

Air-handling Units MANDÍK

INSTALLATION COMMISSIONING MAINTENANCE

Addition instructions of the hygienic design

MANDÍK®



ATEX II 2G IIB T4

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This manual is an integral part of the technical specifications TPM 088/12 Air-handling Units MANDÍK.

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1 GENERALY



This document is an extension and an integral part of the general installation manual of MANDÍK air conditioning units, series M / P / T / M + / P + / T + (hereinafter AHU), enclosed with each AHU delivery. Available at

<https://mandik.cz/getattachment/df87c4cc-4bf8-4b0d-8ca8-f18adcd08381/AHU-Control-and-Commissioning-Guide.aspx>.

This document specifies the necessary requirements for AHU in a hygienic design for proper installation, commissioning and maintenance.

AHUs are designed and manufactured in accordance with the following valid norms:

VDI 6022, Blatt 1

VDI 3803

SWKI VA104-01

ÖNORM H 6021

DIN EN 13779

EN 1886

DIN 1946-4

SWKI 99-3

ÖNORM H 6020



The design of the AHU is certified by a German authorized person - **Hygiene-Institut des Ruhrgebiets** (www.hyg.de). Certificate is available at <https://mandik.cz/product-line/air-handling-units/air-handling-units-mandik>

2 INSTALLATION



First, it is necessary to follow all instructions for assembly and installation according to the general AHU installation manual!

- before installation, the components shall be checked for cleanliness (simple visual assessment will suffice) by qualified personnel having at least Category A qualification according to VDI 6022 Part 4

- it is recommended not to schedule the assembly until after completion of dust-relevant activities in the building



- **any packaging and the protection of the component shall only be removed immediately prior to assembly**

- before and during interruptions of assembly work, any open ends or exposed surfaces shall be protected against the penetration of construction site dust and moisture

- even after installation is complete, it shall be possible to inspect the AHU with reasonable technical effort

- if the AHU has been put into operation before the commencement of specified normal operation of the building, the demonstration of cleanliness and, if required, cleaning of the air-handling unit including all air ducts shall be performed immediately before starting specified normal operation

- suitable cable glands shall be used for feed-through of electric cables; pipes shall be sealed with suitable escutcheons. Cables shall, if possible, be laid outside the unit. Inside the unit, they should preferably not be laid in conduits and cable routes should be as short as possible



Each connection of the two chambers must be additionally sealed inside with a special sealant from the mounting kit, see the following figure. The sealant must be certified according to VDI 6022 for microbial inertness according to the ISO 846 standard (method A + C) !!!



before applying

seal around the perimeter of the chamber

use a cover ledge in the case of two neighboring condensate tray !



after applying

3 COMMISSIONING



First, all commissioning instructions according to the general AHU installation manual must be observed!



- before commissioning, an initial hygiene inspection shall be carried out in accordance with VDI 6022, Blatt 1, Section 7. This inspection is focused on compliance with the design requirements in accordance with VDI 6022, Blatt 1, Section 6.
- before commissioning the intended air filters properly shall to installed
- before commissioning, check that all inspection and cleaning openings and drains for cleaning are securely sealed. All condensate drains shall be tested with a

sufficient quantity of water. Quick and complete drainage shall be watched and documented. This ensures initial filling of the drain traps with sealing water.

- during lifting operations, sealing joints in the unit casing are subject to mechanical stresses. They shall be checked for tightness.
- it is recommended to equip the system with new, clean air filters after commissioning and prior to handing the system over to the customer

4 OPERATION AND MAINTENANCE



First, all commissioning instructions according to the general AHU installation manual must be observed!



AHU shall be operated in such a manner to avoid microbial growth on surfaces of air-handling components, especially air filters, and on surfaces which are wet for technical reasons. Access to the system components for periodic maintenance shall be ensured!

- in case of short standstills of AHU, as, e.g., when switched off during night times or for maintenance purposes, the installed dampers (outdoor air, exhaust air and, as the case may be, supply air) shall close automatically to prevent air from flowing through the system due to wind or buoyant forces
- **additionally, in case of extended standstills of AHU (more than two days), it has to be ensured that any wet surfaces shall be blown dry! (inner casings, coolers, evaporators, recovery heat exchangers, condensate tray, humidifiers, ...)**



The respective switching commands required for automatic dry-blowing shall be entered in the building automation system.



- **The AHU must be regularly inspected at short intervals by trained specialist personnel to ensure that the hygienic requirements for operation and maintenance are observed at all times! Hygienic inspections beyond standard procedures (general installation manual AHU MANDÍK) are summarized in the following table:**

CHECKLIST FOR OPERATION AND MAINTENANCE OF AHU							
	Activity	Action if required	Months (intervals)				
			1	3	6	12	24
1. AHU IN GENERAL/CASING/INLTES-OUTLETS							
1.01.	Check for air-side contamination, microbial growth, damage, and corrosion	Clean and repair		✓			
1.02.	Check for condensation and water pooling	Clean			✓		
1.03.	Check doors/service accesses for tightness	Repair			✓		
1.04.	Check door's sealing for contamination, microbial growth, damage	Clean and repair			✓		
2. AIR FILTERS							
2.01.	Check for unacceptable contamination, damage (leaks), odours and microbial growth	Change affected air filters		✓			
2.02.	Check proper tightness of sealing between filters filter frame and filter frame-casing	Repair or replace		✓			
2.03.	Check differential pressure	Replace filter stage			✓		
2.04.	Maximum interval until 1. filter stage is to be changed					✓	
2.05.	Maximum interval until 2. filter stage is to be changed						✓
3. FANS							
3.01.	Check contamination, microbial growth, damage, and corrosion	Clean and repair			✓		
4. HEAT EXCHANGERS							
4.01.	Heaters: Check for contamination, microbial growth, damage, corrosion, and tightness.	Clean and repair, replace			✓		
4.02.	Coolers: Check tube bundle, droplet eliminator and condensate tray for contamination, microbial growth, corrosion, damage, and tightness.	Clean and repair		✓			
4.03.	Check drain trap function	Clean and repair		✓			
5. HEAT RECOVERY							
5.01.	Check contamination, microbial growth, damage, corrosion	Clean, repair		✓			
5.02.	Check impermeability between supply and exhaust air	Repair		✓			
5.03.	Check condensate tray for contamination and drain trap function	Clean, repair		✓			
5.04.	rotary heat exchangers: check of rotor sealing tightness	Adjust seals, clean, repair		✓			

6. STEAM HUMIDIFIER							
6.01.	Check contamination, microbial growth, damage, corrosion	Clean, repair		✓			
6.02.	Check condensate tray for contamination and drain trap function	Clean, repair		✓			
6.03.	Check steam distribution for deposits	Clean			✓		
6.04.	Function-check control valve	Repair			✓		
6.05.	Check humidity limiter	Repair			✓		
7. DEHUMIDIFIERS							
7.01.	Check contamination, microbial growth, damage, corrosion (casigns, heat exchanger, droplet eliminator)	Clean, repair		✓			
7.02.	Check condensate tray for contamination and drain trap function	Clean, repair		✓			
8. SILENCERS							
8.01.	Check contamination, microbial growth, damage, corrosion (casigns, coulisses)	Clean, repair or replace; test with contact slides if necessary					✓

- shorter or longer intervals of hygiene checks can be required/be allowed based on the result of the hazard assessment according to VDI 6022, Blatt 1, Section 7.5
- extension of check intervals is subject to a well-grounded air-hygiene report by an expert, e.g. a VDIcertified specialist engineer
- for each AHU, the operator shall maintain an operations log according to VDI 6022, Blatt 4
- **Filters - during the air filters changing, any contamination of the environment, downstream air-conditioning units, and the rooms to be ventilated shall be avoided. Particular care shall be taken to prevent contamination of the new air filters to be installed. Personnel involved in changing filters shall wear suitable protective equipment. Air filters shall be stored in a dry and clean place such that damage, contamination or moistening can be excluded.**
- **Steam humidifiers - shall be operated in such a manner that no condensate or aerosol can enter the air duct system and shall not contain any substances harmful to health. When the system is shut down, it has to be ensured that the air humidifiers are switched off early enough to be blown dry while the system is still running.**
- The mandatory tests - microbiological testing of water/surfaces, air measurement, determination of clean-swept condition, ... and its terms of the assessment values, the required qualifications, the measurement procedure, and the evaluation of the measurement results are beyond the scope of this manual and these points are described in VDI 6022, Blatt1, Section 8.



4.1 SERVICE ACCESS

For cleaning and disinfection is each section (fans, filters, heat exchangers, silencers, ...) accessible from both sides via doors or service panels:



heat exchanger's section

light switch

service door with handles/hinges

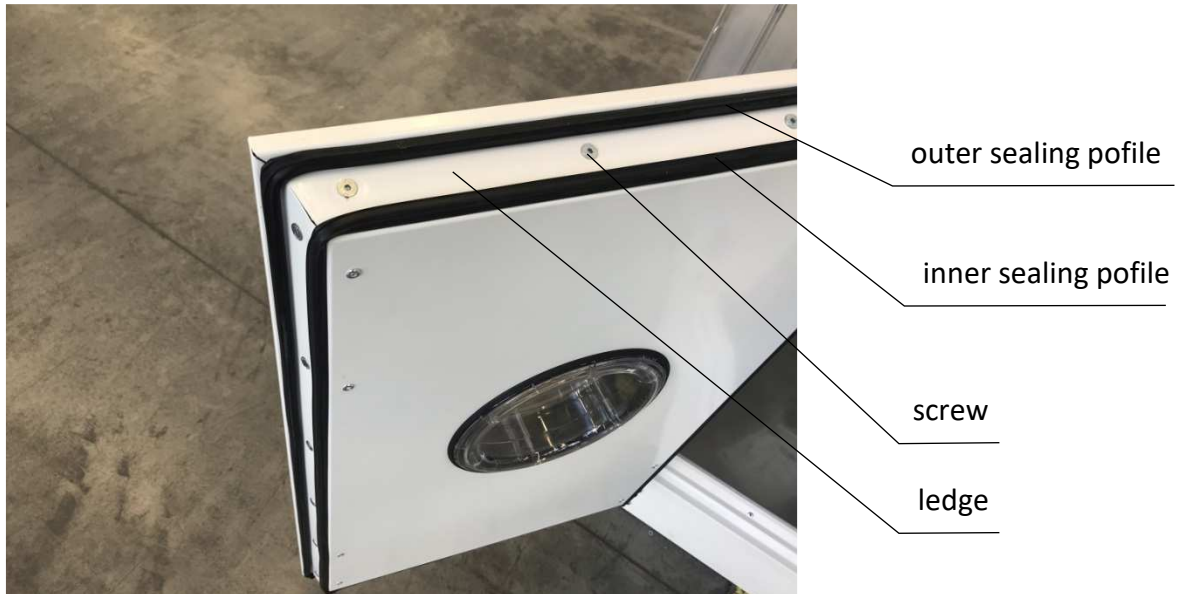


service door with clamping brackets



4.2 REMOVAL AND CLEANING OF THE DOOR SEALING PROFILE

The sealing profile can be extended by releasing the pressure ledge with screws M5 with hex socket 4 around the door:



5 CLEANING AND DISINFECTION



Cleaning agents and disinfectants shall be used in such a manner that no health hazard can occur during operation (care should be taken to read the instructions for use of the agents and to wear protective clothing and gloves)!



- To stop the growth and kill microorganisms, use only chemical disinfectant using the surface disinfectants listed below.
- For effective disinfection (microbicidal effect) the following procedure should be followed:



- 1) Mechanical removal of coarse dirt - wiping, sweeping using suitable agents such as:
 - brushes with natural or artificial bristles
 - soft rags for cleaning machine surfaces, etc.
 - rowels, brooms - must not be placed on the floor, they must hang (organic impurities generally reduce the effect of disinfectants)
- 2) Rinse with warm drinking water
- 3) **Cleaning (sanitation) - application of the cleaning solution according to the manufacturer's instructions given on the product label (observance: exposure times, concentrations, temperatures, pH of water)**
 - without sufficient sanitation, microorganisms are protected by impurities (biofilms are formed, etc.) and disinfectants cannot act sufficiently
 - removes inorganic and organic substances, reduces the initial number of microbes
- 4) Rinsing with warm soft, biologically harmless water - removal of residual dirt and detergents
- 5) Visual inspection of cleanliness
- 6) **Disinfection - application of the disinfectant solution according to the manufacturer's instructions on the label. These factors have a particular effect on the effectiveness of disinfection:**



- tightness of the contact of the disinfectant with the surface - the tighter the contact, the shorter the disinfection time and the stronger the effect
- sufficient temperature of the solution - in general, a higher temperature guarantees a better disinfecting effect, but pay attention to work safety and the possibility of disintegration of some disinfectants
- concentration - in general a higher concentration guarantees a better disinfecting effect, but a low concentration is disinfectant ineffective, on the contrary too high leads to damage to the disinfected material

- exact exposure time - fundamental influence on the final effect of disinfection
 - pH of water - many products have disinfectant effect only at a certain pH
 - type and quantity of microorganisms that we want to eliminate
- 7) Final rinsing with drinking water - removal of disinfectants and thorough ventilation of the exposed area
 - 8) Drying - preferably spontaneous drying by evaporation to dryness
 - 9) Ensuring the right conditions for storage and disposal of waste



- **For effective disinfection (reduction of resistance of microorganisms), it is recommended to alternate or combine disinfectants.**
- It is advisable not to buy chemical disinfectants in large quantities, to ask the seller for comprehensive documentation meeting the requirements of local laws and regulations.
- Some disinfectants have a partial cleaning effect (surfactant character) and the ability to penetrate the dirt, so they can be used as a combined cleaning and disinfecting agent.

If AHU's sections have to be cleaned, a method suitable for the respective case shall be used:

CLEANING METHODS			
Method No.	Type	Activity	Warning !!!
1	Dry	Dry cloth and vacuuming	Be careful not to damage painted surfaces and sealed joints
2	Dry	Manual brushing and vacuuming	Be careful not to damage painted surfaces and sealed joints
3	Dry	Pressure air	Only for installations that can be pulled out of the unit
4	Wet	Wet cloth/spraying and vacuuming	Be careful not to damage painted surfaces and sealed joints
5	Wet	Wet brushing and vacuuming	Be careful not to damage painted surfaces and sealed joints
6	Wet	Foam/Low pressure water 1)	Only for installations that are equipped with a condensate tray and drain
7	Wet	Disinfection with a cloth/spraying	Be careful not to damage the materials/surface of the cleaned components
8	Wet	Disinfection with a foam/low pressure fluid 1) 2)	Only for installations that are equipped with a condensate tray and drain

		METHOD No. vs. APPLICABLE							
	Components	Method No.							
		1	2	3	4	5	6	7	8
Casing	inner surface of casings	■	■		■	■		■	
	service doors	■	■		■	■		■	
	door's sealing profile	■			■			■	
	inner brackets/console/rails/reinforcements/supports of built-in components	■	■		■	■		■	
Filter	filter frame	■	■		■	■		■	
	frame sealing	■			■			■	
Fans	flexible connection/suction sealing/vibration isolators	■	■		■	■		■	
	impeller (metal/composite)	■	■		■	■		■	
Heat exchangers	frame/collectors	■	■	■	■	■	■	■	■
	lamellas			■			■	■	■
Heat recovery - plate	frame	■	■	■	■	■	■	■	■
	lamellas			■			■	■	■
Heat recovery - rotary	frame	■	■	■	■	■	■	■	■
	lamellas			■			■	■	■
Silencers	coulisses	■			■			■	
Condensate tray/trap	surface	■	■		■	■	■	■	■



- 1) In the case of heat exchangers (heaters/coolers/recuperators) clean coils carefully! Be careful of possible damaging the coil's lamellas (bending) by cleaning medium pressure! Use only low pressure equipment up to a maximum of 20 bar.
- 2) In the case of heat exchangers (heaters/coolers/recuperators) use recommended cleaning and disinfecting agents listed below (surfactants based on a Quaternary ammonium, ...).



The internal surfaces of AHU are designed as microbially inert meeting the ISO 846 standard, method A (fungi, fungi) and method C (bacteria), they are:

- painted metal parts provided with a special antimicrobial paint (casings, consoles, brackets, ...)
- plastic components (free impellers of fans, parts of louvre dampers)
- rubber components (seal) - EPDM
- putties (casing, condensate tray)
- stainless steel components 1.4301 (condensate tray/trap, frames of coolers/filters)
- aluminum components (lamellas of heat exchanger/recovery, droplet separators)
- copper components (collectors of heat exchangers)



Even though some parts have an antimicrobial coating, routine cleaning and disinfection cannot be neglected!



Due to material damage and safe operation of the air handling unit, the chemical cleaning and disinfecting agents used must meet the following properties:

- alcohol free, chlorine free, aldehyde free, formaldehyde free
- never use corrosive or corrosive substances
- never use strong acids or bases (optimal pH range 6-8)



It must be ensured that cleaning and disinfecting agents are selected and used only by qualified hygiene professionals!



Do not use abrasive powders, scouring pads or other materials that could damage the surface finish of painted parts!



Selected cleaning and disinfecting agents should be tested by Verbund für Angewandte Hygiene e.V. (VAH) and stored in the list available at <https://vah-liste.mhp-verlag.de/>

The company MANDÍK, a.s. recommends these effective bactericidal and fungicidal substances for the above-mentioned surfaces:

- **Descosept Spezial**, Dr. Schumacher GmbH, bactericidal, Active ingredient: Quaternary ammonium
- **Sanosil**, SANOSIL AG, bactericidal, fungicidal, Active ingredient: Hydrogen peroxide

- **RHEOSEPT-WD plus**, NW-Chemie GmbH, bactericidal, fungicidal, viricidal, Active ingredient: Quaternary ammonium
- **RHEOSEPT-WD plus Wipes**, NW-Chemie GmbH, bactericidal, fungicidal, viricidal, Active ingredient: Quaternary ammonium
- **Mikrobac[®] forte**, BODE Chemie GmbH, bactericidal , yeasticidal, Active ingredient: Quaternary ammonium , Alkylamine derivative
- **Hexaquart[®] pure**, B. Braun Medical AG, bactericidal, fungicidal, Active ingredient: Quaternary ammonium