.

6.3 Software Update

Climate devices are capable of distributing their current software to other Climate devices. This is useful if, in the future, newer Climate devices include additional features or important updates. You will be informed by Impuls.Ing GmbH customer support whether an update is necessary. An update can be performed as follows:

- Connect the Climate device with the new software to your device group (see section 7.7). You can either replace an older device or expand the group with the new one.
- Switch off the Climate device with the new software, i.e., disconnect the 230 V power supply.
- Wire the update plug as shown in Figure 5.
- Switch the Climate device with the new software back on.
  - After switching on, the Status LED will start blinking. This indicates the update process has started.
  - After a short time, the Traffic LED will light up continuously. This means the data is being transmitted to other Climate devices.
  - The process takes approximately two minutes.
  - Afterwards, all devices will reboot and install the new software. This takes a few seconds.

  - Congratulations – the update is complete.

- Remove the update plug (or the wiring connected to it).

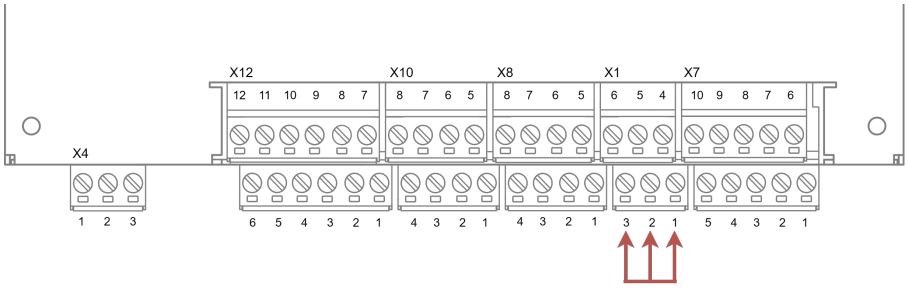

Figure 5: Wiring of the update plug

7 Typical Applications

7.1 2-Pipe System: Fans and 2-Point Valve

The switching between heating and cooling is done via the wall control unit.
For simplicity, only one fan is shown, but up to four fans can be connected.

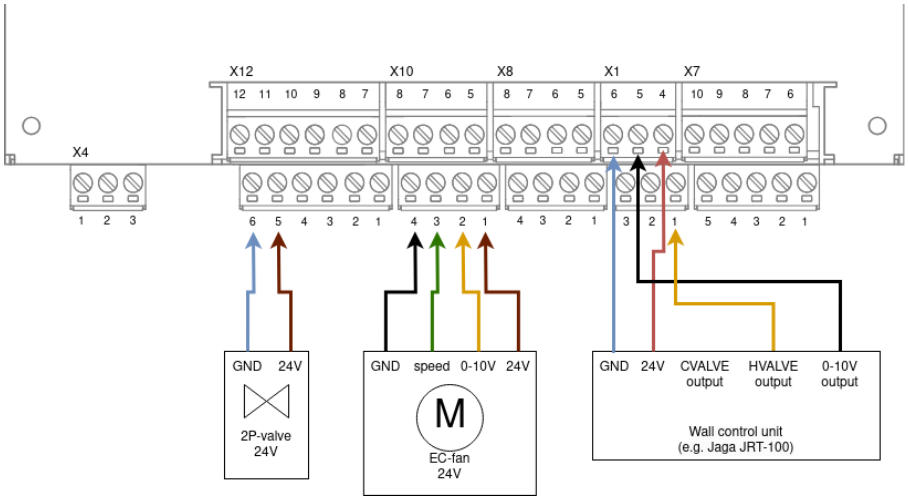

Figure 6: Setup with fan and 2-point valve in 2-pipe operation

7.2 2-Pipe System: Fans and 0–10 V Valve

The switching between heating and cooling is done via the wall control unit.
For simplicity, only one fan is shown, but up to four fans can be connected.

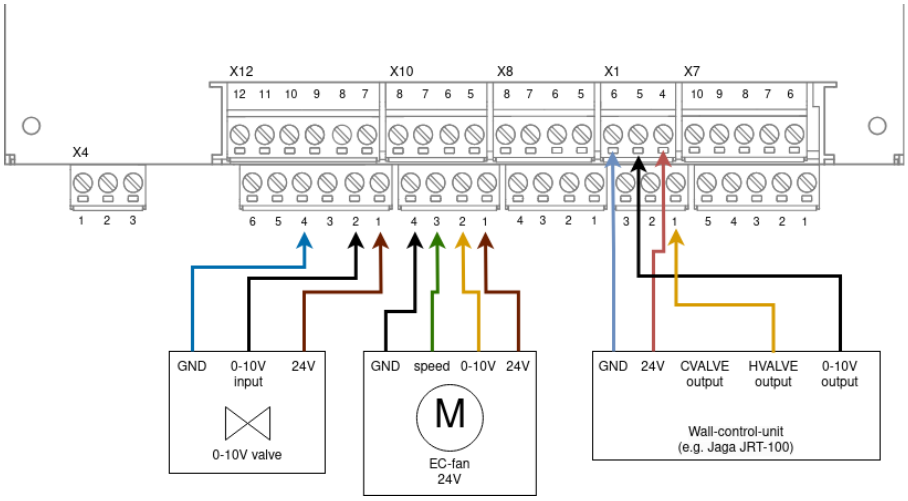

Figure 7: Setup with fan and 0–10 V valve in 2-pipe operation

7.3 2-Pipe System: Fans and 0–10 V Valve with Feedback

The switching between heating and cooling is done via the wall control unit.
For simplicity, only one fan is shown, but up to four fans can be connected.

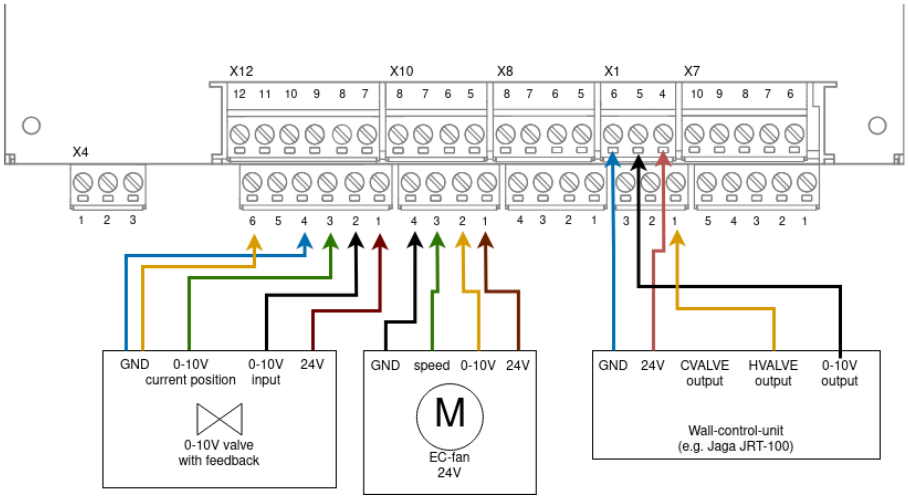

Figure 8: Setup with fan and 0–10 V valve (with feedback) in 2-pipe operation

7.4 4-Pipe System: Fans and 2-Point Valves

For simplicity, only one fan is shown, but up to four fans can be connected.

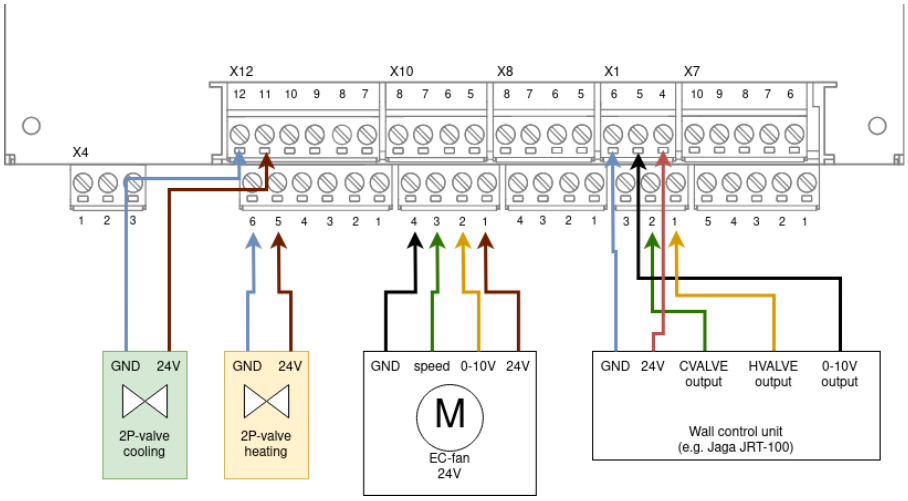

Figure 9: Setup with fan and 2-point valve in 4-pipe operation

7.5 4-Pipe System: Fans and 0–10 V Valves

For simplicity, only one fan is shown, but up to four fans can be connected.

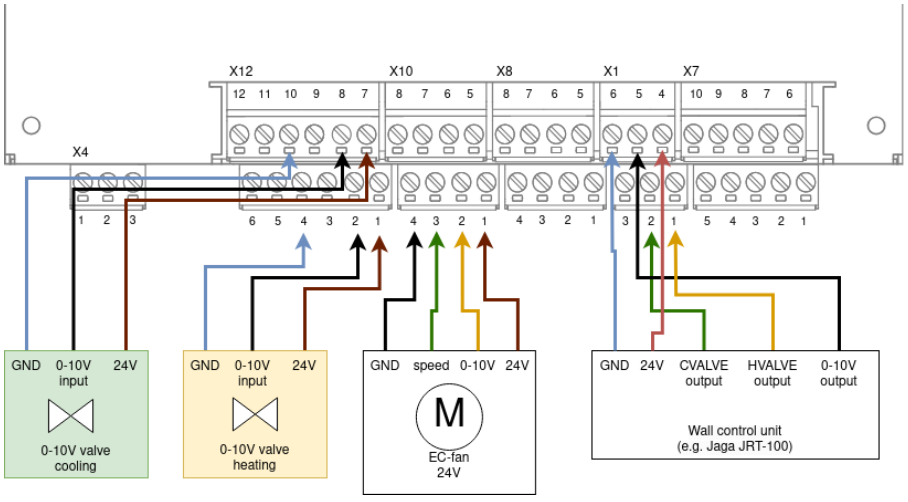

Figure 10: Setup with fan and 0–10 V valve in 4-pipe operation

7.6 4-Pipe System: Fans and 0–10 V Valves with Feedback

For simplicity, only one fan is shown, but up to four fans can be connected.

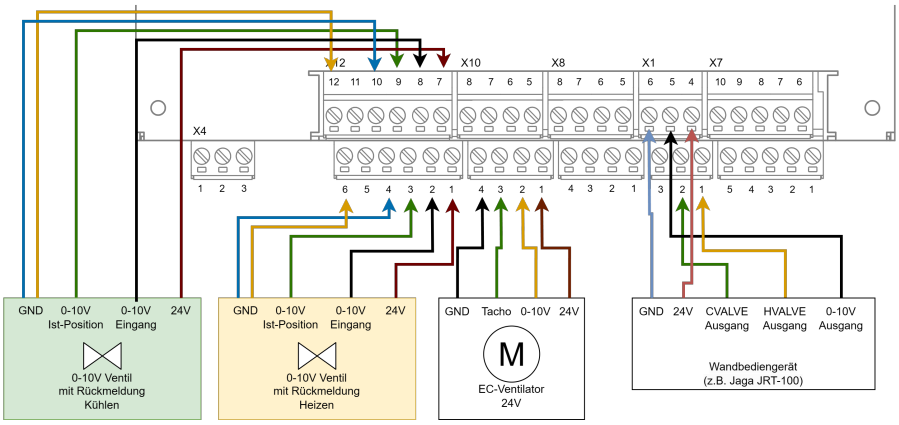

Figure 11: Setup with fan and 0–10 V valve (with feedback) in 4-pipe operation

7.7 Connecting Multiple Climate Devices into a Device Group

Multiple devices can be connected via the *Bus Interface* connector to form a device group. In this case, all connected devices will control their outputs in the same way. This is typically used when multiple Climate devices are located within the same control zone. When connecting the devices, the following must be observed:

1. For a reliable and interference-free connection of multiple Climate devices, the use of a standardised, twisted-pair and shielded 2×2-wire cable with 120 Ohm impedance is recommended.
2. Twisted pairs should be used for the following lines:
   - BUS L and BUS H
   - Bus GND and Detection
3. The *Bus Interface* connectors must be wired *one-to-one*, i.e. pin 1 to pin 1, pin 2 to pin 2, pin 3 to pin 3, etc.
4. The total length of all BUS cables must not exceed 300 meters.
5. The shield of the BUS cable should be connected to ground on only one side, at one Climate device.

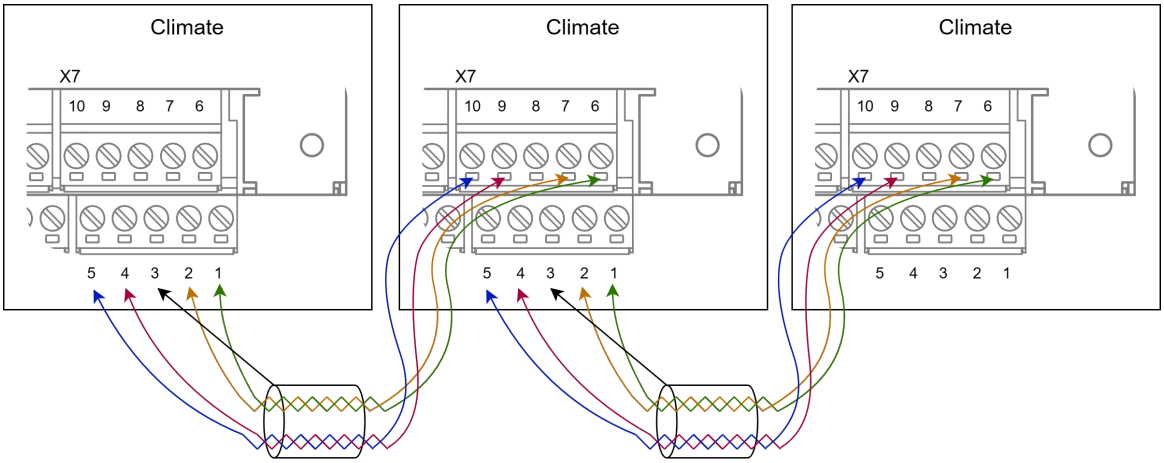

Figure 12: Connecting multiple Climate devices into a device group

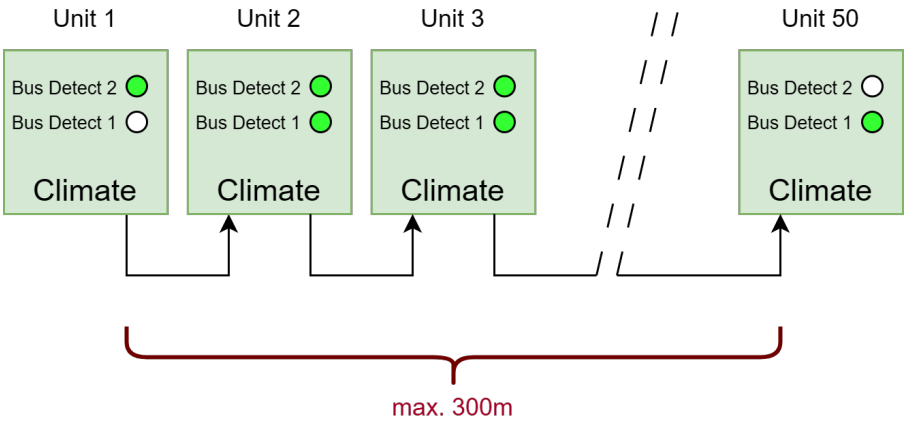

Figure 13: Example wiring with maximum length

8 Commissioning

> ☞ The following description assumes that all fans and valves are correctly connected to the respective Climate devices.

> ☞ Only one wall control unit may be connected to each device group.

To commission a Climate device group, follow these steps:

1. Ensure that a wall control unit is connected.
2. Ensure that all Climate devices are connected as shown in section 7.7.
3. Ensure that all Climate devices have a 230V power supply.
4. Switch on the 230V power.
5. Visually check the *Bus Detect 1* and *Bus Detect 2* LEDs to verify that the BUS connection is working correctly:
   - For the **first and last** device, **one of the two** LEDs should be lit.
   - For **all other** devices, **both** LEDs should be lit.
   - This is also shown in Figure 13.
6. Visually check the *Error* LED to ensure that no device is in an error state.
7. Force an output signal by operating the wall control unit and check whether the fans turn on.[4]
8. Congratulations, you're done!

9 Error Diagnosis

Below is a list of known error cases and how to resolve them:

- Error: Traffic LED is continuously on.
  - Possible cause: The software of the Climate devices is being updated.
  - Solution: No action required. After the update (max. 5 minutes), everything will function normally again.

[4] If necessary, refer to the wall control unit's manual.

- Error: Traffic LED is continuously on.
  - Possible cause: Short circuit on the BUS (BUS H and BUS L are shorted).
  - Solution: Disconnect the bus connections step by step to find where the short circuit is located. Then replace the bus cable.
- Error: Error LED is continuously on.
  - Possible cause: A fan is no longer running, or a valve has not reached the setpoint position (see section 6.2).
  - Solution: Fix the issue with the fan or valve.
- Error: Error LED is continuously on.
  - Possible cause: More than one wall control unit has been connected.
  - Solution: Connect only one wall control unit and restart all devices.
- Error: Error LED is blinking.
  - Possible cause: The error monitoring on another Climate device has detected an error (see section 6.2).
  - Solution: Find the device that reports the error and resolve the issue there. Look for the device where the Error LED is continuously lit.

10 Contact and Further Information

If you have any further questions, we are happy to assist you:

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