



**Flexible Space**  
Under Floor Air Conditioning

**FANTILE TU4-AC**  
PRODUCT DESCRIPTION

ISSUE 3.0  
FEBRUARY 2017



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## Section One - Product Description

### 1.0 General

The Fantile TU4 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 also re-circulates room air. It has been designed to be installed within a raised floor and may be used as part of the walking surface in the room. The supply and return section are both positioned below two robust grilles suitable for office operation.

The TU4 comprises four sections:

- Casing
- Damper
- Fan
- Controller (Fatronic) and electrical connection



### **1.1 Casing**

The TU4 casing is of steel sheet, finished in black powder coat. It features two separate aluminium grilles, both with straight fins, one grille for the air supply and the other for the re-circulation of air from above the floor. The supply grille features a hatch which allows access to the control without the need to remove the grille itself. The overall dimensions of the TU4 beneath the floor are 600 x 740 x 215 mm and it occupies the space of only one raised floor tile, 600 x 600mm at floor level.

The face area of each grille is 215 x 599mm; its height can be adjusted from 30 to 50mm to suit the surrounding floor finish. Under floor supply air enters through one side of the terminal. A raised floor height of at least 220mm is required, depending on the slab roughness and tolerance.

### **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 bypass that permits the TU4 to draw an amount of under floor supply air whilst it is in re-circulation mode.

When the damper is open the fans draw air from the underfloor void. When the damper is closed, the fan draws room air through the re-circulation grille and delivers it to the room via the supply grille. The bypass section can be regulated from a minimum to a maximum opening by an adjustable stop.

### **1.3 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.

One side of the re-circulating section contains a compartment which houses the room air temperature sensor. The positioning of this sensor guarantees that it constantly samples ambient air, even when the terminal is supplying air from under the floor. The airflow can be electronically modulated from a minimum to a maximum value.

## 1.4 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 and 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, set point 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.

## 1.5 Electrical Connections

The electric components are housed within the cabinet and isolated from the air flow. The TU4 is fitted with 4.6m power cable and plug for connection to the 230/1/50 electrical supply. Two models of plug are available: Standard European Schuko plug and Standard British three-pin plug. Alternatively, the terminal unit can be supplied without a plug.

## 1.6 Electrical heater (Optional)

The TU4 can be fitted with an optional electric heater (core and fins) which operates at a very low surface temperature, and is equipped with a manually resettable safety thermostat for automatic cut-out in case of high temperatures. Three models are available:

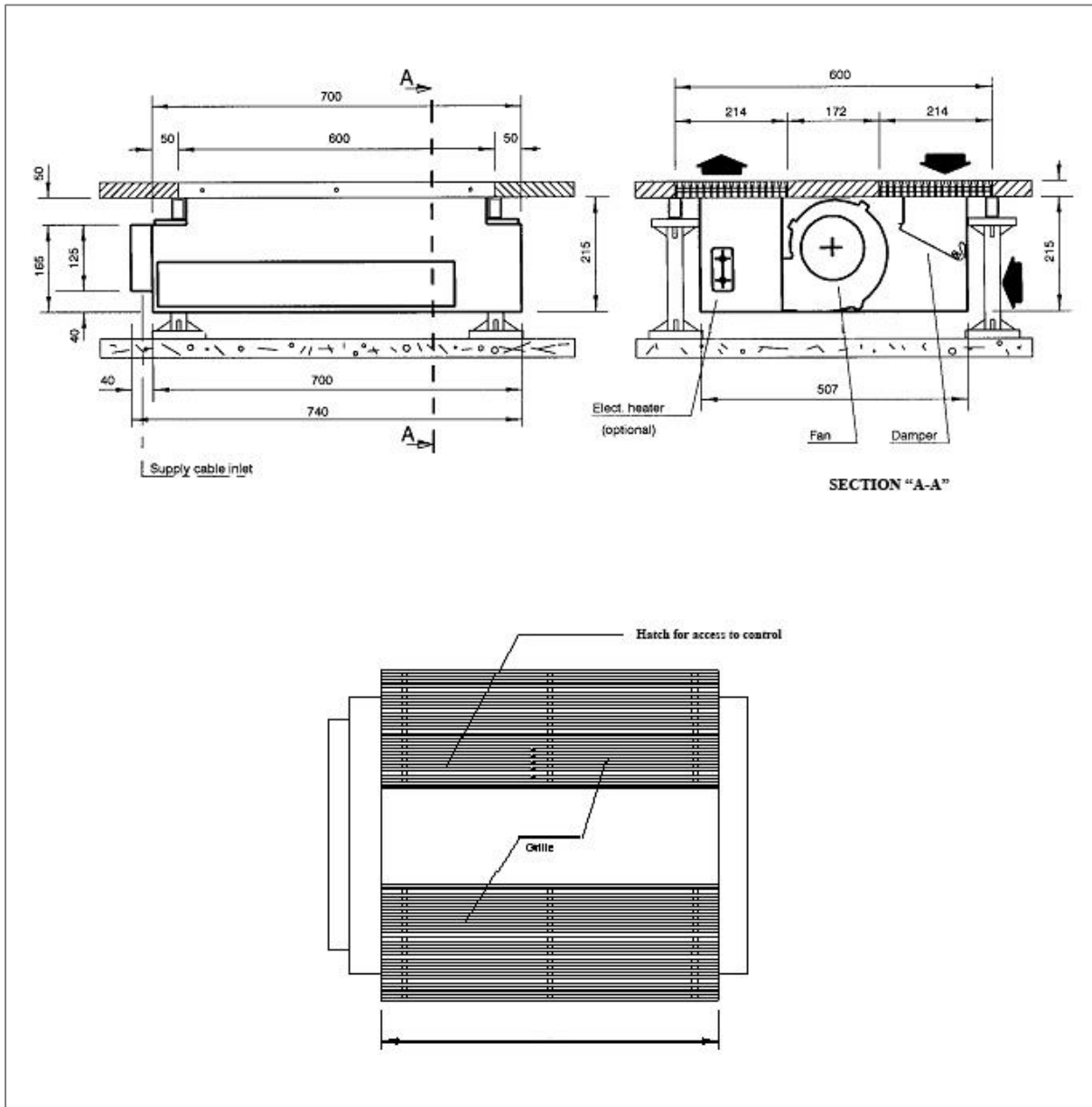
1. 250W/230V
2. 500W/230V
3. 1000W/230V

An 800W LPHW coil is available as an option.

## 1.7 Standards

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

### 1.8 Overall Dimensions



## Section Two - Control Functions

### 2.0 General

All functions of the TU4 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 TU4 configuration; please refer to the Fatronic user manual for full information.

Each TU4 can function completely independently, or it can be connected into small independent groups for each micro-climate. A complete system is formed when all TU4 units 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 TU4 allows its own adjustment to cooling or heating operation automatically and independently of the CAM unit. 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

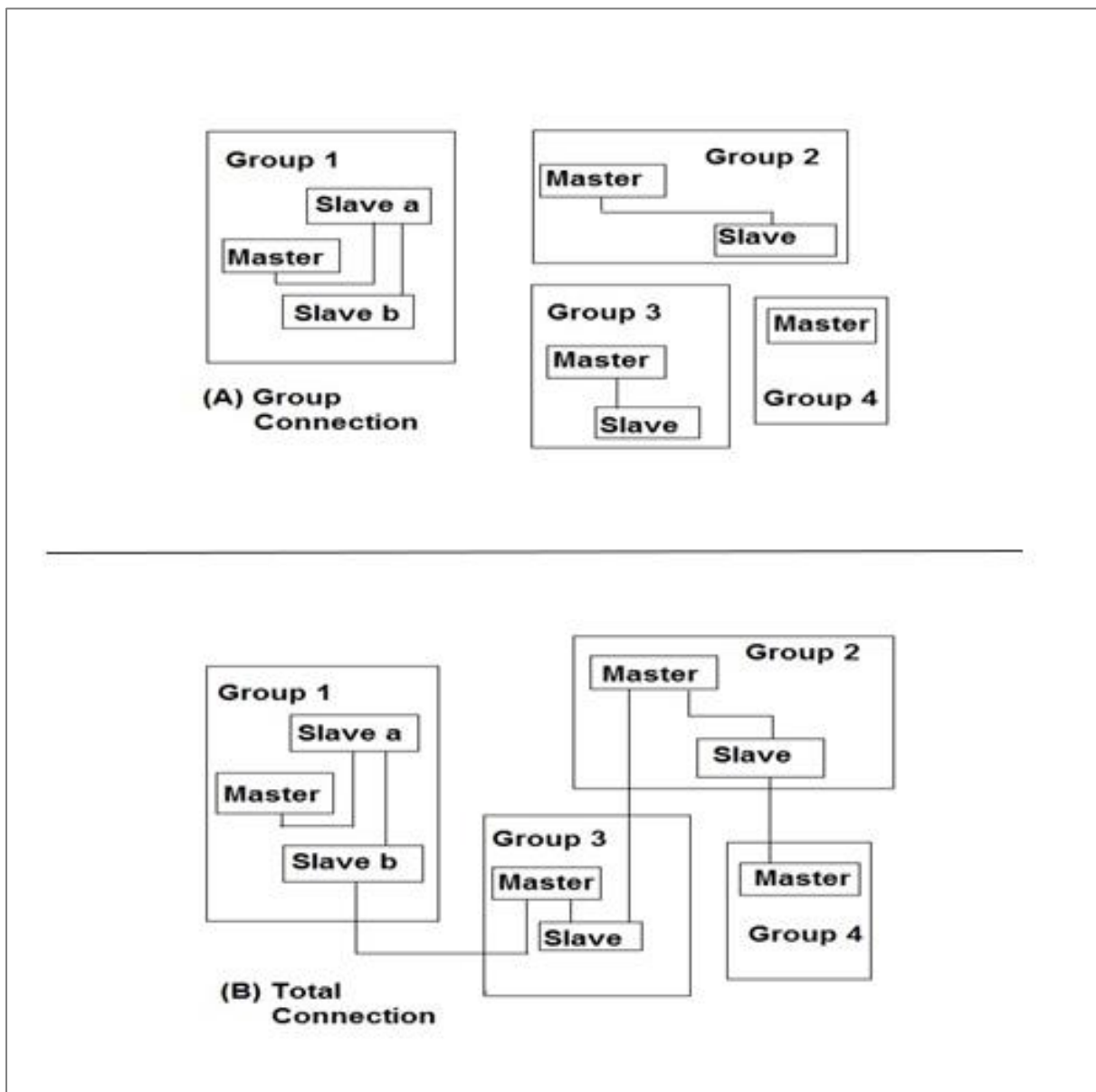
This function is possible only if the TU4 is connected by Flexbus cable to another TU4. Connection is made with a flat 8-wire cable and relevant connector, plugged into the back of the controller. Each TU4 can be set up as a Master or a Slave, and settings are easily interchangeable.

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 TU4.



## 2.4 Power 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 TU4 serving an entire zone can be obtained with a time switch on the main power supply to which the TU4 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 minimum 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) automatic.

- **(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 the switching ON of the terminal, and the permitted switching ON of the electrical heating element, from 0 to 310 minutes. 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)

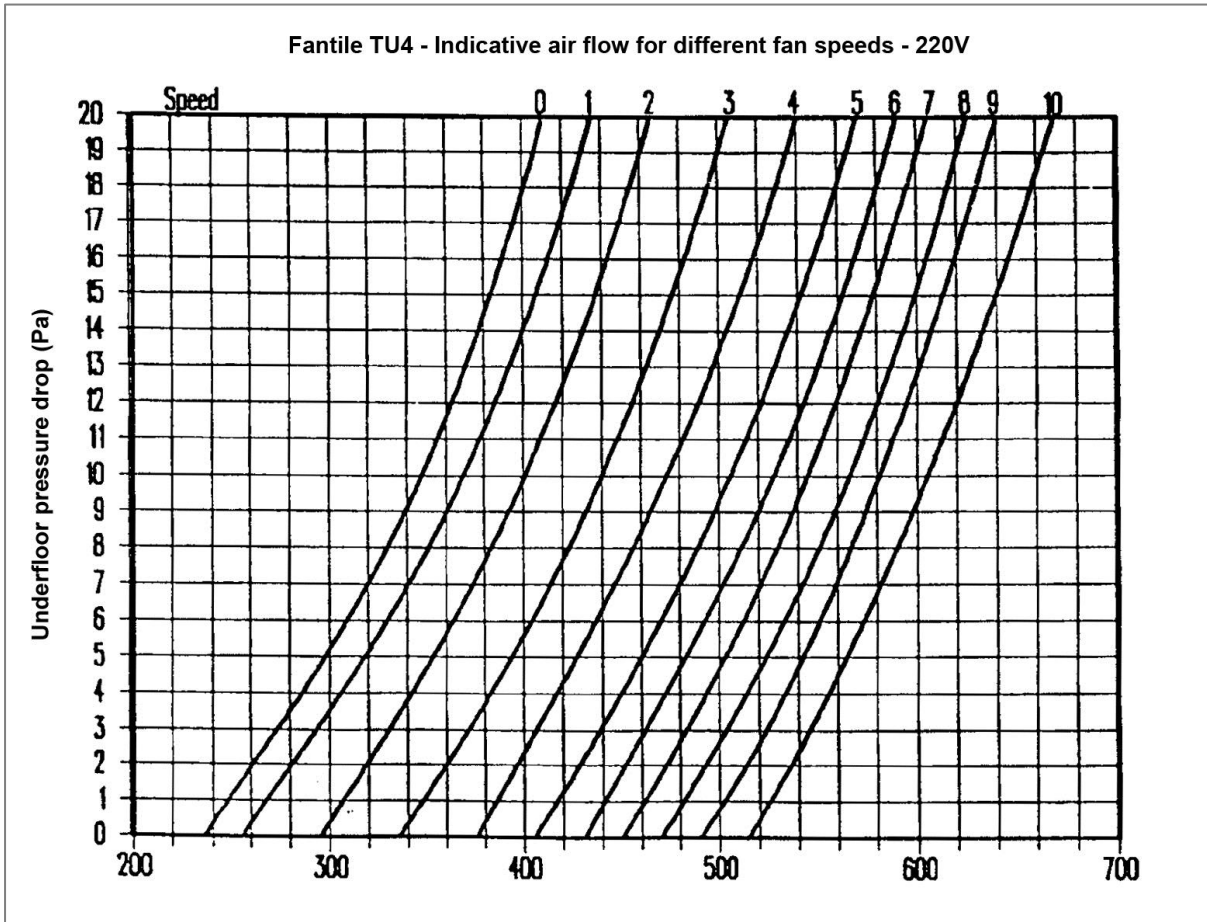
In the case of AL1 and AL2 the controller will switch off the fan and close the damper.

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 air flow values at various underfloor static pressures. The underfloor static pressure is relative to the ambient pressure and has been considered up to the nominal maximum value of 20 Pa.

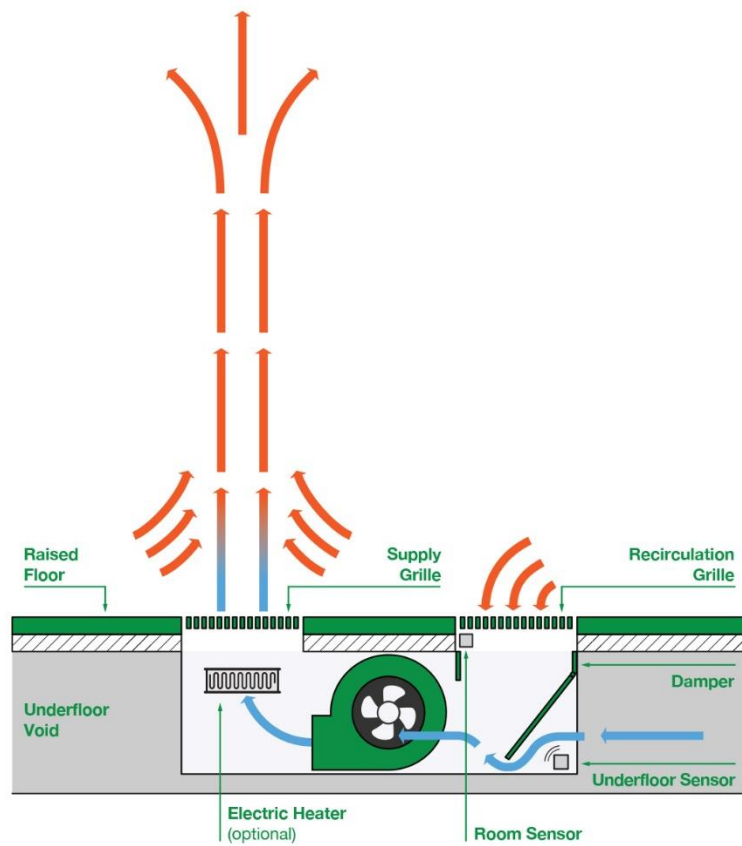
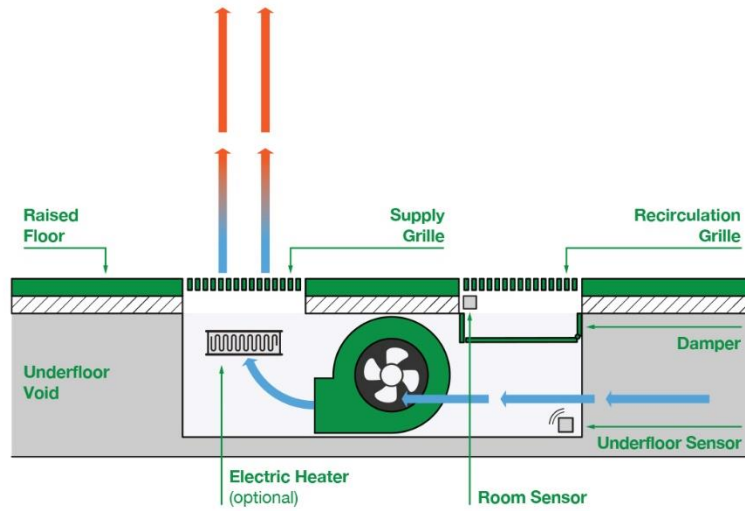


In the reading of the air flow value it must be considered that in a typical installation the under floor static pressure in the supply zone is normally between 3 and 15 Pa.

The TU4 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.

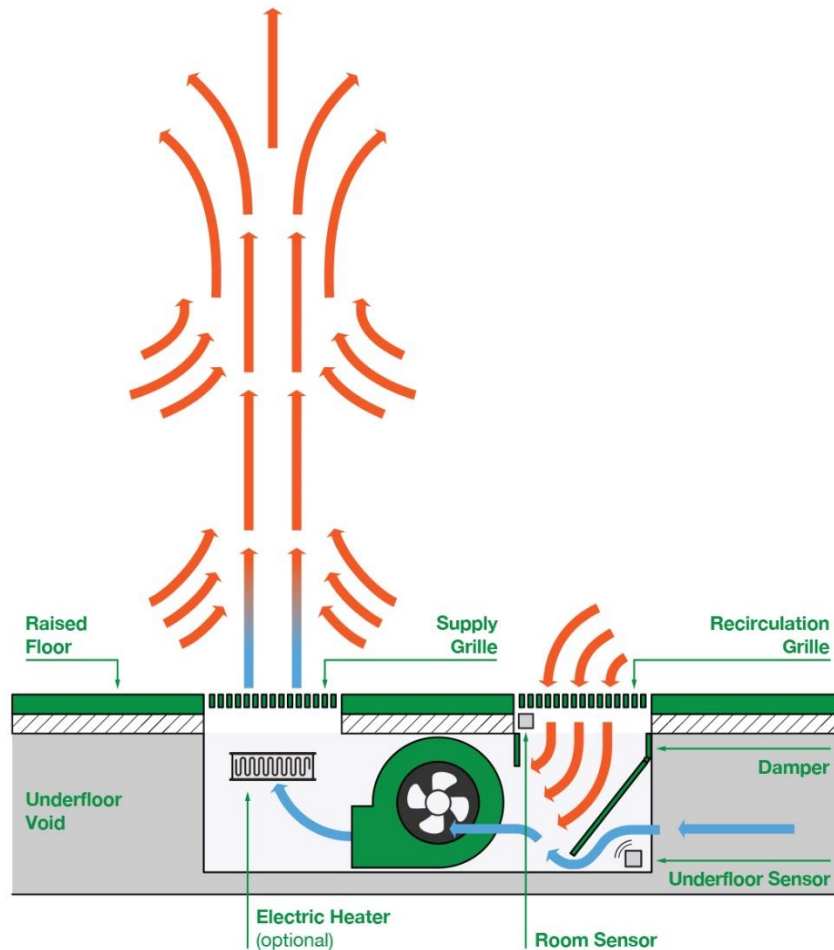
The sensor positioning guarantees that it is always subject to a stream of room air, to ensure that it senses the correct temperature. In the image below, the under floor air intake is indicated: it is the air drawn from under the floor.

**Fantile Airflow – Cooling Mode**



**Note:** Approximately 5% air flow reduction must be considered when the TU4 is fitted with the optional electric heater

**Fantile Airflow –Cooling Mode - Recirculation**

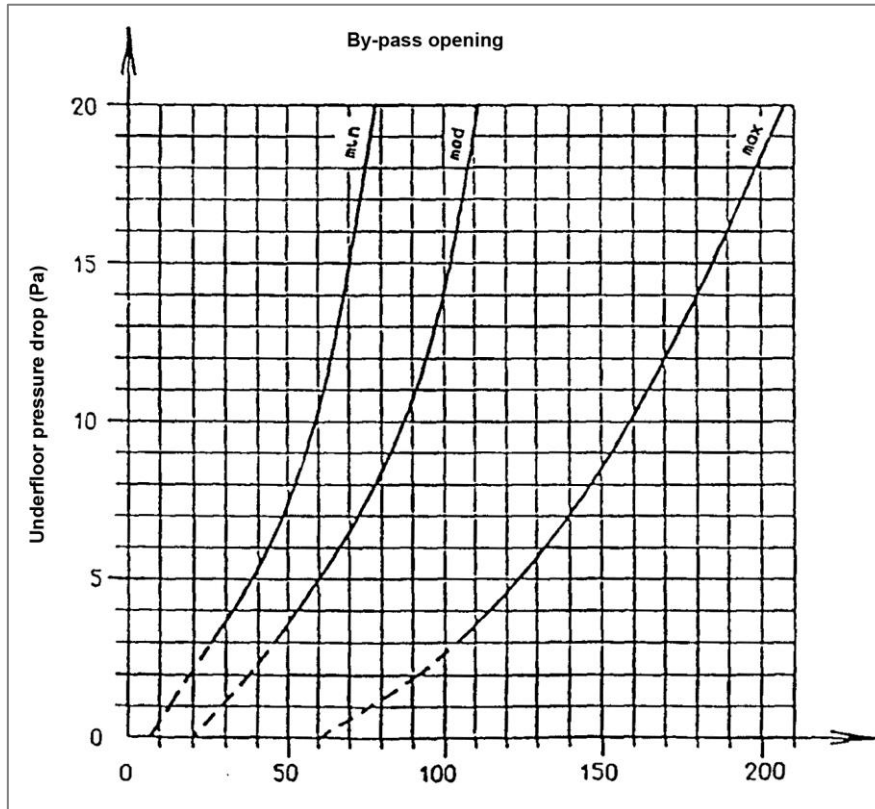


**3.1 By Pass Air Flow**

A variable by-pass is fitted on the TU4 which ensures a continuous bleed of the required quantity of fresh air even 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:** Approximately 5% air flow reduction must be considered when the TU4 is fitted with the optional electric heater



The values in the diagram refer to the air flow through the by-pass.

### 3.2 Noise Level in Controlled Space

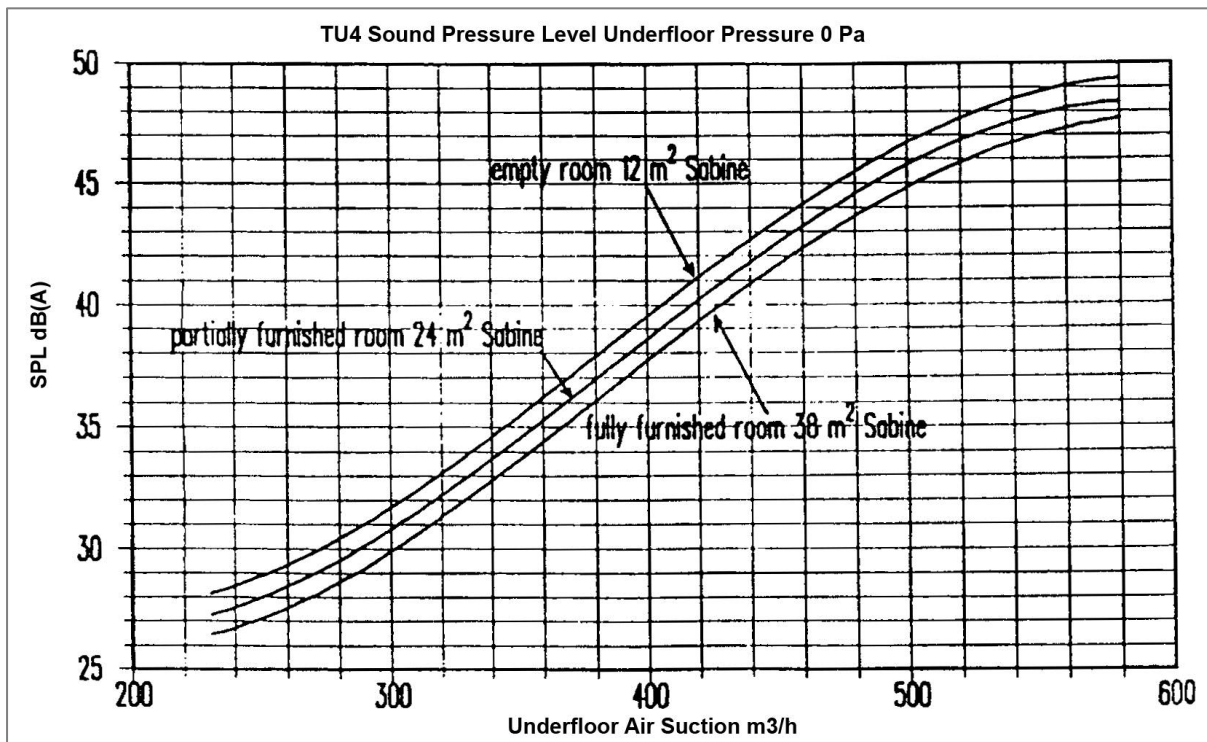
The diagram can be used for a quick assessment of the noise produced by the TU4 when installed in a room with a given sound absorption characteristic.

Noise generated by the TU4 is related to the fan speed. The underfloor pressure level has a minor effect and becomes negligible at high fan speed. The noise generated can be estimated quite accurately at 0 Pa overpressure working condition (re-circulating mode) using the diagram.

Measurements have been carried out at one metre distance and one metre height from the TU4 at 0 Pa under floor pressure. Indicative 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) with differing furnishing situations:

- 38 m<sup>2</sup> Sabine, fully furnished standard office
- 24 m<sup>2</sup> Sabine, partially furnished standard office
- 12 m<sup>2</sup> Sabine, empty standard office





**How to use the diagram:**

Enter the air flow diagram with the required discharge air flow and the working underfloor pressure and determine the airflow at 0 Pa (re-circulating mode)

With this airflow value enter the noise diagram above and determine the sound pressure level in dB (A) corresponding to the given equivalent absorption surface.

**Example:**

**Airflow Required:** 450 m³/h (H=200 mm)

Underfloor pressure: 5 Pa

Fully furnished room (38 m²)

**From Air Flow Diagram**

Air flow at 0 Pa = 390 m³/h

**From Noise Level Diagram**

Sound Pressure Level = 37 dB (A)

If detailed noise assessment is required, we recommend a specialist consultant be appointed.

### 3.3 Noise Level in Free Field Conditions

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

#### Test Method

The test has been carried out according to ISO 3745:2012+A1 “determination of sound power levels of noise sources. Precision methods for anechoic and semi-anechoic rooms”

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 different working modes:

1. Air re-circulated above the floor (damper closed)
2. Air taken from underfloor with 0 Pa overpressure
3. Air taken from underfloor at maximum nominal pressure of 20 Pa

For each mode four different air flow values have been selected.

#### Test Results

The reported values refer to:

##### **Noise Pressure Level in dB (A) – LP:**

Measured on the surface on the semi-sphere in free field conditions (radius 1.26m)

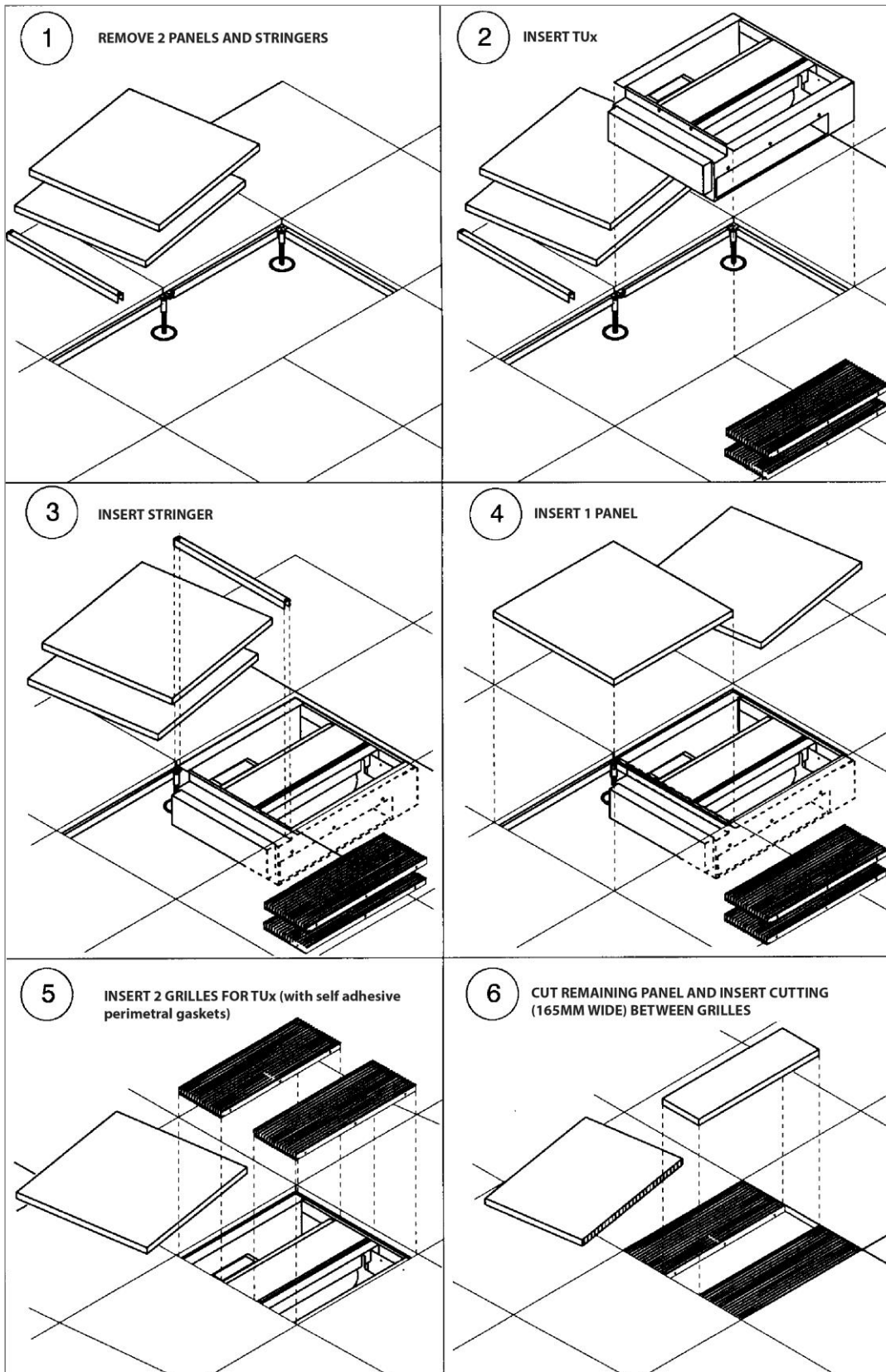
**Noise Power Level in dB – Lw:** Obtained from the above measurement (reference 1 pw).

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 TU4 in the space where the terminal will be installed.

**Indicative Noise Levels**

Work Condition	Air Flow m <sup>3</sup> /h	Lp dB(A)	Lw dB
<b>Air re-circulated from the ambient</b>	260	23	33
	385	30	40
	495	38	48
	545	41.2	51.2
<b>Air taken from underfloor with 0 Pa overpressure</b>	260	22.5	32.5
	385	28.5	38.5
	495	36.5	46.5
	545	40	50
<b>Air taken from underfloor with 20 Pa overpressure</b>	450	28.8	38.8
	555	31.5	41.5
	655	38	48
	700	40.8	50.8

### 3.4 Installation

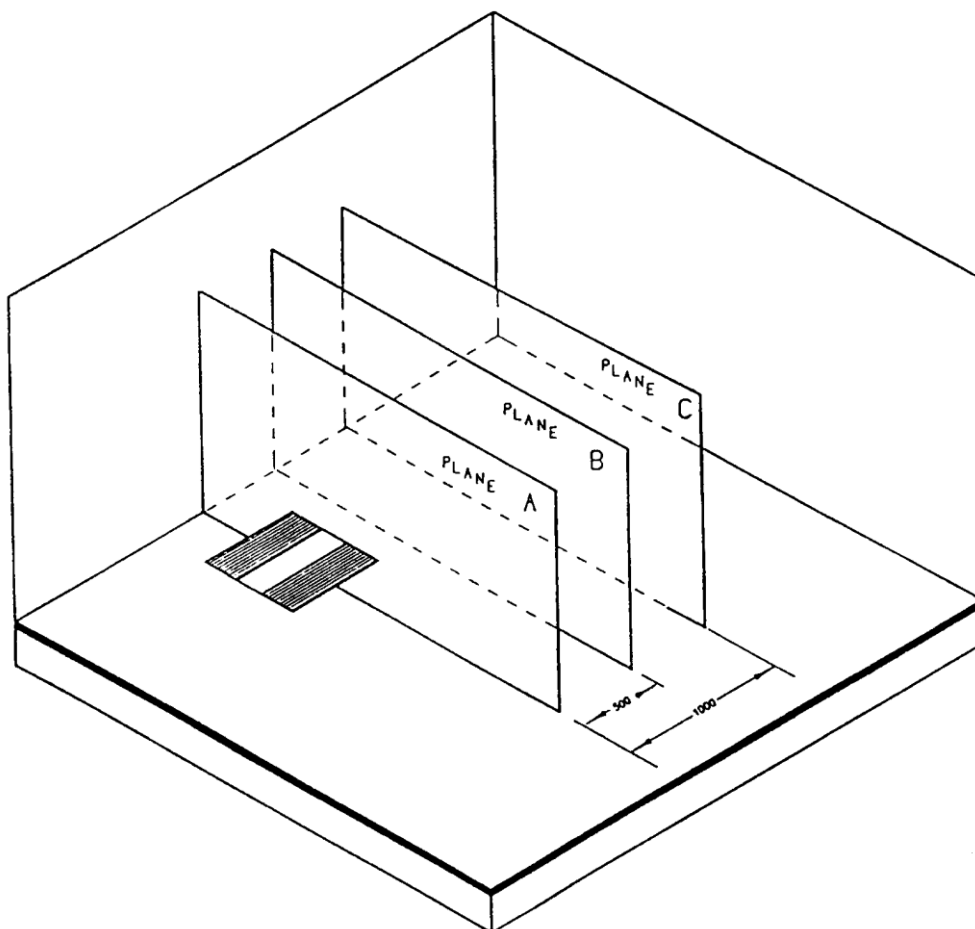


### 3.5 Air Distribution in the Space

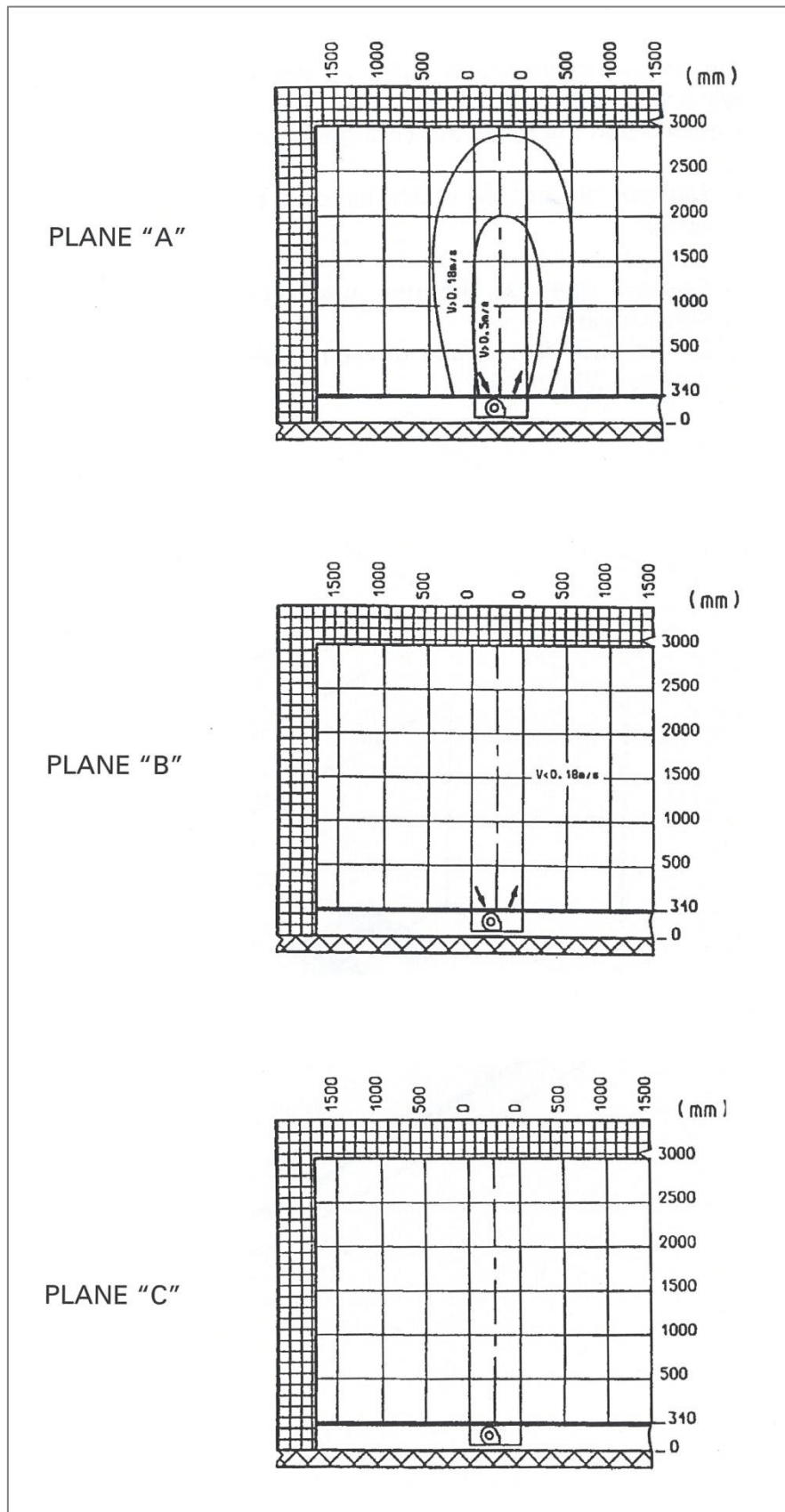
The following diagrams refer to the air velocity in the space where the TU4 is installed in the following configurations:

- Damper closed: air re-circulated in the space
- Damper open at differing under floor static pressure:
  1. 0 Pa underfloor static pressure (total air flow: 350 m<sup>3</sup>/h)
  2. 10 Pa underfloor static pressure (total air flow: 470 m<sup>3</sup>/h), the most frequent situation
  3. 20 Pa underfloor static pressure (total air flow: 525 m<sup>3</sup>/h)

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

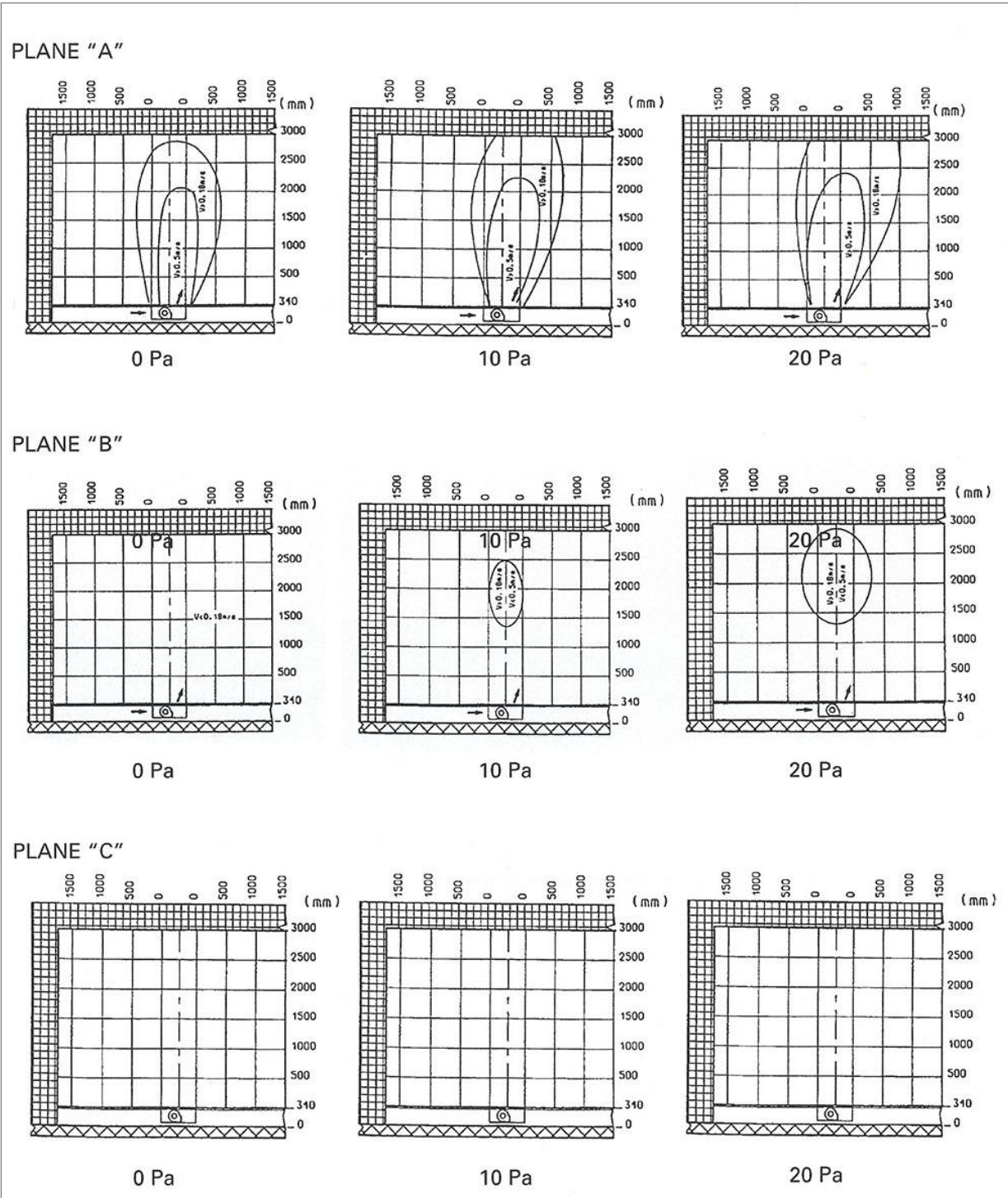


### 3.6 Air Velocity in the Space - Room Air Suction





### 3.7 Under Floor Air Suction



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