AET Flexible Space
Under Floor Air Conditioning

CONSOLE TUC-500
PRODUCT DESCRIPTION

ISSUE 3.0
FEBRUARY 2017

AET Manufacturing (UK) Ltd. Registered in England. Company No. 10050347

Table of Contents

Section One - Product Description

1.0 General

The TUC-500 is a fan terminal unit used as part of the AET Flexible Space Under Floor Air Conditioning (UFAC) system, which extracts air from below the raised floor and supplies into occupied space. In addition, it also re-circulates room air. It has been designed for positioning upon the raised floor, over a purpose made opening in the floor tile.

Applications include small meeting rooms, limited floor voids below 150mm – 100mm but may also be used in regular space when desired and off floor grid when required.

The TUC-500 is made up of four fundamental sections:

- Casing
- Damper
- Fan section
- Controller (Fatronic) and electrical connections

1.1 Casing

The TUC-500 casing is of steel sheet, finished in powder coat of Pearl White colour (RAL 7035 or RAL 9010). The front panel can easily be removed by means of two quick-release fasteners allowing access to the principal components.

The TUC-500 also features perforated panels as grilles. These are located on the lower part of the front panel (intake from the space) and on the top of the unit (air discharge). The air inlet, from below the raised floor, may be located on one or more floor tiles for the installation of the TUC-500.

The overall dimensions of the TUC-500 are 500 x 840 x 235 mm.

1.2 Damper

The damper is automatically controlled to allow air to be drawn from the raised floor void or re-circulated from the working space. The damper includes an adjustable by-pass that permits the TUC-500 to draw an amount of under floor supply air, whilst it is in re-circulation mode. The by-pass section can be regulated from a minimum to a maximum opening by an adjustable stop.

1.3 Temperature Sensing

The room temperature sensor is mounted on the front of the unit. The supply air sensor is located inside the unit in the supply air path.

1.4 Fan Section

The fan section comprises two centrifugal fans, each driven by a totally enclosed electric motor to IP23 standard. The electric motor is equipped with in-built thermal protection with automatic reset. The airflow can be electronically modulated from a minimum to a maximum value.

1.5 Controller (Fatronic)

The controller is of the electronic microprocessor type. It is fitted with two air temperature sensors; the first sensor is used to read the space temperature, the second sensor is used to read the underfloor temperature. By comparing these two readings with the chosen setpoint, the Fatronic controls the opening or closing of the damper.

The following indications are available on the backlit LCD screen: room temperature, underfloor temperature, setpoint value, fan speed selected, direct or inverse operating mode, Electronic ID.

The controller will perform the functions of: temperature control, fan speed modulation, automatic and independent cooling/heating changeover with the possibility of automatic setpoint shift, alarm visualisation and programmable time delay on the electric heater.

1.6 Electrical Connections

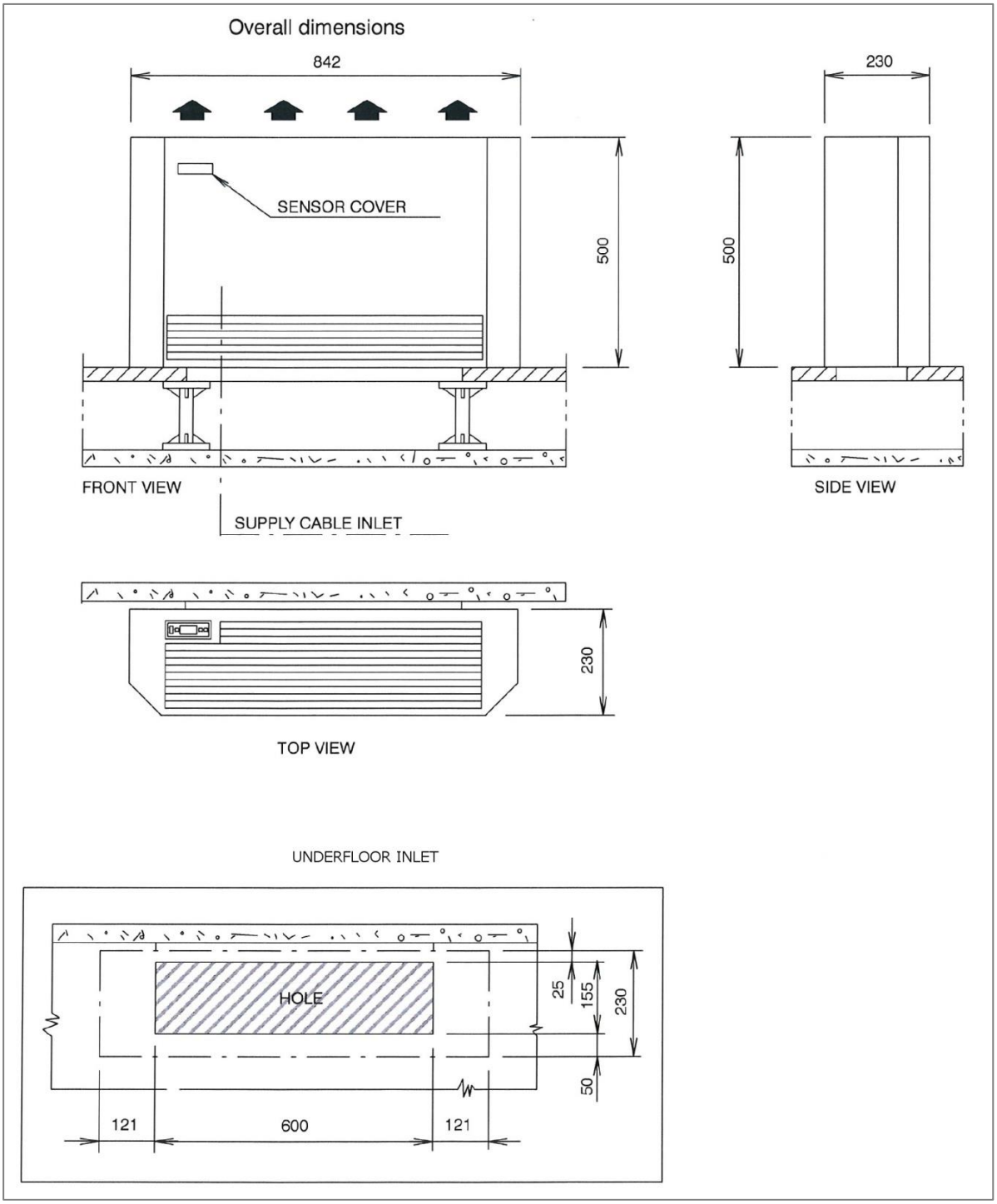
The electric connections are housed within the cabinet and isolated from the air flow. The TUC-500 is fitted with a 4.6 m supply cable and plug for the connection to the 230V electrical supply. Two models of plug are available: standard European Schuko plug or Standard British plug.

1.7 Electric Heater (optional)

The TUC-500 can be fitted with an optional electric heater (core and fins) which operates at a very low surface temperature and is equipped with a manual resettable safety thermostat for automatic cut-out in the event of high temperatures. Two models are available:

1. 250W / 230V
2. 500W / 230V

1.8 Overall Dimensions



1.9 Standards

The unit has been designed according to IEC and CE standards.

Section Two - Control Functions

2.0 General

All the functions of the TUC-500 are performed by the electronic controller (Fatronic).

With the LCD controller, all programming setup and modification of the working parameters are carried out using the controller's four push buttons as indicated in the image above. The functions available depend upon the TUC-500 configuration; please refer to the Fatronic user manual for full information.

The TUC-500 can function completely independently, or they can be connected into small independent groups for each micro-climate. A complete system is formed when all TUC-500 are connected to their zonal CAM unit.

2.1 Temperature Control

The room temperature, and the underfloor temperature, are read by two sensors placed within the terminal, and are shown on the control panel display. The room temperature value is compared with the selected setpoint. When the underfloor air temperature is lower than that in the room, the cooling function is possible. In this situation the damper is opened, allowing the fan to draw cold air from the underfloor void. The damper is closed when the room temperature drops below the set point value. In heating mode, when there is underfloor air available which is at a higher temperature than that within the room, the damper opens for heating purposes and closes when the room temperature rises above the setpoint value. When required, the electric heater will be activated.

2.2 Cooling/heating Operation Changeover

The automatic changeover feature of the TUC-500 allows its own adjustment to cooling or heating operation automatically and independently of the CAM. This is possible because of the under floor air temperature sensor; from the comparison with the ambient temperature the controller detects which operational mode is possible. Both the ambient temperature and the underfloor temperature can be shown on the display of the electronic controller (Fatronic). Manual changeover is possible in case of failure of the under floor sensor by use of the appropriate push button.

2.3 Master and Slaves

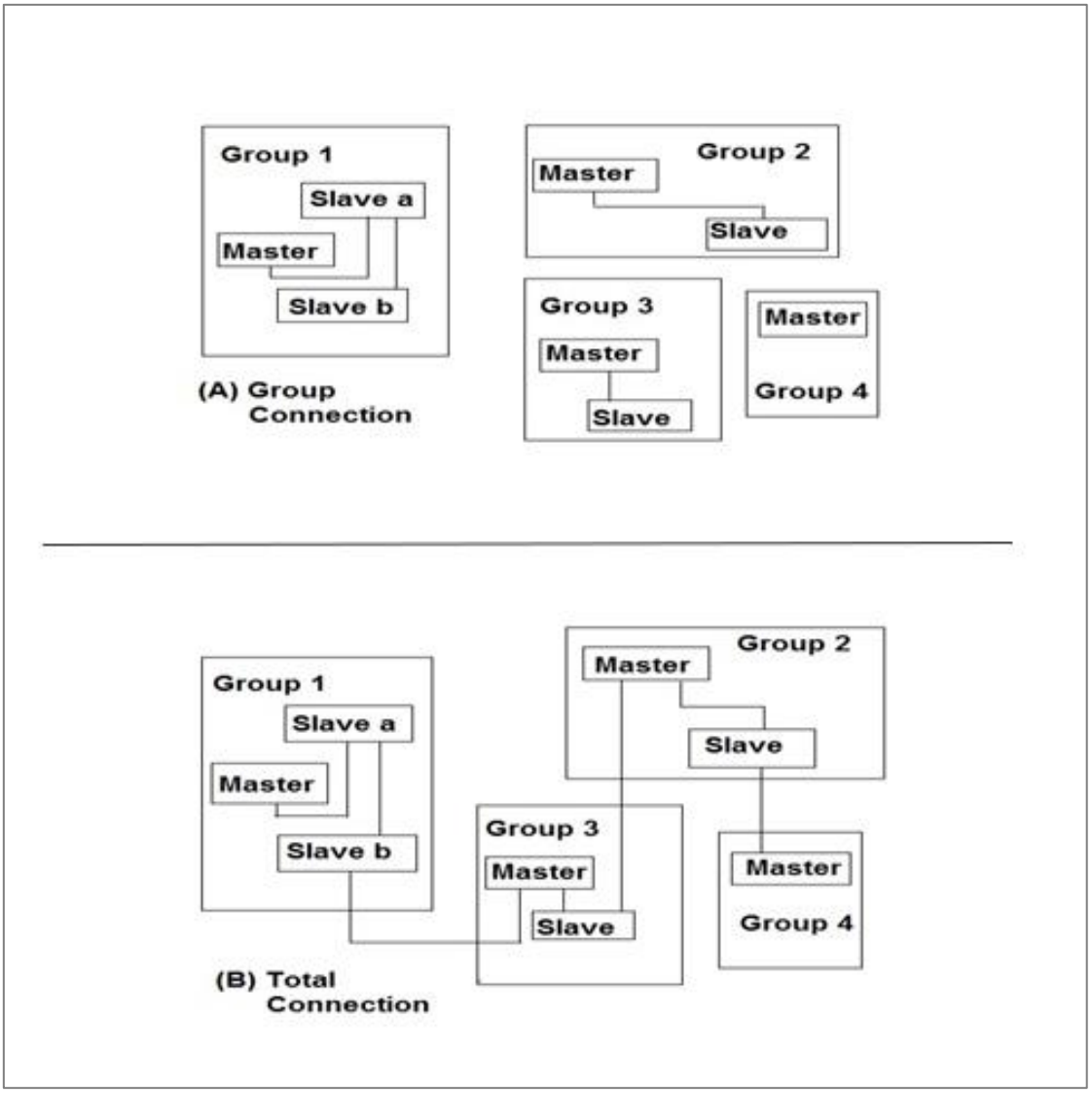
This function is possible only if the TUC-500 is connected by Flexbus cable to another TUC-500. Connection is made with a flat 8-wire cable and relevant connector, plugged into the back of the controller. Each TUC-500 can be set up as a Master or a Slave, and settings are easily interchangeable.

If more than one terminal is to be installed within a single room/micro-climate zone the control should be carried out by one terminal only (Master), with the other units (Slaves) following the Master exactly in the controlling of the temperature. The only actions permitted on the terminals set as Slaves are that of On/Off and, if desired, the fan speed variation.

Connection is possible in two ways:

1. Group connections: groups are identified by different physical settings and they are not connected to each other.
2. Total connection: groups are all connected to each other and to a parent CAM for full control and maximum energy efficiency operation.

Master and Slaves are identified by programming each TUx



2.4 On/Off

The use of a push button switch on the control panel allows the switching on and off of the unit, but this can be electronically isolated if required. Automatic start and stop of all the TUC-500 serving an entire zone can be obtained with a time switch on the main power supply to which the TUC-500 are connected, or with the Flexmatic control fitted in the CAM.

2.5 Regulation of Setpoint

The temperature setpoint is set locally at the controller, or remotely at the Flexmatic visual display. In Master/Slave configurations, only the Master units can be adjusted.

2.6 Variation of the Fan Speed

The fan speed can be modified from mininum to maximum value (eleven steps), according to the user requirements. It is possible to select on the controller, four alternative modes for the fan speed at terminal start-up: (Y) memorised, (D) default, (N) prohibited and (A) auto.

- **(Y) -** By selecting the memorised mode the fan, at start-up returns to the speed it had at the moment it was switched off.
- **(D) -** When switched on in the default mode, it operates at a fixed speed that can be altered by the user but will default to this setting when power is turned off and then restored.
- **(N) -** In the prohibited mode the possibility of varying the fan speed using the push buttons is excluded: the speed will be fixed at the value entered at the time of the selection of this mode.
- **(A) -** By selecting the auto mode the fan speed will automatically change on the basis of the deviation between setpoint and room temperature.

2.7 Electric Heater Delay

For maximum energy efficiency on start-up, the terminal electric reheat may be delayed. It is possible to define, using the controller, a delay between switching ON of the terminal, and the permitted switching ON of the electrical heating element; from 0 to 310 minutes. This action has the effect of maximising energy efficient use of LPHW reheat options centrally or avoiding current peaks at system start-up by staggering group start-ups. The electric heater may also be disabled using this feature.

2.8 Alarm Visualisation

The electronic controller is equipped with programs to auto diagnose sensor failure and loss of communication.

Alarm 1: AL1 – Room sensor failure

Alarm 2: AL2 – Supply sensor failure

Alarm 3: AL3 – Loss of communication with Master (Slave only)

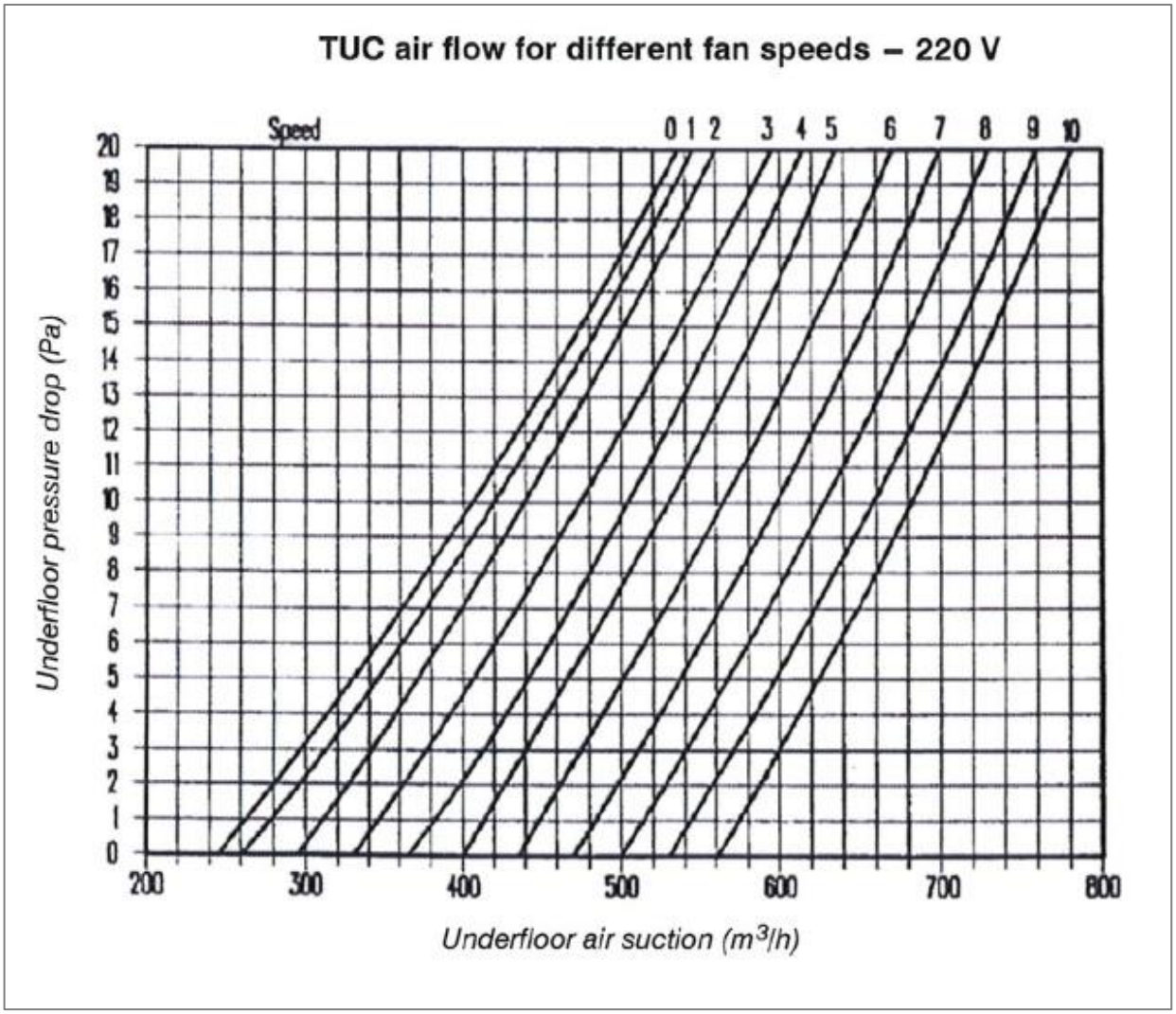
In the case of AL1 and AL2 the controller will switch off the fan and close the damper.
With AL3 the unit continues to run but with the settings previously selected within its controller. Please refer to the Fatronic user manual for full information.

Section Three - Technical Data

3.0 Airflow

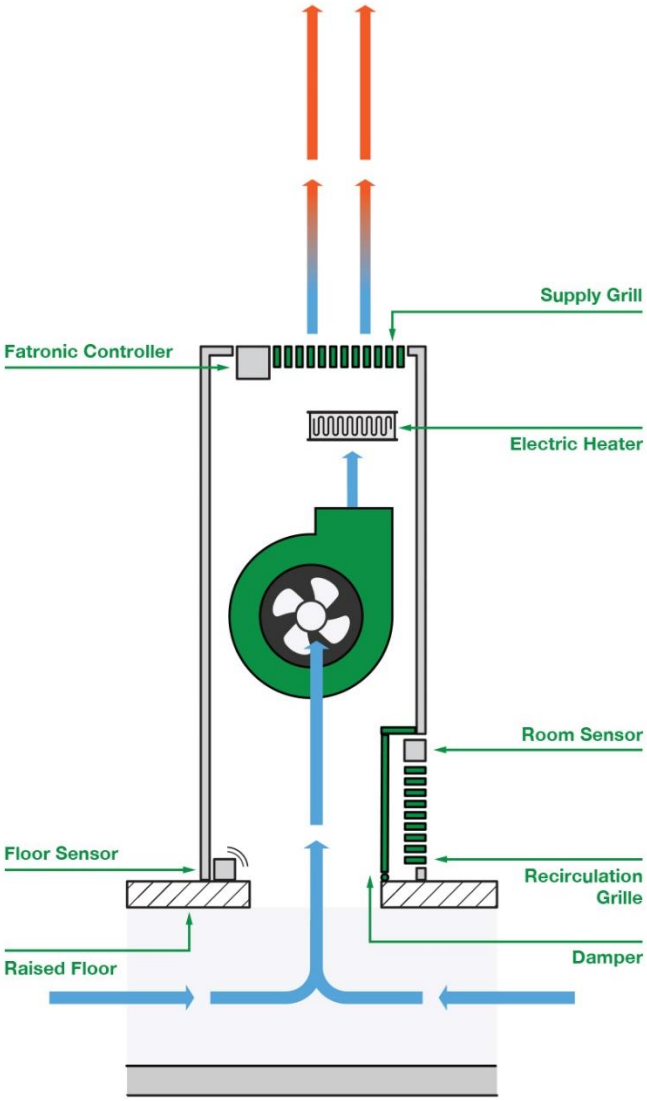
The following diagram shows airflow values at various under floor static pressures. The under floor static pressure is relative to the ambient pressure and has been considered up to the nominal maximum value of 20 Pa.

In the reading of the air flow value it must be considered that in a typical installation, the underfloor static pressure in the supply zone is normally between 3 and 15 Pa.

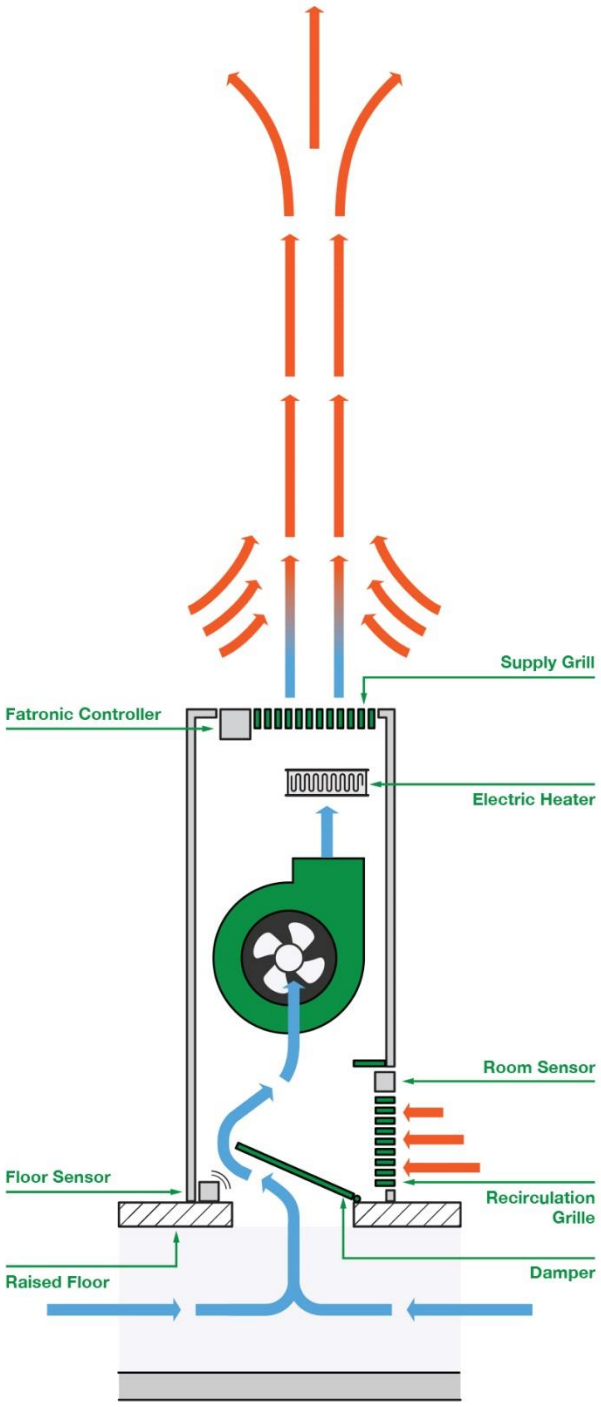


The TUC-500 constantly draws a certain amount of ambient air through a compartment in which the sensor for the room temperature reading is located, regardless of damper position.

The sensor positioning guarantees that it is always subject to a stream of room air, to ensure that it senses the correct temperature. In the image below, the under floor air intake is as indicated: it is the air drawn from under the floor.



Note: A 5% reduction in airflow must be allowed when the TUC-500 is fitted with an optional electric heater.

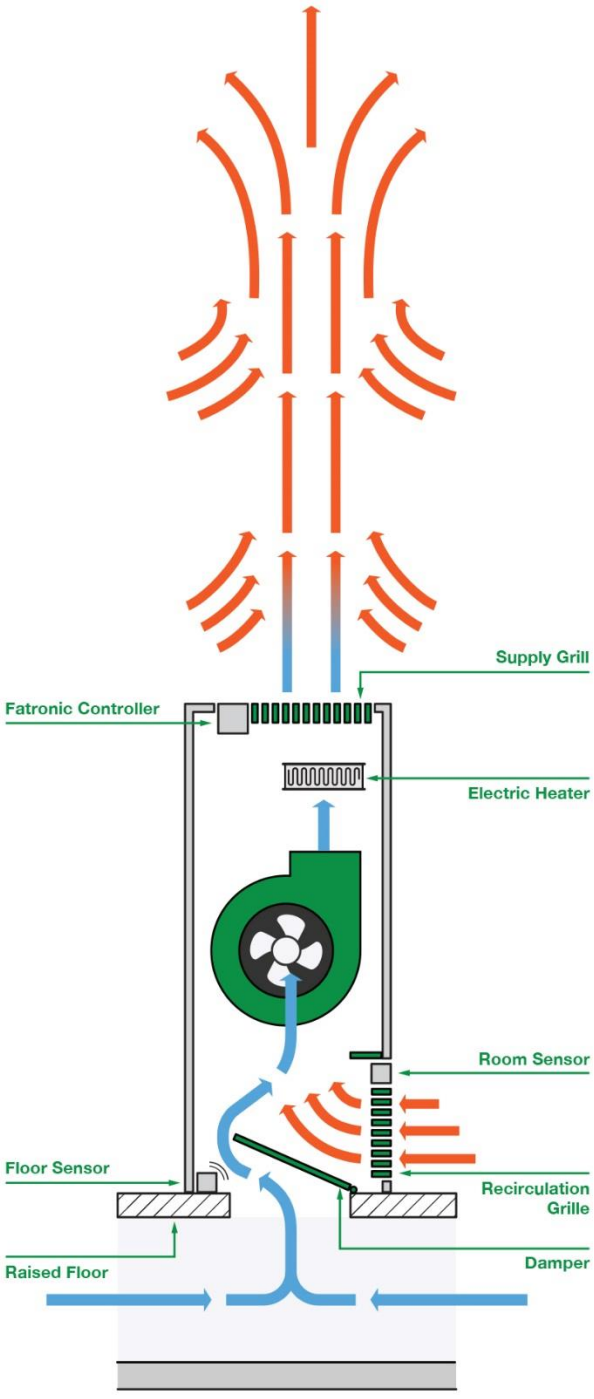


3.1 Bypass Airflow

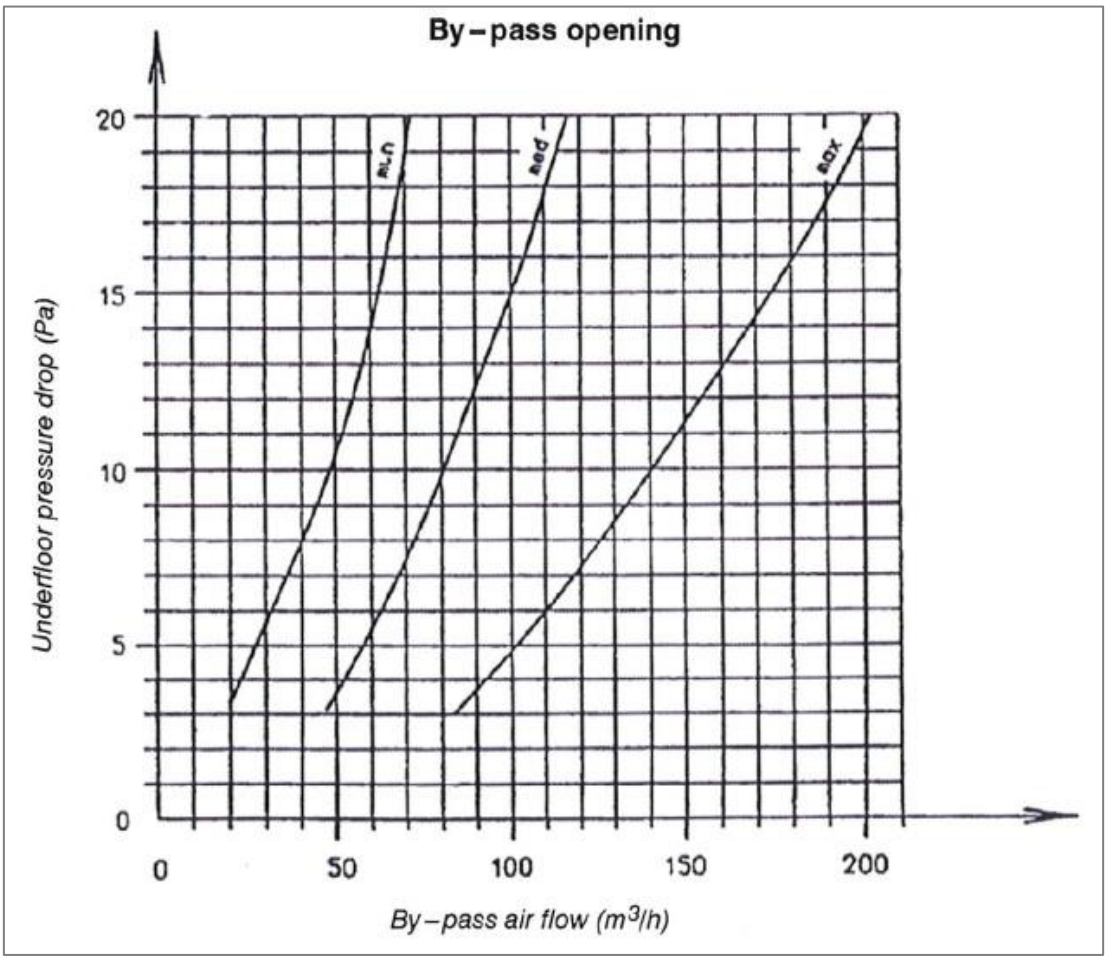
A variable by pass is fitted on the TUC-500 which ensures a continuous supply of the required quantity of fresh air even when the damper is closed.

The values in the diagrams below refer to the air derived through the bypass when the damper is closed.

In the reading of the air flow value it must be considered that in a typical installation, the under floor static pressure in the supply zone is normally between 3 and 15 Pa.



Note: A 5% reduction in airflow must be allowed when the TUC-500 is fitted with an optional electric heater.


By–pass opening
20
15
10
5
0
0
50
100
150
200
Underfloor pressure drop (Pa)
By–pass air flow (m3/h)

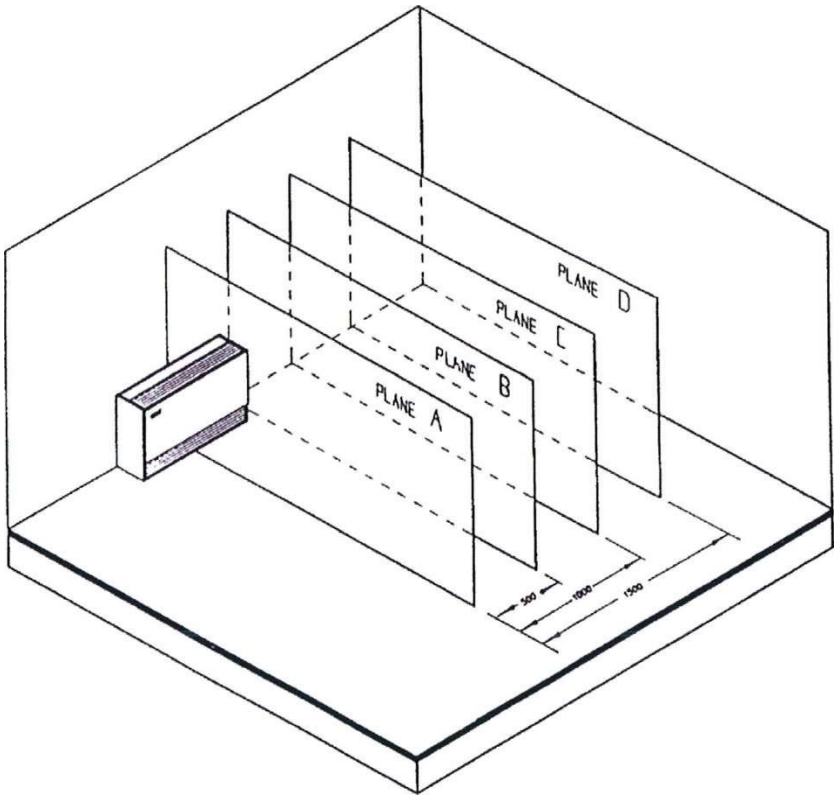
3.2 Air Distribution within the Space

The following diagrams refer to the air velocity in the space where the TUC-500 is installed in the following configurations:

- Damper closed: air re-circulated in the space
- Damper open at differing static pressure:

1) 0 Pa underfloor static pressure (total Airflow: 350 m^3/h;
2) 10 Pa underfloor static pressure (total Airflow 490 m^3/h), the most frequent situation;
3) 20 Pa underfloor static pressure (total Airflow: 610 m^3/h)

The values have been measured on four planes as indicated. The curves are limits of the zones where the air velocity is higher than 0.5 m/s and 0.18 m/s respectively. Diagrams without any curves indicate that the air velocity is lower than 0.18 m/s at all the points tested.



3.3 Noise Level in a Room

The sound pressure diagram can be used for a quick assessment of the noise produced by the TUC-500 when installed in a room with a given sound absorption characteristics. Noise generated by the TUC-500 is related almost completely to the fan speed that is selected on the control. The underfloor pressure level has a minor effect and becomes negligible at high fan speeds. The noise generated can be therefore estimated accurately at 0 Pa over pressure working condition (recirculation mode) using the diagram. Measurements have been carried out at one metre distance and one metre height from the TUC-500 at 0 Pa underfloor pressure.

Sound pressure levels are given for three values of equivalent absorption surface. As indications only, these correspond to a standard office 3 x 4 m -2.8 m height at differing furnishing situations:

- 38 sqm Sabine, fully furnished standard office;
- 24 sqm Sabine, partially furnished standard office;
- 12 sqm Sabine, empty standard office.

How to use the diagram:

Enter the airflow diagram with the required discharge airflow and the working underfloor pressure and determine the airflow at 0 Pa (recirculation mode).
With this airflow value enter the noise diagram below and determine the sound pressure level in dB (A) corresponding to the given equivalent absorption surface.

Example:

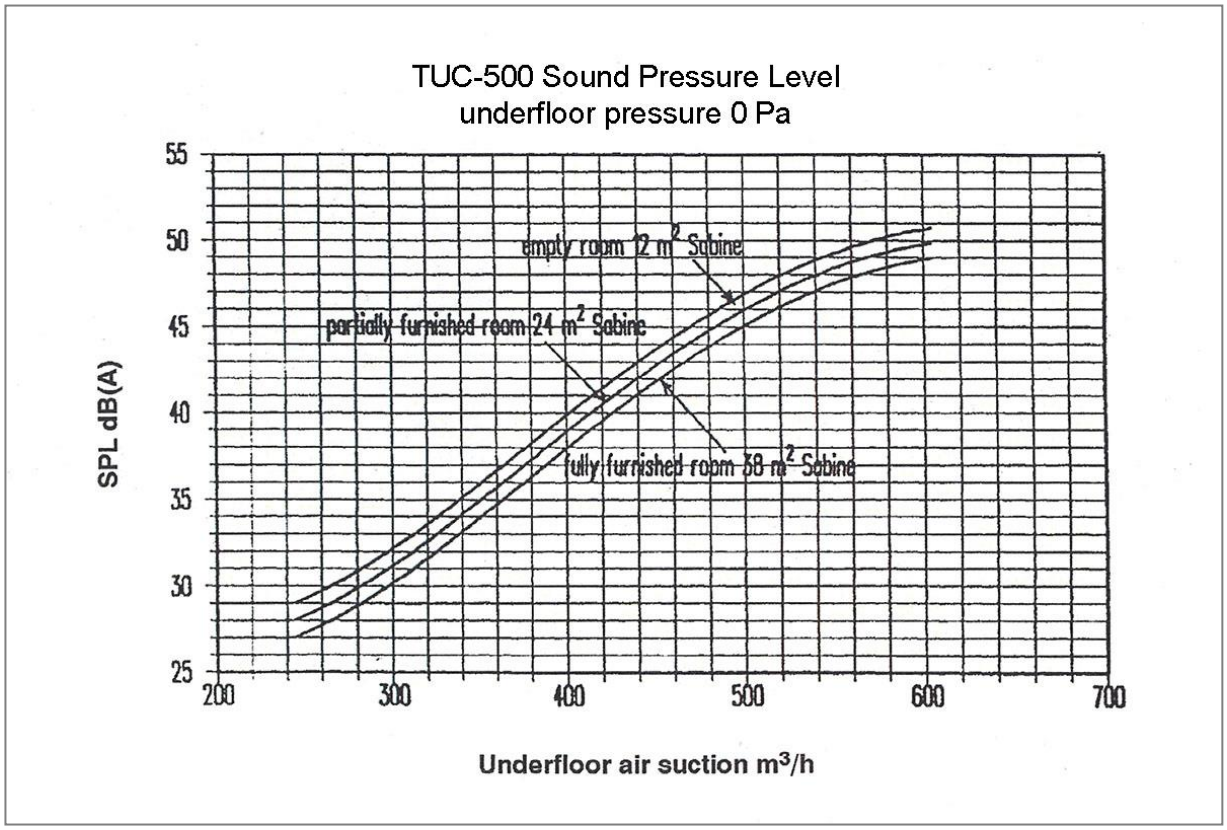
- Airflow required: 450 m^3/h.
- Underfloor pressure: 5 Pa.
- Fully furnished room (38 m^2 Sabine).

From Airflow diagram:

- Airflow at 0 Pa =380 m^3/h

From noise level diagram:

- Sound Pressure Level = 36.5 dB(A)



3.4 Noise Level in Free Field Conditions

3.4.1 General:

The noise level table refers to the values of Sound Pressure Level in free field conditions and Sound Power Level, measured by an independent laboratory.

3.4.2 Test method:

The test has been carried out according

To ISO 3745-1977 “Determination of sound power levels of noise sources. Precision methods for anechoic and semi anechoic room”. Ten fixed microphones were used, these being within the area of a hypothetical hemisphere (radius = 1.26m) around the unit.

Measurements have been carried out for three working modes:

- Air re-circulated from the room (damper closed)
- Air taken from underfloor with 0 Pa overpressure
- Air taken from underfloor at maximum nominal pressure of 20 Pa.

For each mode four different airflow values have been selected.

3.4.3 Test results

The reported values refer to:

- **Noise Pressure Level in dB(A) – Lp:** measured on the surface of the semisphere in free field conditions.
- **Noise Power Level in dB(A) – Lw:** obtained from the above measurements.

Due to the system configuration the numeric value of Lw exceeds the corresponding Lp by ten units. The Noise Power Level can be used by acoustic experts to determine the actual noise of the TUC-500 in the space where the terminal will be installed.

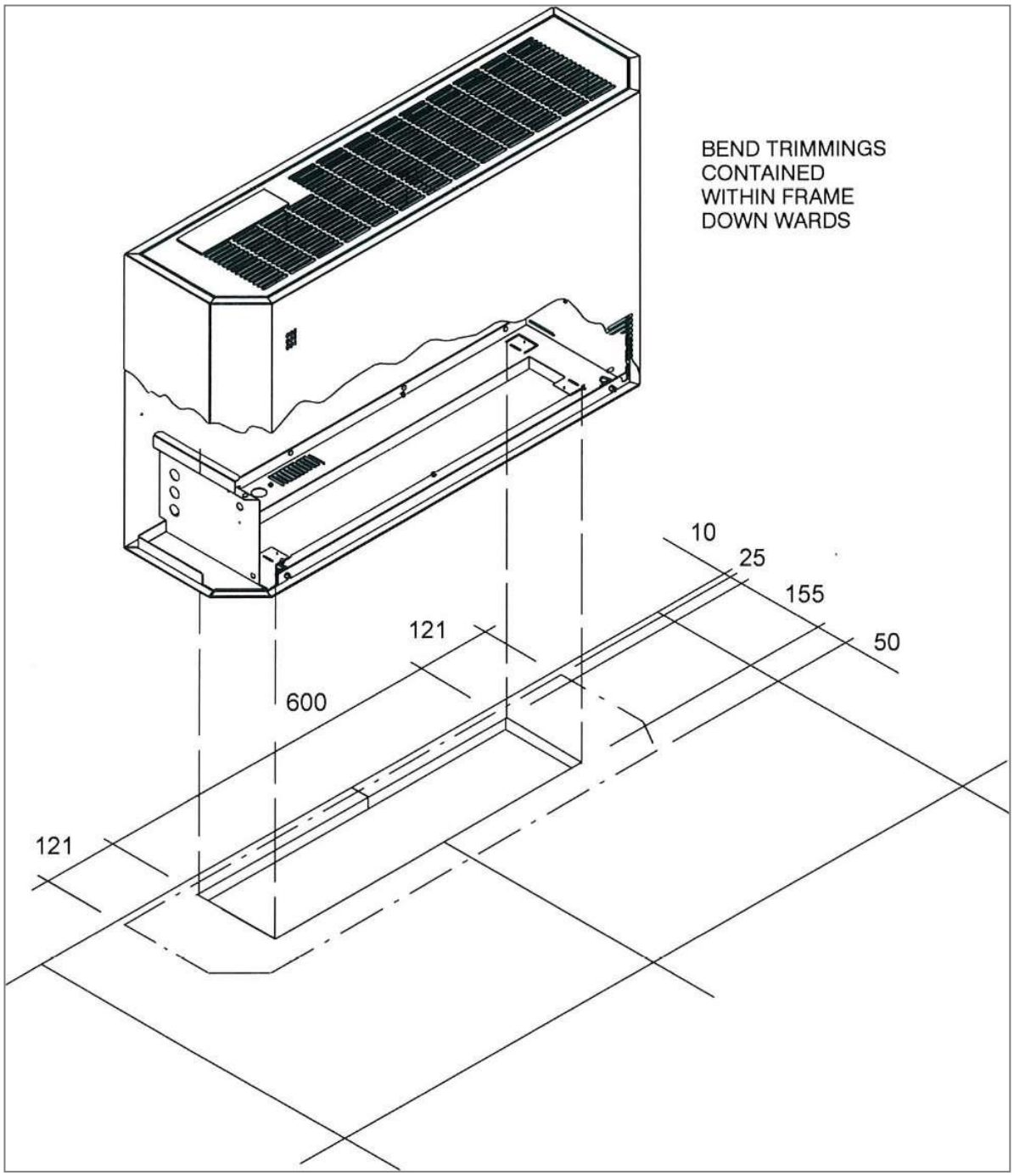
TUC-500 Noise Level (*according to ISO 3745-19T7, free field conditions*)

Work conditions	Airflow (m^3/h)	Lp dB (A)	Lw dB (A)
Air re-circulated from the ambient	245	22.8	32.8
	330	28.8	38.8
	435	36.0	46.0
	500	40.2	50.2
Air taken from underfloor with 0Pa overpressure	245	22.0	32.0
	330	27.8	37.8
	435	35.2	45.2
	500	39.8	49.8
Air taken from underfloor with 20 Pa overpressure	535	26.5	36.5
	595	29.5	39.5
	670	35.8	45.8
	730	40.2	50.2

Lp = Sound pressure level in dB(A) (reference 20 uPa) measured on the surface of a hypothetical hemisphere (radius = 1.26 m) around the unit in free field condition.

Lw = Sound pressure level dB (A) (reference 1 pw)

3.5 Installation



AET Manufacturing (UK) Ltd, The Center, 201-203 London Road, East Grinstead, West Sussex, RH19 1HA
+44 (0)1342 310400 aet@flexiblespace.com

flexiblespace.com

AET Flexible Space
Under Floor Air Conditioning