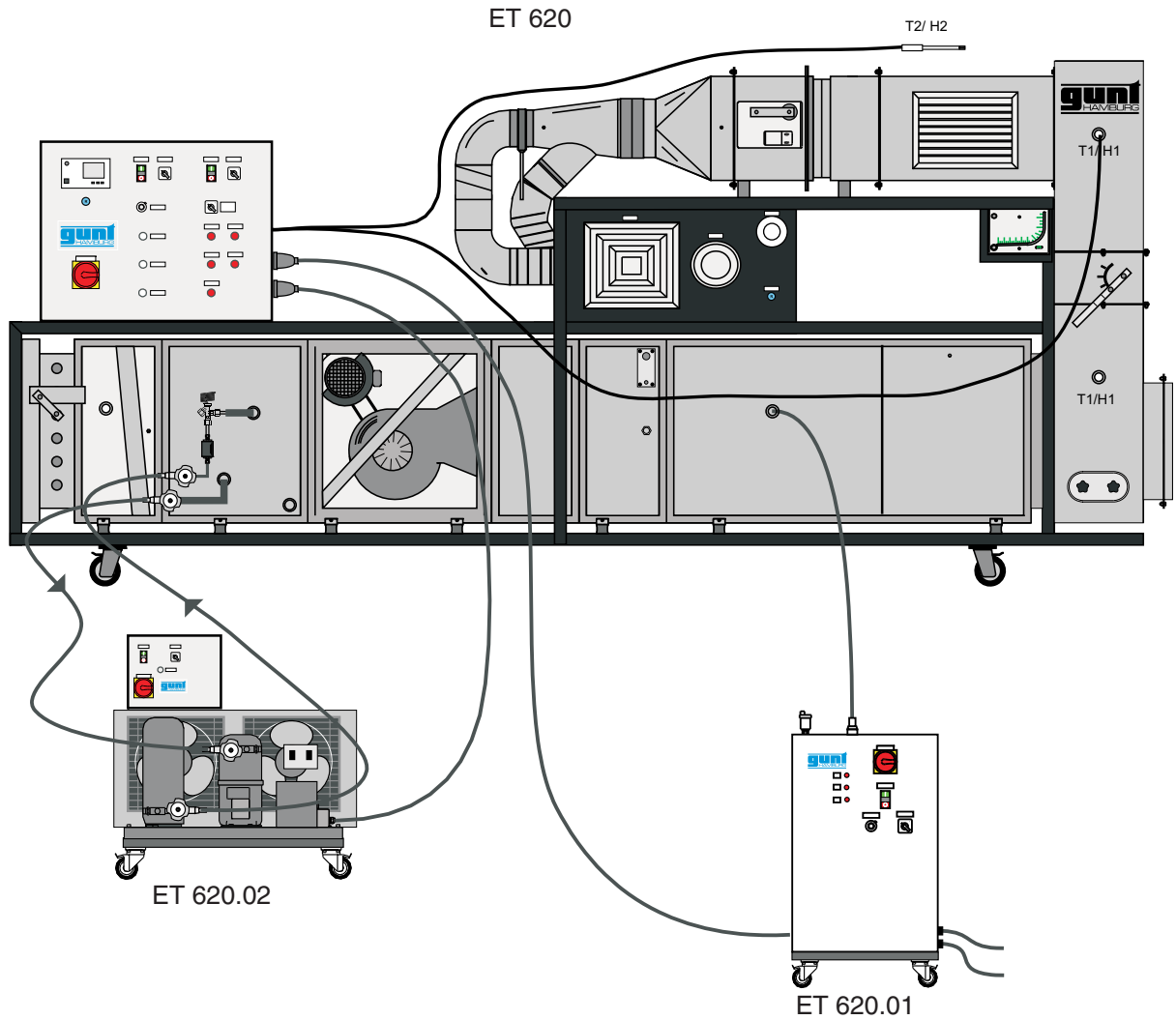


Instruction Manual

ET 620 Air Conditioning and
Ventilation System

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Instruction Manual

Last modification by: Dipl.-Ing. J. Boxhammer

Please read and follow the safety regulations before the first installation!

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1 Introduction

An air conditioning and ventilation system is intended to generate and maintain uniform ambient conditions in a room. Depending on its purpose, it can ensure a constant temperature by heating or cooling the air, regulate the humidity by humidifying or dehumidifying the air or reduce the proportion of dust in the air by filtration.

The **ET 620 Air Conditioning and Ventilation System** is an example of an industrial air conditioning and ventilation system, as is commonly used in ventilation engineering in larger buildings. The use of industrial components permits a realistic insight into the structure and functioning of such units.

The major elements of the trainer are:

- Adjustable speed fan,
- Direct evaporator for cooling,
- Electric heater for heating,
- Air humidifier with water vapour,
- Air filter

Condenser set for feeding the direct evaporator and a vapour humidifier are additional elements.

ET 620.01 Additional vapour humidifier module

The vapour humidifier is mounted on a separate support frame. The vapour that is generated is fed via a hose to a lance in the ventilation duct.

ET 620.02 Additional condenser set module

The condenser set is mounted on a separate support frame. It requires only an electric power supply. The ET 620 is connected to the direct evaporator by hoses.

At certain points on the ventilation duct, there are connecting fittings, where hoses and differential pressure measurement sensors are used to detect the pressure losses along individual segments of the duct.

In addition, the ventilation duct has a connecting flange to allow connection to an external ventilation system.

Learning Objectives / Experiments

- Practice-oriented principles of air conditioning and ventilation technology
- Design and servicing of an air conditioning and ventilation system
- Principles of room air conditioning (h-x diagram)
- Explanation of components: filter, air heater, air cooler, humidifier, condensing unit, air conditioning controller, flaps, outlets
- Operation of safety devices
- Measurement of pressure curve and pressure losses
- Effect of air cooler, air heater and humidifier on the state of the air at the outlet
- Investigation of the control behaviour of an automatic air conditioning controller, determination of limiting factors

ET 620

AIR CONDITIONING AND VENTILATION SYSTEM

2 Unit description

2.1 Equipment layout

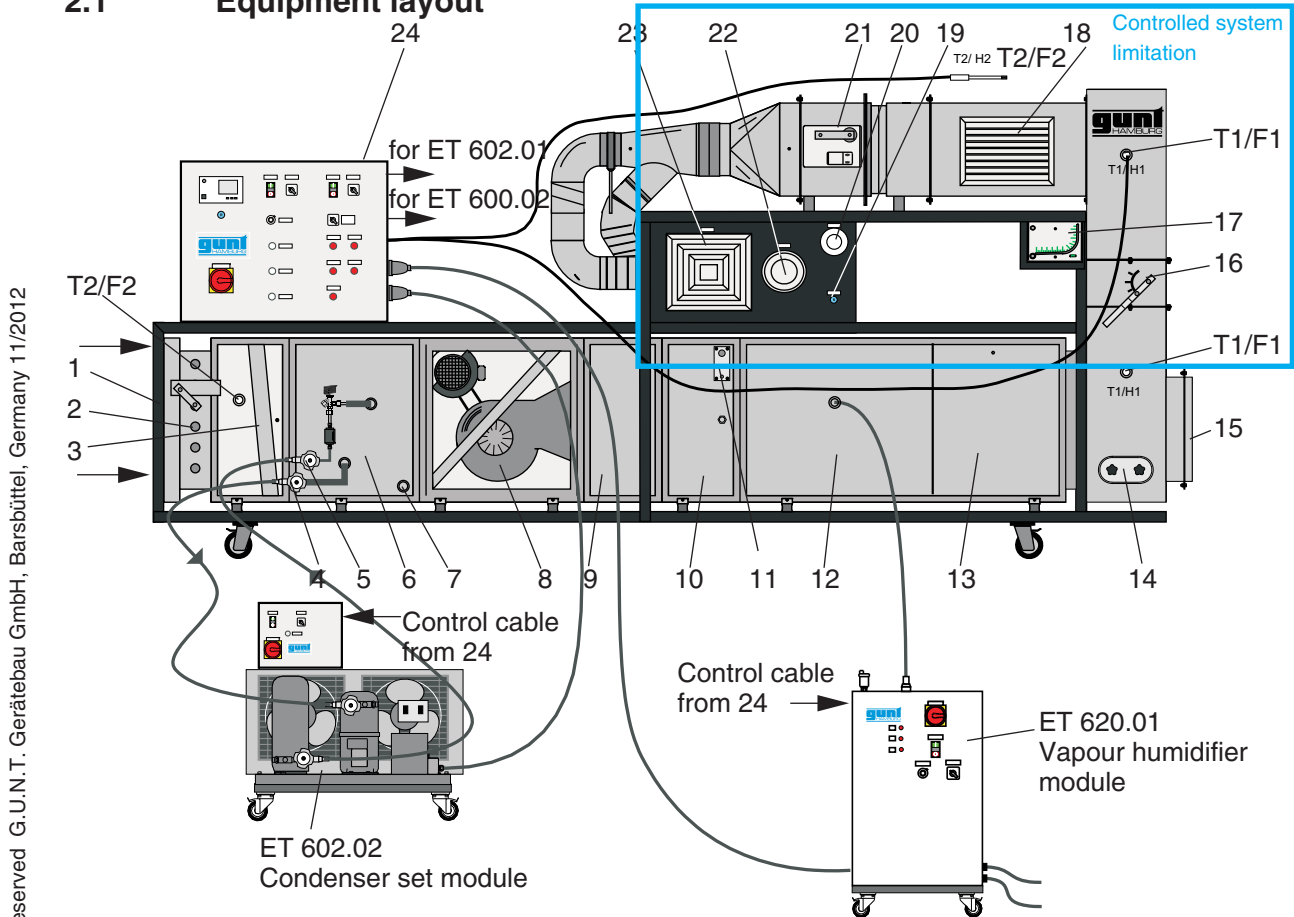


Fig. 2.1 Overall view of ET 620 with ET 620.01 and ET 620.02 accessories. - (Variant: 400 V/50Hz/3) Connection with CEKON 63A plug, Accessories connected to the main unit.

1	Weather protection grille (fresh air)	14	Inspection cover
2	Louvered flaps	15	Connecting flange for external system
3	Air filter	16	Butterfly valve
4	Refrigerant inlet connection	17	Inclined-tube manometer
5	Refrigerant outlet connection	18	Ventilation grille (feed air)
6	Air cooler (evaporator)	19	Fire alarm reset button
7	Condensate drain	20	Fire alarm
8	Fan	21	Fire damper
9	Flow distributor	22	Disk valve (feed air)
10	Air heater	23	Ceiling air outlet (feed air)
11	Safety temperature limiter	24	Switch cabinet
12	Air humidifier	T1/F1	Opening for air temperature / humidity sensor - Feed air
13	Inspection flap	T2/F2	Opening for feed air temperature / humidity sensor - Room air

ET 620

AIR CONDITIONING AND VENTILATION SYSTEM

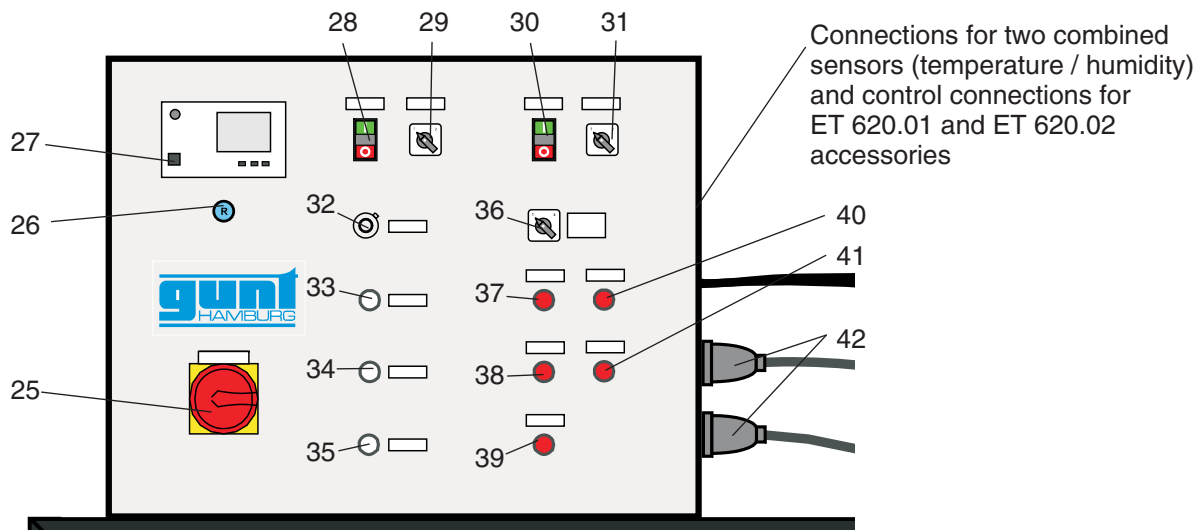


Fig. 2.2 Switch cabinet ET 620 air conditioning and ventilation system

25	ET 620 main switch	34	Humidifier in operation indicator lamp
26	Reset button for the fire alarm in the climate controller	35	Condenser set in operation indicator lamp
27	Climate controller	36	Heating level selector switch
28	Fan on/off switch	37	Filter warning lamp
29	Manual mode / climate controller toggle switch	38	STM warning lamp
30	Air heater on/off switch	39	STL warning lamp
31	Manual mode / climate controller toggle switch	40	Fire damper warning lamp
32	Fan speed adjusting knob	41	Fire alarm warning lamp
33	The minimum air flow indicator lamp shows that the minimum air flow is present.	42	Supply connections for ET 620.01 and ET 620.02 (400 V/ 50 Hz/ 3 version only)

ET 620

AIR CONDITIONING AND VENTILATION SYSTEM

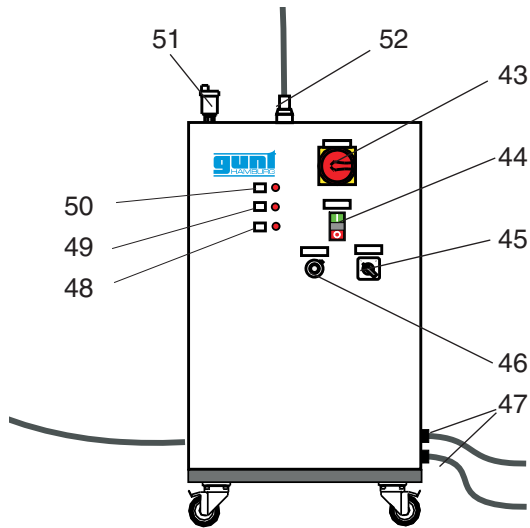


Fig. 2.3 ET 620.01
Vapour humidifier module

43	Vapour humidifier main switch
44	On/Off switch
45	Manual mode / climate controller toggle switch
46	Power adjusting knob 0...100%
47	Water inlet and water outlet
48	Fault display
49	Steam generator display
50	Operating display
51	Automatic bleed valve
52	Fitting for vapour outlet

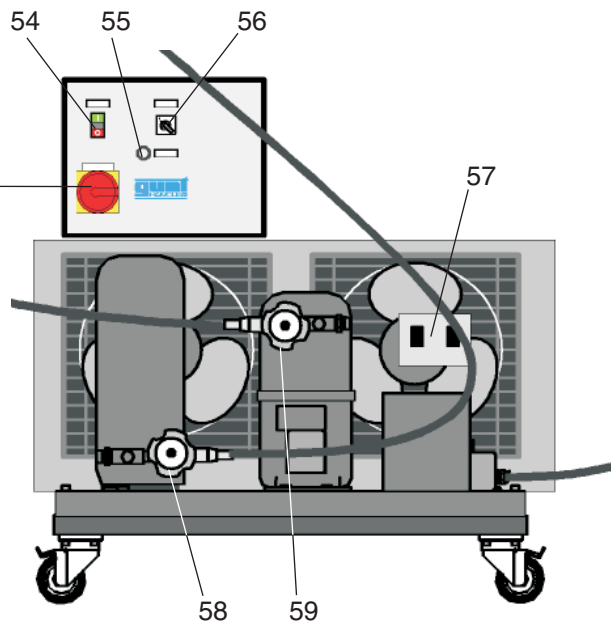


Fig. 2.4 ET 620.02
Condenser set module

53	Condenser set main switch
54	On/Off switch for manual mode only
55	Indicator
56	Manual mode / climate controller toggle switch
57	Overpressure switch
58	Refrigerant return, vacuum side
59	Refrigerant outlet, high pressure side

ET 620 AIR CONDITIONING AND VENTILATION SYSTEM

2.1.1 ET 620 System Diagram

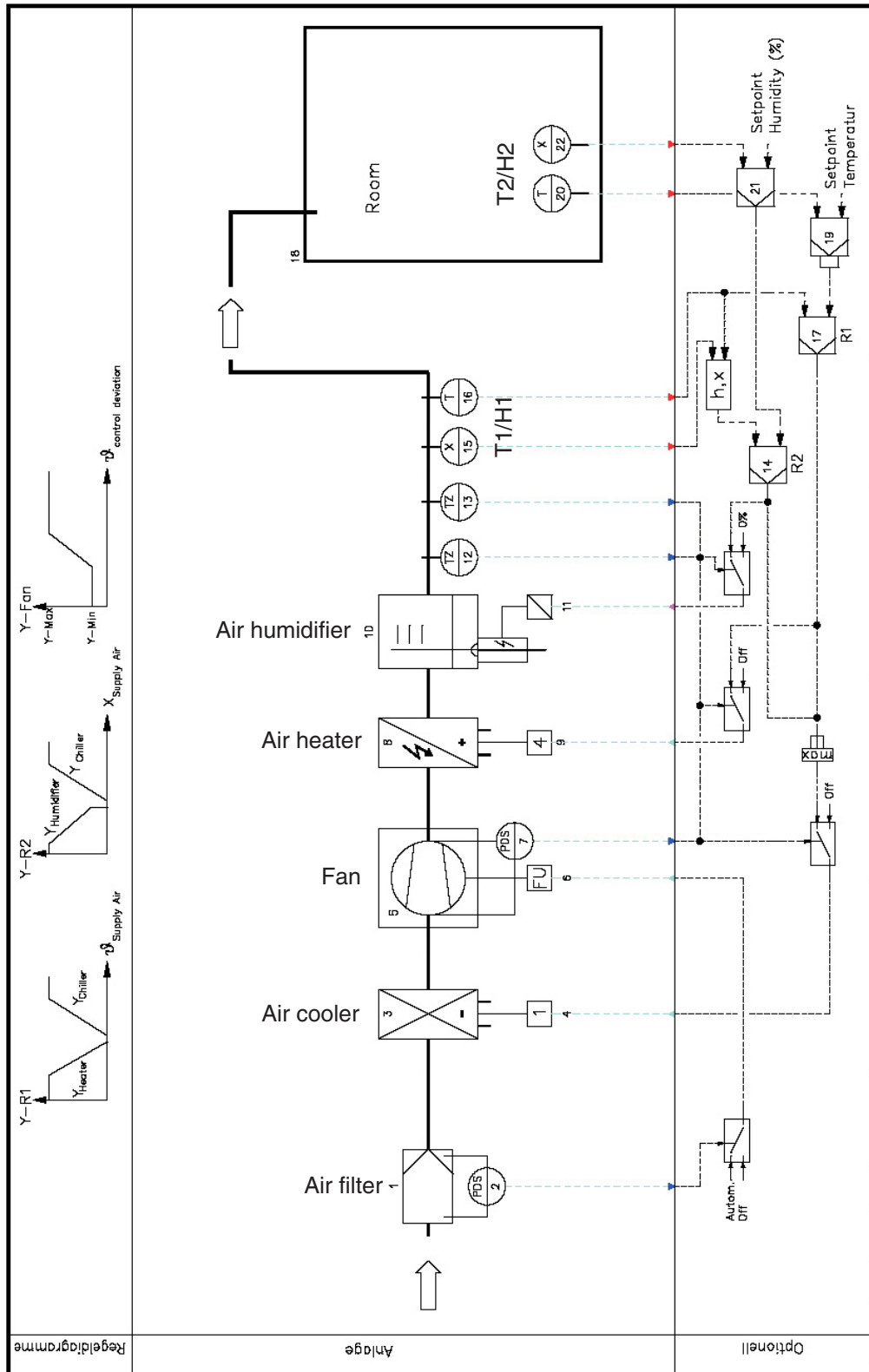


Fig. 2.5 ET 620 system diagram

2.2 Function and components of air conditioning and ventilation system

The air conditioning and ventilation system uses a fan to take in external air through a weather protection grille. On its way to the fan, the air passes through the louvered flaps, the air filter and the air cooler. Then the air is heated and humidified, before it passes through ventilation ducts and branches to its destination.

2.2.1 Weather protection grille

Weather protection grilles prevent the ingress of rain, foreign bodies and animals into the air conditioning and ventilation system ducts.

2.2.2 Louvered flaps

Louvered flaps are adjustable or control flaps, used in ventilation systems for metering the air quantity. They can be a one piece or multiple piece design. Variants are available with blades that rotate in the same sense and blades that rotate in opposite senses. The two variants have different opening characteristics.

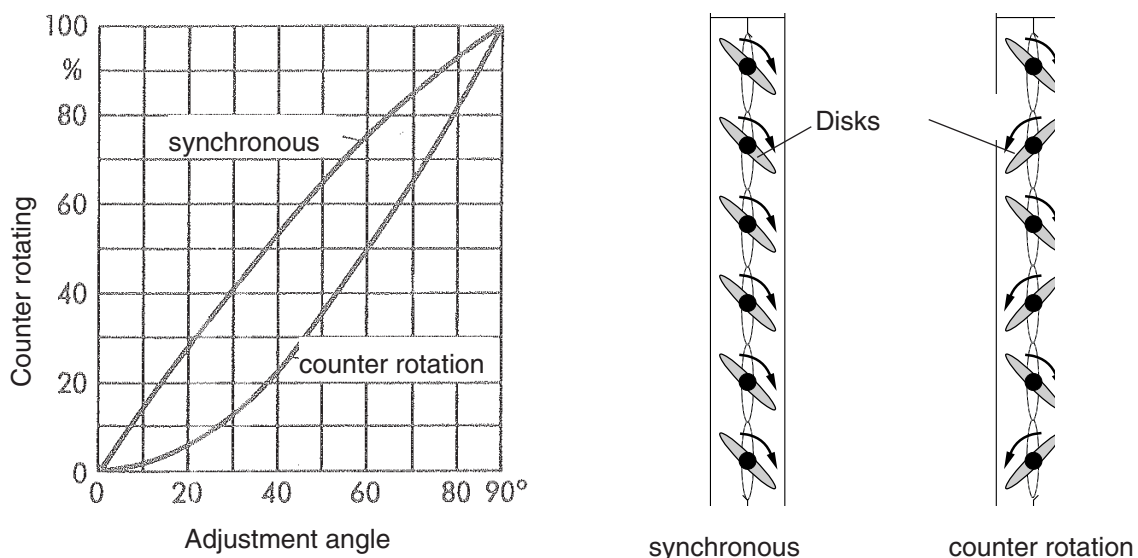


Fig. 2.6 Opening characteristics for louvered flaps

2.2.3 Air filter



Fig. 2.7 Air filter and louvered flaps to front left

The duty of air filters is to filter out and trap solid and gaseous contamination in the air.

Atmospheric air is contaminated with a variety of substances.

The particle size is generally in the range
~0.001 ... 500 μm .

The concentration of such impurities in the air can range from ~0.05 ... 3.0 mg/m^3 .

2.2.4 Air cooler



Fig. 2.8 Air cooler

In the air cooler, the air passes over the heat exchanger in a direct evaporator. This is supplied with refrigerant from an external condenser set (ET 620.02). The refrigerant enters the heat exchanger pipe coil through an expansion valve and evaporates. This is done by drawing heat from the air passing by. If the surface temperature of the heat exchanger falls below the dewpoint temperature, water from the air is precipitated as condensate, and the air is dehumidified.



Notice! To prevent unfiltered air being drawn in through the condensate drain, the drain must incorporate a siphon. This siphon is a U-tube, in which the trapped water acts as a barrier to the air.

2.2.5 Flow distributor

The task of the flow distributor is to smooth out most of the turbulence in the air as it leaves the fan. This is generally achieved by using a bundle of tubes or rectangular ducts. Turbulence reduces the air flow rate and causes annoying noises in the air ducts.

2.2.6 Air heater



Fig. 2.9 From left, flow distributor and air heater with STL

If the heating power required is relatively low, or heating by vapour or hot water is difficult, electrical air heaters are generally used. They consist of a frame, which carries electrical heating elements. The air flows around these heating elements and is heated. If more heating power is required, heating is generally split into several stages.

If the air flow is too low, the heating element surface temperatures can quickly rise to 400...600°C. Therefore air conditioning and ventilation systems are generally fitted with safety cutouts. The ET 620 is fitted with the following elements, amongst others:

STM : Safety temperature monitor ~75°C, on reaching this temperature it trips, sending a signal to the switch cabinet and cutting off the electric heating. It is reset automatically after cooling.

STL : Safety temperature limiter ~100°C, on reaching this temperature it trips, sending a signal to the switch cabinet and cutting off the electric heating. It has to be reset manually.



Fig. 2.10 Air heater when removed

2.2.7 Air humidifier

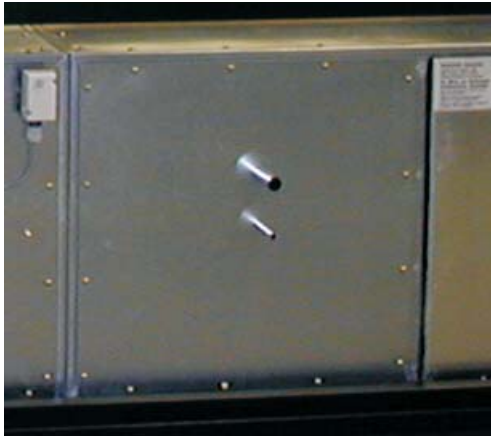


Fig. 2.11 Air humidifier without connecting cables
Top: Vapour connection
Bottom: Condensate return

In the air humidifier, moisture is added to the air flow to increase the absolute water content. This is done using water vapour, which on the ET 620 is generated by an external vapour humidifier (ET 620.01). A hose delivers the vapour to a vapour distributor in the air humidifier. The vapour distributor is constructed in such a way that the vapour is distributed in very fine and uniform droplets, so that condensate formation in the air humidifier is kept to a minimum.



Fig. 2.12 Vapour distributor

2.2.8 Fan



Fig. 2.13 Fan with belt drive in ET 620

The fan used is a belt driven radial fan. The fan is powered by an asynchronous motor. To allow the speed to be continuously adjusted, the asynchronous motor is controlled by a frequency converter (FU).

2.2.9 Air transmission and distribution

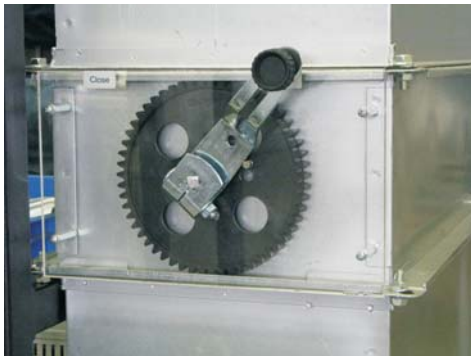


Fig. 2.14 Butterfly valve (16)

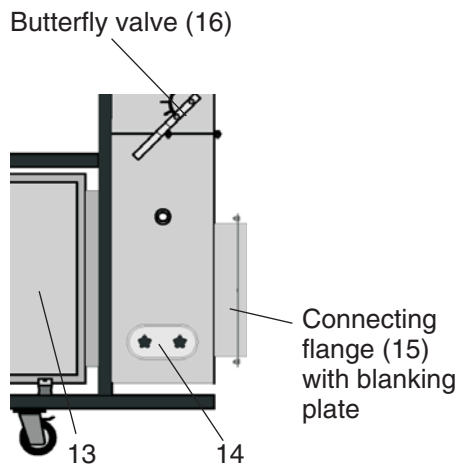


Fig. 2.15 Connection to external ventilation system



Fig. 2.16 Inspection cover

Air distribution refers to the transportation of air to different rooms.

Ducts and pipes are used to convey the air into the rooms and to extract it from the rooms. Ducts and pipes are also a significant element in the cost of a system. Since dirt easily accumulates in the ducts and pipes, inspection covers (14) or entire inspection flaps (13) are fitted at appropriate points.

Because of the diverse demands on them, special consideration must be given to the materials and surfaces:

- the surfaces should be as smooth as possible, to reduce the flow resistance. This reduces losses and flow noises.
- dust repellent and easy to clean
- not hygroscopic
- not combustible
- corrosion resistant
- lightweight and airtight.

Behind the humidifier unit, the ET 620 has a connecting flange (15), which is sealed with a blanking plate. Removal of the blanking plate allows the trainer to be connected to an external ventilation system. When doing this, the extension duct must also be closed off with a butterfly valve (16).

2.2.10 Fire damper

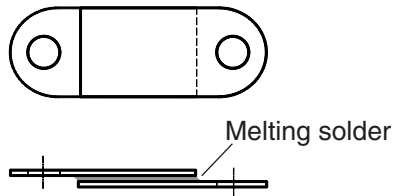


Fig. 2.17 Thermal release element



Fig. 2.18 Fire damper

The task of the fire damper is to prevent smoke, sparks or the gaseous products of combustion being drawn into the ventilation ducts in the building in the event of fire. It contributes to partitioning the building into fire compartments, by automatically isolating the ventilation system from the seat of the fire.

Such a fire damper is a fire resistant seal, which blocks the entire cross-section of the ventilation duct. The fire damper is spring-loaded and locked in the open position by a thermal release element. The release element consists of two metal strips, joined by low-melting point solder. If the ambient temperature at the release element reaches the melting point of the solder, it softens and the two metal strips spring apart. The fire damper lock is released and the spring loading closes it. The ventilation duct is then sealed off. At the same time the “**Fire damp**” warning lamp lights up on the switch cabinet.

Triggering destroys the release element, which must then be replaced.

2.2.11 Ventilation grille with flow control

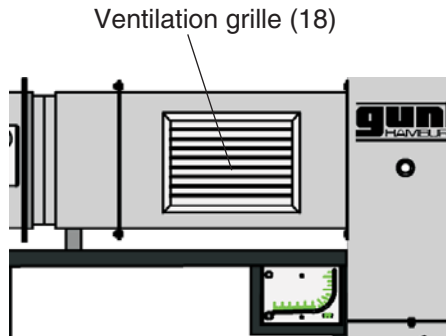


Fig. 2.19 Air outlet

The task of ventilation grilles is to distribute the air. In so doing they should avoid creating an excessive draught, since this creates discomfort. In addition, the noise generated must be kept as low as possible, and short-circuit flows between feed air and outgoing air excluded.

Air outlets have a critical influence on the flow of air in a room and the exchange of energy between the feed air and the room air. This can be achieved by adjusting the outlets.

2.2.12 Ceiling air outlet

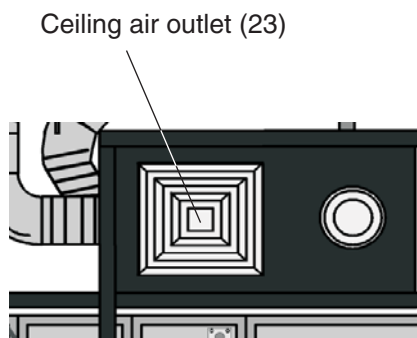


Fig. 2.20 Air outlet

Ceiling air outlets are characterized by directional jets, fans, conical guide plates or diffusers, which aim to distribute the air in a direction as near to horizontal as possible, i.e. parallel to the ceiling. Many ceiling air outlets also have an adjustable design, which allows both the flow rate and the air direction to be changed. Ceiling air outlets are usually connected to the air ducts by hoses.

2.2.13 Disk valve

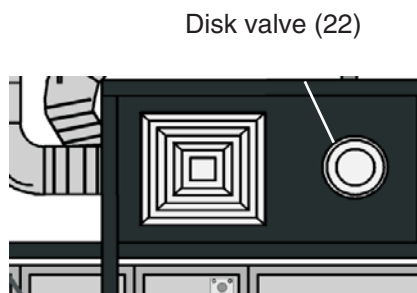


Fig. 2.21 Air outlet

The disk valve enables the size of the resulting ring gap to be changed by adjusting the disk, thus influencing the flow rate.

2.2.14 Fire alarm



Fig. 2.22 Smoke detector with reset button

The fire alarm is a standard commercial smoke detector. If smoke is detected (alarm), it sends a fault signal to the controller.

Once the smoke detector has been triggered, it has to be reset manually in smoke-free air using the button on the bottom. The fault signal then has to be reset using the button below the climate controller.

2.2.15 Inclined-tube manometer

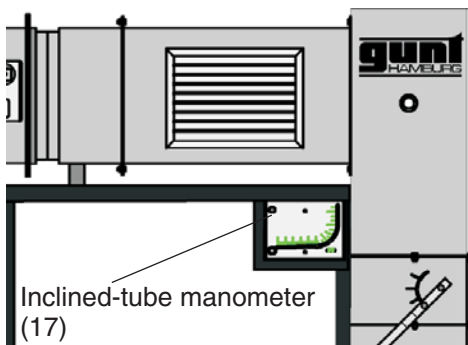


Fig. 2.23 Pressure gauge

The inclined tube manometer allows differential pressures to be measured. For these measurements, there are measuring points on the central axis of the ventilation duct, which allows the pressure difference across each component to be determined.



Fig. 2.24 Inclined-tube manometer (17)

2.2.16 Climate controller

The task of the climate controller is to operate the **ET 620 Air Conditioning and Ventilation System** in such a way that the climate produced by the system remains within certain limits. To do this, the controller records variables such as temperature and humidity at various points in the air conditioning and ventilation system. In order to remain within the limits, variables such as setpoints, limit values, gain factors and adjustment times are entered in the controller. The control variables of the control loop are detected by the sensor T2/H2. Controlling an air conditioning and ventilation system normally only involves controlling the following parameters:

- Temperature
- Humidity

The illustration below provides an overview of the three options for operating the ET 620 system:

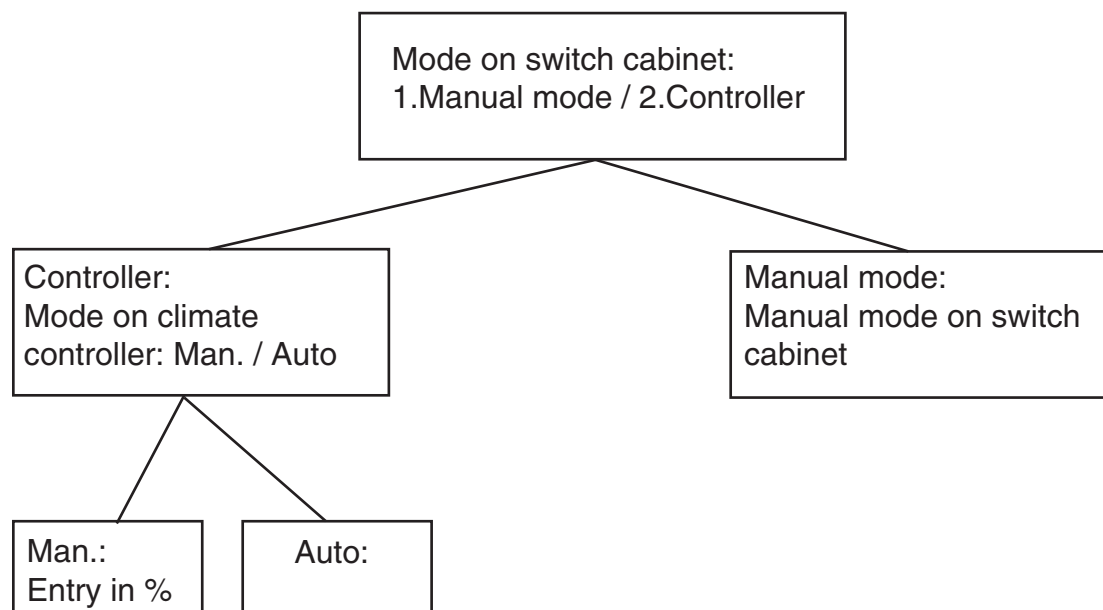


Fig. 2.25 Overview of operating options on ET 620 system

2.3 Climatic controller TROVIS 5571

The climate controller (type: TROVIS 5571) is a programmable logic controller (PLC) made by Samson. Detailed information about the design and operation of the system can be found in the manufacturer's operating instructions.

The PLC allows free programming. As supplied, the memory does not contain any executable application. The application is created on a PC using ISaGRAF for a specific purpose (programming in line with DIN IEC 61131-1) and transferred to the unit. The use of a PLC enables complex control and regulation tasks to be performed easily and transparently.

There are extensive libraries for the PLC containing special functions / function blocks in the area of heating, ventilation and air conditioning technology. The function blocks are linked using a standard tool complying with IEC 61131 before being loaded to the controller. Actual values, setpoints and operating values are accessed through the fully graphical illuminated display.

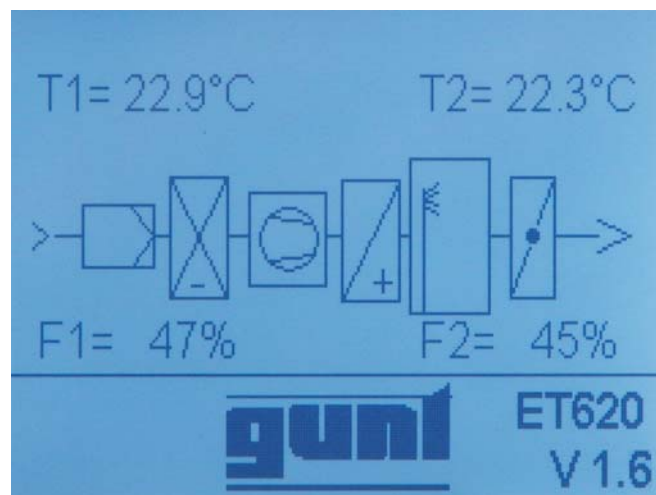


Fig. 2.26 Application process diagram

2.3.1 Operation with the climate controller

The climate controller display is used to operate and observe the system. The process information recorded by the climate controller can be accessed using the menu structure.

2.3.1.1 System control modes

Automatic mode represents the normal operating situation, where all controllers and regulators are running automatically based on the defined parameters. All safety functions are active.

2.3.1.2 Automatic mode

To operate the system in automatic mode using the climate controller, the corresponding field devices must be set to “Automatic” and the reference variables for room temperature and relative humidity entered.

In other words, the switches (45 & 56) on the switch cabinets must be set to automatic (controller). The Trovis controller for the required variables must also be set to automatic.

With individual components in manual mode, automatic control is only possible to a limited extent.

2.3.1.3 Manual mode

There are two types of manual mode:

- Manual mode using the TROVIS climate controller:
In this case, switches 45 & 56 must be set to automatic (controller).
The components are operated manually using the TROVIS climate controller with the

“Switch” level menu on the climate controller. Here, it is possible to specify values manually, release / block individual switching operations and view system statuses.

- Manual mode directly on switch cabinet

Manual operation by setting the switches on the control cabinet (29, 30, 45, 56) from automatic to manual mode is not registered by the climate controller.

Manual component operation should only be used by trained personnel as improper operation can cause damage. The system must always be monitored.

2.3.2 Commissioning the climate controller

2.3.2.1 Controller initialisation

After connecting to the power supply, the PLC briefly displays “Initialising system...”. If the display remains dark or if the contrast is too high or too low, the display illumination can be adjusted.

28.11.2005	10:00:05	V1.1x
Application:	...	
Version:	...	
Date:	...	
CRC:	...	
Size:	... kB	
Cycle time:	... ms	

If no application is saved in the PLC, the adjacent start screen specifying the date, time and current firmware version is displayed.

Fig. 2.27 Initialisation without application

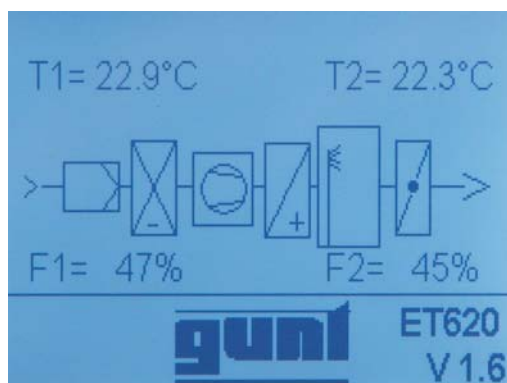
06.10.2009	14:24:53	V1.22
Application:	et_620	
Version:	10	
Date:	18.09.2009 09:50	
CRC:	33172490	
Size:	28.3 kB	
Cycle time:	238 ms	387 ms

If an application is saved in the PLC, an application-specific start screen is displayed.

Important! Please check

The current date and the current system time must appear in the top line.

Fig. 2.28 Initialisation with application

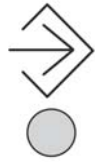


The process diagram then appears showing the temperatures and humidities at the measurement sensors.

Fig. 2.29 Application process diagram

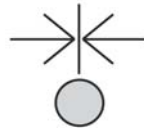
2.3.2.2 Control keys on the controller

Shift key



(to be pressed with a pen or pointed object)
Switches to setting menu (after entering the code number)

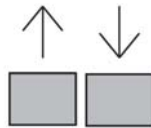
Reset key



(to be pressed with a pen or pointed object) Resets all application-specific settings to the default values (factory settings)

Select key(s)

(to be pressed with the finger)



Both keys simultaneously:

- Switches to information menu



Individual key:

- Navigates within the menus (including the application created in ISaGRAF)
- Adjusts data points

Enter key

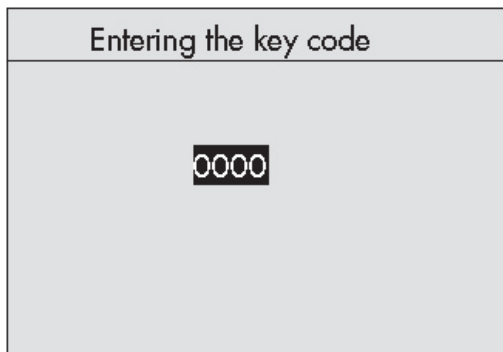


- Opens menus (including the application created in ISaGRAF)
- Adjusts data points in editing mode
- Confirms the set data points

2.3.2.3 Controller display

The climate controller (PLC) has a plain text display. For operator actions (querying information, changing settings), the display is illuminated.

Adjusting the contrast



- ⇒ Set the PLC to configuration mode.
Display: "0000" flashing
- * Confirm the display.
- ⏴ Adjust the contrast.
- * Confirm the setting.
Display: Initialising application (Fig. 2.28)

Fig. 2.30

2.3.3 Setting the system time on the controller

The current date and time must be set immediately after commissioning and after a power failure of more than 24 hours.

The **system time** is set in the setting menu under "Date/Time". The **Automatic Summer Time** function can also be activated and deactivated here.

System time: Time-dependent functions in the saved application are based on the system time set in the PLC.

Automatic summer time: The time is automatically adjusted to summer time on the last Sunday in March at 02:00; the time is automatically adjusted to winter time on the last Sunday in October at 03:00.

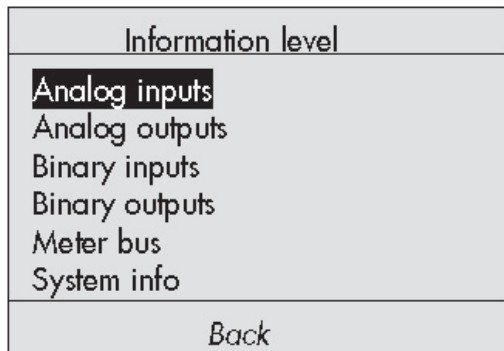


Fig. 2.31 Code key entry

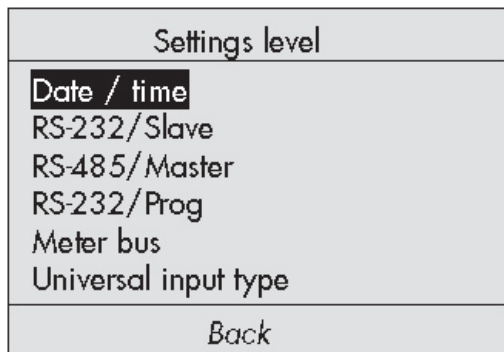


Fig. 2.32 Setting level

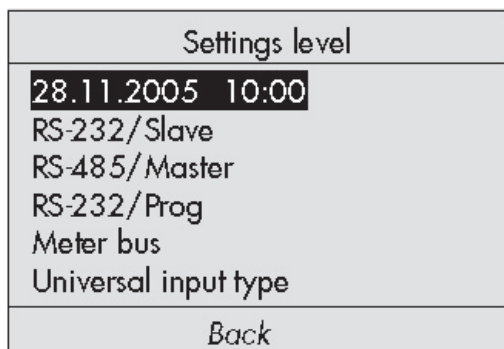


Fig. 2.33 Date/Time editing mode

Procedure:

⇒ Set the PLC to configuration mode.
Display: "0000" flashing
"Enter 1732"

⏴ Enter key code.

* Confirm key code.

Display: "Settings level".

The selection bar is set to "Date/Time".

* Open the "Date/Time" screen.

Display: System time
(DD.MM.YYYY HH:MM)

* Set the system time to editing mode.
DD flashes in the date display.

⏴ Set the day.

* Confirm the day.

Display: Month (MM) flashes.

⏴ Set the month.

* Confirm the month.

Display: Year (YYYY) flashes.

⏴ Set the year.

* Confirm the year.

Display: Hours (HH) flashes.

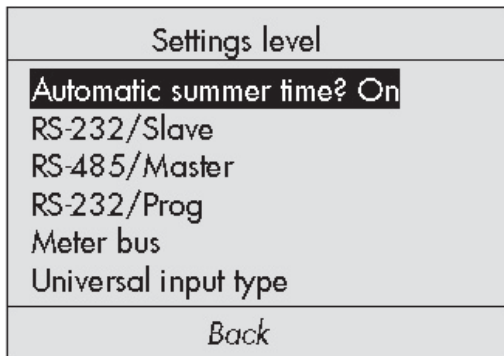


Fig. 2.34 Summer time editing mode

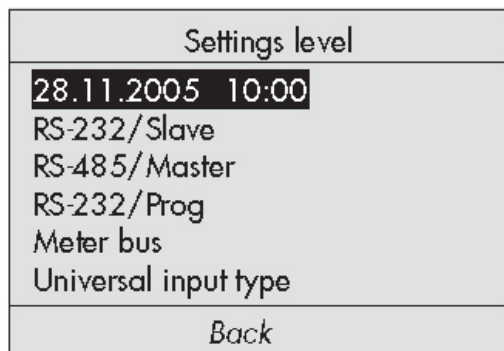


Fig. 2.35 Date/Time editing mode

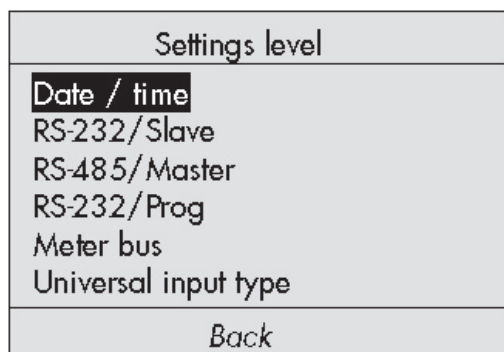


Fig. 2.36 Setting level

- ⏴ Set the hours.
- ✳ Confirm the hours.
Display: Minutes (MM) flashes.
- ⏴ Set the minutes.
- ✳ Confirm the minutes.
Display: "Automatic summer time?" flashing
If you wish, change the current status (On/Off) for the automatic summer time function.
- ⏴ Activating the function:
"Automatic summer time?" On"
- ⏴ Deactivating the function:
"Automatic summer time?" Off"
- ✳ Exit the "Date/Time" screen.

Display: "Settings level".

Exit the setting menu.

- ⏴ Select the "Back" data point.

Exit the setting menu

- ✳ Display: Initialising application

Notice: If you do not press any key for two minutes, the PLC returns from the setting menu to the process diagram. The background lighting goes out. Settings that have not been confirmed are not saved and need to be entered again.

2.3.4 Operating the application specific components

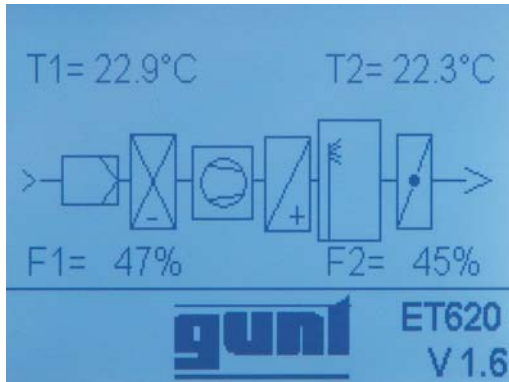


Fig. 2.37 Process diagram with measured inlet and outlet values for temperature and relative humidity of air conditioning and ventilation system

When the climate controller is turned on, the process diagram for the application appears.

This is a system diagram of the ET 620 air conditioning and ventilation system. The view shows the measured values for the air taken in by the air conditioning and ventilation system:

T1: Temperature at outlet from air conditioning and ventilation system

F1: Relative humidity at outlet from air conditioning and ventilation system

and the measured values for the conditioned air at the outlet from the air conditioning and ventilation system:

T2: Room Temperature (control system of a process)

F2: Relative humidity in the room (control system of a process)

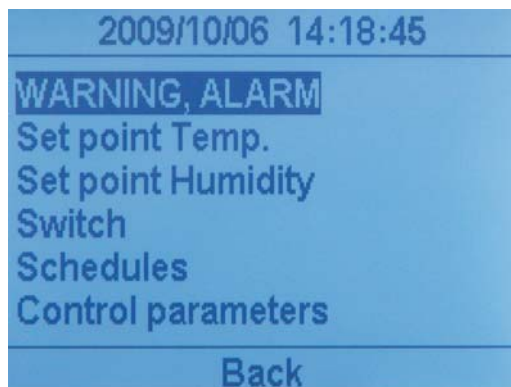




Fig. 2.38 First menu level

Pressing the Enter key (*) takes you to the first menu level for the application-specific data.

The  and  keys take you to the secondary options.

There are two kinds of secondary options:

- A further menu level
- A value that can be read and edited

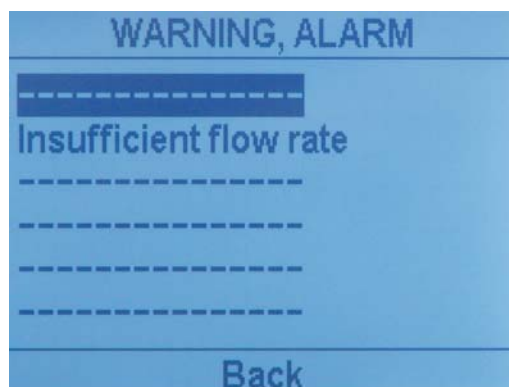


Fig. 2.39 Second menu level

Pressing the Enter key * takes you to the selected secondary option.

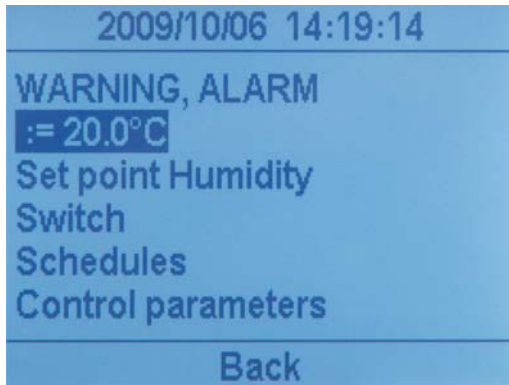


Fig. 2.40 View when changing the temperature setpoint

If an equals sign (=) appears before the figure, it is a value that can be read.

Changed values are indicated by a (:=) sign. Pressing the Enter key again allows you to change the value. Entering a new value is completed by pressing the Enter key.

Pressing the \uparrow , \downarrow and “Back” keys and the Enter key (\ast) take you back to the previous menu.

First menu level

The first menu level contains the following application-specific options:

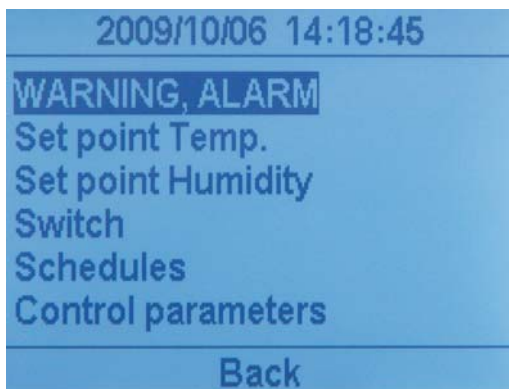


Fig. 2.41 First menu level

- WARNING, ALARM
Faults and alarms on the air conditioning and ventilation system are displayed here.
- Set Point Temp.
The temperature setpoint (reference variable) can be displayed and changed here.
- Set point Humidity
The relative humidity setpoint (reference variable) can be displayed and changed here.
- Switch
The component modes used to operate the air conditioning and ventilation system are specified here.

- Schedules
The timer programs (periods in which the climate controller is active) can be set here.

- Control parameters
The control parameters Kp and Tn can be set here.

- Limit values
The temperature limits (min. and max.) for the feed air, the maximum feed air humidity, the temperature limits for the room air and the minimum on and off time for the condenser set are set here.

- Settings
The fire protection equipment is configured here.

- Heater level=0%
Displays which heating level is currently activated by the climate controller.

- Humidifier=0%
Shows what power is being requested by the humidifier.

- Language
You can select one of the four languages (D, GB, E, F) here.

Feed air: The air fed into the room to be air conditioned (air conditioning and ventilation system outlet).

Room air: The air in the room to be controlled.

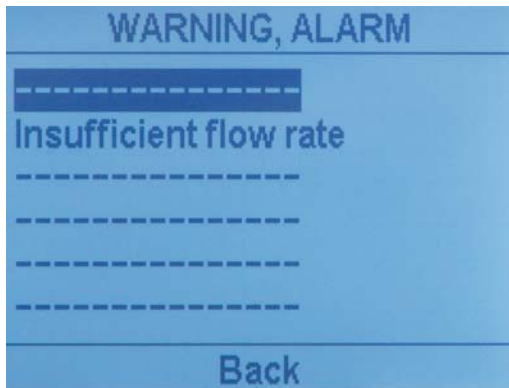


Fig. 2.42 Second menu level - Alarm

Other menu levels:**WARNING,ALARM**

Four possible alarms can be displayed:

- No alarm
There are no faults.
- Filter blocked
The air filter in the air conditioning and ventilation system is clogged.
- Insufficient flow rate
The air volumetric flow rate is too low.
- Safety temperature monitor (STM)
The safety temperature monitor (STM) has tripped. The STM resets itself automatically after tripping, i.e. once it has cooled down.
- Safety temperature limiter (STL)
The safety temperature limiter (STL) has tripped. Once tripped, the STL must be reset manually.

Set point Temperature

The reference variable (setpoint) for the temperature in °C is entered here. Once the option has been selected by using the \uparrow and \downarrow keys and pressing the Enter key (*), the old setpoint flashes and the new setpoint can be set using the \uparrow and \downarrow keys. Pressing the Enter key (*) confirms and applies the new setpoint.

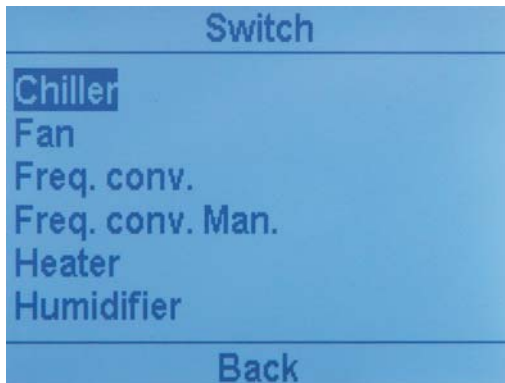


Fig. 2.43 Second menu level modes for individual components

Set point Humidity

The reference variable (setpoint) for the relative humidity in % is entered here. It is changed in the same way as described above for the temperature.

Switch

The modes for the individual components of the air conditioning and ventilation system are set here.

- Chiller
The mode for the cooler is set here. The cooler has the following modes: Automatic (Auto), On and Off.
- Fan
The mode for the fan is set here. The fan has the following modes: Automatic (Auto), On and Off.
- Freq. Conv.
The fan is actuated with a frequency converter. The available modes are Automatic (Auto), Manual (Man), On at maximum value and Off. The On, Off and Auto modes can only be used if the system is set to mode 2. Controller.
- Freq.conv.Man.
The speed of the fan can be manually set to a figure from 0 to 100% here, if manual mode has been selected in the previous point. A rotary frequency of 0 - 50 Hz is specified for the frequency converter. This corresponds to a fan speed of 0 - 1415 rpm. Note that there is a minimum speed with corresponding minimum volumetric flow rate, above with the air cooler, heater and humidifier operate. This minimum volumetric flow rate is indicated by an indicator lamp.

- Heater

The mode for the heater can be set here. The available modes are Automatic (Auto), heater off (Off), heating level 1 (ST1), heating level 2 (ST2), heating level 3 (ST3) and heating level 4 (ST4). In automatic mode, the controller activates and deactivates all four heating levels.

ST1: Heating level 1, 5 kW heating power

ST2: Heating level 2, 10 kW heating power

ST3: Heating level 3, 15 kW heating power

ST4: Heating level 4, 20 kW heating power

The fourth level can only be activated at a rotary frequency of 90% of the rated frequency of the fan (50 Hz).

- Humidifier

The mode for the humidifier (vapour humidifier) is set here. The humidifier has the following modes: Automatic (Auto), manual (Man), On and Off.

- Humidifier Man.

The humidifier power can be manually set to a figure of 0 - 100%.



Schedules

The timer programs (periods in which the climate controller is active) can be set here.

The setting can be made for a time on each day of the week or for a period on the individual days Monday to Sunday.

Fig. 2.44 Second menu level -
Timer programs

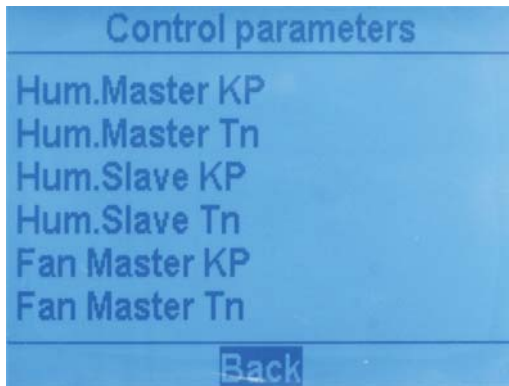


Fig. 2.45 Second menu level - Control parameters

Control parameters

The following parameters of the control loop can be set here: The optimum values depend on the controlled system and must be individually determined. Standard values can be found in the Appendix. (Kp : Proportional gain, Tn: Adjustment time)

Temp. Master Kp	(Master controller)
Temp. Master Tn	(Master controller)
Temp. Slave Kp	(Slave controller)
Temp. Slave Tn	(Slave controller)
Hum. Master Kp	(Master controller)
Hum.Master Tn	(Master controller)
Hum. Slave Kp	(Slave controller)
Hum. Slave Tn	(Slave controller)
Fan Master Kp	(Master controller)
Fan Master Tn	(Master controller)

Limit values

The temperature limits for the feed air (air conditioning and ventilation system outlet), the limit for the maximum humidity, the temperature limits for the outgoing air (air conditioning and ventilation system inlet), and the minimum on and off time for the condenser are set here.

Supply max	Max. feed air
Supply min	Min. feed air
Humidity max	Max. humidity
Air temp.max	Maximum room air temperature
Air temp.min	Min. room air temperature
ChillerMinOn	Minimum on time for condenser set (default: 20 s)
ChillerMinOff	Minimum off time for condenser set (default: 20 s)

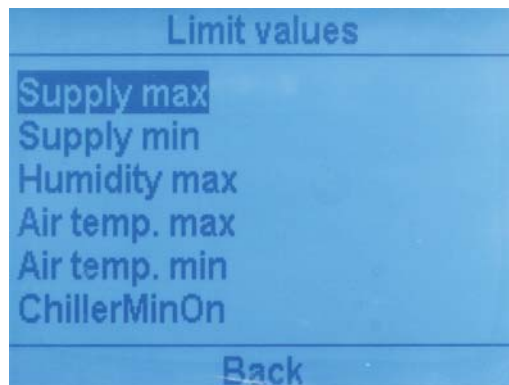


Fig. 2.46 Second menu level - Limit values

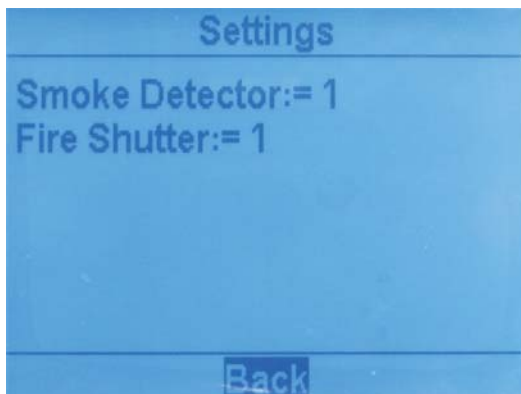


Fig. 2.47 Second menu level - Settings

Settings

The fire protection equipment is configured here. If a smoke detector or fire shutter is present in the system, the corresponding value under "Settings" must be set to 1. Otherwise, it should be set to 0.

The following lines in the controller record the current conditions in normal operation:

Heater level=0.Level

Humidifier=0 %

DeHumidifier=0

Language

One of the four languages can be selected here.

- German
- English
- French
- Spanish

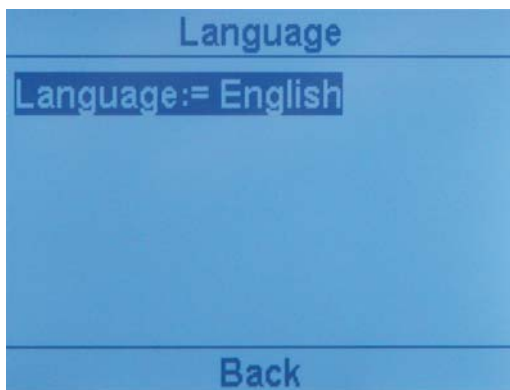
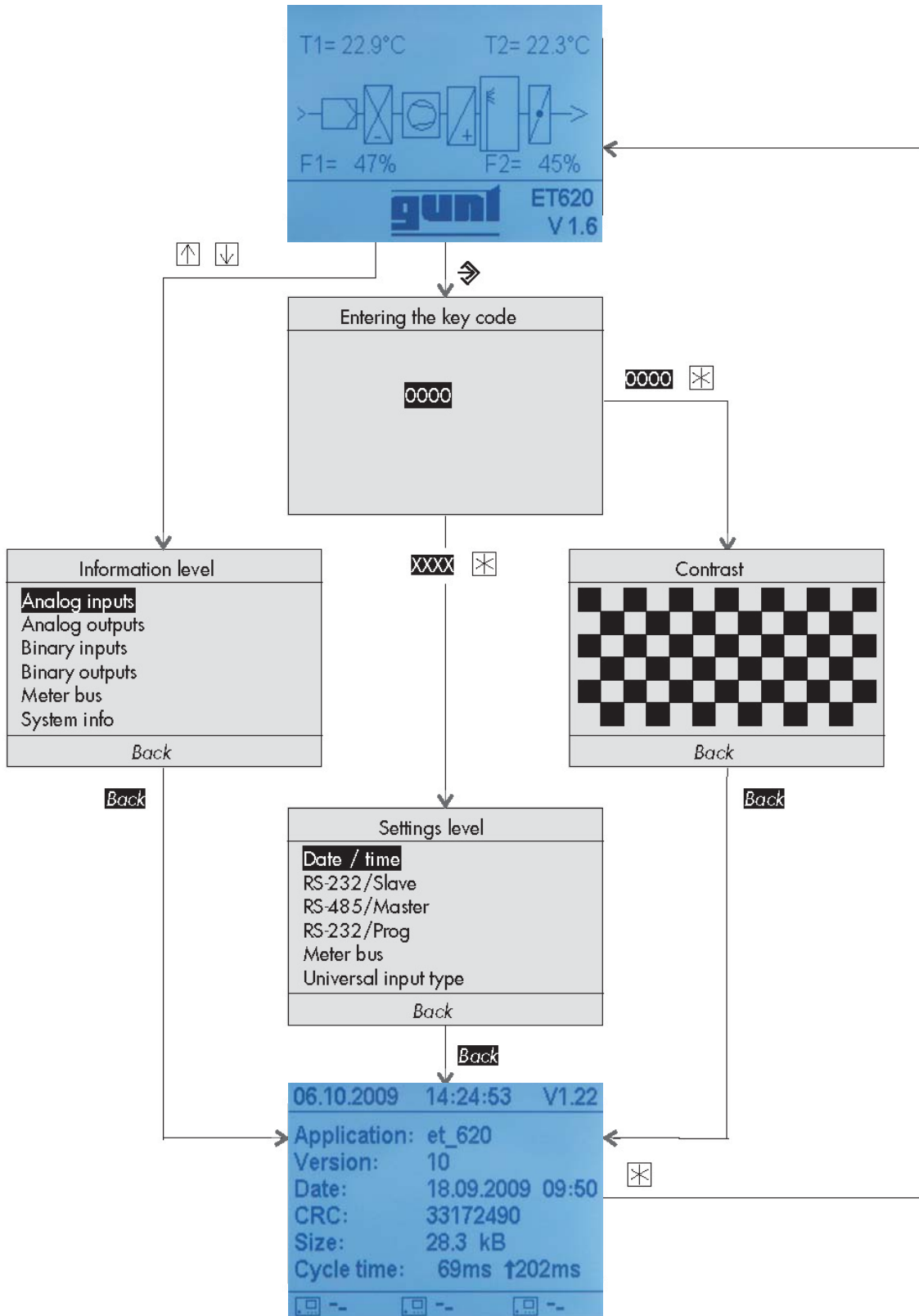


Fig. 2.48 Second menu level - Language

ET 620 AIR CONDITIONING AND VENTILATION SYSTEM

2.3.5 Controller menu structure overview



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Fig. 2.49 Climate controller menu structure

2.3.6 Querying data with the climate controller

The status of the inputs and outputs and information about connected counter bus devices can be queried in the information menu. No changes can be made. Analogue and digital outputs can only be changed in the settings menu (see Samson operating instructions for manual mode, chapter 3).

The information menu is divided into the following sub-menus:

- **Analogue inputs** · Measured values for the connected sensors
- **Analogue outputs** · Output values for analogue outputs *)
- **Binary inputs** · Status of the binary sensors (On/Off)
- **Binary outputs** · Status of the binary outputs (On/Off) *)
- **Meter bus** · Output values for the counters connected via M-Bus

*) Settings for the analogue and binary outputs can be changed after entering the code number in the setting menu.

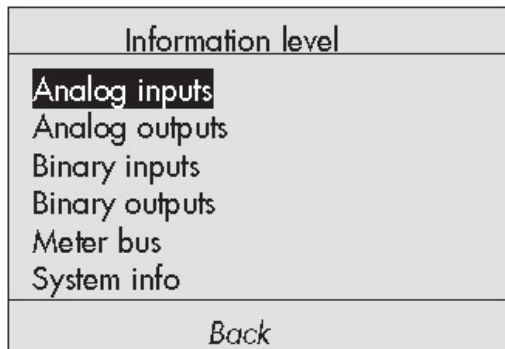


Fig. 2.50 Information menu

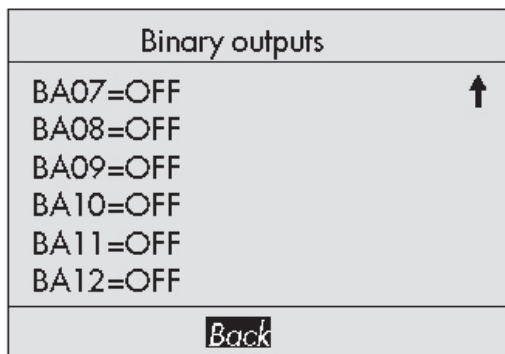


Fig. 2.51 Binary outputs

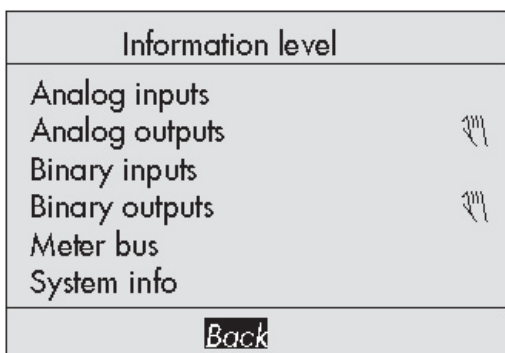


Fig. 2.52 Information menu

Procedure:

Switch to the information menu.

Press  and  simultaneously.

Display: "Information level"

The selection bar is set to the "Analogue inputs" menu.

Select the required sub-menu, e.g. "Binary outputs".

Open the menu.

Select the relevant data point.

Return to the "Information level" screen.

Set the cursor to "Back" and press the Enter key.

The menu is closed.

Display: "Information level"

Exiting the information menu

Set the cursor to "Back" and press the Enter key.

The information menu is exited.

Display: Start screen (application specific)

Notice:

If you do not press any key for two minutes, the PLC returns to the process diagram.

2.3.7 System components in the controller

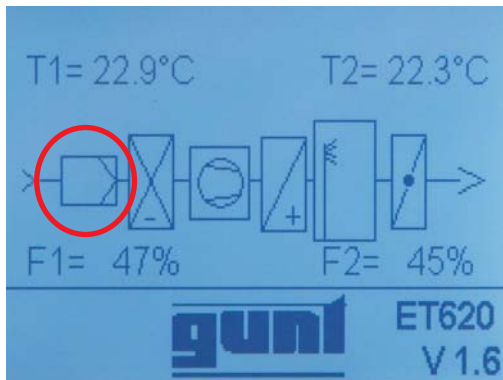


Fig. 2.53 Air filter in process schematic

Air filter

The air filter (Fig. 2.7) is monitored by a pressure monitor (pressure sensor) with maximum contact. If the set limit is reached, a fault signal is generated and the system is turned off.

The air filter monitor is displayed as a fault signal on the switch cabinet.

PLC functionality:

Signal status (read) display on PLC for:

- Pressure monitor

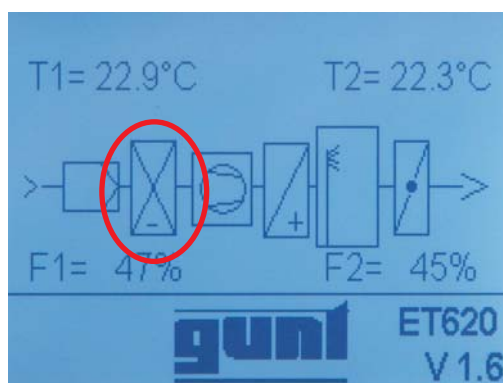


Fig. 2.54 Air cooler in process schematic

Air cooler

The air cooler (Fig. 2.8) is a direct evaporator. It is controlled using a single stage connection. A minimum on and off time are programmed to protect the direct evaporator. This is intended to prevent excessively frequent switching.

Regulation involves a cooling sequence for temperature regulation and a dehumidification sequence for humidity regulation.

PLC functionality:

Changing values (write) on the PLC possible for:

- Switching command actuation

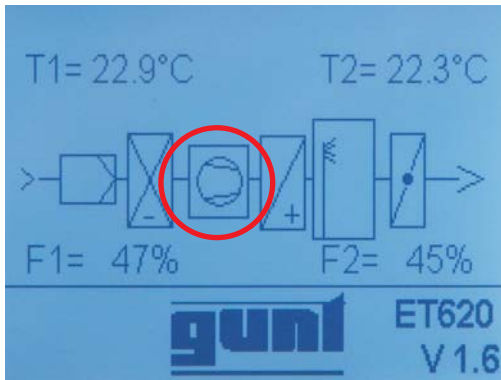


Fig. 2.55 Fan in process schematic

Fan

The fan fitted in the air conditioning and ventilation system (Fig. 2.13) is a belt driven fan regulated with a frequency converter. The fan is controlled by the PLC or using manual operation. In automatic mode the control signal is determined by the control different in the temperature control loop. The greater the control difference, the higher the speed of the fan. The speed setpoint for the fan in manual mode must be specified using the rotary potentiometer (Fig. 2.2, 32). The safety components required to control the fan are integrated into the controller hardware, which means that they are also effective in manual mode. Software processing is not available.

PLC functionality:

Changing values (write) on the PLC possible for:

- Switching command actuation (fan release)
- FU control signal actuation (automatic / maximum / minimum / manual value)

Air heater

The air heater (Fig. 2.9 & 2.10) is a 4-level electric air heater. The air heater draws its power supply from the switch cabinet. The air temperature is monitored by a safety temperature monitor (STM) and a safety temperature limiter (STL) after the electric air heater in the direction of flow. If the setpoint is exceeded, the electric air heater is shut down by the hardware.

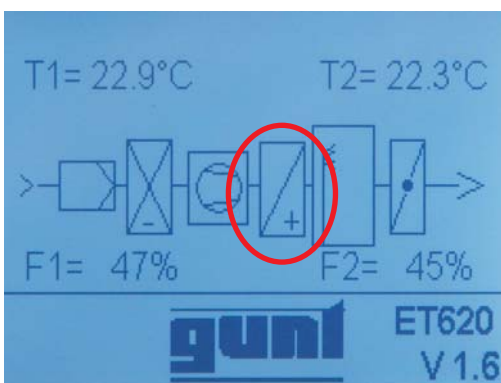


Fig. 2.56 Air heater in process schematic

It is regulated with a heating sequence for temperature control.

PLC functionality:

Signal status (read) display on control panel for:

- STM
- STL
- Released heater levels

Changing values (write) on the PLC possible for:

- Switching command actuation (4-level electric heater)

Air humidifier

The air humidifier (Fig. 2.11) is a continuous vapour humidifier with 0 - 0.10 V actuation. The power supply for the 400 V / 50 Hz / 3 version of the vapour humidifier comes from the switch cabinet. The humidity is measured in the direction of flow after the humidifier using a humidity sensor. If the set maximum value is exceeded, the vapour humidifier is shut down by the controller software.

It is regulated with a humidification sequence for humidity control.

PLC functionality:

Changing values (write) on the PLC possible for:

- Control signal actuation (automatic / maximum / minimum / manual value)
- Entry of maximum feed air humidity

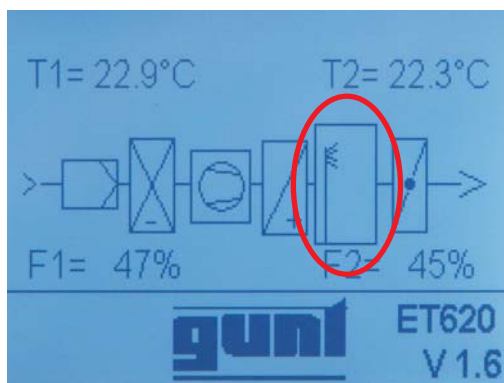


Fig. 2.57 Air humidifier in process schematic

2.3.8 Control functions

Air filter

The air filter (Fig. 2.7) is monitored for a maximum value by a pressure sensor. Tripping results in the fan being shut down and thus deactivation of the controller. The shut down value can be set on the pressure sensor.

Air cooler

The air cooler (Fig. 2.8) is switched on or off at the request of the temperature / humidity regulation. A minimum on and off time is programmed to protect the system.

The air cooler can only be switched on by the TROVIS 5571 controller if the air volumetric flow rate is greater than the set minimum (i.e. the air filter is not severely contaminated) and the safety temperature monitor (STM) and the safety temperature limiter (STL) have not tripped.

Fan

The fan (Fig. 2.13) is released on request (timer program / PLC intervention / manual operation). If the filter is contaminated, the fan is switched off. If there is a fault with STM or STL, the fan remains active to cool the heater.

To ensure that a minimum air volumetric flow rate is maintained, the frequency converter for the fan is actuated by a corresponding signal from the TROVIS 5571 controller.

Air heater

The air heater (Fig. 2.9 & 2.10) is switched on or off according to the temperature regulation requirements. A 0 - 10 V signal is binary coded and output to the heater as a 4-stage request. A minimum on time for each level is programmed to protect the system and stabilise the control. If the STM or STL trips, the air heater is shut down immediately.

The individual air heater levels can only be actuated by the TROVIS 5571 controller, and thus heating is only possible, if the minimum air volumetric flow rate is reached, the filter is not contaminated and the STM and STL have not tripped. The 4th heating level can only be activated if the rotary frequency of the fan is greater than 90% of its rated frequency (at 50 Hz).

Air humidifier

To prevent excessive condensation of the air in the air conditioning and ventilation system, the feed air is monitored for a maximum humidity. If the feed air exceeds an adjustable humidity limit, the vapour humidifier is deactivated.

The air humidifier (ET 620.01 vapour humidifier) can only be switched on by the TROVIS 5571 controller if the minimum air volumetric flow rate is sufficient (i.e. the fan is turning at the required minimum rotary frequency), the air filter is not contaminated and the safety temperature monitor (STM) and safety temperature limiter (STL) have not tripped.

2.3.9 Control functions

Note that when turned on for the first time, the controller always starts with the cooling function and runs an internal counter from 0 to 100. For this counter, the cooling range runs from 0 to 47 and the heating range from 53 to 100.

This process is not so obvious in real systems, as the controllers are usually only turned on once and then remain in this state.

2.3.9.1 Room / feed air cascade control

Temperature regulation on the air conditioning and ventilation system takes the form of room / feed air cascade control. The room temperature setpoint that can be adjusted using the display on the PLC acts as the reference variable for the room temperature control loop (master controller). This provides a setpoint for the feed air temperature control loop (slave controller). This setpoint is monitored for a maximum and minimum (both values can be adjusted in the PLC display). The calculated setpoint for the slave controller is compared with the current feed air temperature. The possible control difference is output as a cooling sequence to the cooler (1 level) or as a heating sequence to the heater (4 level).

2.3.9.2 Humidity control

Humidity regulation on the air conditioning and ventilation system takes the form of room / feed air cascade control. The room humidity setpoint that can be adjusted using the display on the PLC acts as the reference variable for the room humidity control loop (master controller). This provides a setpoint for the feed air humidity control loop (slave

controller). This setpoint is scaled to g/kg (absolute humidity). The absolute humidity of the feed air is determined from the current feed air temperature and the feed air humidity. The calculated setpoint for the slave controller is compared with the current feed air humidity. The possible control difference for the slave controller is output as a humidification sequence to the humidifier or as a dehumidification sequence to the cooler.

2.3.9.3 Fan control

The speed control for the fan uses the control difference from the room / feed air temperature cascade master controller as its controlled variable. The greater the control difference, the higher the speed of the fan. If the air conditioning and ventilation system is in an almost fully regulated condition, the speed of the fan is reduced to a minimum.

ET 620

AIR CONDITIONING AND VENTILATION SYSTEM

2.4 Commissioning the air conditioning and ventilation system

2.4.1 Air conditioning and ventilation system

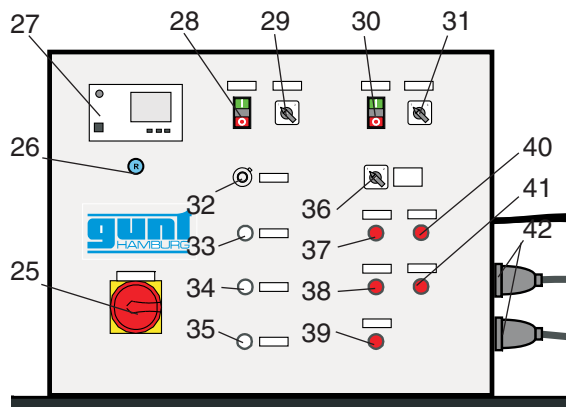


Fig. 2.58 ET 620 switch cabinet

25	Main switch
26	Reset button for the fire alarm in the climate controller
27	Climate controller
28	Fan push button
29	Fan mode changeover switch
30	Heater push button
31	Heater mode changeover switch
32	Fan speed adjusting knob
33	Indicator lamp, minimum air flow reached
34	Indicator lamp, humidifier in operation
35	Indicator lamp, condenser set in operation
36	Heating level selection switch
37	Warning lamp, filter clogged
38	Warning lamp, STM
39	Warning lamp, STL
40	Warning lamp, fire damper
41	Fire alarm warning lamp
42	Electrical connections for ET 620.01 and ET 620.02

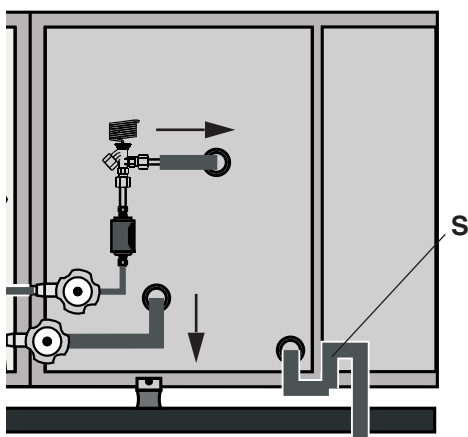


Fig. 2.59 Condensate drain with siphon

- To prevent unfiltered air being drawn in through the condensate drain on the air cooler, the drain must incorporate a siphon. This siphon (S) takes the form of a U-tube. It must be filled with water to act as a barrier to the air.
- Connect the trainer to the mains.
- Initially set the mode for fan (29) and heater (30) to "Manual mode".

- Switch on the trainer at the main switch (25).
- Select the speed on the “*Fan speed*” (32) adjusting knob.
- Open the butterfly valve (16) and fire damper (21).
- Switch on the fan at the “*Fan*” (28) push button.
- Select the heating power using the heating level selector switch - “*Selection Heating Stage*” (36).
- Switch on the heater at the “*Heater*” (30) push button.

Conditions for operation of the heater



The trainer has a number of safety conditions. These must be satisfied for both modes (controller/manual mode) before the heater will operate.

In automatic mode (controller) these conditions also apply to the vapour humidifier module and the condenser set.

There are four different devices.

- **Minimum airflow reached**

A minimum quantity of air must be flowing through the duct. The “**Minimum airflow reached**” indicator lamp will light up when this is the case. The measurement is performed by a sensor which detects the differential pressure across the fan.

- **STL** : Safety temperature limiter

This is located on the air heater and measures the temperature of the heated air. The limit temperature is **~100°C**. If this is exceeded, the STL trips and cuts off the electrical supply to the heater. At the same time the “**STL**” warning lamp lights up on the switch cabinet.



Notice! Each time the STL trips, the reset button must be pressed to reactivate it! If necessary, remove the cap first.

- **STM** : Safety temperature monitor

This is located between the heating elements of the air heater and also measures the temperature of the heated air. The limit temperature is **~75°C**. If this is exceeded, the STM trips and cuts off the electrical supply to the heater, and at the same time the “**STM**” warning lamp lights up on the switch cabinet. If the temperature falls again, the STL automati-

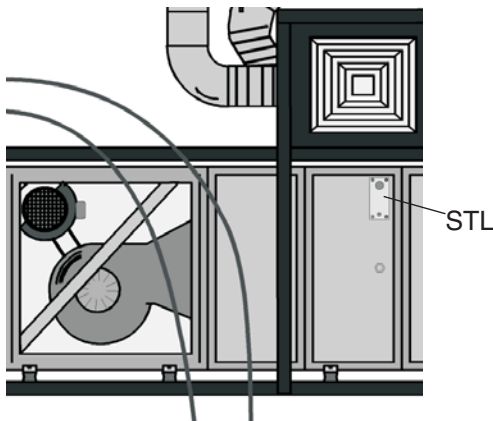


Fig. 2.60



Fig. 2.61 STL with reset button

cally restores the supply to the electric heater.



Notice! The STM and STL have different response times. Under certain operating conditions it is therefore possible that the STL (~100°C) trips before the STM (~75°C)!

- **Air filter clogged**

If the air filter is clogged, the electrical supply to the heater is cut off and at the same time the “**Air filter clogged**” warning lamp lights up on the switch cabinet. The measurement is performed by a pressure sensor, which detects the differential pressure across the air filter.

This function can be checked by fully closing the louvered flaps.

2.4.2 ET 620.01 vapour humidifier connection

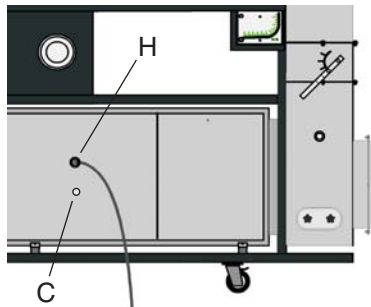


Fig. 2.62 Vapour and condensate connection

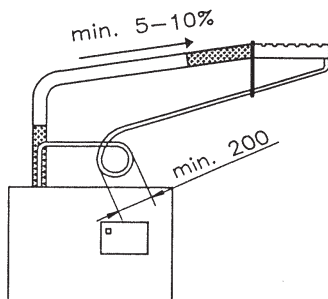
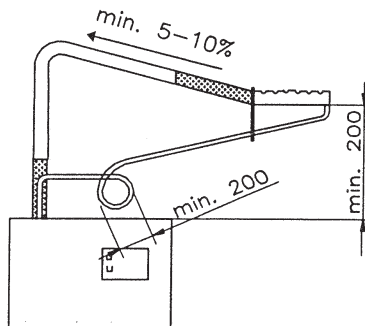


Fig. 2.63 Routing of vapour line

- Electrical connection
 - Connect the 230 V / 60 Hz / 3 version of the ET 620.01 to the mains power supply.
 - Connect the 400 V / 50 Hz / 3 version of the ET 620.01 vapour humidifier to the power supply at the ET 620 trainer switch cabinet. The module is supplied with power from there.
 - Connect the ET 620.01 signal cable to the socket on the right of the ET 620 trainer switch cabinet.
 - Connect the water inlet to the water supply.
 - Connect the water outlet and run it to a water drain.
 - Fit the vapour hose and the vapour distributor lance, and insert the lance in the relevant opening (H) on the air humidifier.
- Position the vapour hose with a constant gradient / fall of 5-10%, ensuring there are no sags or kinks.
- Connect the air humidifier condensate drain (C) to a water drain.



Notice! There is an automatic bleed valve on the vapour humidifier module for venting and bleeding. To ensure that it functions, the small black cap must be loosened until air can escape through the hole in the cap.



Notice! Real air conditioning and ventilation systems always have their ventilation ducts within the ceiling of the room. This makes it possible to drain the condensate from the air humidifier back into the vapour humidifier module. This cannot be done on the ET 620, because the air humidifier condensate drain is lower than the ET 620.01 return fitting. Therefore this fitting is blanked off. This return fit-

- ting could still be brought into use if the system components were arranged differently.
- Plug both the combined temperature and humidity sensors (T1,F1 / T2,F2) into openings in the air conditioning duct and connect them to the ET 620 trainer switch cabinet.
 - Put T1/ F1 in the outlet air (additional air) of the air conditioning and connect T1/F1 to the right side of the cabinet.
 - Put T2/ F2 in the control system of a process (room)
 - Select the mode on the selector switch
 - 1 : Manual mode
 - 2 : Controller
 - **Turn on the main switch.**
 - Turn on the ET 620.01 vapour humidifier **at the on/off switch.**
 - In manual mode, the adjusting knob can be used to set the vapour quantity to between 0 and 100%. The percentage figure relates not to the resulting air humidity but to the vapour generator output range.



Notice! After it is switched on, the vapour humidifier always first performs a purge and cleaning routine lasting ~2 minutes, before it is ready for use.

Further information can be found in the manufacturer's manual.



CAUTION! In “*Manual mode*” the conditions for operating the heater do not apply to the vapour humidifier! In this mode the vapour humidifier must therefore always be separately monitored.

2.4.3 Connecting the ET 620.02 condenser set

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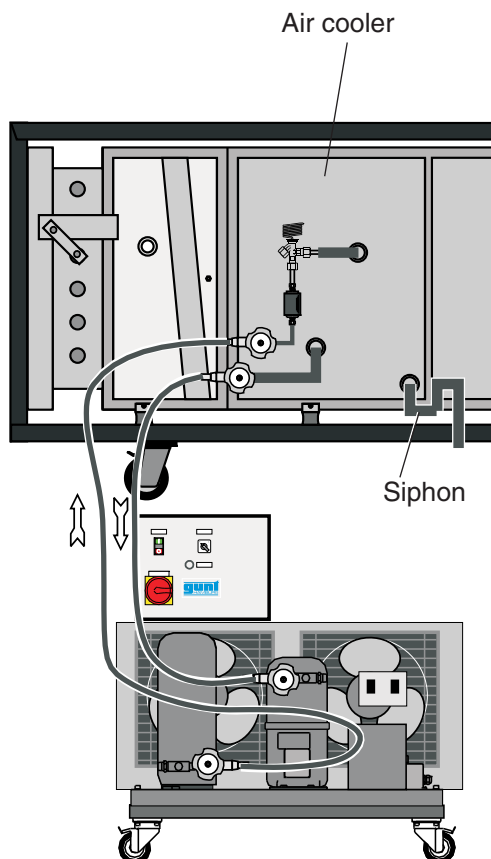


Fig. 2.64 Connection of hoses for refrigerant

- Electrical connection
 - Version 230 V / 60 Hz / 3:
Connect the ET 620.02 condenser set to the mains power supply.
 - Version 400 V / 50 Hz / 3:
Connect the ET 620.02 condenser set to the power supply at the ET 620 trainer switch cabinet. The module is supplied with power from there.
- Connect the ET 620.02 signal cable to the socket on the right of the ET 620 trainer switch cabinet.
- Use refrigerant hoses to connect the ET 620.02 condenser set to the refrigerant connections on the air cooler. Make sure the connections are correct for the direction of flow of the refrigerant!
- **Turn on the main switch.**
Select the mode on the selector switch
 - 1 : Manual mode
 - 2 : Controller
- In manual mode, the ET 620.02 condenser set must be turned on using the on/off switch.

Further information can be found in the manufacturer's manual.

CAUTION! In “*Manual mode*” the conditions for operating the heater do not apply to the condenser set! In this mode the condenser set must therefore always be separately monitored.



Notice! For reliable operation it is essential that the condenser set is installed physically separately from the main equipment. If this is not done, the waste heat from the condenser set will seriously affect the cooling and give incorrect results.

2.4.4 Useful control variants for ET 620

Since the air conditioning and ventilation system has no spatially delimited controlled system, yet loop control is always limited to one system, the loop control can only be demonstrated if the on-site conditions create a controlled system and the parameters have been adjusted accordingly.

Variant 1:

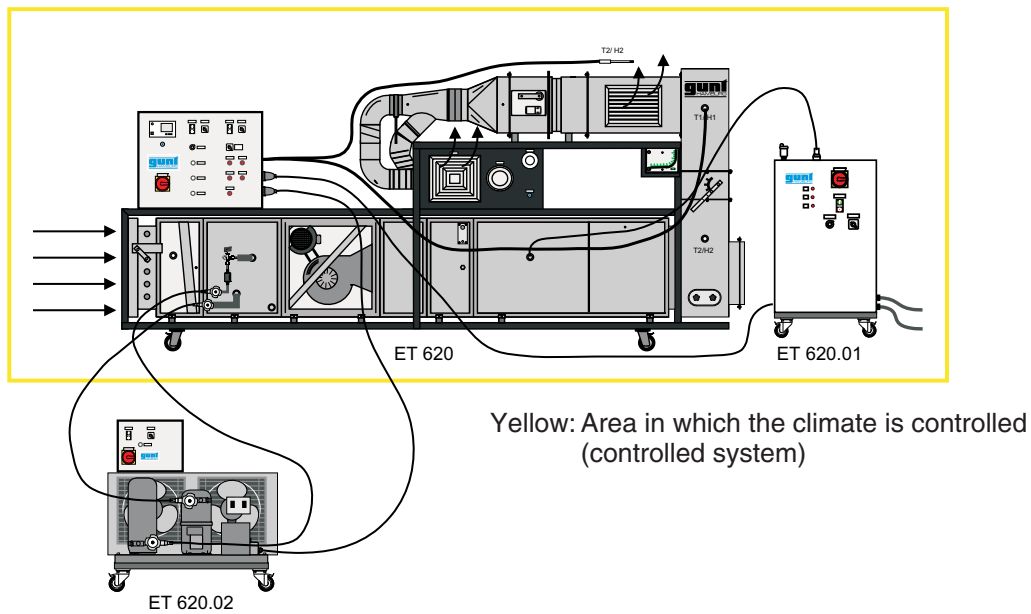
The ET 620 system and the accessory unit ET 620.01 are located in one room, which forms the controlled system. The refrigeration unit ET 620.02 is located outside of the controlled system, as it is capable of generating a considerable amount of heat. The air conditioning system extracts the air from the room in which it is located and returns to it the conditioned feed air.

ET 620

AIR CONDITIONING AND VENTILATION SYSTEM

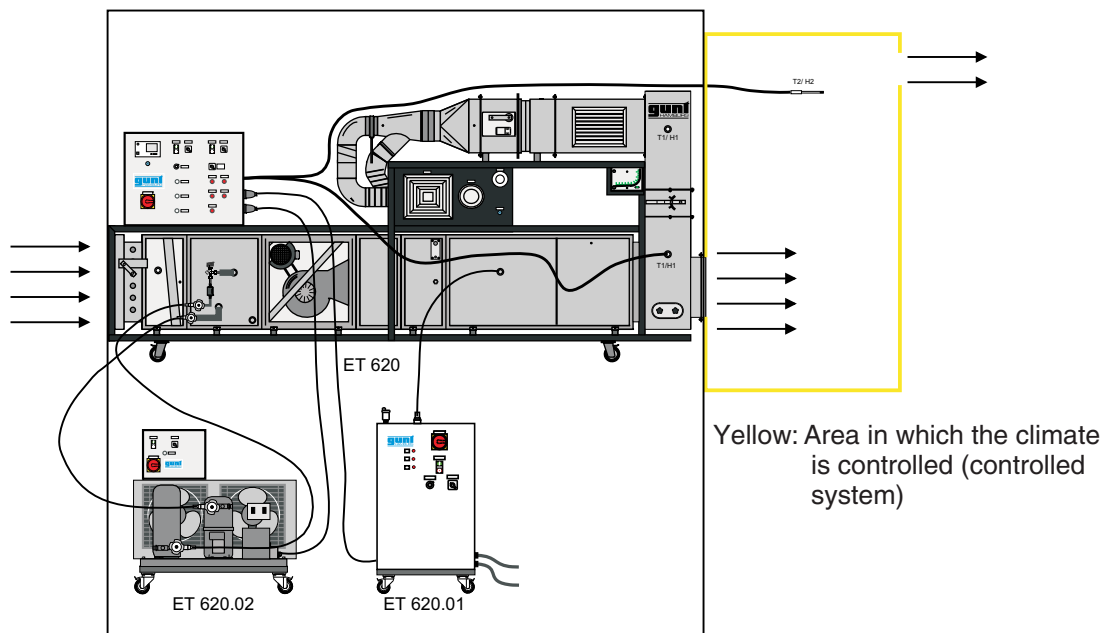
Variant 2:

The ET 620 system and all the accessories are located outside of the controlled system. The system draws in fresh air and routes the conditioned feed air into a separate room, which is the controlled system. Outgoing air can be allowed to escape by opening up the room.



Yellow: Area in which the climate is controlled (controlled system)

Fig. 2.65 Variant 1



Yellow: Area in which the climate is controlled (controlled system)

Fig. 2.66 Variant 2

2.5 Modes

The trainer is fitted with a controller which is specially designed for operating air conditioning and ventilation systems. As soon as the air conditioning and ventilation system is switched on, the controller comes into operation. It controls the following components:

- Fan
Proportionally 0...100%
- Heater
Switching, four power settings
Off, 5kW, 10kW, 15kW and 20kW
- ET620.01 vapour humidifier
Proportionally 0...100%
- ET 620.02 condenser set
Switching, On - Off

Each of these components has two modes:

- Automatic (controller):

The controller undertakes all control functions, and the safety conditions are applicable.

For this purpose the combined sensors for temperature and humidity (T1,F1 / T2,F2) must be correctly connected.

The “*Humidifier running*” and “*Chiller running*” indicator lamps only light up in this mode when the controller activates them.



Notice! The controller is programmed for day and night operating routines, which are implemented depending on the time of day. In order to avoid inappropriate operation, the clock setting should be checked every time the unit is started up.

(Set the time using code 1732)

Refer to chapter 2.3.3 of the separate controller manual for setting the time.

- Manual mode

The respective components must be set manually. In this mode the controller provides no safety functions for the respective components.

2.6 Demonstration of the "manual cooling" function

In the event that neither the controlled system nor the local ambient conditions (temperature, humidity) are known, it is impossible to define a general, optimal set of parameters for control

To be able to demonstrate the functionality independent of those criteria, the system is set to manual cooling and dehumidifying mode.

The following settings are necessary for this:

Switches on switch cabinet ET 620

Main switch:	Turning on
Fan on/off switch:	On
Manual/climate controller toggle switch:	Manual
Fan speed:	78%
Air heater:	Off
Manual/climate controller toggle switch:	Manual
Heating level selector switch:	0

Switches on switch cabinet ET620.01 (humidifier)

Main switch:	Turning off
--------------	-------------

Switches on switch cabinet ET 620.02

Main switch: Turning on

Manual/climate controller toggle switch: Manual

On/Off switch for manual mode only: On

Controller settings (in this case irrelevant, as operated in manual mode on switch cabinet)

2.7 Demonstration of the function "control of temperature and humidity with the controller"

In order to ensure optimal operation of the system with the controller, the parameters K_p and T_n must be adjusted to the controlled system (the spatial conditions) in the controller. Sensible, realistic values should be chosen as the setpoints.

Example of the control of temperature and humidity with the controller:

Switches on switch cabinet ET 620

Main switch: Turning on

Fan:

Manual/climate controller toggle switch:
Climate controller

Air heater:

Manual/climate controller toggle switch:
Climate controller

Switches on switch cabinet ET 620.01 (humidifier)

Main switch: Turning on

Manual/climate controller toggle switch:
Climate controller

Switches on switch cabinet ET 620.02

Main switch: Turning on

Manual/climate controller toggle switch:
Climate controller

Controller settings

set point temperature: 20°C

set point humidity: 50%

Switch (operating mode)

Chiller:	Auto
Fan:	Auto
FU:	Auto
Heater:	Auto
Humidifier:	Auto

Control parameters

Temp. Master Kp:	0.5
Temp. Master Tn:	100
Temp. Slave Kp:	0.5
Temp. Slave Tn:	100
Hum. Master Kp:	0.5
Hum. Master Tn:	100
Hum. Slave Kp:	0.5
Hum. Slave Tn:	100
Fan Master Kp:	1.2
Fan Master Tn:	240

Limit values

Supply max.:	32°C
Supply min.:	16°C
Humidity max.:	85%
Air Temp. max.:	26°C
Air Temp. min.:	18°C
Chiller min On:	20s
Chiller min Off:	20s

2.8 Switching off the air conditioning and ventilation system

First switch off the additional modules.

ET 620.01 vapour humidifier

- (Manual mode only) Switch off the vapour humidifier (Fig. 2.3, 44)
- Switch off the main switch (Fig. 2.3, 43).
- Shut off the water supply.

ET 620.02 condenser set

- (Manual mode only) Switch off the condenser set (Fig. 2.4, 54)
- Switch off the main switch (Fig. 2.4, 53).
- If the system will be shut down for a long period, we strongly recommend returning the refrigerant to the collecting tank (pump down). This prevents the refrigerant from flowing to the compressor and accumulating in the oil, which can lead to liquid locks when commissioning.

ET 620 air conditioning and ventilation system

When operated at a high heating level:

- First set the air conditioning and ventilation system to manual mode (Fig. 2.2, 29 & 31).
- Switch off the heater (Fig. 2.2, 30).
- Leave the fan running for around 5 minutes.
- Switch off the fan (Fig. 2.2, 28).
- In case of an extended period without use, disconnect the trainer from the mains.

When operated at a low heating level:

- Switch off the main switch (Fig. 2.2, 25).
- In case of an extended period without use, disconnect the trainer from the mains.

Pump down

“Pump down” conveys the refrigerant into the collecting tank using the compressor. This is done as follows:

- Close the valve on the pressure side of the condenser set.
- Switch on the compressor and leave it running until the low pressure switch on the pressostat shuts down the compressor.
- Close the valve on the intake side of the condenser set.

2.9 Maintenance / care

Depending on the level of dust in the air that is drawn in and the time in operation, the filter will become clogged and its flow resistance will gradually increase. The filter must then be cleaned.

The synthetic fibre mats used for the filter inserts can be regenerated. They can be beaten, blown out, vacuumed or washed out with conventional detergents in hand-warm water.



Caution! Never wring the mats or spin dry them! Do not refit the mats until they are fully dry.

3 Safety

3.1 Health hazards



Risk of electric shock!

Caution - high voltage!

Before opening any electrical cabinet on the experimentation stand, switch the main switch to OFF and disconnect the experimentation stand from the electrical mains. Work on the electrical system may only be carried out by qualified personnel.



Risk of injury! Moving parts

Before opening the inspection door, it is essential to wait until the fan has completely stopped. Otherwise, when the cover is opened the vacuum that may be present could suck in any loose objects or items of clothing, leading to injuries and damage to the equipment.



Risk of burns! Hot surfaces

The vapour humidifier hose will be hot. There is a risk of burns.

Only operate the heater with an adequate air flow. There is a risk of burns.

Never touch the vapour humidifier hose during operation. If it must be adjusted, wear suitable gloves.



Fire hazard! Avoid deposits of dirt and dust on the heater wires and in the ventilation ducts. There is a risk of fire if the deposits combust. Regularly inspect and clean the duct.

3.2 Hazards to the unit and its function



Caution! Position the vapour hose with a constant gradient / fall. Ensure there are no sags or kinks.



Caution! Do not install the air conditioner where there is any risk of frost. If a risk of frost cannot be ruled out in the installation location, appropriate measures must be taken to prevent the lines from freezing.



Caution! Never oil the louvered flaps. This can damage the plastic materials from which they are made.



Caution! When cleaning the filter mats, never kink them, wring them or spin-dry them!
Do not refit the mats until they are fully dry.



Caution! In “*manual mode*” the safety conditions for operating the heater do not apply to the ET 620.01 vapour humidifier or the ET 620.02 condenser set! In this case, the operator must always ensure that operating conditions are safe.

4 Appendix

4.1 Technical data

Air conditioning duct	L x W x H	4000 x 810 x 1770 mm
	Weight	530 kg
	Electrical connection	3 x 400 V/ 50 Hz; 63 A

Optional alternatives, see rating plate

In the 400 V / 50 Hz / 3 variant, accessory units ET 620.01 and ET 620.02 receive their power supply from the base unit.

Total power consumption approx. 38 kW.

Connection with 63 A-CECON-Connector.

In the 230 V/ 60 Hz/ 3 and 208 V CSA/ 60 Hz/ 3 variants, accessory units ET 620.01 and ET 620.02 are not connected to the main unit but are connected and powered separately.

ET620 building main fuse min. 3x 63 A necessary, fixed wiring to the mains supply necessary.

Total power consumption approx. 22 kW

ET620.01 building main fuse min. 3x 30 A necessary, NEMA connector 30 A. Total power consumption approx. 8 kW.

ET620.02 building main fuse min. 3x 30 A necessary, NEMA connector 30 A. Total power consumption approx. 8.4 kW.

Duct cross-sections:

Bottom:	630 x 630 mm
Top	357 x 357 mm

Required supply connections:

For ET 620.01 vapour humidifier

- Fresh water
- Water outlet

Weather protection grille	L x W x H	330 x 398 x 85 mm
Louvered flap	L x W x H Air tight closure	305 x 630 x 180 mm
Air filter	L x W x H Initial resistance: Design resistance:	300 x 630 x 630 mm 31 Pa 81 Pa
Air cooler	L x W x H Refrigerating capacity (with refrigerant R404a): Pressure loss, air side:	500 x 630 x 630 mm 17.2 kW Max. 102 Pa
		Direct evaporator with moisture separator, expansion valve with nozzle, sight glass and filter dryer preassembled, stop valves
Air heater	L x W x H Electrical connection Optional alternatives, see rating plate Power:	300 x 630 x 630 mm 3 x 400 V/ 50 Hz Max. 20 kW
		4 levels selectable (4 x 5.0 kW), with temperature limiter STL

Fan	L x W x H	500 x 630 x 630 mm
	Electrical connection	3 x 400 V/ 50 Hz
	Optional alternatives, see rating plate	
	Motor power	1.1 kW
	Rated motor speed	1500 rpm
	Fan shaft power	0.83 kW
	Rated fan speed	1947 rpm
	Volumetric flow rate	Max. 2500 m ³ /h
	Differential pressure	Max. 715 Pa
	Noise output, total	88 dBA
Flow distributor	L x W x H	300 x 630 x 630 mm
	Design resistance:	31 Pa
Air humidifier	L x W x H	1250 x 630 x 630 mm
	Vapour lance with condensate drain	DN 25 , L = 400 mm
Fire damper	L x W x H	357 x 357 x 506 mm
Ceiling air outlet	L x W	250 x 250 mm
Disk valve		DN 125
Differential pressure sensors		
	Filter and heater monitoring, factory set	
Combined sensor	Temperature & relative humidity	
	0 ... 50 °C	
	5 ... 100 % rel.	
	For further details, refer to manufacturer's instructions	

Inclined-tube manometer

Measuring range 0...700 Pa

For further details, refer to manufacturer's instructions

ET 620.01 vapour evaporator module

L x W x H 550 x 450 x 1100 mm

Weight 50 kg

Electrical connection 3 x 400 V, 50 Hz

Optional alternatives, see rating plate

With the 400 V / 50 Hz / 3 version, the ET 605.01 and ET 605.02 accessories receive their power supply from the base unit.

Steam generating capacity: 10 kg/h

Power consumption: 7.5 kW

For further details, refer to manufacturer's instructions

ET 620.02 condenser set module

L x W x H 1100 x 700 x 1150 mm

Weight 150 kg

Electrical connection 3 x 400 V, 50 Hz

Optional alternatives, see rating plate

With the 400 V / 50 Hz / 3 version, the ET 605.01 and ET 605.02 accessories receive their power supply from the base unit.

Refrigerant: R404a

Refrigerating capacity:

At 7.2°C/ 32°C 16.6 kW

Electric power consumption: 7.4 kW

4.2 Standard values for TROVIS 5571 climate controller

Temperature control:

Master controller	K_P	0.5
Master controller	T_N	100 s
Slave controller	K_P	0.5
Slave controller	T_N	100 s

Humidity control:

Master controller	K_P	0.5
Master controller	T_N	100 s
Slave controller	K_P	0.5
Slave controller	T_N	100 s

Fan:

Master controller	K_P	1.5
Master controller	T_N	240 s

Feed air minimum	Y_{Minimum} (Master controller)	16 °C
------------------	--	-------

Feed air maximum	Y_{Maximum} (Master controller)	32 °C
------------------	--	-------

Room setpoint	20 °C
---------------	-------

Room setpoint minimum	18 °C
-----------------------	-------

Room setpoint maximum	26 °C
-----------------------	-------

Room humidity setpoint	50 % r.H.
------------------------	-----------

Maximum feed air humidity	85 % r.H.
---------------------------	-----------

ET 620**AIR CONDITIONING AND VENTILATION SYSTEM**

Heater (air heater):

Level 1 switching limit	Y(Slave controller)	5.0 %
Level 2 switching limit	Y(Slave controller)	30.0 %
Level 3 switching limit	Y(Slave controller)	55.0 %
Level 4 switching limit	Y(Slave controller)	80.0 %

Condenser set (air cooler):

Minimum on time t	20 s
Minimum off time t	20 s

4.3 Items supplied

- 1 x ET 620 Air Conditioning and Ventilation System, complete
- 1x ET 620 Air Conditioning and Ventilation System: Operating instructions
- 1x ET 620.01 Humidification module
- 1x ET 620.02 Condenser set module

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