



# Flexible Space

Under Floor Air Conditioning

## FANTILE TUS-EC PRODUCT DESCRIPTION

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## Section One - Product Description

### 1.0 General

The Fantile TUS-EC 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 operations. The unit has been designed to operate in the range 0-10 Pa at normal fan speeds.

The TUS-EC comprises four sections:

- 1) Casing
- 2) Damper
- 3) Fan section
- 4) Controller (Fatronic) and electrical connection



### **1.1 Casing**

The TUS-EC casing is of steel sheet, finished in black powder coat. It features two aluminium grilles, both with straight fins (optional 20 degree oriented fins are available); one grille for the air supply and the other for the recirculation 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 TUS-EC are 600 x 600 x 150mm (below floor tile) and it occupies the space of one raised floor tile.

The face area of each grille is 215 x 599mm; its height can be adjusted from 30mm to 50mm to suit the surrounding floor finish. The under floor air inlet of the TUS-EC is positioned on the rear side of the terminal. A raised floor height of 180mm-200mm 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 TUS-EC 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 under floor 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 forward curved, single inlet centrifugal fans with integral EC motors, 230V AC 50-60Hz. The fan speed is controlled via a 0-10V signal from the Fatronic controller.

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 microprocessor controlled electronic 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 under floor temperature. By comparing these two readings with the chosen set point, the fatronic controls the opening or closing of the damper.

The following indications are available on the backlit LCD screen: room temperature, under floor 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 set point 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 TUS-EC is fitted with 4.6m-long 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.

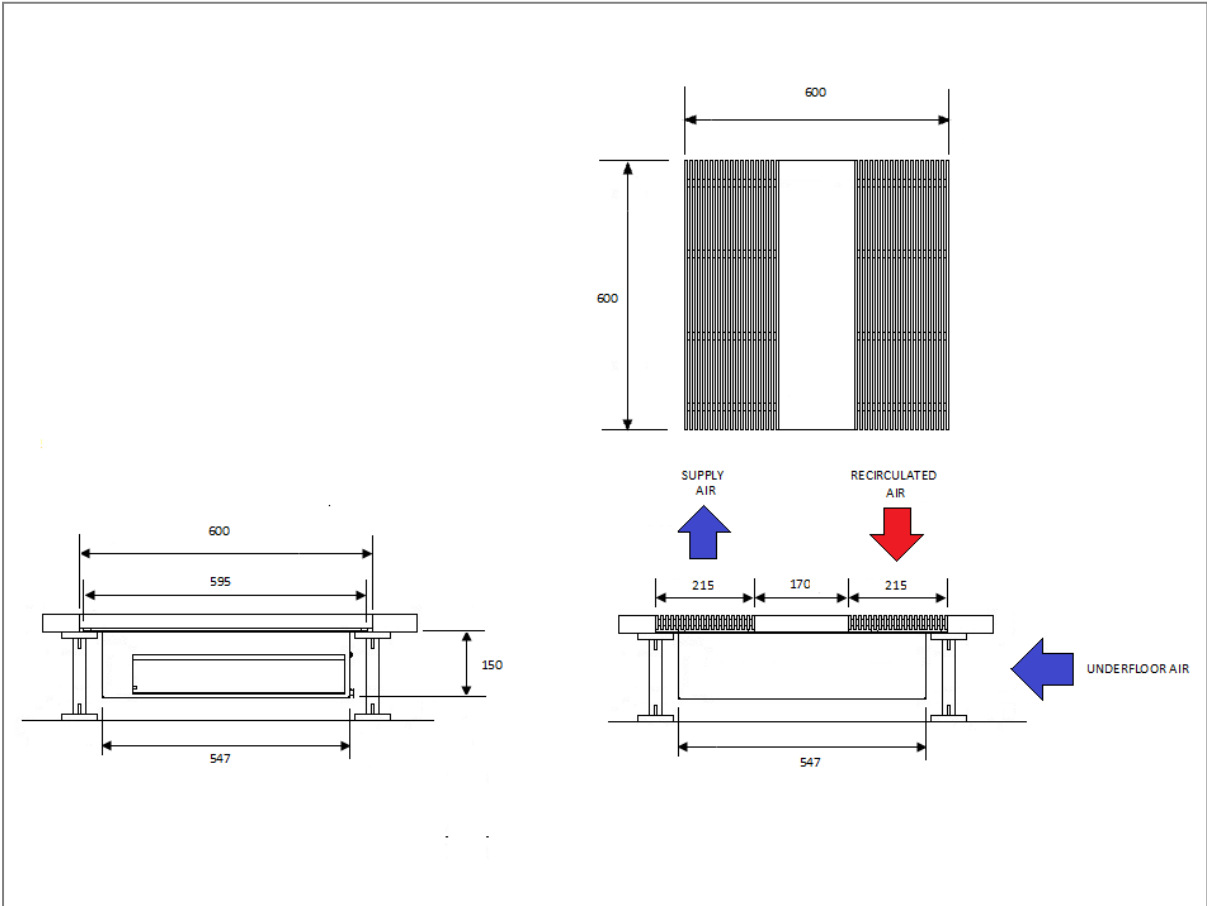
#### **1.6 Electric heater (optional)**

TUS-EC can be fitted with an optional 230V, 300W electric heater which operates at a low surface temperature. The heater is equipped with a manually resettable safety thermostat for the automatic cut-out in case of high temperatures.

#### **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 TUS-EC are performed by the electronic controller.



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

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



## 2.1 Temperature control

The room temperature, and the under floor 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 set point. When the under floor 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 under floor void. The damper is closed when the room temperature drops below the set point value. In heating mode, when there is under floor 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 set point value. When required, the electric heater will be activated.

## 2.2 Cooling/Heating Operation Changeover

The automatic changeover feature of the TUS-EC 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 under floor temperature can be shown on the display of the 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

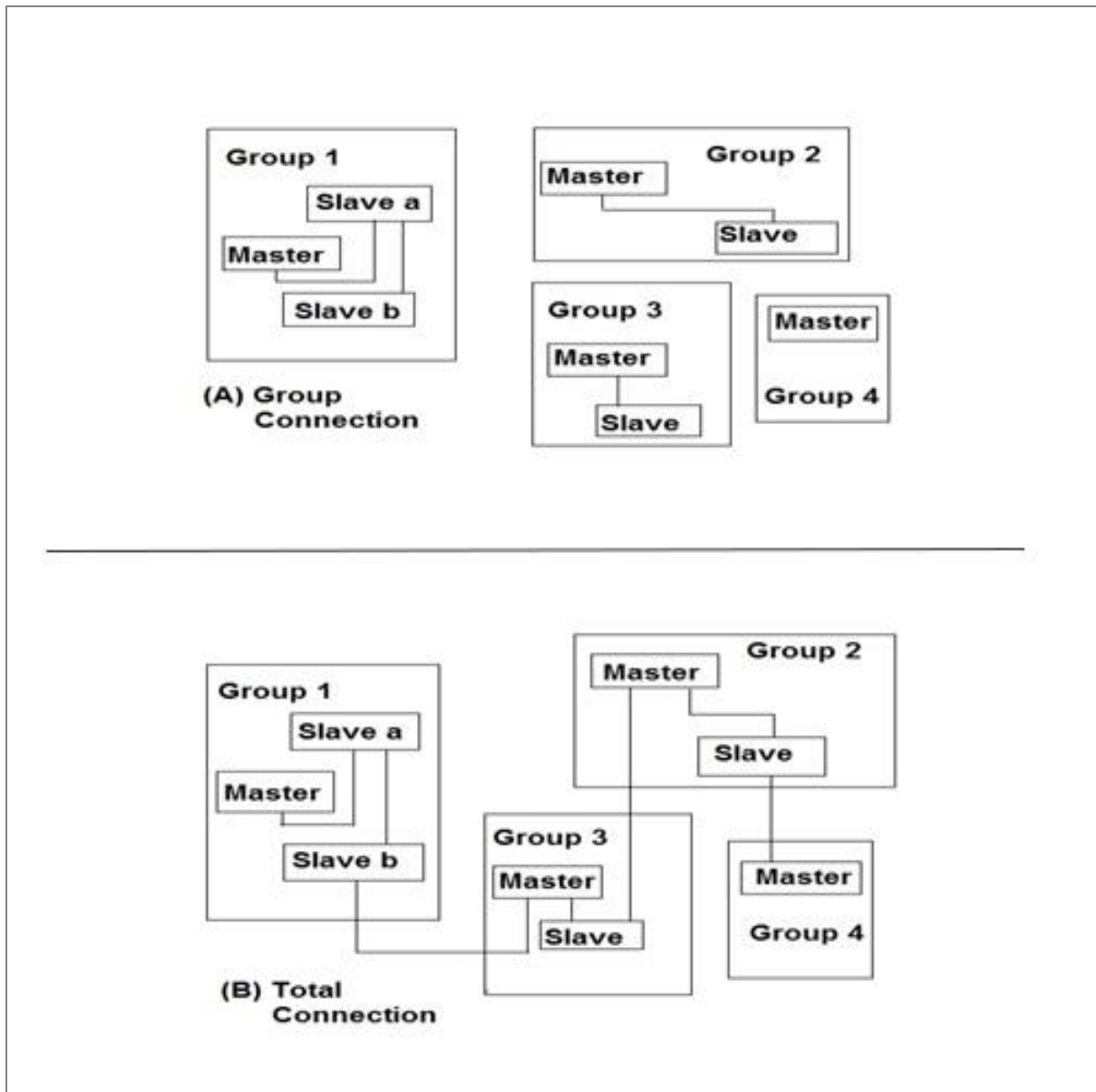
This function is possible only if the TUS-EC is connected by Flexbus cable to another TUS-EC. Connection is made with a flat 8-wire cable and relevant connector, plugged into the back of the electronic control. Each TUS-EC can be set up as a Master or a Slave, and settings are easily interchangeable.

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 effects and maximum energy efficiency operation.

Masters and Slaves are identified by programming each TUS-EC.



## 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 TUS-EC serving an entire zone can be obtained with a time switch on the main power supply to which the TUS-EC are connected, or with the Flexmatic control fitted in the CAM.

## 2.5 Regulation of set point

The temperature set point 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 min. to max. 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 set point and room temperature.

## 2.7 Electric heater delay

For maximum energy efficiency on start-up, the terminal electric reheat may be delayed to permit central zonal CAM units to take full charge of the heating input. It is possible to define, using the control unit, 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 groups start-up delays. 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.

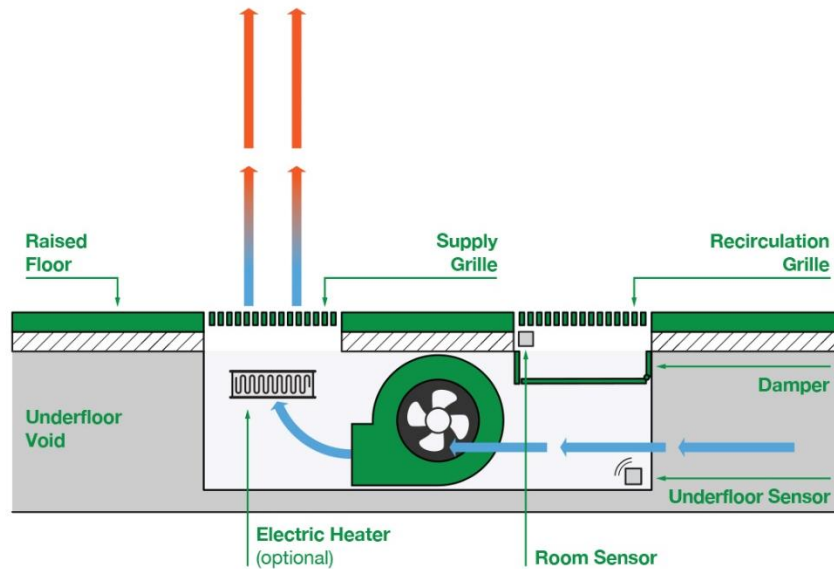
## Section Three - Technical Data

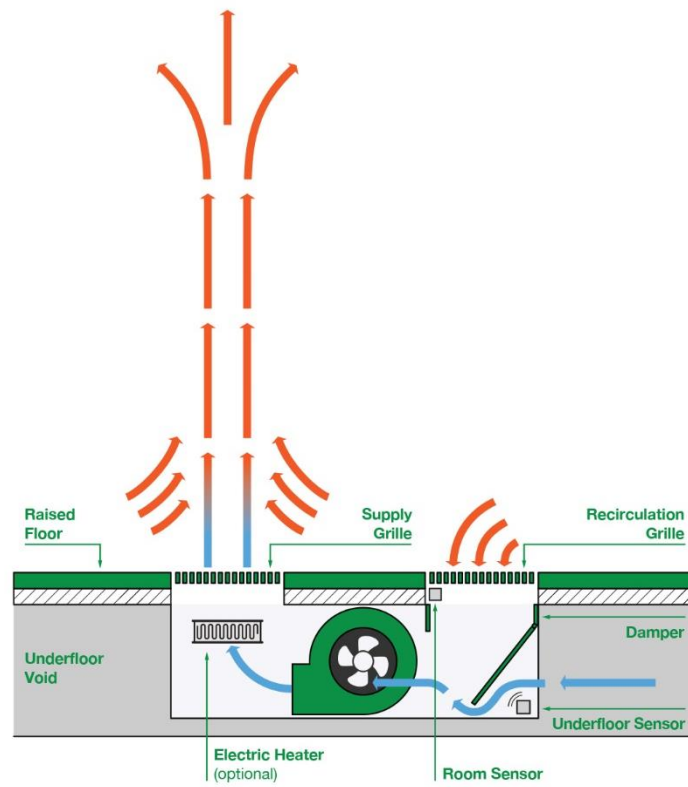
### 3.0 Air Flow Characteristics

The TUS-EC 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.

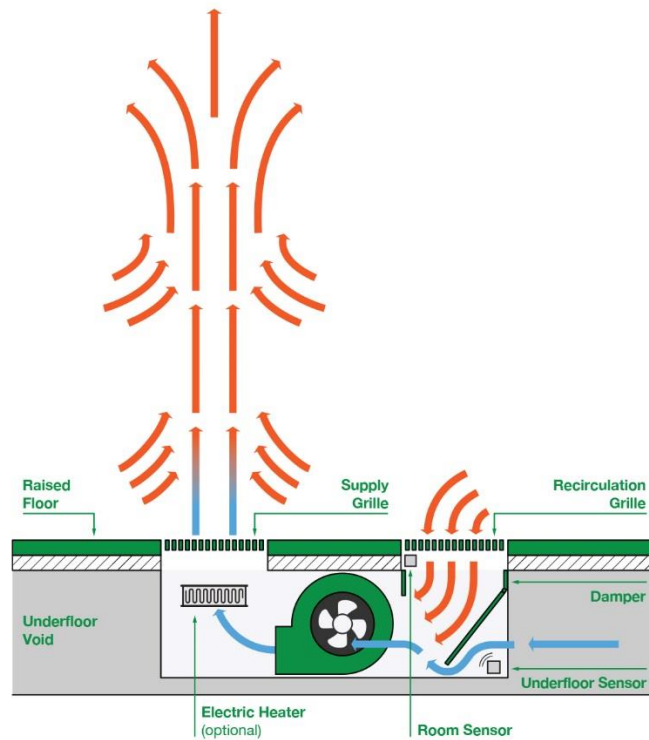
The sensor positioning guarantees that it is always subject to a stream of room air, to ensure that it senses the correct temperature. In the image below, the under floor air intake is indicated: it is the air drawn from under the floor.

#### Fantile Airflow – Cooling Mode





**Fantile Airflow – Cooling Mode - Recirculation**



### 3.1 Bypass Air Flow

A variable bypass is fitted on the TUS-EC which ensures a continuous bleed of the required quantity of fresh air even when the damper is closed.

The maximum bypass air flow could reach 100 m<sup>3</sup>/h, with 15-20 Pa under the floor. This is to be avoided to combat over cooling/heating when the damper is closed.

NOTE: 5% airflow reduction must be considered when the TUS-EC is fitted with the optional electric heater.

### 3.2 Noise Level

Indicative Sound Power Levels as tested by Sound Research Laboratory

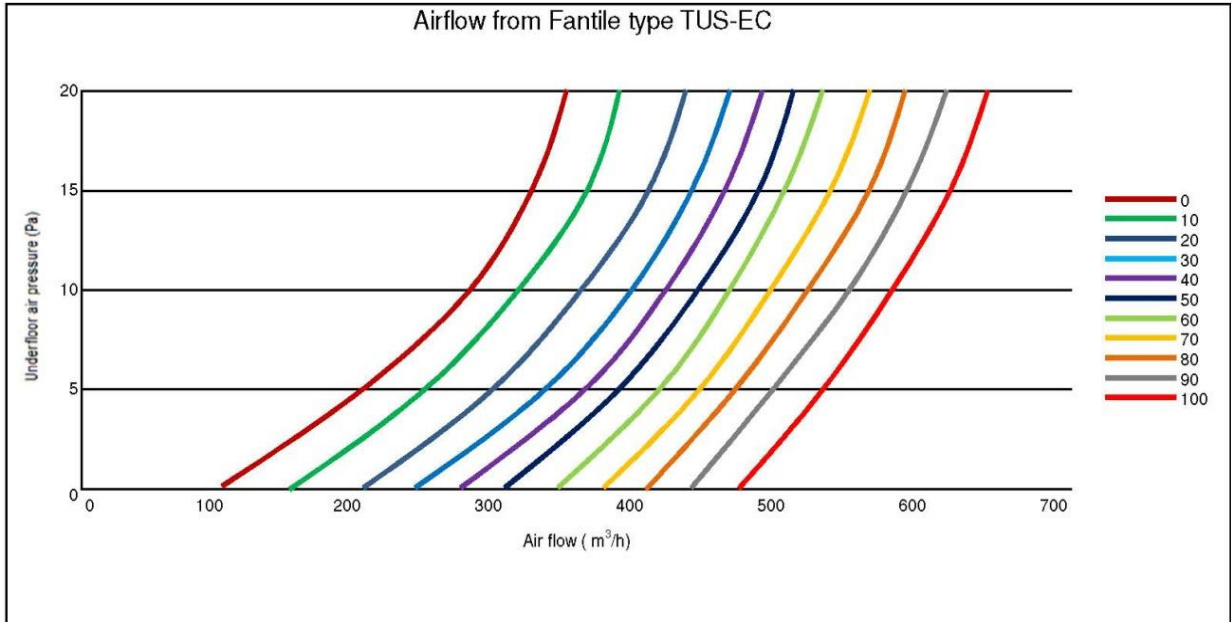
#### Sound Power Level dB re IpW

Inlet Pressure (Pa)	63	125	250	500	1000	2000	4000	A
0 Pa	47.1	48.5	54.4	54.4	52.8	47.2	38.9	56.3
5 Pa	52.0	45.5	49.7	50.8	48.7	41.1	31.7	52.0
10 Pa	50.9	42.8	42.8	42.1	36.7	27.6	20.7	38.6
15 Pa	50.8	41.1	43.9	46.3	37.2	27.6	20.8	44.8
20 Pa	50.8	43.4	45.9	49.6	37.6	27.8	20.8	47.0

**A = Overhead A-weighted sound power level Lw dB (A)**

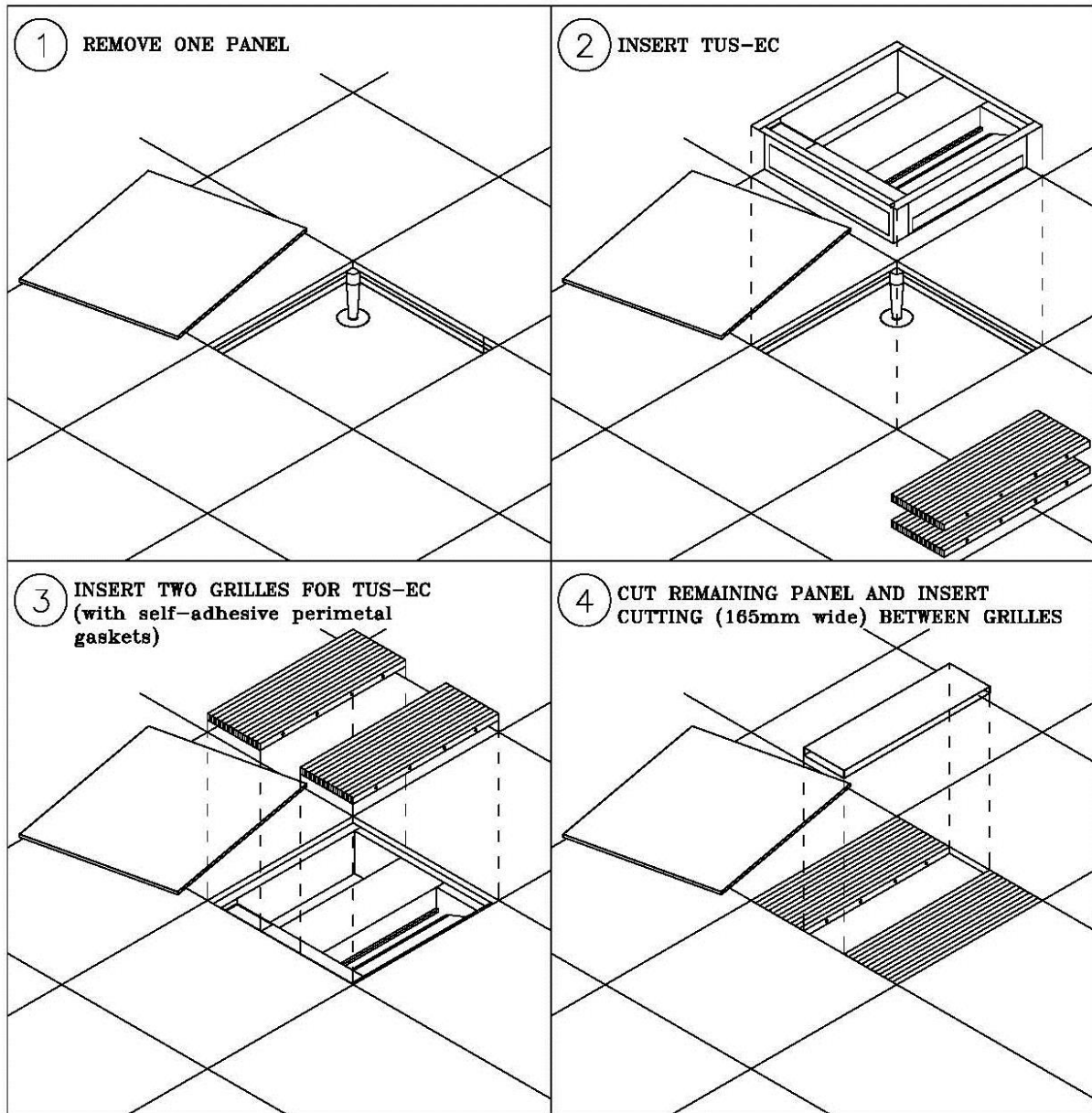
**Air Flow – 360m<sup>3</sup>/hr**

### 3.3 Airflow from Fantile TUS-EC (Indicative)





### 3.4 Installation



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