the air handling company

robatherm AHUs.

Operation and incidents.

October 2024

English - Translation of the original instructions

Air handling units | type RM/RL/TI-50

robatherm GmbH + Co. KG
John-F.-Kennedy-Str. 1
89343 Jettingen-Scheppach
Germany

You can find the currently valid version of these instructions, and further instructions, on our website at www.robatherm.com/manuals.

This leaflet is based on the generally accepted engineering standards at the time of drafting. Since the printed version is not subject to change control, the current version must be requested from robatherm or downloaded from the Internet at www.robatherm.com before application.

Content subject to change.

To improve readability, this document does not use male, female, and non-binary pronouns (m/f/d). All pronouns apply equally to all genders.

Last modified: October 2024

Contents

General remarks

Information about these instructions

These instructions will facilitate safe and efficient use of the AHU.

All persons working on the AHU must thoroughly read and understand these instructions before starting any kind of work.

Safe working is dependent on adhering to all safety information and instructions.

Further information

The instructions describe all the available options. Whether and which options are available in the AHU depends on the options selected and the country for which the AHU is intended. The illustrations serve as an example and may differ.

The instructions consist of several parts and have the following structure:

Fig. 1: Parts of the instructions

Main operating instructions

- ➔ Transport and unloading
- ➔ Installation and assembly
- ➔ Commissioning
- ➔ Operation and faults
- ➔ Maintenance and cleaning
- ➔ Disabling and disposal

Security

General risk sources

DANGER

Fire hazard due to improper operation of the electric heater

In case of improper operation of the electric heater, there is a danger to life due to fire.

- The electric heater may only be operated if flow monitoring is present. This flow monitoring is performed by a type-tested triple thermostat with safety temperature limiter with manual reset.
- Both in nominal and partial-load operation, the air velocity must not fall below a minimum of 2 m/s. This setting must be specially monitored during commissioning to ensure that insufficient casing air velocity cannot occur.

DANGER

Danger to life due to burns

When working on the electric heater, there is a danger to life due to hot surfaces or heat radiation.

- Let the fan run to cool down to room temperature.
- Before carrying out any work on the electric heater, switch off the AHU and secure it so that it cannot be switched back on.
- Wear heat-resistant gloves.

WARNING

Risk of death due to moving parts

Risk of death when closing fins, moving coupling bars or gears due to crushing between two moving parts.

- Attach separating protective devices (e.g., downstream grid, duct) to the damper.
- Before opening the door, switch off the AHU and secure it against restarting.
- Do not reach between the fins.

WARNING

Danger to life from falling!

When stepping on the protection roof, there is a risk to life from falling, as the protection roof is unsuitable for supporting loads.

- Do not enter the protection roof.

WARNING

Danger to life from high pressure!

When working with spray humidifiers in the high-pressure range, there is a danger to life due to a pressure build-up in the pipelines or in the pressure vessel.

- Before carrying out any work on high pressure spray humidifiers, switch off the AHU and secure it so that it cannot be switched back on.

WARNING

Danger to life from suffocation

There is a risk of suffocation if the cooling circuit is completely emptied, as vapours, aerosols or gases can spread through the duct in the building.

- Maintain a minimum volume flow of 25% of the nominal volume flow (EN 378-1).
- Prevent ingress in places where accumulation could be hazardous (e.g. cellar, waste water system).
- Observe inspection intervals and enter them in the service booklet for refrigeration systems.

WARNING

Danger to life due to suffocation!

There is a risk of suffocation if refrigerant escapes, as refrigerant is odorless and tasteless and displaces atmospheric oxygen.

- A refrigerant sensor for monitoring the installation site and suitable ventilation must be present and functional.
- Observe the safety data sheet of the refrigerant.
- Leave the danger zone.
- Ensure good air exchange in the danger zone.
- Use self-contained respiratory protection.

WARNING

Danger to life due to harmful substances

In conjunction with an open flame, refrigerants and compressor oils develop toxic substances that are harmful to health.

- Do not smoke in the machinery compartment.

WARNING

Fire hazard due to heat accumulation

With the electric heater, there is a risk of fire due to heat accumulation when installed at the end of the AHU and, e.g., improper switch-off, power failure, or fan failure.

- Let the fan run to cool down to room temperature.
- Install the triple thermostat according to the instructions.
- Check the functions of the triple thermostat according to the instructions.
- The components and parts installed downstream must be heat-resistant up to 145 °C or protected by radiation protection.
- A distance of 300 mm must be maintained between the device outlet and the first component or part installed in the duct.

WARNING

Fire hazard due to loose parts

There is a fire hazard when flammable substances come into contact with the combustion chamber or the direct gas-fired heater.

- Check that there are no parts in front of the combustion chamber and the direct gas-fired heater that could be carried away when the AHU is switched on for the first time.

WARNING

Danger to life due to burns

When working on the steam heater, there is a danger to life due to burns.

- Let the fan run to cool down to room temperature.
- Do not touch the hot surface.

WARNING

Danger to life from party flying around

Serious personal injury or even death may be caused by flying parts as a result of impeller breakage.

- Pay attention to unusual vibrations during commissioning, especially when starting the fan for the first time.
- Do not exceed the maximum fan speed specified on the nameplate and in the technical data sheet.
- Do not operate the fan in the event of unusual vibrations.

CAUTION

Severe health damage due to infection and hypersensitivity reactions

When exposed to water, there is a health risk from viruses, bacteria or fungi due to poor water quality.

- Check water quality at the specified intervals.
- The total colony count of 1000 CFU/ml in the humidifier water must not be exceeded (according to DIN EN ISO 6222).
- The legionella concentration of 100 CFU/100 ml must not be exceeded (according to DIN EN ISO 11731).
- The bacterial count of Pseudomonas aeruginosa King B of 100 CFU/100 ml must not be exceeded.
- There must be no visible mold growth.
- If bacterial counts are too high, clean the AHU immediately.

TIP

Recurrent contamination

In cases of doubt or in the event of rapidly recurring high levels of contamination, it is advisable to seek the advice of a qualified institute.

CAUTION

Risk of injury due to cold surfaces

There is a risk of injury from ice burns or frostbite when touching cold pipes.

- Pipes outside the AHU must be insulated by the customer to make them impermeable.

CAUTION

Risk of injury due to cold surfaces

Cold surfaces of components (e.g., cooling coils, refrigeration technology) pose a risk of injury from ice burns or frostbite during operation and even after the AHU has been switched off.

- Wait until the temperature of components matches room temperature.
- Do not touch cold surfaces.

CAUTION

Hot surfaces due to heat radiation of the electric heater

There is a risk of burns when touching the surfaces (duct, spigots,...) if the electric heater is at the end of the AHU.

- Let the fan run to cool down to room temperature.
- Wear heat-resistant gloves.

CAUTION

Hot surfaces due to thermal radiation from the combustion chamber

Touching surfaces (duct, nozzles...) when the combustion chamber is at the end of the AHU will cause burns.

Let the fan run to cool down to room temperature.

Wear heat-resistant gloves.

NOTE

Damage due to thermal radiation from the electric heater

Damage to the downstream component and parts (duct, nozzles ...) due to thermal radiation from the electric heater if the electric heater is at the end of the AHU.

- The components and parts installed downstream must be heat-resistant up to 145 °C or protected by radiation protection.
- A distance of 300 mm must be maintained between the device outlet and the first component or part installed in the duct.

NOTE

Damage due to thermal radiation from the combustion chamber Damage to the downstream component and parts (duct, nozzles ...) due to thermal radiation from the combustion chamber if the combustion chamber is at the end of the AHU.

The components and parts installed downstream must be heat-resistant.

A distance of 300 mm must be maintained between the device outlet and the first component or part installed in the duct.

NOTE

Heat damage to the AHU due to steam heater

Overheating of the steam heater causes heat damage to the AHU.

- Operate the steam heater only when the fan is running.
- Provide airflow monitoring or temperature limiters.

Personnel qualification

The work described in this section may only be performed if the person has the following qualifications:

➔ Operator

Humidifier

Circulating water spray humidifier (low pressure)

Disinfection

UV-C technology for water disinfection

NOTICE

Cancelling the monitoring of the UV-C intensity by subsequently setting the UV-C intensity

The monitoring of the UV-C intensity can be cancelled by subsequently setting the UV-C intensity. This leads to an incorrect display of the disinfection effect.

- Set the UV-C intensity according to the manufacturer's instructions (see appendix "Herco – UV disinfection system UVE 35 – 45 (P) digital", "Setting – UV intensity" section).

For operation, see appendix "Herco – UV disinfection system UVE 35 – 45 (P) digital", "Operation" section.

Troubleshooting
Personnel qualifications
The tasks described in the section may only be carried out if the person concerned has the following qualification:

➔ Qualified electrician

For troubleshooting, see appendix "Herco – UV disinfection system UVE 35 – 45 (P) digital", "Fault table" and "Fault and fault rectification" sections.

Desalination system

- For operation, see attachment "Herco – Cooltrol data desalination system", attachment "Herco – Cooltrol data open-loop control manual", "Operation" section.
- For faults, see attachment "Herco – Cooltrol data desalination system", attachment "Herco – Cooltrol data open-loop control manual", "Faults and fault rectification" section.

Circulating water contact humidifier

Disinfection

UV-C technology for water disinfection

For operation

- See appendix "fisair – installation and operating instructions for the basic control panel (CCB2.0) of the fisair evaporation humidifier", "Operation" section or
- See appendix "fisair – installation and operating instructions for the step control panel (CCE2.0) of the fisair evaporation humidifier", "Operation" section.

Troubleshooting
Personnel qualifications
The tasks described in the section may only be carried out if the person concerned has the following qualification:

➔ Qualified electrician

For troubleshooting, see

- Appendix "fisair – installation and operating instructions for the basic control panel (CCB2.0) of the fisair evaporation humidifier", "Alarms" section or
- Appendix "fisair – installation and operating instructions for the step control panel (CCE2.0) of the fisair evaporation humidifier", "Alarms" section.

Refrigeration technology (refrigeration plant, heat pump, and split air conditioner)

Split outdoor units with R32 refrigerant

Split outdoor units with R32 may only be used if the following requirements are met:

- Split air conditioners comprise a closed refrigeration circuit.
- The minimum required volume flow V_{min} of the AHU must be observed see chapter "Determining the minimum required volume flow of the AHU", page 12.

Determining the minimum required volume flow of the AHU

The minimum required volume flow [m³/h] of the AHU is calculated as follows:

$$V_{min} = 60 \cdot \frac{m_{max}}{LFL}$$

V_{min} $\left[\frac{m^3}{h}\right]$	m_{max} [kg]
400	2,0
550	2.8
800	4.0
1250	6.3
1350	6.8

Table 1: Filling quantities depending on volume flow

Type name	m_{max} [kg]
PUZ – ZM50	2.0
PUZ – ZM60	2.8
PUZ – ZM71	2.8
PUZ – ZM100	3.6
PUZ – ZM125	3.6
PUZ – ZM140	3.6
PUZ – ZM200	6.3
PUZ – ZM250	6.8

Table 2: Filling quantities for each Mitsubishi electric split outdoor unit for pipework distance of < 30 m

For calculating the maximum permissible filling quantities m_{max}

- see chapter "Determining the maximum permissible filling quantity of refrigerant without a refrigerant sensor", page 13.
- see chapter "Determining the maximum permissible filling quantity of refrigerant with a refrigerant sensor", page 15.

Determining the maximum permissible filling quantity of refrigerant without a refrigerant sensor

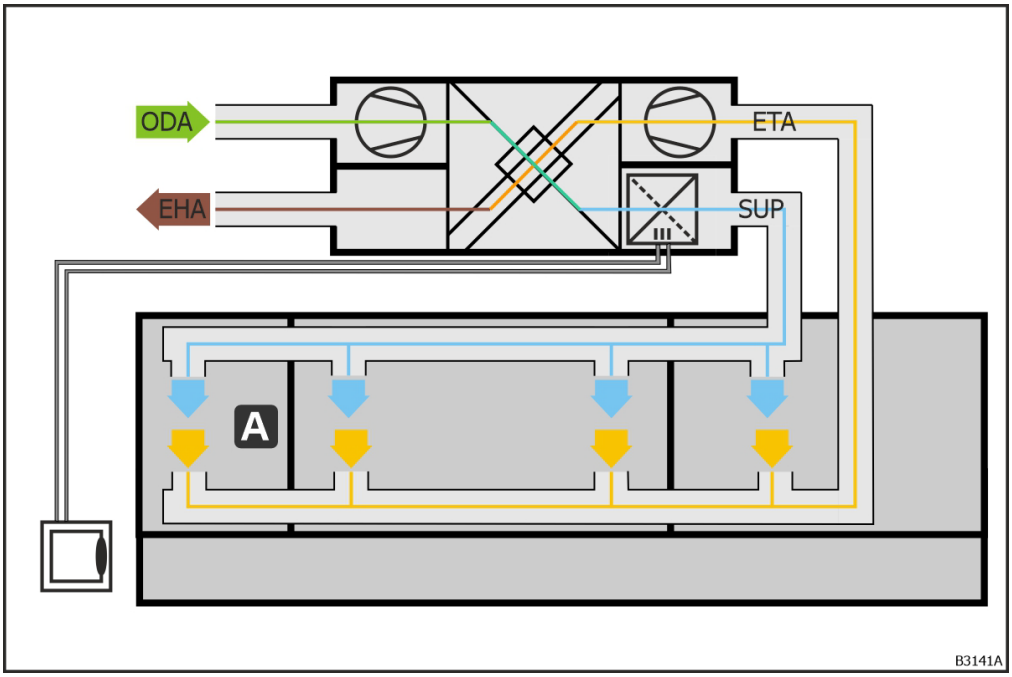

Fig. 2: AHU with split outdoor unit and ventilated spaces without a refrigerant sensor
A – smallest ventilated room

m_{max} = maximum permissible filling quantity [kg] of a cooling circuit

$$m_{max} = 2.5 LFL^{1.25} \cdot h_o \cdot A^{0.5} \leq 15.96 \text{ [kg]}$$

With LFL = lower explosion limit of R32 [kg/m³]

$$LFL = 0.307 \left[\frac{kg}{m^3}\right]$$

With h_o = air outlet height [m] in the smallest ventilated room

h_o [m]	**Air outlet height**
0.6	Floor
1.0	Window
1.8	Wall
2.2	Ceiling

Table 3: Air outlet height h_o

And with A = area of the smallest ventilated room [m²]

When calculating the maximum permissible filling quantity based on the room size, the cooling circuit with the largest filling quantity should always be used if there are several split outdoor units.

Examples:

	Size of the smallest ventilated room A [m²]			
m_{max} [kg]	$h_o = 0.6$ [m]	$h_o = 1.0$ [m]	$h_o = 1.8$ [m]	$h_o = 2.2$ [m]
2.0	34	13	4	3
2.8	67	24	8	5
4.0	137	49	16	11
6.3	338	122	38	26
6.8	394	142	44	30

Table 4: Filling quantities and volume flow in relation to room size and air outlet without a refrigerant sensor

Type name	m_{max} **[kg]**
PUZ – ZM50	2.0
PUZ – ZM60	2.8
PUZ – ZM71	2.8
PUZ – ZM100	3.6
PUZ – ZM125	3.6
PUZ – ZM140	3.6
PUZ – ZM200	6.3
PUZ – ZM250	6.8

Table 5: Filling quantities for each Mitsubishi electric split outdoor unit for pipework distance of < 30 m

Determining the maximum permissible filling quantity of refrigerant with a refrigerant sensor

If a refrigerant sensor (B) is installed near the coil, the maximum permissible filling quantity increases in relation to the room size. The air outlet height h_o is not taken into account.

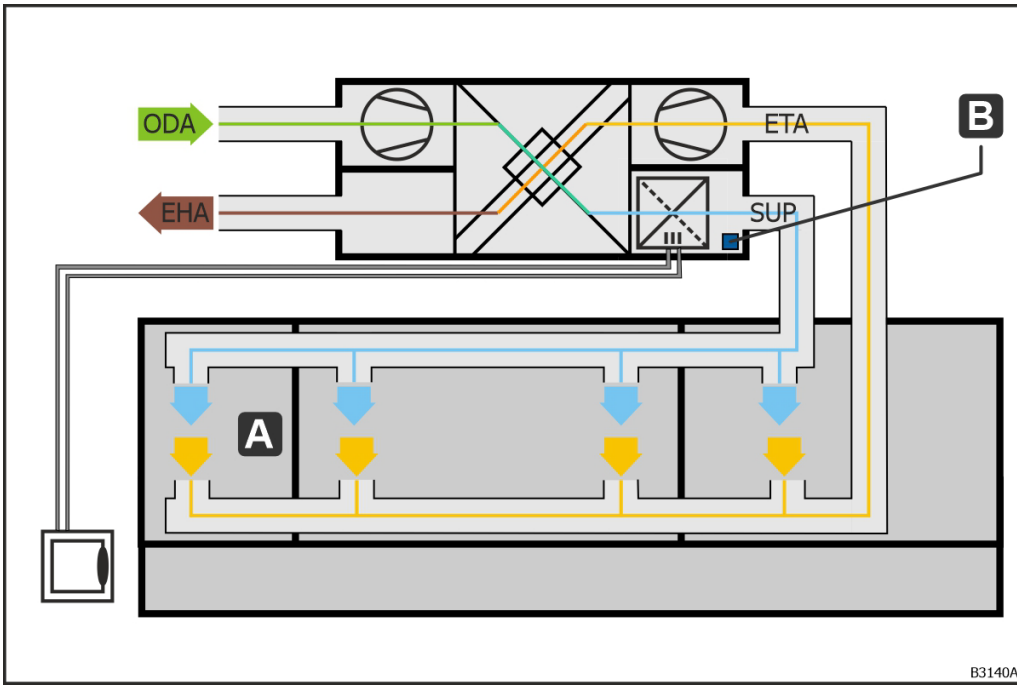

Fig. 3: AHU with split outdoor unit and ventilate rooms with refrigerant sensor
A – smallest ventilated room
B – refrigerant sensor

m_{max} = maximum permissible filling quantity [kg] of a cooling circuit

$$m_{max} = 0.5 \cdot LFL \cdot H \cdot TA \leq 15.96 \text{ [kg]}$$

With LFL = lower explosion limit of R32 [kg/m³]

$$LFL = 0.307 \left[\frac{kg}{m^3}\right]$$

With H = room height [m] ≤ 2.2 [m]

And with TA = total ventilated room area [m²] if:

- no volume flow controllers are present or
- the volume flow controllers are opened when there is a detector alarm.

Or with $TA = A$ = area of the smallest ventilated room [m²] if

- the volume flow controllers are not actuated.

Examples of a room height $H = 2.2\ [\mathrm{m}]$:

m_{max} [kg]	TA [m²]
2.0	6
2.8	9
4.0	12
6.3	17
6.8	21

Table 6: Filling quantities and volume flow in relation to room size with a refrigerant sensor

Type name	m_{max} [kg]
PUZ – ZM50	2.0
PUZ – ZM60	2.8
PUZ – ZM71	2.8
PUZ – ZM100	3.6
PUZ – ZM125	3.6
PUZ – ZM140	3.6
PUZ – ZM200	6.3
PUZ – ZM250	6.8

Table 7: Filling quantities for each Mitsubishi electric split outdoor unit for pipework distance of < 30 m

UV-C technology

UV-C technology for air disinfection

For operation, see appendix “Light progress – Master-SM operating instructions”, “Description and meaning of commands” section.

UV-C technology for surface disinfection

For operation, see appendix “Light progress – Master-16-MA operating instructions”, “Description and meaning of controls” and “Operation” section.

Directory

List of figures

Keyword index

robatherm
John-F.-Kennedy-Str. 1
89343 Jettingen-Scheppach

Tel. +49 8222 999 - 0
info@robatherm.com
www.robatherm.com

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the air handling company