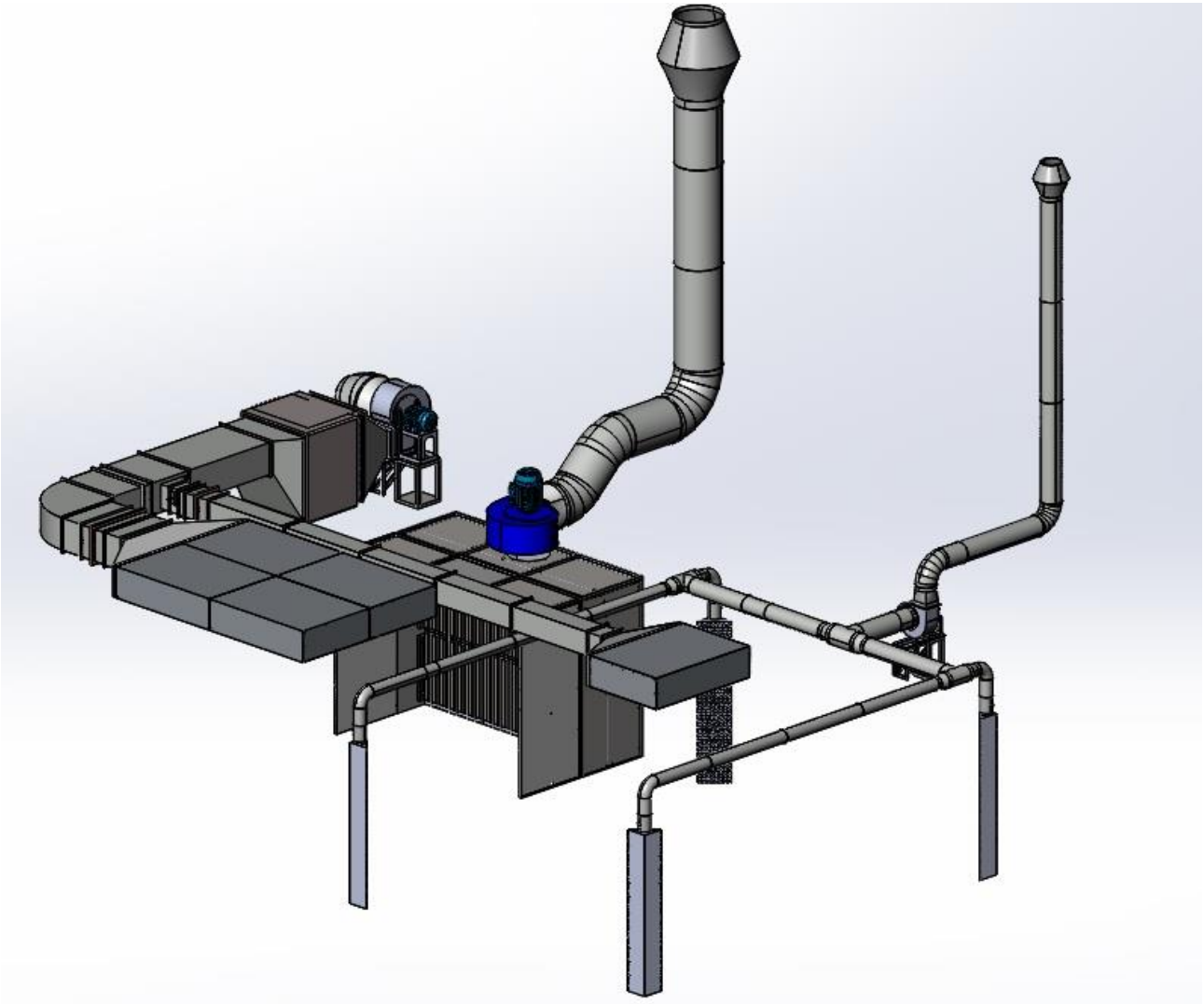
OPERATION MANUAL

COMPLEX FOR PAINTING TBS-3D.COMPLEX



Content

1. General

1.1. Signs and symbols

Warning sign: CAUTION! Important safety notices related to personnel safety. Strictly follow these instructions.

Protective gloves. Use protective gloves to avoid cut injuries caused by contact with sharp edges

Protective clothing. Wear protective suit to avoid personal injuries during performance of the assembly works

Footwear. Use safety footwear to protect your feet form heavy weights, which may fall during performance of the assembly works

Personal protective equipment – respiratory and eye protection equipment

1.2. Safety instructions

Persons performing installation, operation and maintenance of the unit shall read and understand this Installation and Operation Manual, and observe the requirements it contains.

Connection and initial commissioning of the unit shall only be performed by qualified persons or under supervision of such personnel. Take into consideration regulations and standards related to installation works as well as the workplace safety rules. Use personal protective equipment when performing any works with the painting booth or its units.

Always disconnect the booth and all its electrical assembly units from the mains before starting any repair works.

1.3. Intended use

TBS painting booth is a professional solution for organization of the painting section in the woodworking, furniture and metalworking industries. The primary task of such booth is to create excess pressure in internal space of the booth and to distribute air flow between painting and drying zones.

The painting zone is equipped with the TBS booth, air supply unit with a water coil air heater provided for maintenance of the desired temperature (in the range from 5 °C to 20 °C) and plenum boxes for uniform distribution of the air flow. The air supply unit creates excess pressure to ensure the minimum possible dust content in the painting zone, thus significantly improving product quality.

It should be mentioned that TBS painting booth is designed in compliance with the requirements of State building codes (DBN), which ensures operational efficiency and safety of the painter:

- Absence of draughts allows preventing cold-related illnesses of the personnel.
- Increase in production performance due to process organization when the painter does not need to take breaks for breathing “fresh air” outdoors.

The air supply unit in the drying zone and suction columns maintain the required temperature and create horizontal air flow, allowing for uniform drying of the painted parts.

1.4. Nameplate

The nameplate attached to the equipment in a clearly visible location contains identification data of the booth.

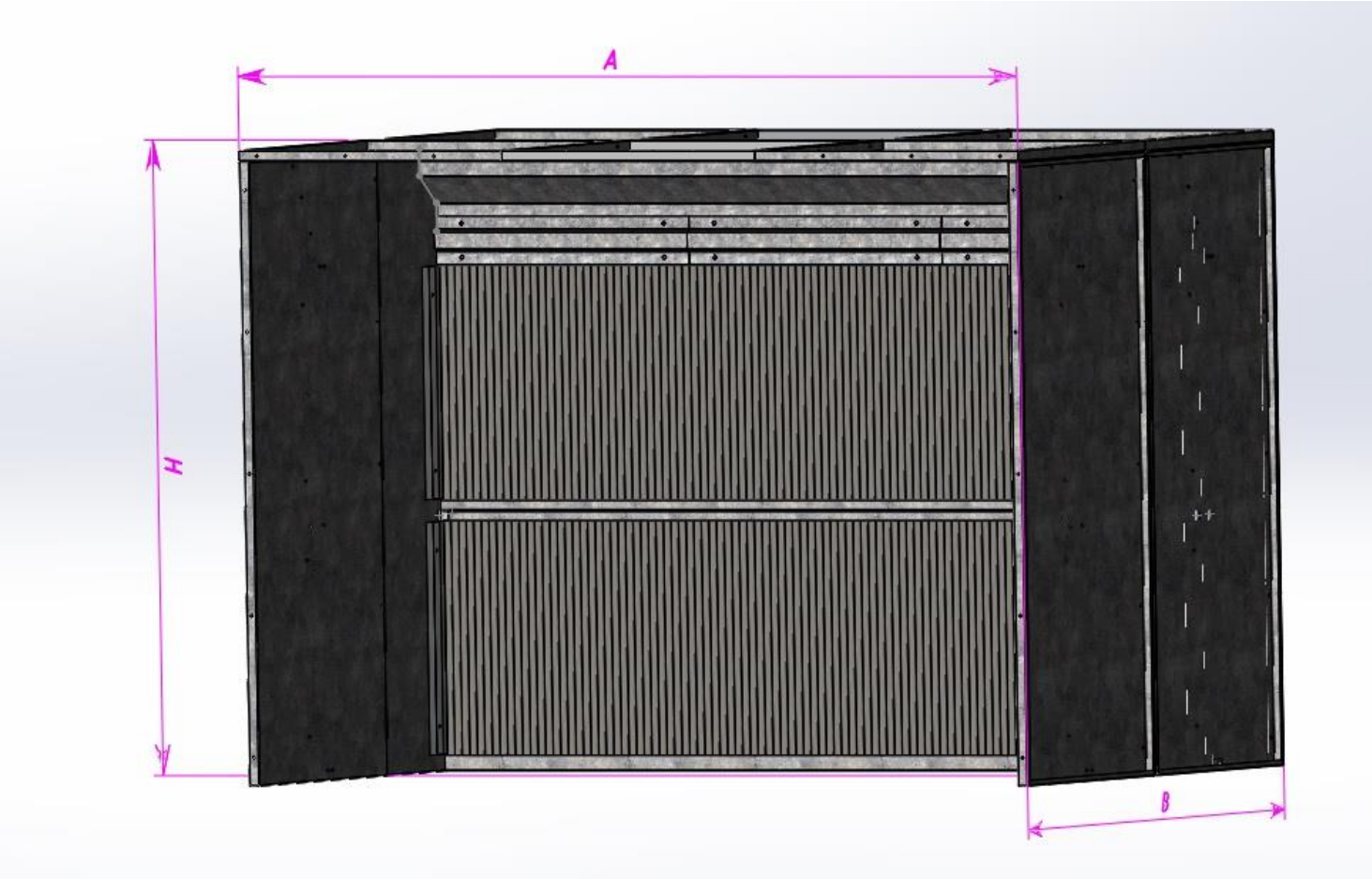
Identification nameplate:

- **Series and model**
- **Data of manufacture**
- **Serial number**

1.5. Technical specifications

Specifications and characteristics of TBS-3D.COMPLEX produced and delivered by Aton Service LLC are given in the table below:

Parameter	TBS-3D.COMPLEX
Capacity by removed air, m^3/h	9000
Total pressure, Pa	1300/630
Power, kW	8.25
A, mm	3080
B, mm	2000
H, mm	2240
Heating capacity, kW	45
Heat transfer fluid temperature, °C	80/60
Air temperature, °C	5/20
Blower	RL-AS 500/4/2.2 kW
Filter type	Corrugated board (labyrinth) filter PaintStop type
Filter size, mm	900 1000
Number of filters	3
Tunnel extension module	1
Drying zone, m^2	> 24
Automatic control station	CP TBS professional
Ductwork, set	1

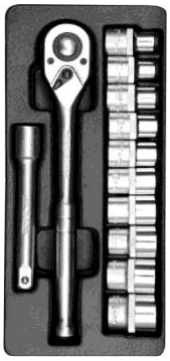

A
H
B

2. Preparations for installation

2.1. Necessary tools

A set of tools necessary for installation of the booth: power nut driver with a set of jets (or a set of socket heads with ratchet wrench), sealant gun, a set of open end wrenches, ladder.






2.2. Personal protective equipment

Protective gloves. Use protective gloves to avoid cut injuries caused by contact with sharp edges.

Protective clothing. Wear protective suit to avoid personal injuries during performance of the assembly works.

Footwear. Use safety footwear to protect your feet form heavy weights, which may fall during performance of the assembly works.

2.3. Completeness of the equipment

Before starting assembly and installation works, make sure that all necessary parts and components are available by checking the equipment against the delivery list.

Depending on air delivery rate, the booth may consist of the following main parts:

- Paint booth TBS-3D;
- Tunnel extension module;

- Air-preparation unit, including pre-filtration and heating;
- Supply blower;
- Plenum boxes;
- Adjustable air dampers;
- Control panel.

All component elements of the booth are listed is the shipment checklist (either for standard or for extended delivery package). Standard scope of delivery includes only equipment initially offered by the manufacturer, and extended scope of delivery additionally includes options requested by the customer.

3. Installation

3.1. Preliminary instructions

- Installation of the booth equipment shall be carried out by qualified personnel in compliance with safety rules and taking into account instructions of the manufacturer's engineer.
- Use drawings and specifications to facilitate the installation process.
- Refer to the connection diagram for details on power supply connection to the control panel

3.2. Location of the booth

- Location of the unit on-site shall ensure easy connection of power supply to the control panel.
- The supporting floor surface shall be plane and shall have sufficient strength to take loads from the booth.
- It is necessary to ensure free space of at least 1 m at each side of the booth for maintenance purposes.
- Do not install the equipment close to sources of open flame or highly flammable substances.
- Electrical safety of this equipment is only achieved in case of proper connection to the grounding system (in accordance with the electrical safety standards).

4. Adjustment and connection

4.1. Electrical connection

WARNING: After turning off the booth and after alarm reset, the booth equipment continues working until the end of the operating cycle. For safe performance of works on the equipment, deenergize the equipment by opening circuit breakers (input switch) and take measures (lockout-tagout) to prevent its accidental re-energizing in accordance with the Rules for Safe Operation of Electrical Installations of Consumers (DNAOP).

CAUTION! Ground the control panel and metal parts of the booth after connection of the power supply.

This operation manual for the control cabinet of the ventilation system is intended for engineers and technicians who perform its installation, adjustment and operation.

The control cabinet is designed for operation of the ventilation system and is built based on Freemax MX S2 controller. The controller allows the operator to set the required air temperature, monitor system conditions and identify alarm events.

The control cabinet performs the following functions:

– supply air temperature regulation
– controlling system modules
– protection of the equipment

Brief description of the control system

– control cabinet.
– supply blower 1.
– exhaust blower 1.
– exhaust blower 2.
– heat transfer fluid (HTF) circulation pump.
– three-way valve.

When the system is started in Winter mode, the water coil air heater warms-up until the set HTF return temperature (which depends on the outside air temperature) is reached. Air damper of the supply unit opens only upon expiry of the preset holding time.

During operation of the system, the controller regulates the supply air temperature by means of the three-way valve.

The supply and exhaust blower s always work simultaneously, and are both controlled by the controller.

HTF circulation pump is permanently running in Winter mode, and is permanently off in Summer mode.

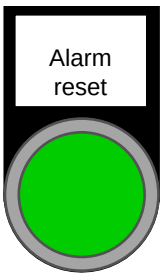
Caution!

It is forbidden to de-energize the control cabinet or to cut off circulation of HTF through the water coil air heater when the system is running in Winter mode. Failure to comply with this instruction may result in damage to the heater.

Fire alarm signal

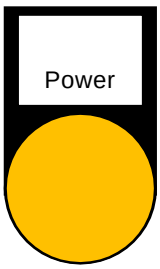
When fire alarm signal becomes active, all blower s are stopped.

SB1



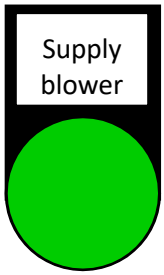
Alarm reset button

H1



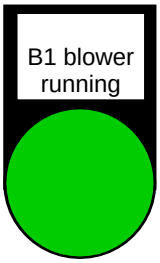
Power supply indicator light

H3



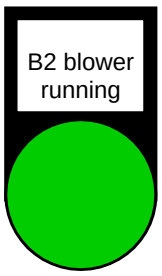
Indicator light – supply blower of the paint booth is running

H4



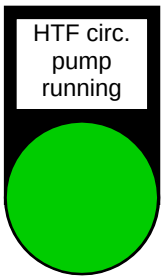
Indicator light – exhaust blower B1 of the paint booth is running

H7



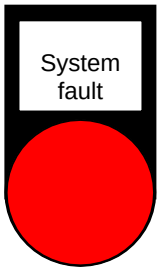
Indicator light – exhaust blower B2 of the drying zone is running

H5



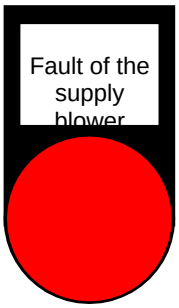
Indicator light – HTF circulation pump is running

H6



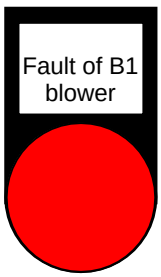
Indicator light – system fault

H8



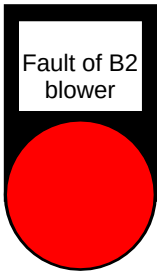
Indicator light – fault of the supply blower drive
Fault removal actions – close QF1 motor circuit breaker

H9



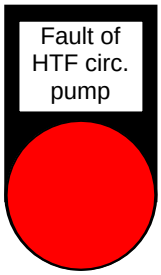
Indicator light – drive fault of exhaust blower B1.
Fault removal actions – close QF2 motor circuit breaker

H1



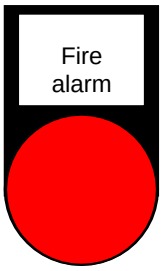
Indicator light – drive fault of exhaust blower B2.
Fault removal actions – close QF4 motor circuit breaker

H10



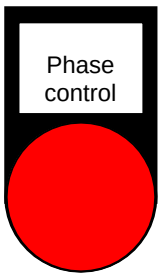
Indicator light – fault of the HTF pump drive.
Fault removal actions – close QF3 motor circuit breaker

H16



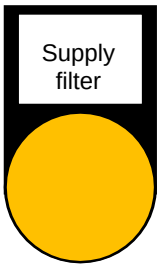
Indicator light – Fire alarm

H2



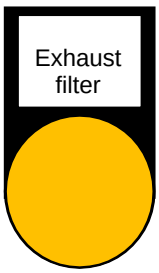
Indicator light – indication of the power-system fault status

H12



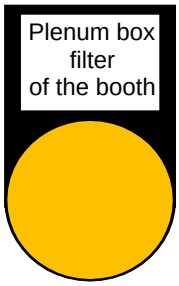
Indicator light – filter of the supply unit is clogged

H15



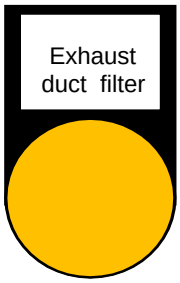
Indicator light – filter of the exhaust booth wall is clogged

H13



Indicator light – supply plenum box filter of the paint booth is clogged

H14



Indicator light –supply plenum box filter of the drying zone is clogged

List of electrical components:

Q1 – main switch.
F1 – 24 V control circuits.
QF1 – circuit breaker of supply blower П1.
QF2 – circuit breaker of exhaust blower В1.
QF3 – circuit breaker of the paint booth HTF circulation pump.
QF4 -- circuit breaker of exhaust blower В2 of the drying zone.
QF5 – 380 V control circuit.
Т1 – transformer 220/24 V 50 VA.
РКФ – phase control relay.
К1, К2 – electromagnetic relay.

Freemax MX S2 controller

The controller has 6 control keys:

Esc	• Return to the parent window. • Cancel changes made for the parameter being edited.
Enter	• Switch to subwindow. • Enter parameter editing mode. • Save new value for the parameter being edited.
⇦	• Navigate through windows to the left (if the focus mode is not active). • Navigate through parameters in the current window to the left (if the focus mode is active). • Decrease value of the parameter being edited.
⇨	• Navigate through windows to the right (if the focus mode is not active). • Navigate through parameters in the current window to the right (if the focus mode is active). • Increase value of the parameter being edited.
F1	Turn cursor on/off.
F2	Switch between the service menu and parameter windows.

Accessing menu functions

The controller menu is formed by multilevel windows that contain various variable data

Navigating through windows

The controller offers two navigation modes – navigation with active or non-active focus (cursor). You can turn the focus on and off by pressing **F1** key. The focus mode is on if any of the menu elements is boxed (enclosed in frame).

If the input focus is not active, arrow keys ⇦ ⇨ are used to navigate between windows in the current level. If the input focus is active, arrow keys ⇦ ⇨ are used to navigate (in a cyclic manner) between elements of the current window.

When the focus mode is active, navigation between some windows is performed by selecting certain items of the current window – activation of such items moves you to another window.

When the focus is active and positioned on any window element, pressing **ENTER** key moves you from the parent window to subwindow or activates the parameter editing mode. Pressing **ESC** key returns you back from subwindow to the parent window.

Accessing service menus

Service menu (i.e. service engineer's menu) of the controller contains date and time settings, as well as the firmware loading option. Press **F2** key to enter the service menu. Pressing the **F2** key again will bring you back to the window that was active before calling the service menu.

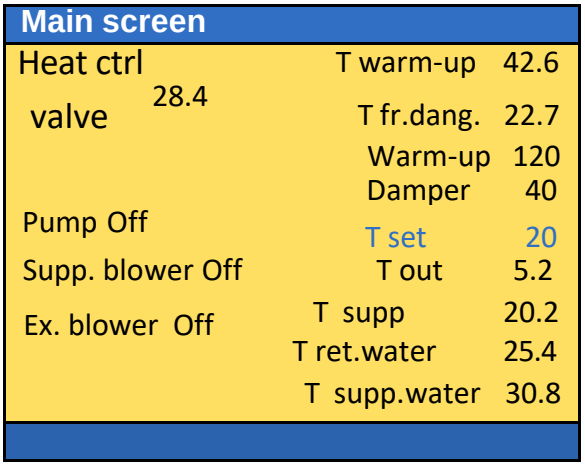
Changing parameters

Changing any parameter setting is performed with active focus. Place the input focus onto the desired parameter value and press **ENTER**. The parameter value starts flashing. Then use arrow keys ⇦ ⇨ to set a new value. Press **ENTER** to confirm new parameter setting or **ESC** to cancel changes. The parameter value stops flashing.

Entering password

In order to restrict user access to configuration settings, some parameters are password protected.

If a parameter or access to certain subwindow is password protected, the controller will display the password input field.



Heat ctrl valve – heat control valve opening percentage (100% – opened).

Pump – state of the HTF circulation pump (Off – stopped, On – running).

Supp. blower – state of supply blower (Off – stopped, On – running).

Ex. blower – state of exhaust wall blower 1 (Off – stopped, On – running).

T warm-up – warm-up temperature. Warm-up is considered to be successful upon expiry of the warm-up period the HTF return temperature is higher than T warm-up.

T fr.dang. – temperature of freeze-up danger. Return water temperature at which the danger of water coil freezing during system operation arises.

Warm-up – warm up time or countdown timer during warming up.

Damper – damper opening time or countdown for damper opening.

T set – preset supply air temperature. Position the input focus onto the parameter value and set the desired temperature.

T out – indication of the external air temperature.

T supp. – indication of the supply air temperature.

T ret.w – indication of return HTF temperature.

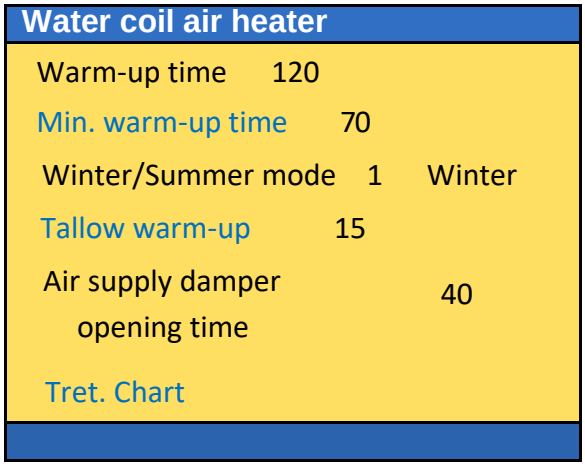
T supp.water – indication of supply HTF temperature.

Warm-up mode

If **T out** is below 2 °C, warming-up is performed during the entire warming-up time, and the damper begins to open after **T ret** reaches **T ret.warm-up**.

If **T out** is above 2 °C, warming-up is performed during **Min. warm-up time**, and warming-up is stopped when **Tret** reaches **Tret.warm-up**. In any case, the damper begins to open as soon as the warming-up starts.

During warming-up the heat control valve stays 100% open.



Warm-up time – heat exchanger warming-up time when the system is started in Winter mode.

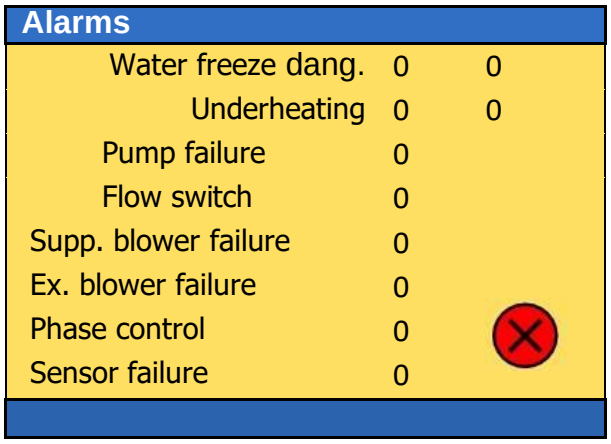
Min. warm-up time – minimum heat exchanger warming-up time when the system is started in Winter mode.

Winter/Summer mode – set the desired operating mode (1 – Winter, 0 – Summer). Indication of the current operating mode. Summer mode cannot be activated if the outside temperature is below 2 °C. If Winter mode is activated, it is necessary to feed hot water to the heat exchanger inlet.

T allow warm-up – set the limiting value when warming-up is allowed. If outside temperature is higher than the T allow warm-up, warming-up at system start-up will not be performed.

Air supply damper opening time –opening time for the damper of the of the air supply unit.

Tret.chart – open "**Tret. Chart**" window.



Water freeze dang. – 0 – normal operation, 1 – danger of water coil freezing acc. to readings of the HTF return temperature sensor. Current number of the alarm events (on the right).

Underheating – 0 – normal operation, 1 – underheating of the water coil air heater (upon expiry of the warm-up period, HTF return temperature has not reached the set value (see "**Tret. Chart"** window)). Current number of the alarm events (on the right).

Pump failure – indication of the HTF circulation pump alarm (0 – normal operation, 1 – alarm). Alarm – tripping of the pump motor current protection device.

Flow switch – indication of the flow switch alarm (0 – normal operation, 1 – alarm) acknowledge signal from the flow switch (if installed) is not available.

Supp. blower failure – indication of the supply blower alarm (0 – normal operation, 1 – alarm). Alarm – tripping of the supply blower motor current protection device.

Ex. blower failure – indication of the exhaust blower 1 alarm (0 – normal operation, 1 – alarm). Alarm – tripping of the exhaust blower motor current protection device.

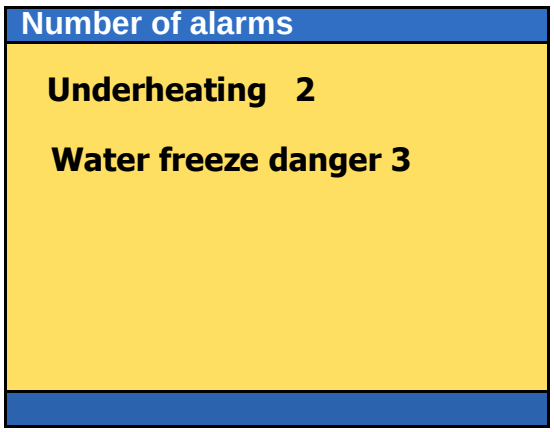
Phase control – power-system fault. Check if all phases are available, check phase sequence and voltage.

Sensor failure – failure of one of the temperature sensors (0 – normal operation, 1 – alarm).

 Alarm reset button.

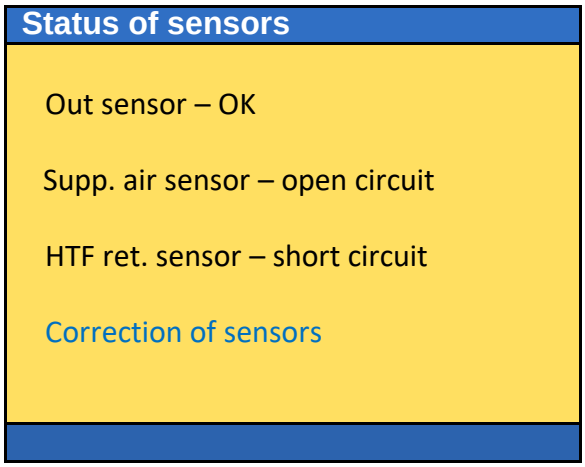
Alarms

Active alarm causes stop of the system, inactive alarms are only displayed in the menu screen.
To turn on the system after alarm, it is necessary to select the active alarm and press the "Reset alarm" button.



Underheating – number of underheating events that resulted in generation of alarm signal.

Water freeze danger – number of water coil freezing danger events acc. to signal of the return HTF temperature sensor.

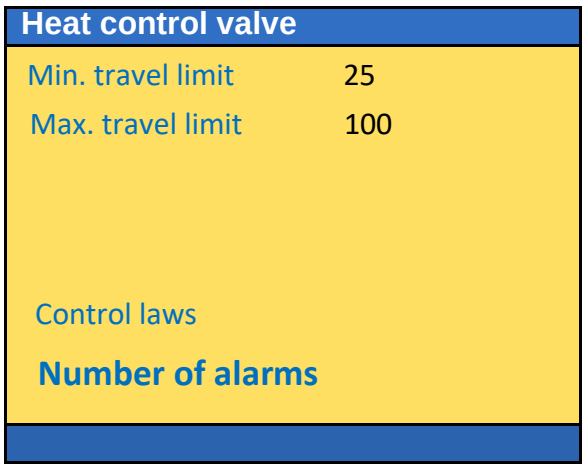


Out sensor – OK – status of the external air temperature sensor.

Supp. air sensor – open circuit – status of the supply air temperature sensor.

HTF ret. sensor – short circuit – status of the return HTF temperature sensor.

Correction of sensors – open temperature sensors correction window.

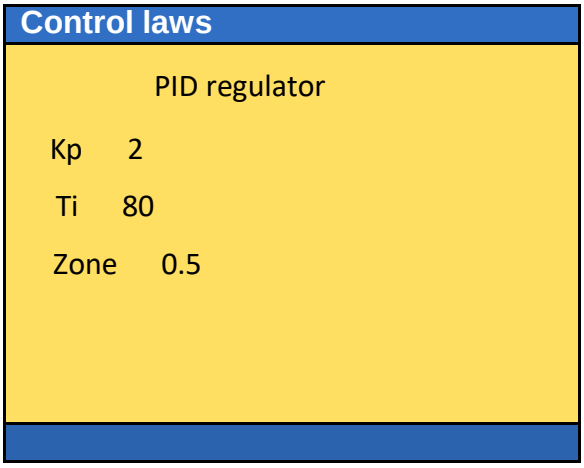


Min. travel limit – set the minimum travel limit for the heat control valve (%)

Max. travel limit -- set the maximum travel limit for the heat control valve (%)

Control laws – open “Control laws” window

Number of alarms – open “Number of alarms” window



Kp – proportional gain factor.

Ti – integration time (s).

Zone – dead band (°C).

Tret. Chart			
	Tout1 -22	Tout2 2	Tout3 15
Tret. set	40	30	20
Tret. prog	50	45	35
Tret. dang.	40	20	10

The below protection functions are active only in Winter mode.

Tout – temperature of the external air.

Tret. set – HTF return temperature that will be maintained when the blower s are off.

Tret.prog. – HTF return temperature. The system will be started if upon expiry of the warm-up period HTF return temperature is higher than Tret.prog.

Tret.dang. – HTF return temperature. If during operation HTF return temperature drops below Tret.dang., “Danger” alarm signal is generated and the system is stopped.

Correction of sensors	
Out air sensor	0
Supp. air sensor	0
HTF ret. sensor	0
HTF supp. sensor	0

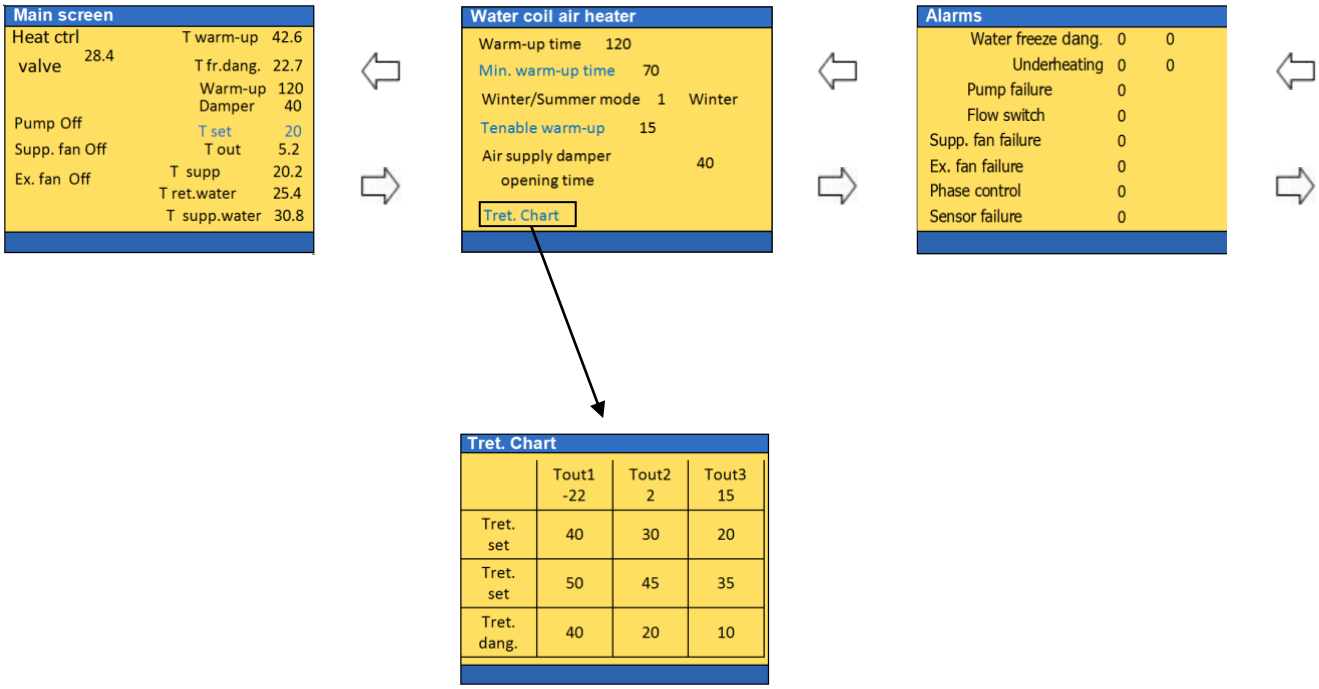
Out air sensor – correction of the external air temperature sensor.

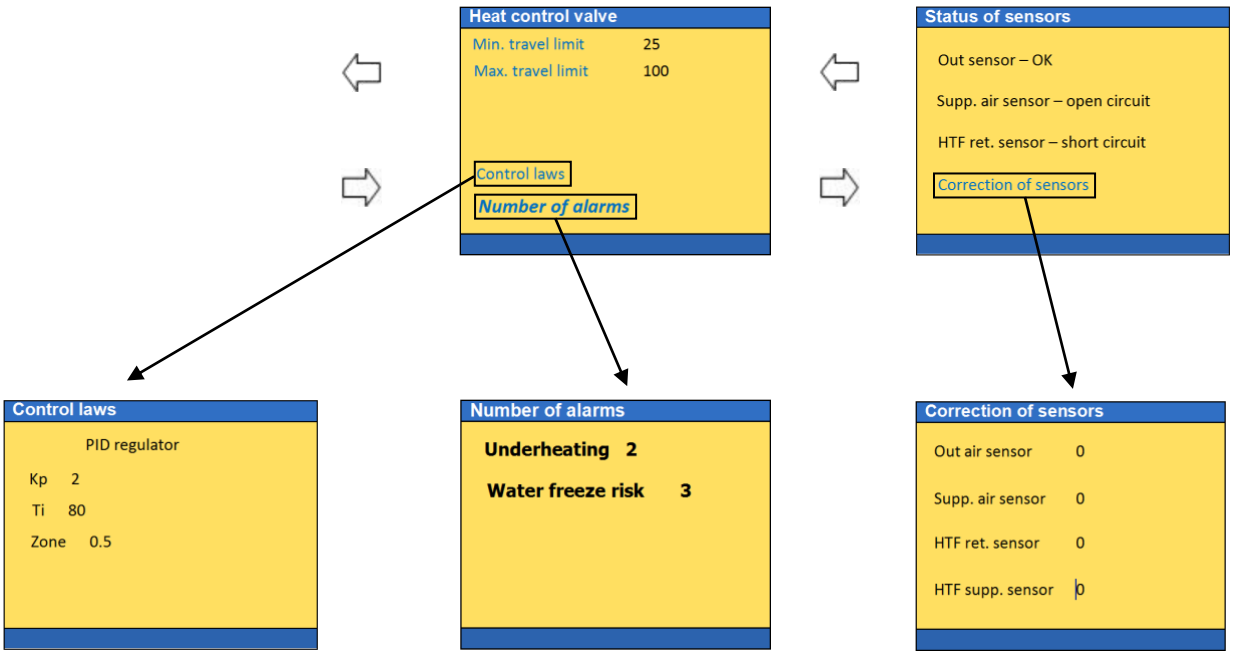
Supp. air sensor – correction of supply air temperature sensor.

HTF ret. sensor – correction of the return HTF temperature sensor.

HTF supp. sensor – correction of the supply HTF temperature sensor.

Window tree


Main screen
Heat ctrl valve 28.4
Pump Off
Supp. fan Off
Ex. fan Off
T warm-up 42.6
T fr.dang. 22.7
Warm-up Damper 120 40
T set 20
T out 5.2
T supp 20.2
T ret.water 25.4
T supp.water 30.8
Water coil air heater
Warm-up time 120
Min. warm-up time 70
Winter/Summer mode 1 Winter
Tenable warm-up 15
Air supply damper opening time 40
Tret. Chart
Alarms
Water freeze dang. 0 0
Underheating 0 0
Pump failure 0
Flow switch 0
Supp. fan failure 0
Ex. fan failure 0
Phase control 0
Sensor failure 0
Tret. Chart
Tout1 -22
Tout2 2
Tout3 15
Tret. set 40 30 20
Tret. set 50 45 35
Tret. dang. 40 20 10


Heat control valve
Min. travel limit 25
Max. travel limit 100
Control laws
Number of alarms
Status of sensors
Out sensor – OK
Supp. air sensor – open circuit
HTF ret. sensor – short circuit
Correction of sensors
Control laws
PID regulator
Kp 2
Ti 80
Zone 0.5
Number of alarms
Underheating 2
Water freeze risk 3
Correction of sensors
Out air sensor 0
Supp. air sensor 0
HTF ret. sensor 0
HTF supp. sensor 0

5. Operation of the booth

5.1. Functioning principle and operation

Working zone – air of the working zone is cleaned from harmful contaminating particles that are formed during paintworks of woodworking, furniture and metalworking industries. The blower draws the contaminated air into the painting booth. Major part of harmful particles formed during paintworks is retained in the system of successive filters, which are mounted inside the stand. Filtered air is discharged to the outside.

Drying zone – allows organizing drying of painted parts by maintaining the required temperature and creating horizontal air flow in the room, which contributes to establishing advantageous drying conditions for the paint coatings.

The drying zone includes:

- Plenum box for distribution of clean air;
- Suction columns placed at the corners of the zone for extraction of paint vapours and creation of horizontal air flow;
- MB-AS series exhaust blower.

Air supply unit with water coil air heater in the drying zone maintains the required temperature (in the range from 5 °C to 20 °C). It is also equipped with plenum boxes for uniform distribution of the air flow. The unit creates excess pressure to ensure the minimum possible dust content in the painting zone, thus significantly improving product quality.

The air supply unit in the drying zone and suction columns maintain the required temperature and create horizontal air flow, allowing for uniform drying of the painted parts.

The booth is turned on by pressing the green button on the control panel.

The booth is turned off by pressing the red button on the control panel.

5.2. Operating conditions

This unit is designed and manufactured to handle any air mixtures.
The booth shall not be used for treatment of air that contains large and long fractions of sawdust, cloth, foreign metal inclusions or any other materials that can damage the blower, filters and the booth.
Do not remove filter elements. It is only allowed to remove filter elements for maintenance or repair purposes and only when the control panel is deenergized. Do not perform any interventions when the booth is in operation.

6. Maintenance

CAUTION! Any maintenance works shall be performed when the equipment is disconnected from power supply

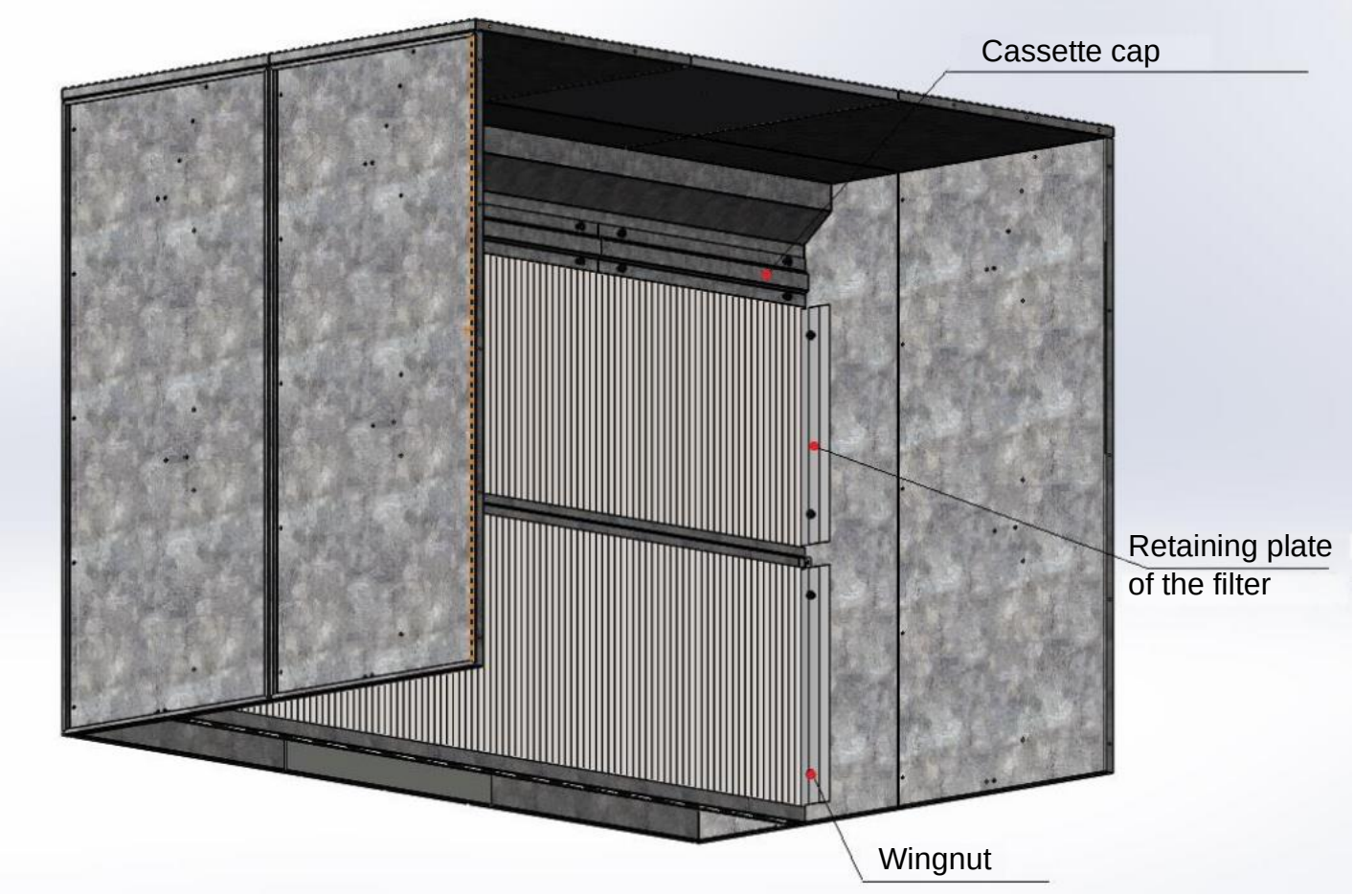
6.1. Equipment cleaning, cleaning/replacement of filters

Follow the below procedure to carry out cleaning of the equipment:

- Cut off power supply to the equipment by turning the main switch to OFF position and wait until the blower comes to a complete standstill;
- To replace the cardboard filter, unscrew wingnuts (8 pcs.), then remove the retaining plates of the filter (4 pcs.), after which you can replace the used cardboard filter with a new one.
- To replace PaintStop filter, unscrew wingnuts (12 pcs.), and then remove the filter cassette cap (3 pcs.). The filters are now accessible and can be replaced.

Always use personal protective equipment when performing the above operations.

CAUTION! Keep any ignition sources (cigarettes, flames, sparks) away when performing cleaning operations.


Cassette cap
Retaining plate
of the filter
Wingnut

6.2. Regular condition monitoring

Regular condition monitoring of the booth and its filter elements is of critical importance for ensuring adequate safety level and prevention of explosion and fire risk, which may be attributed to deposition and accumulation of highly flammable particles inside the filtering unit. When moving, the accumulated highly flammable dust particles create potentially explosive dust cloud, so such dust deposits and accumulations shall be minimized. The dust deposits can also ignite due to exposure to hot surfaces, sparks and flame.

6.3. Regular maintenance

Every 600 hours of operation:

- Listen for noise from the rotating motor parts, impeller, and bearings.

Every 1200 hours of operation:

- Check bolt connections for tightness.

Every 2400 hours of operation:

- Test blower impeller assemblies for balancing.

Every 1600 hours of operation:

- Clean and lubricate bearings, replace if necessary.

Every 180 hours of operation:

- Remove and clean the filter elements, replace if necessary.

Every 160 hours of operation:

- Air purging of the main air ducts: open all dampers, start the blower for a few minutes (do not perform any operations on the unit during air purging).

6.4. Mounting/dismounting the blower impeller

- Unscrew mounting bolts and nuts and dismount the blower.
- Remove the inlet nozzle of the blower.
- Remove the fixing screw and washer used to attach the impeller to the shaft.
- Take off the impeller using a puller tool. In doing so, place a spacer between the impeller support and the shaft to prevent the shaft from being damaged.
- Assemble the blower in the reverse order.

6.5. Dismounting the blower impeller support

- Dismount the impeller as described above.
- Unbolt the support by removing the fixing bolts and change, if necessary, internal parts of the support and the bearings.
- Assemble the support in the reverse order.

6.6. Cleaning the impeller

The impeller shall be statically and dynamically balanced to prevent vibration. Regularly check the impeller for cleanliness. Oil vapours, resins, air humidity and other factors contribute to the adhesion of dust, grease and other materials to the impeller surfaces, which leads to its disbalancing and results in damage to the motor and the blower case. The symptoms are increased noise and vibration.
To clean the impeller, first check if the motor is disconnected from the electric power supply. All cleaning actions shall be carried out through the inspection door of the blower. Clean the impeller with a brush. Make sure to remove all contaminating materials during cleaning, as any remains can result in disbalance.
Aton Service LLC declines any responsibility for damages to the motor, blower case and impeller itself due to accumulation of foreign materials on the impeller.

6.7. Filter elements

- Damage of the filter fabric results in passage of unfiltered air through the filter.
- Average operating life of a filter element makes 12 to 24 months provided that the filter element is used properly and is protected from ingress of moisture and foreign objects that can damage the filter fabric.
- Replacement and installation of filter elements is described in section 6.1.

6.8. Unscheduled maintenance

If unscheduled maintenance is required due to visual or hearing defects that occurred during operation of the booth, it is recommended to assign a person responsible for maintenance of the blower. The defect/failure and its exact cause shall be detected and recorded in the Unscheduled Maintenance Report. If a defect/failure occurs during the warranty period, contact the manufacturer for repair. If a defect/failure occurs after the manufacturer's warranty expires, and if you are not able to locate or remedy the problem by yourself, contact the manufacturer's personnel for advice.

Filter types used in the painting booth:

- **Cardboard filter:**

SepaPaint ink mist separation filters (sometimes referred to as "labyrinth" filters) for paint-spraying cabins constitute the first filtering stage for the air extracted from the painting zone. These filters are made of pleated multilayer filtering material with process holes for the passage of air. Particle-loaded air flow has to change its direction several times due to the labyrinth filter construction. As a result of such air flow arrangement, airborne particles stick to the walls and plaiting of SepaPaint filter. After passing through the pre-filtration stage, the exhaust air is directed to the mate-type filtering material. Pre-filtration of air extracted from the paint-spraying cabin ensures prolonged operational life for the material of the second filtering stage. Thus, the use of labyrinth filters in paint-spraying cabins helps to cut down costs for the purchase and replacement of more expensive filter materials of fine filtering classes.

- **Temperature of the working environment:** up to 100 °C
- **Fire behaviour classification acc. to DIN 53438:** F1/K1
- **Initial pressure drop (V=0.5 m/s):** 20 Pa
- **Initial pressure drop (V=0.75 m/s):** 40 Pa
- **Initial pressure drop (V=1 m/s):** 70 Pa
- **Recommended final pressure drop:** 130 Pa

- PaintStop filter:

PaintStop mate-type floor filtering material for paint-spraying cabins represents the final air filtering stage in rooms where different products are painted by aerosol paints. The filter material is made of unevenly arranged pre-heat-treated fibreglass. These fibres are relatively elastic, and their width gradually increases towards the rear mate side (clean air side). Rear side of the Paint Stop floor filter is reinforced by applying a special layer.
Due to its innovative structure, PaintStop floor filters feature high dust accumulation ability and gradual (not rapid) increase of pressure drop across the filter. These properties allow extending maintenance intervals for the paint booth ventilation system and help to reduce variable costs for replacement of the PaintStop floor filter.

- **Material:** glass fibre
- **Air flow per 1 m^2:** 2500-6300 m^3/h
- **Initial pressure drop:** 4-12 Pa
- **Final pressure drop:** 80 Pa
- **Arrestance:** 95%
- **Material thickness:** 70 ± 5 mm
- **Unit weight:** 210 ± 30 g/m^2

- Pocket filters for ventilation systems:

These filters are one of the most widely used in ventilation equipment for separation of dust particles from the supply and recirculated air. Pocket filters are used to prevent clogging of heat exchangers and heat recuperators in air conditioning equipment as well as for treatment of atmospheric air before supplying it to service areas.
Pocket filters for ventilation systems feature relatively long service life owing to their design – the filter material is sewn to form dust collection bags (pockets). Area of the filtering material and depth of pockets vary depending on the filter size. The larger the filtration area and the deeper the pocket, the longer is the service life of a pocket filter.

- **Filter class:** G3, M5, F7, F9
- **Filtering media:** polyester, micro-glass fibre media, meltblown media
- **Final pressure drop:** 200/200/250 Pa
- **Maximum operating temperature:** 90 °C
- **Regeneration:** no

- **Ceiling mounted filter for paint-spraying cabins:**

These filters prevent dust particles, including dust of the finest fractions, from entering to the painting zone. Here ceiling mounted particulate filters guard against degradation of painting quality, as deposition of dust on the surface to be painted may result in production of low-quality products.
Ceiling mounted filters for paint-spraying cabins serve as the last filtration stage before the supply air enters the working room. Generally, stages of primary filtration by means of pocket filters are either provided as part of the air supply unit, or installed in the supply duct in filter boxes.
Ceiling filters for paint-spraying cabins shall be placed in a damper in a way to completely cover the entire cross section of the air distribution grille. This ensures uniform distribution and filtration of the entire volume of supplied air, as well as long service life of the filtering material.

- **Temperature of the working environment:** ≤ 80 °C
- **Humidity of the working environment:** ≤ 100%
- **Filter class:** M5
- **Filtering medium:** polyester
- **Fire behaviour classification acc. to DIN 53438:** F1/K1
- **Certification:** Öko-Tex Standard 100
- **Nominal air flow:** 900 m^3/h
- **Air velocity:** 0.25 m/s
- **Initial pressure drop:** 30/35 Pa
- **Final pressure drop:** 650/750 Pa
- **Average arrestance:** 90%
- **Material thickness:** 25 mm

7. Other provisions

7.1 Checks

CAUTION! The following operations shall be carried out by qualified personnel at disconnected equipment.

Item to be checked	Frequency of maintenance	Works to be performed
Cleaning	Cleaning shall ensure that deposits and accumulations of dust do not remain for more than one working shift	Cleaning of internal and external surfaces
Filtering elements	Once a month	Check
Screws and nuts	After the first 500 hours of operation, then – once a year	Check for tightness
Warning plates	Once every 6 months	Make sure that the plates are legible and undamaged

7.2 Troubleshooting tips

CAUTION! The following operations shall be carried out by qualified personnel at disconnected equipment and only after contacting the equipment Supplier.

PROBLEM	POSSIBLE REASON	REMEDY
The system does not draw in air once it is started	Incorrect blower direction	Check the direction of rotation

7.3 Possible blower failures – troubleshooting

Problem	Possible reason	Remedy
Insufficient air flow	♦ Incorrect direction of rotation ♦ Insufficient speed ♦ Deposit of dirt on the impeller ♦ Dirty filters	• Interchange motor phases • Check supply voltage, reliability of electrical contacts • Clean the impeller • Clean or replace filter elements
Heavy starting	♦ Excessive power consumption ♦ Insufficient motor torque	• Replace the motor • Check motor data against the technical documentation
Power consumption of the blower exceeds the value specified in the technical documentation	♦ Dirty filters ♦ Deposit of dirt on the impeller ♦ Air ducting/air intakes clogged or partially blocked	• Perform cleaning of filters more frequently • Clean the impeller • Clean the air ducting, check position of the air dampers

Elevated noise level	♦ Unbalanced impeller, displaced relative to the housing	• Check for correct installation and condition of the impeller
Excessive vibration	♦ Unbalanced impeller or other rotating parts ♦ Improperly installed or fixed blower	• Cleaning or replacement • It is recommended to install the blower on foundation made of concrete slabs or on a sufficiently rigid frame.

7.4 Warranty conditions

- The warranty period shall make 12 months from the date of signing of the delivery note or Acceptance Act, but shall be limited to 18 months from the moment of dispatch.
- The warranty shall mean Supplier's obligation to provide the Buyer (free of charge for the Buyer) with non-defective part in exchange for the defective one if the defect is due to the manufacturer's fault. At that, the part (assembly unit) shall be replaced in the shortest possible time, but not later than 30 business days from the date of written Buyer's notice informing about the detected defect and based on the act issued by the Supplier's customer service department.
- The Buyer shall request for replacement of a part (assembly unit) in writing only; the request shall contain indication of the equipment model, serial number and description of the defect.
- Assembly (disassembly) of the part shall be carried out by the Buyer. The Buyer may charge the Supplier with performance of this work. At that, terms of work and payment conditions shall be agreed separately.
- The warranty shall become void if the Buyer violates any of the following provisions:
    - the equipment shall be used for its intended purpose or in accordance with the relevant instructions of the Supplier or the manufacturer;
    - regular maintenance of the equipment shall be carried out in accordance with the requirements of the Operation Manual;
    - any modifications to the design and update of the equipment shall be made only upon the Supplier's written consent;

  - warranty seals specified in the operational documents remain intact;
  - the equipment is operated by persons who have received relevant training and are aware of the operation conditions, allowable and forbidden operating methods, maintenance procedures, safety rules (for example, received training during start-up and adjustment works);
  - observance of all transportation, preservation and shipping conditions relating to the equipment;
  - observance of operation conditions and connection specifications relating to the equipment (electric power and pneumatic connections) and their conformance to Operation Manual for the equipment;
  - use of original spare parts authorized by the manufacturer only;
  - compliance with the humidity conditions in premises where the equipment is operated (booth for indoor use).
- The Supplier's warranty shall not cover damages of the equipment caused by force majeure events as well as assembly units and parts subject to natural wear and tear during operation, such as
  - driving belts;
  - rubber blades, plastic parts and woven fabrics;
  - light bulbs, fuses and similar parts;
  - drive screws, drive screw nuts, gear segments, gear wheels.
- Equipment or its components, included to the Buyer's claim (complaint), shall be provided to the Supplier's representative for review and verification within 14 calendar days from their breakdown. Otherwise the part (assembly unit) will be replaced on a paid basis.
- The warranty shall not cover defects caused by the following factors:
  - Unqualified (unskilled) operation or external impacts (e.g. scratches, dents, other deformations);
  - contamination of any origin;
  - repair and any other operations with respect to the equipment performed by technical personnel who has not received training from the Supplier;
  - damages that occurred during transportation of the equipment by the Buyer.
- Requirements contained in the Operation Manual provided by the Supplier to the Buyer shall be mandatory. The Buyer has the right to request in writing an additional copy of the Operation Manual, and the Supplier has the right to provide it in paper or electronic form.
- The Supplier shall neither accept nor consider Buyer's claims for damages related to stoppage or downtime of the equipment.

7.5 Safety instructions

The Buyer shall comply with instructions/requirements contained in this Operation Manual and in fire safety regulations. Particular care shall be paid to cleaning of the internal space of the unit and its external parts to avoid excessive accumulation of highly flammable dust. It is also necessary to prevent any ignition sources (such as live coal, sparks, open flame, cigarettes, or any other sources) from entering into the unit through air intakes.

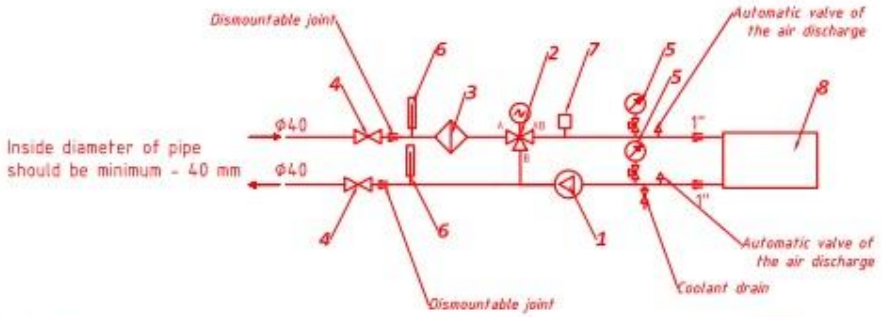
7.6 Transportation, pacing and storage

- Transportation (if performed by the Buyer). Each item of the equipment shall be checked and tested before shipping. The warranty period starts from the date of delivery and covers workmanship and quality of materials. The shipper shall bear responsibility for any damages that occurred during transportation. Disassembled filtering complex is packed in plastic materials or cardboard. All packing waste shall be disposed of in accordance with the legislation in force. The equipment shall be transported with care to avoid dropping or overturning. Lifting and transportation shall be carried out by appropriate vehicles and lifting machinery. Transportation shall be carried out in accordance with the accident prevention regulations currently in force.
- Unloading. Unloading of the equipment shall be entrusted to professional loaders or to personnel experienced in unloading of this kind of equipment.
    - Do not remove transport fixtures used to lock parts of the equipment during transportation until all the equipment parts are unloaded and located in place.
    - Follow handling instructions and use lifting and load-attaching points marked on the equipment.
- Storage and reallocation (if performed by the Buyer). The equipment shall be protected from atmospheric effects, dust and falling objects that may hit the equipment. In case of long period of time between the delivery and installation dates, it is necessary to perform periodic (weekly) checks of the blower by rotating it manually in order to prevent damage of the bearings. It is not allowed to leave blower impeller at rest for a long period of time. The manufacturer shall not be liable for damages of the equipment caused by prolonged standing period.
- Dimensions and the weight are shown in the technical data specification, section 1.5.

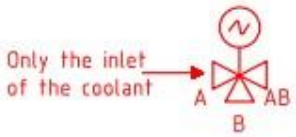
8. Notes

9. Annexes

The mixing module of the system's heating unit for one heat exchanger.
Aton service LTD. company provides 3-way valve, heat exchanger and small circuit pump.
Aton service LTD. doesn't provide filter, global-valve, manometer, thermometer and relay of the duct.



1.Recirculating pump
2.Regulated 3-way valve
3.Filter
4.Globe-vave
5.Manometer
6.Thermometer 0-150 ° C
7.Relay of the duct
8.Heat exchanger (dismountable joints should be foreseen on the heat exchanger)



Technical data of the heat exchanger
Air temperature range: +5°C/+20°C
Power: 45 кВт
Volume: 6 dm^3
Pressure losses: 10,97 kPa
Coolant outgo: 2 m^3/hour
Coolant temperature inlet/outlet: 80°C/60°C

Technical data of the 3-way valve
Pressure loses: 7 kPa
Coolant outgo: 2 m^3/hour
Maximum capacity: 10 m^3/hour
Maximum temperature: 100°C.

Technical task for the sanitary engineer.

The main line of the coolant should have the internal diameter not less, than ø40 mm.

Nominal working mode 80°C/60° (suppling/backward pipe). The outgo of the coolant is not less than 2 m^3/hour.

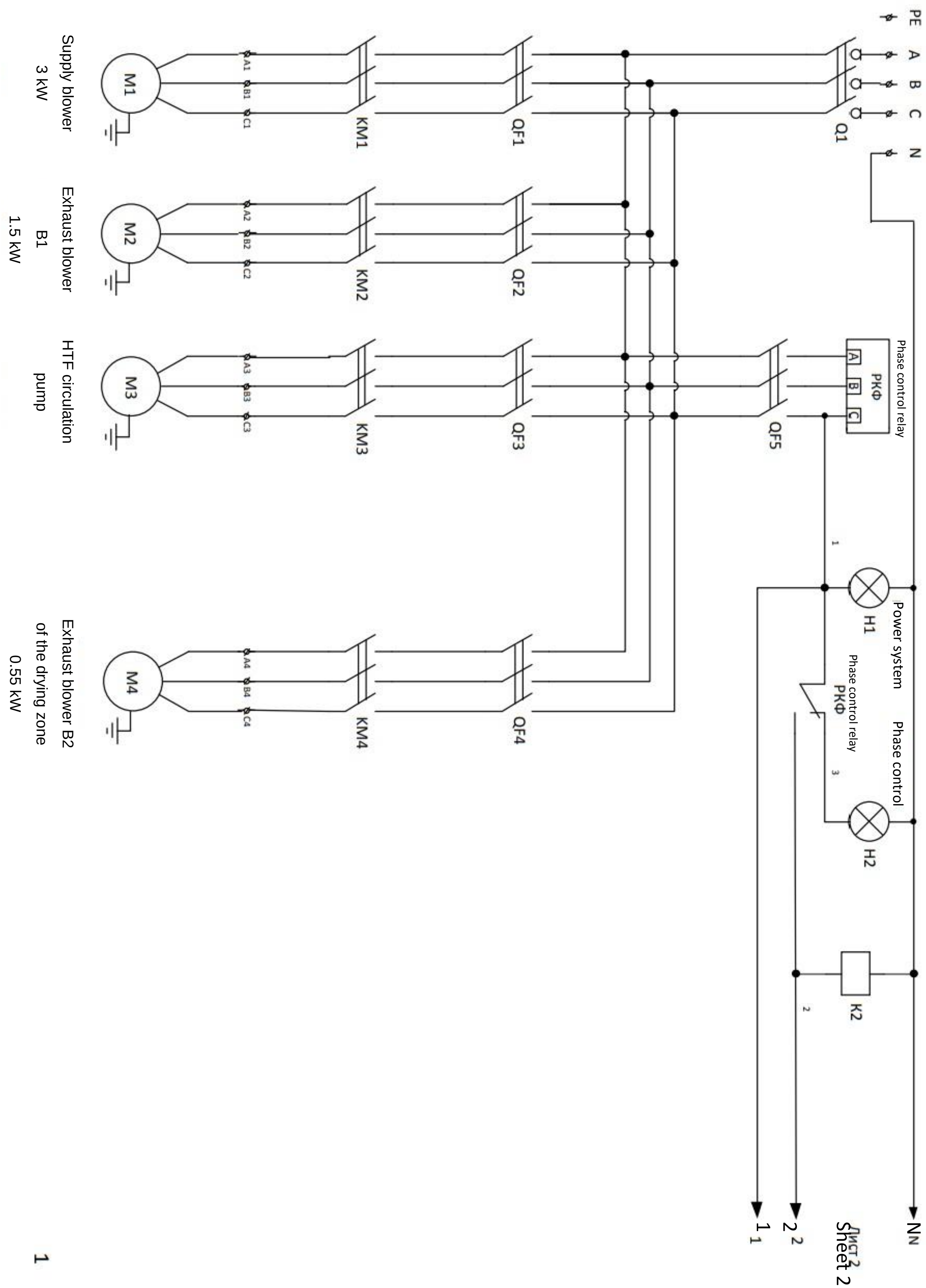
The mixing module is producer and assembled by Buyer. Company Aton service Ltd. provides the 3-way valve with connection 1" (inches) of the internal thread, the heat exchanger with connection 1" (inches) of the outside thread and circulating pump with connection 1" (inches) of the inside thread.

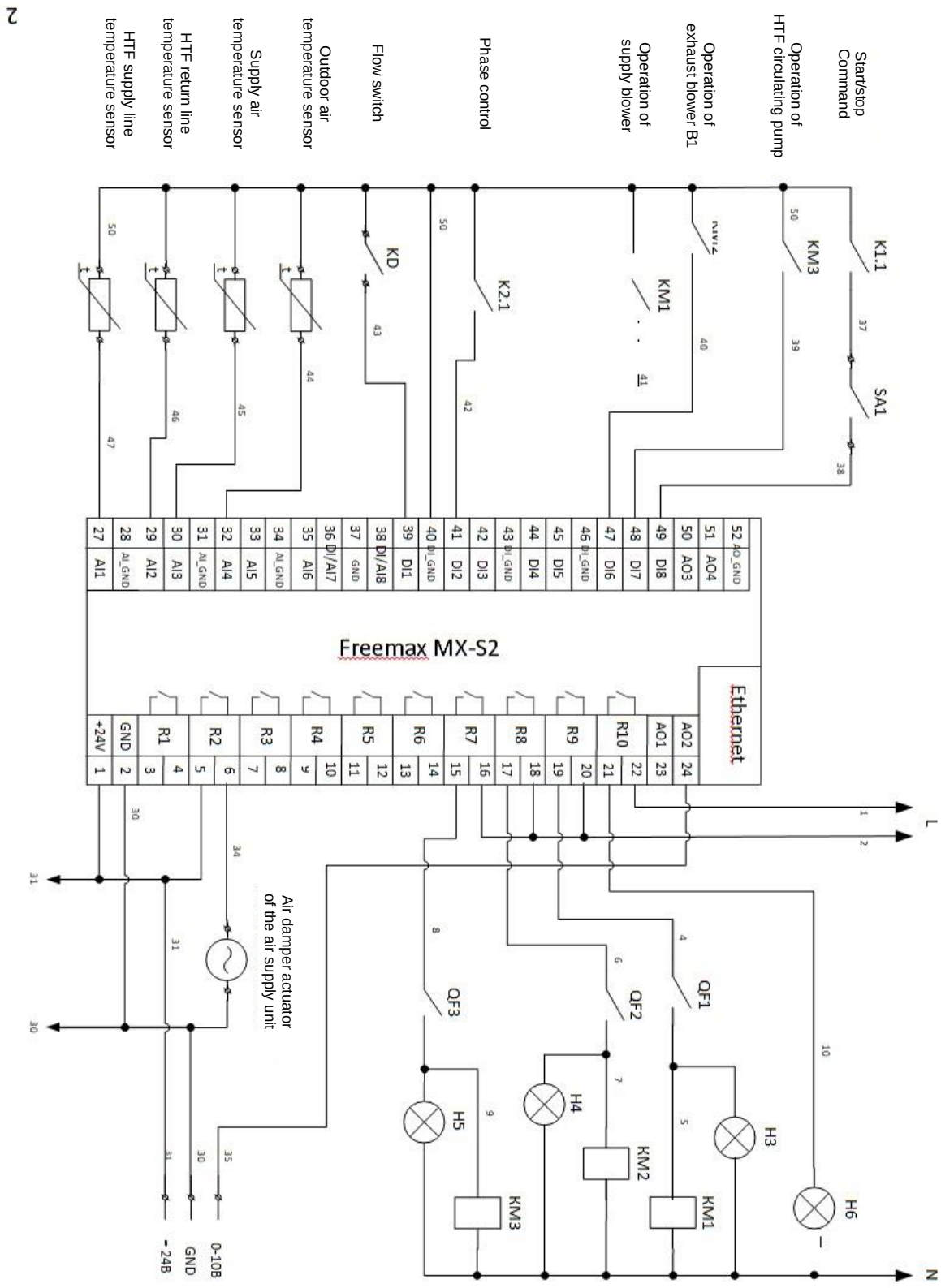
The scheme of the mixing module is attached.

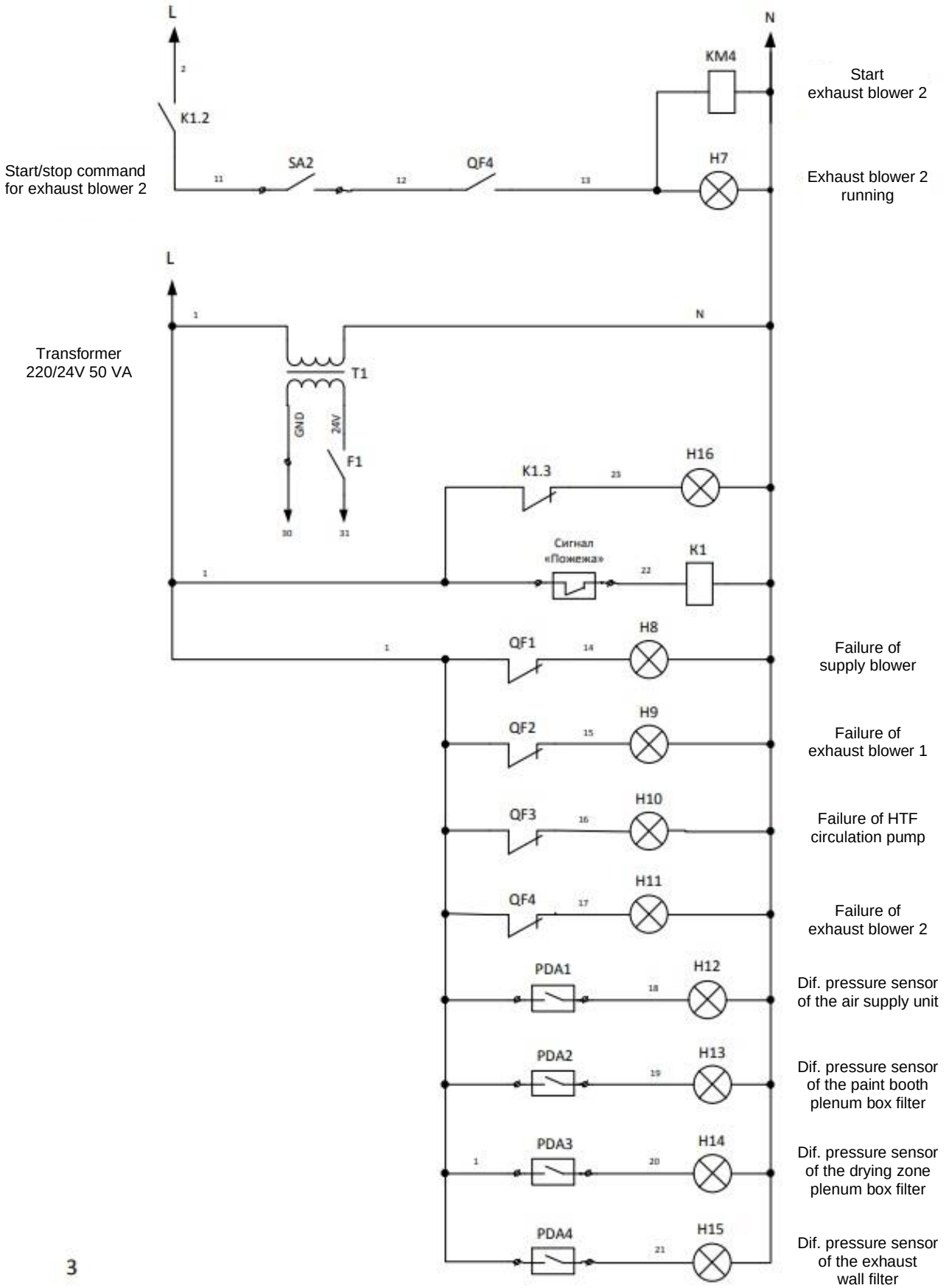
The pump position 1 (one) provides the circulation only in the heat exchanger.

Circulation in the main line of the coolant and boiler is provided by other pumps, that are calculated and supplied by the Buyer.

Rev.	sheet	Docum №	Signature	Date	Painting Complex Zlatev Inzinering dooel	Lit	Sheet	Sheets
Designed							6	6
Approved								
					Technical task for the sanitary engineer	"Aton Service"		


PE
A
B
C
N
Q1
QF1
KM1
A1
B1
C1
M1
Supply blower
3 kW
QF2
KM2
A2
B2
C2
M2
Exhaust blower
B1
1.5 kW
Phase control relay
РКФ
A
B
C
QF5
QF3
KM3
A3
B3
C3
M3
HTF circulation
pump
1
H1
Power system
Phase control relay
РКФ
Phase control
3
H2
QF4
KM4
A4
B4
C4
M4
Exhaust blower B2
of the drying zone
0.55 kW
K2
2
N
N
2
2
1
1
Sheet 2
Лист 2


Start/stop Command
Operation of HTF circulating pump
Operation of exhaust blower B1
Operation of supply blower
Phase control
Flow switch
Outdoor air temperature sensor
Supply air temperature sensor
HTF return line temperature sensor
HTF supply line temperature sensor
K1.1
KM3
SA1
KM1
K2.1
KD
Freemax MX-S2
Ethernet
+24V
GND
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
AO1
AO2
AI1
AI2
AI3
AI4
AI5
AI6
DI/AI7
DI/AI8
DI1
DI2
DI3
DI4
DI5
DI6
DI7
DI8
AO3
AO4
AO_GND
L
N
QF1
QF2
QF3
KM1
KM2
KM3
H3
H4
H5
H6
Air damper actuator of the air supply unit
0-10В
GND
+24В
3-way valve
Operation of HTF circulating pump
Operation of exhaust blower
Operation of supply blower
System failure


L
N
KM4
Start
exhaust blower 2
K1.2
Start/stop command
for exhaust blower 2
SA2
QF4
H7
Exhaust blower 2
running
L
N
Transformer
220/24V 50 VA
T1
GND
24V
F1
K1.3
H16
Сигнал
«Пожежа»
K1
QF1
H8
Failure of
supply blower
QF2
H9
Failure of
exhaust blower 1
QF3
H10
Failure of HTF
circulation pump
QF4
H11
Failure of
exhaust blower 2
PDA1
H12
Dif. pressure sensor
of the air supply unit
PDA2
H13
Dif. pressure sensor
of the paint booth
plenum box filter
PDA3
H14
Dif. pressure sensor
of the drying zone
plenum box filter
PDA4
H15
Dif. pressure sensor
of the exhaust
wall filter