



## **FFU 127 B**

### **The ultimate Filter Fan Unit**

**PROClea S.R.L.**

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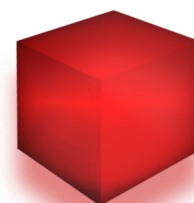
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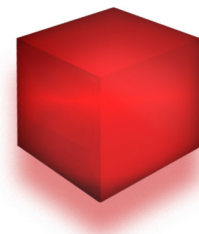
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## **1. THE INSTALLATION CONCEPT**

Filter fan units PROCLEA FFU127 series are designed to be installed in a standard PROCLEA SW10B grid.

Filter is replaceable from the cleanroom side without using special tools or particle generating systems.

When filter is removed, the ceiling grid supports FFU structure.

When the filter is on site, the filter frame supports the FFU structure and assures the air tightening between filter and blow module (See Annexe 1)

## **2. THE FLOW CONTROL AND ENERGY SAVING CONCEPT**

One of the most important features that a cleanroom filtration system requires is a uniform flow for all the installed filters.

Common FFU controls, including frequency or voltage controls, groups a certain number of FFU under a unique control device.

This means that flow control inside that filter group can be only an "average" control and the single filter situation (filter pressure loss, plenum turbulence or resistances etc.) can't be compensated.

PROCLEA choose a different way to assure a single point control.

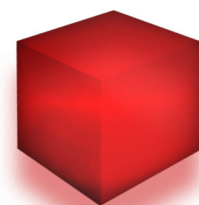
Fan is provided with an Electronic Commutation Motor (ECM).



Basis of this motor is a continuous current motor feed with a pulsed current generated by the built in electronic (PWM technology).

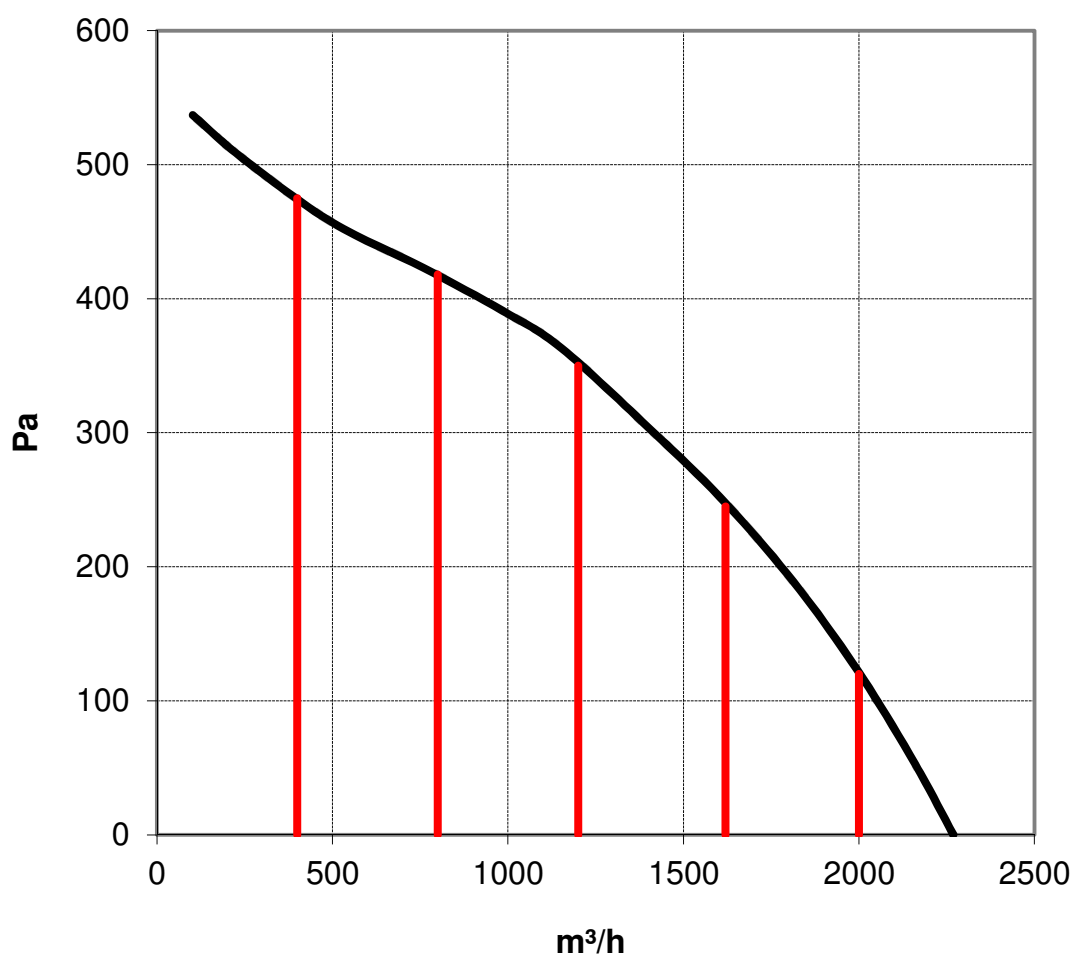
The motor is coupled to the fan and "knows" the fan characteristic (flow vs. pressure, torque etc.).

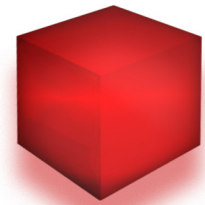
Knowing the characteristic means to be able, through a patented algorithm, to control the fan flow in any moment and to drive the fan, through a rotation speed change, to maintain a constant flow through the filter and then in the cleanroom (red lines in the following figure).



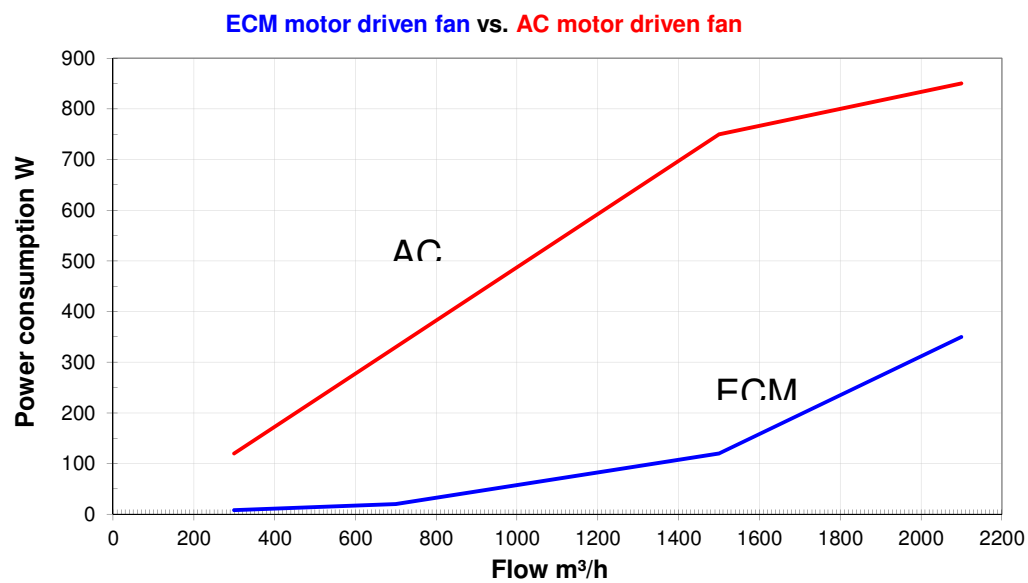
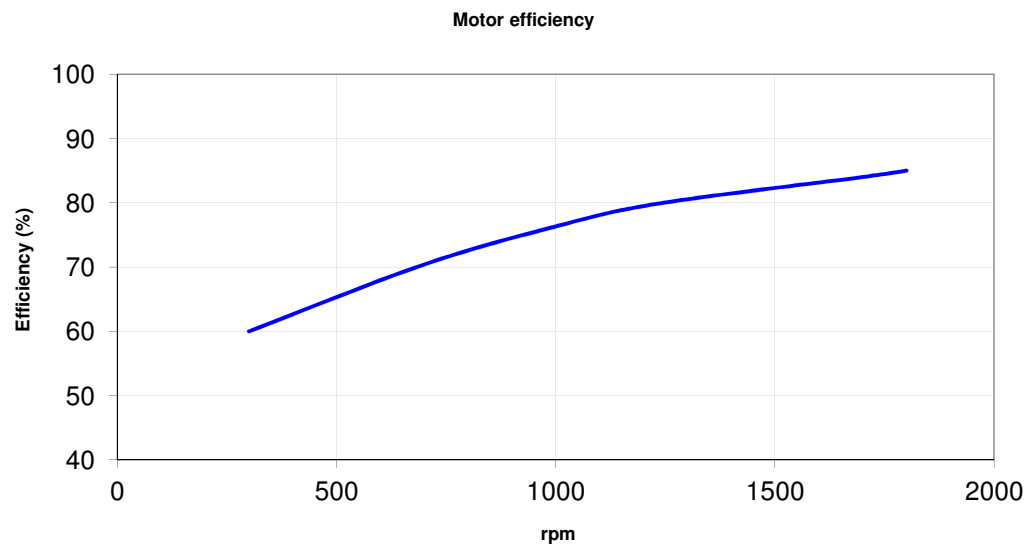
Built in electronic communicate with the external world through an on board secondary electronic (the control) under here described.

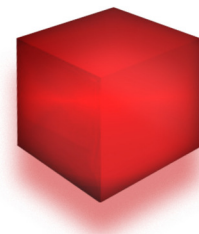
### DD 9-7 TH ECM2 1/2





Another great advantage of the ECM is the high efficiency: an ECM driven fan saves at least the 30% of energy vs. the same fan driven with an asynchronous motor as showed in the next figures.





### 3. GENERAL FEATURES

Every FFU type has got the following common features:

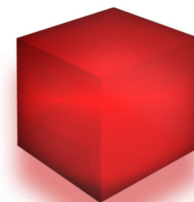
- STRUCTURE Aluminum sheet self supporting structure
- SURFACE FINISHING Roller coated polyester painting
- COLOR "Silver" gray
- FAN Centrifugal, double inlet
- MOTOR Electronic commutation
- POWER SUPPLY 230 V, 50Hz
- FILTER HEPA, ULPA or Goretex filter as per Purchaser requirement

### 4. STANDARD TYPE DATA

#### 4.1. 127bA and 127bAST

|                                    | 127bA                                                                                   | 127bAST              |
|------------------------------------|-----------------------------------------------------------------------------------------|----------------------|
| Installed filter size              | 1140 x 540 mm                                                                           | 1220 x 610 (48"x24") |
| Flow @ 0,45 m/s                    | 950 m³/h                                                                                | 1150 m³/h            |
| FFU dimensions                     | 1165x565x525 mm                                                                         | 1245x635x525 mm      |
| SW10b Grid size                    | 1200 x 600 mm                                                                           | 1280 x 670 mm        |
| Consumption                        | 280 W                                                                                   | 315 W                |
| Max total pressure                 | 380 Pa                                                                                  | 340 Pa               |
| Noise                              | 50 dbA                                                                                  | 51 dbA               |
| Fan performances (D2 control type) | Yellow field: suggested; Curves over 17 and under 9 have been omitted but are available |                      |

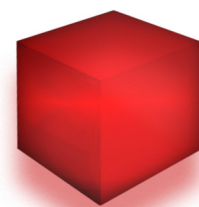
| AVAILABLE FLOW SETTINGS FOR D2 TYPE CONTROL 127bA and 127bAST FFUs |                      |             |                |            |                            |                       |                   |
|--------------------------------------------------------------------|----------------------|-------------|----------------|------------|----------------------------|-----------------------|-------------------|
| Curve nr.                                                          | Dip-switches setting | "High" Flow | "Average" Flow | "Low" Flow | Total pressure (High flow) | Power max (High flow) | I max (High Flow) |
|                                                                    | 1 to 5               | m³/h        | m³/h           | m³/h       | Pa                         | W                     | A                 |
| 31                                                                 | 11111                | 2000        | 1315           | 660        | 110                        | 500                   | 3,0               |
| 17                                                                 | 10001                | 1245        | 820            | 410        | 330                        | 325                   | 2,1               |
| 16                                                                 | 10000                | 1190        | 785            | 400        | 340                        | 315                   | 2,0               |
| 15                                                                 | 01111                | 1135        | 750            | 400        | 350                        | 305                   | 2,0               |
| 14                                                                 | 01110                | 1080        | 710            | 400        | 360                        | 300                   | 1,9               |
| 13                                                                 | 01101                | 1035        | 680            | 400        | 365                        | 290                   | 1,9               |
| 12                                                                 | 01100                | 980         | 645            | 400        | 370                        | 280                   | 1,8               |
| 11                                                                 | 01011                | 925         | 610            | 400        | 380                        | 270                   | 1,7               |
| 10                                                                 | 01010                | 870         | 575            | 400        | 385                        | 260                   | 1,7               |
| 9                                                                  | 01001                | 815         | 540            | 400        | 395                        | 255                   | 1,6               |
| 0                                                                  | 00000                | Soft stop   | Soft stop      | Soft stop  | -                          | -                     | -                 |



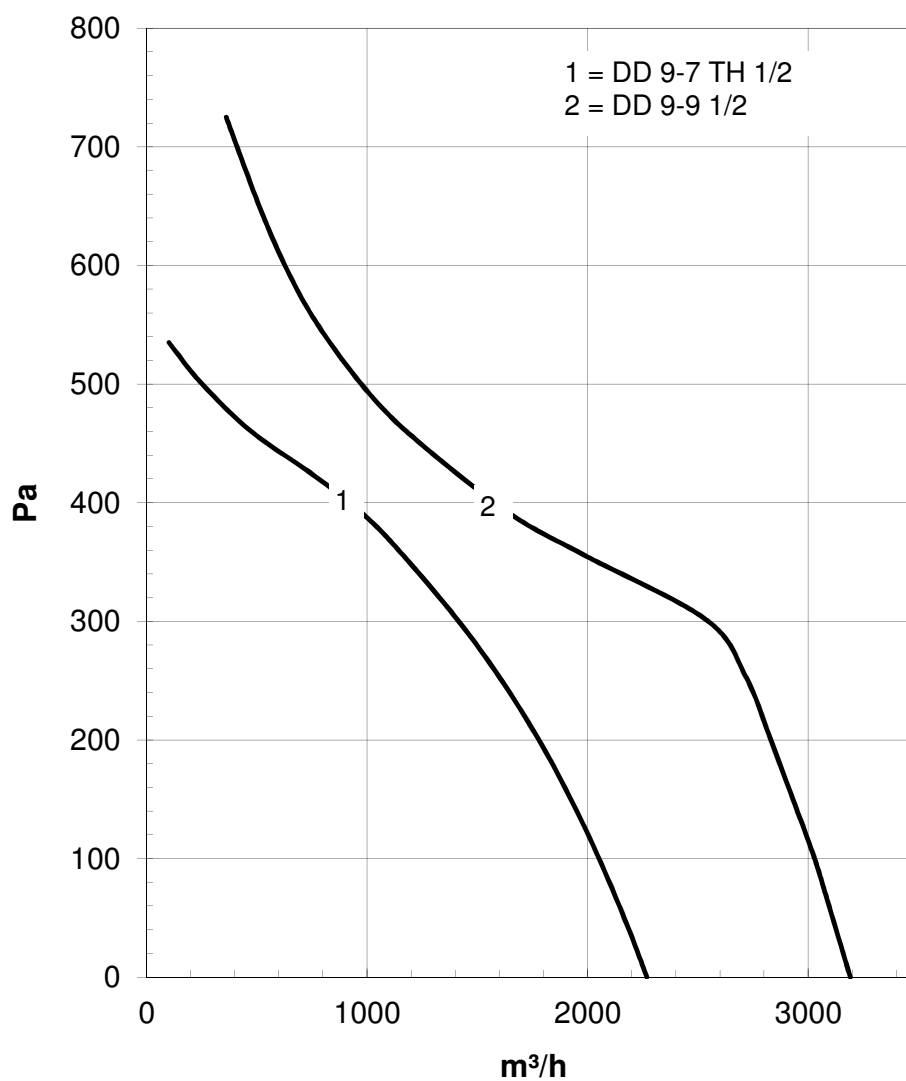
#### 4.2. 127bB and 127bBST

|                                    | 127bB                                                                                    | 127bBST               |
|------------------------------------|------------------------------------------------------------------------------------------|-----------------------|
| Installed filter size              | 1140 x 1140 mm                                                                           | 1220 x 1220 (48"x48") |
| Flow @ 0,45 m/s                    | 2050 m³/h                                                                                | 2300 m³/h             |
| FFU dimensions                     | 1165x1165x525 mm                                                                         | 1245x1245x525 mm      |
| SW10b Grid size                    | 1200 x 1200 mm                                                                           | 1280 x 1280 mm        |
| Consumption                        | 490 W                                                                                    | 535 W                 |
| Max total pressure                 | 355 Pa                                                                                   | 320 Pa                |
| Noise                              | 50 dbA                                                                                   | 51 dbA                |
| Fan performances (D2 control type) | Yellow field: suggested; Curves over 24 and under 19 have been omitted but are available |                       |

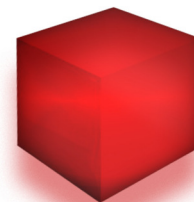
| AVAILABLE FLOW SETTINGS FOR D2 TYPE CONTROL 127bA and 127bAST FFUs |                      |             |                |            |                            |                       |                   |
|--------------------------------------------------------------------|----------------------|-------------|----------------|------------|----------------------------|-----------------------|-------------------|
| Curve nr.                                                          | Dip-switches setting | "High" Flow | "Average" Flow | "Low" Flow | Total pressure (High flow) | Power max (High flow) | I max (High Flow) |
|                                                                    | 1 to 5               | m³/h        | m³/h           | m³/h       | Pa                         | W                     | A                 |
| 31                                                                 | 11111                | 2900        | 1915           | 960        | 165                        | 550                   | 3,3               |
| 24                                                                 | 11000                | 2360        | 1560           | 780        | 320                        | 535                   | 3,3               |
| 23                                                                 | 10111                | 2285        | 1510           | 755        | 325                        | 530                   | 3,2               |
| 22                                                                 | 10110                | 2210        | 1460           | 730        | 335                        | 515                   | 3,2               |
| 21                                                                 | 10101                | 2130        | 1405           | 705        | 345                        | 500                   | 3,1               |
| 20                                                                 | 10100                | 2055        | 1355           | 680        | 350                        | 490                   | 3,0               |
| 19                                                                 | 10011                | 1980        | 1305           | 650        | 355                        | 480                   | 2,9               |
| 18                                                                 | 10010                | 1900        | 1255           | 630        | 365                        | 465                   | 2,9               |
| 1                                                                  | 00001                | 600         | 600            | 600        | 580                        | 315                   | 2,0               |
| 0                                                                  | 00000                | Soft stop   | Soft stop      | Soft stop  | -                          | -                     | -                 |



## 5. FAN CURVES







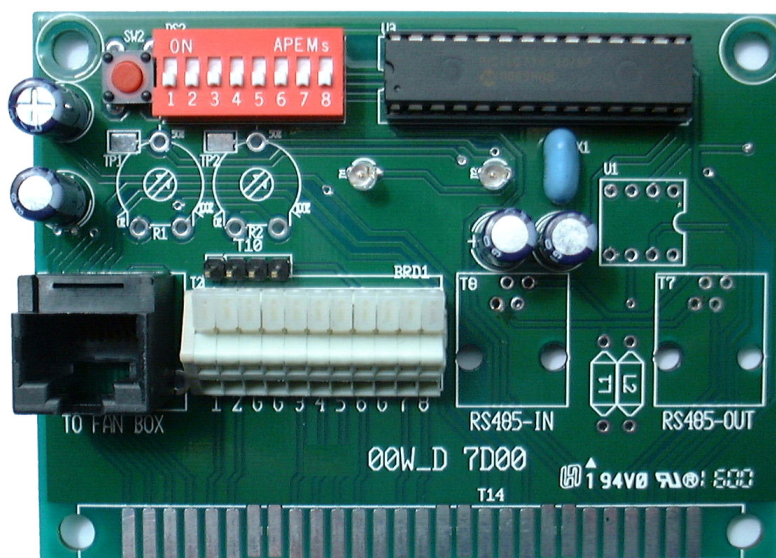
|                            |                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Feed:</b>               | 230 VAC (> 208 V < 240 V)                                                                                                                                                                                                                                                                                                                                                            |
| <b>Frequency</b>           | 50/60 Hz                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Grounding</b>           | Compulsory                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Electric protection</b> | Motor is self-protected against shaft locking and against the over range working point.<br>Motor will be protected against short circuits using an appropriate fuse.<br>Due to the current peak occurring each time power is supplied (not when the fan is stopped or started by the soft start / stop system) [140A 4 ms max], an appropriate curve D power switch must be provided |
| <b>Insulation</b>          | Thermal insulation class: B                                                                                                                                                                                                                                                                                                                                                          |
| <b>T° (working)</b>        | -10° to 55° C without condense                                                                                                                                                                                                                                                                                                                                                       |
| <b>CE approval</b>         | CE (55S9900028 – 80s9900159/i/e) e UL (#E100625)                                                                                                                                                                                                                                                                                                                                     |

### 6.3. D2 CONTROL TYPE

D2 type control permits a discrete choice (selection) of the flow feed by the fan.

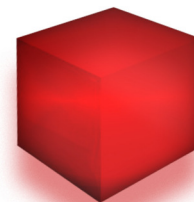
Selection occurs through an 8-digit dipswitch on the control boxboard.

#### 6.3.1.1. D2 control box

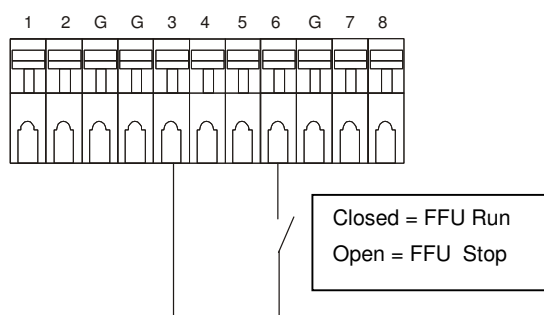


The d2 control box permits:

- the flow selection setting the red dip switches from 1 to 5 by the tables indicated in the "Standard Type data" section

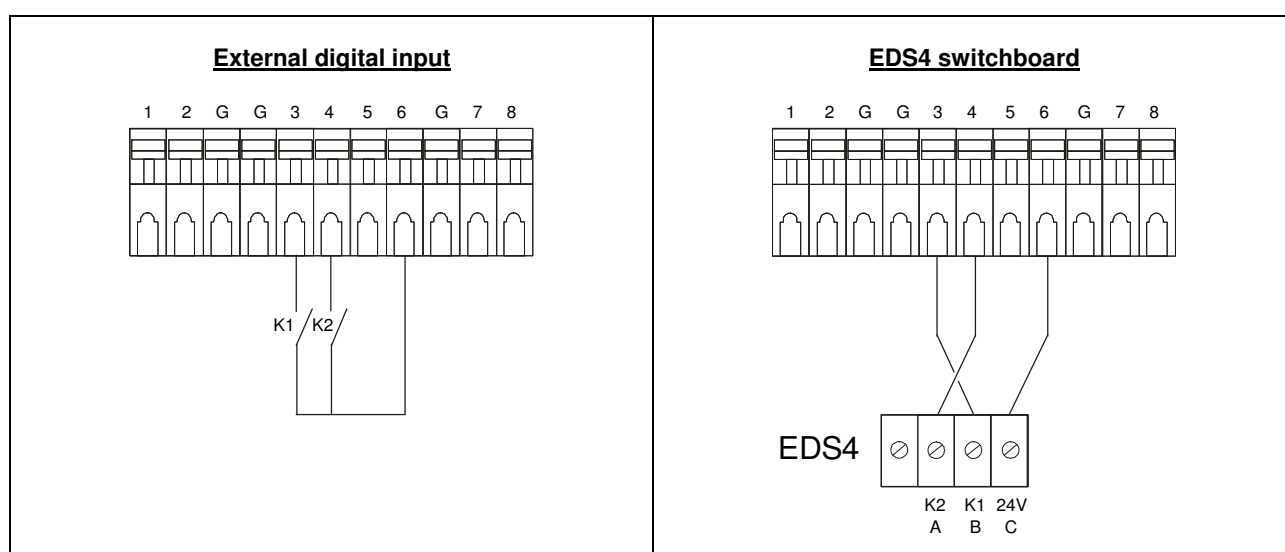


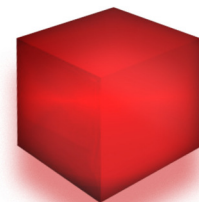
- the fan soft start - soft stop by mean of a digital (no voltage) input connected as under shown at the proper white terminals



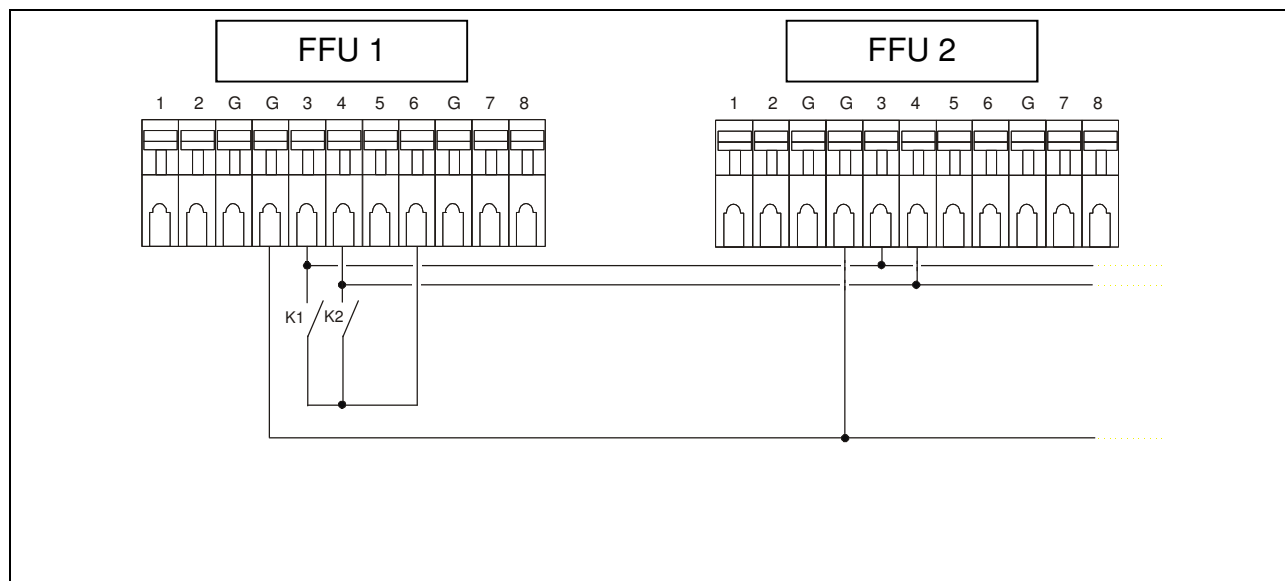
- the reduction of the set flow at 1/3 or 2/3 (for instance if an “empty room” mode is forecasted) by no voltage digital inputs

| To multiply the flow for | EDS4 | Digital inputs<br>K1 - K2 |
|--------------------------|------|---------------------------|
| 1,00                     | III  | Closed - Open             |
| 0,66                     | II   | Closed - Closed           |
| 0,33                     | I    | Open - Closed             |
| Soft stop                | O    | Open - Open               |



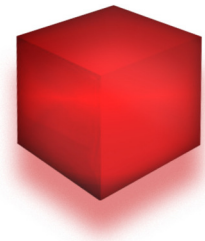


- The multiple FFU switch on switch off control (and / or flow reduction) with a single digital inputs set (max 20 FFU and max cable length of 100 m)



- The direct measurement of the actual flow and the actual pressure (pins G-7 for the flow and pins G-8 for the pressure): the output is a 0-5 V linear voltage directly proportional to the flow or the pressure
- The alarm revelation of:
  - high overpressure (HEPA/ULPA filter end-of-life) (digital output between G and 2 pins)
  - a fan trouble (digital output between G and 1 pins)
  - a communication or electronic trouble: the on board LED's flashes with the following frequency:

| Error Id | Error description                  | LED 1      | LED 2 |
|----------|------------------------------------|------------|-------|
| INIT3    | No motor rotation feed back signal | 5 x        | 1 x   |
| INIT4    | D2 board errors                    | 1, 2 o 3 x | 1 x   |



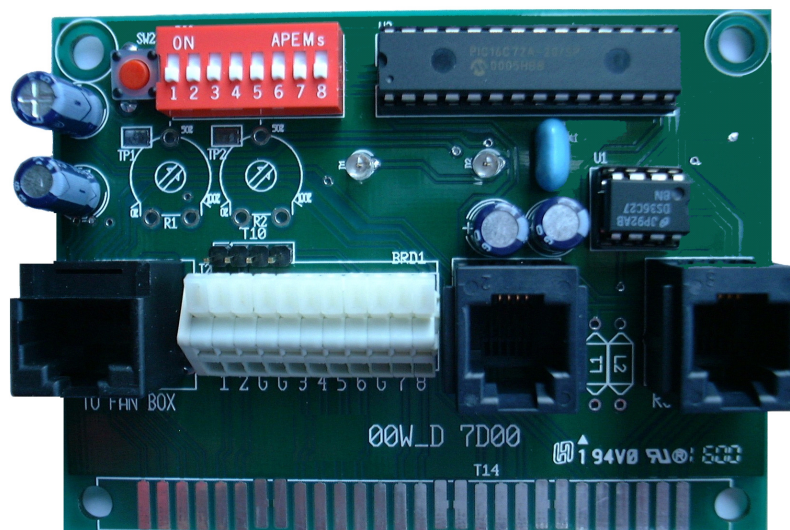
## 6.4. N2 CONTROL BOX

N2 control box permits:

- a continuous setting of the flow
- a complete control of the FFUs via a RS485 asynchronous serial lines up to 128 FFU for each serial line.
- the possibility to control up to 99 serial lines (it means a maximum of 12672 FFU controlled via 1 PC)
- a complete control of the actual parameters of the FFU : start, stop, actual flow, actual pressure, actual rpm, actual power consumption, using a Windows based PC and program supplied by PROCLEA and Customer configurable

### 6.4.1. THE N2 BOARD

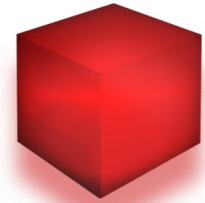
N2 board it's very similar to the D2 one:



The two RJ11 connectors on the right are used for the RS485 communication between the PC and the other FFUs.

#### 6.4.1.1. Wiring

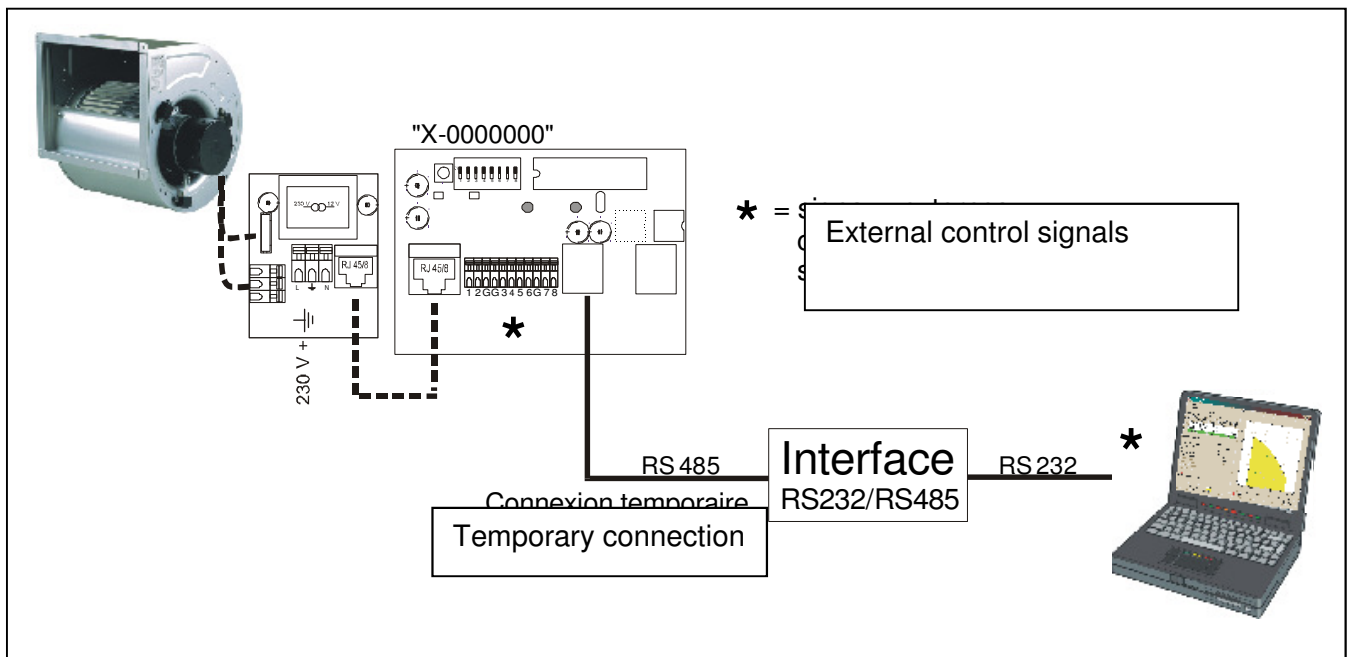
THE RJ11 connector will use the central left pin for A+ (TX/RX), the central right pin for B- (RX/TX) , and the right pin for grounding (or cable shielding)



#### 6.4.2. NETWORKING

N2 can be used in three different ways:

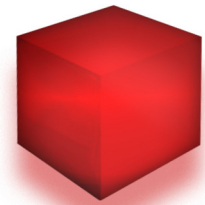
- stand alone configuration (SAC)



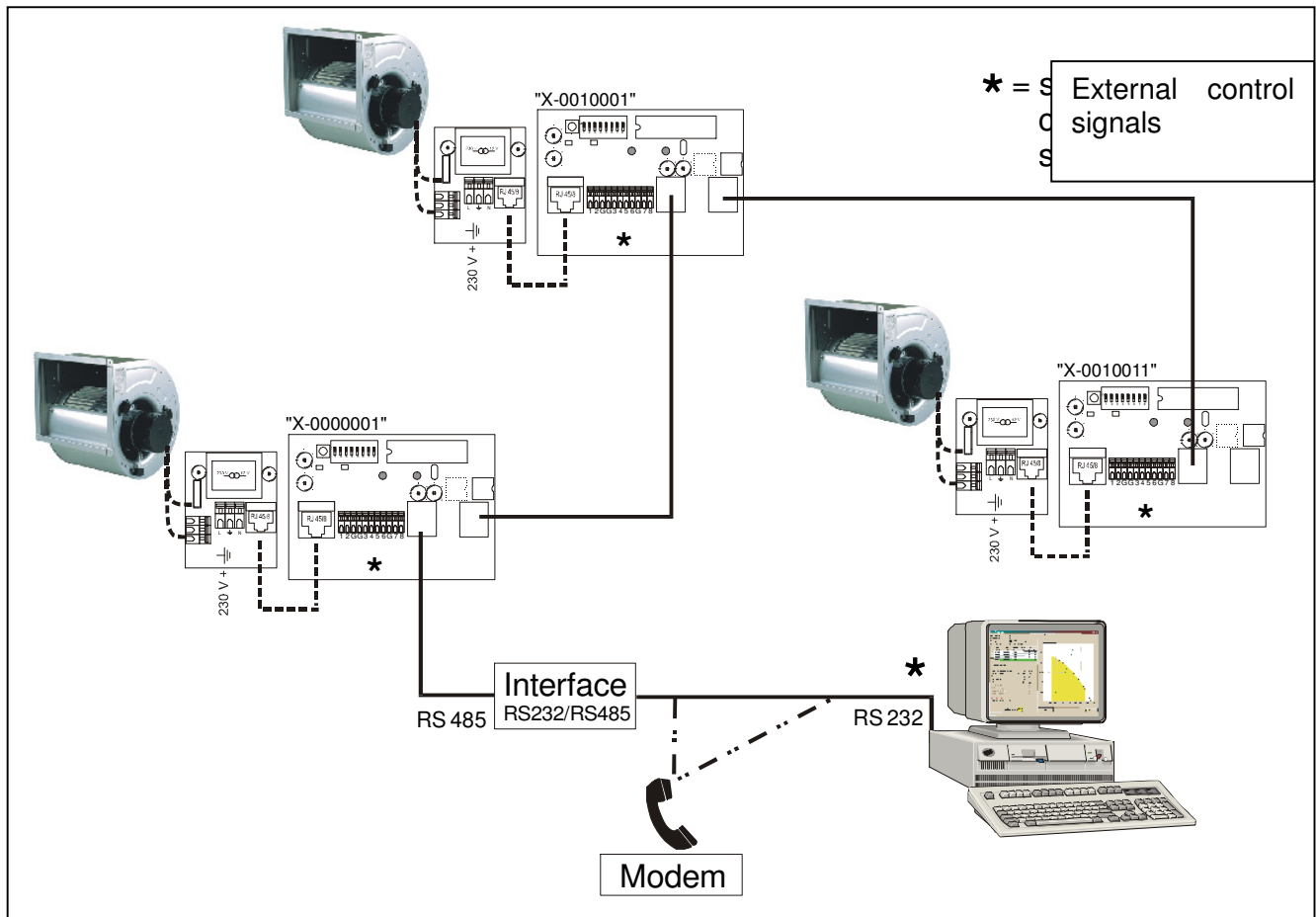
A single FFU can be addressed (every unit using a N2 control box MUST has got her own address X using the 1 to 8 red dip switches) and then locally set via a laptop.

After setting and / or check the laptop is disconnected and the FFU properly works with:

- the flow set gave by the laptop
- the soft stop / start gave by the external switches and all the other output features (flow signal, pressure signal, alarms) through the white pin board as described in the D2 control box paragraph.



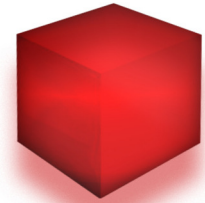
- Permanent network configuration (NC) or temporary network configuration (TNC)



Up to 128 FFU for each serial line can be connected using the networking system.

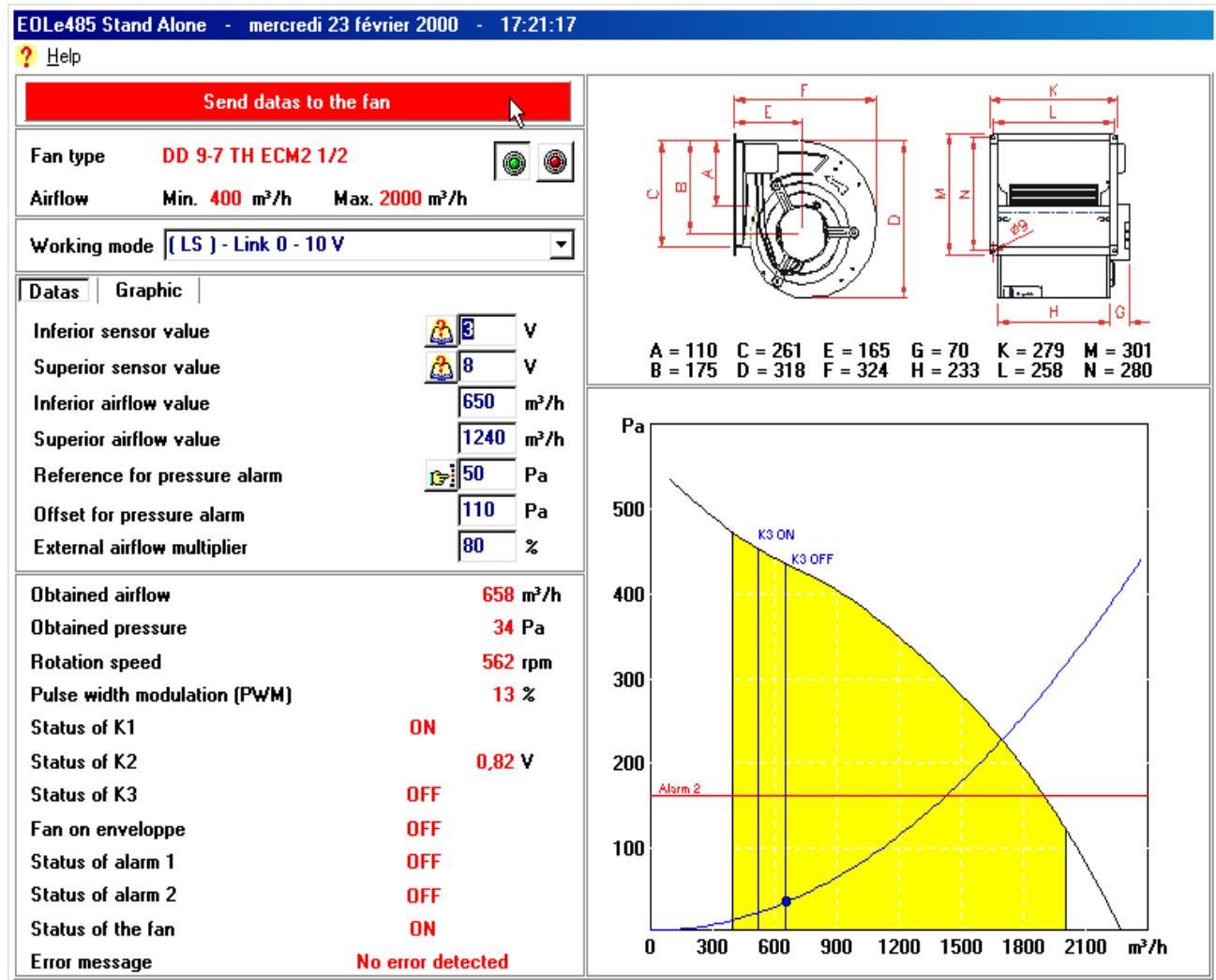
As per the stand-alone configuration, the PC, with the appropriate program, can be permanently or temporary connected at the RS485

In the same way, the same PC can manage, using an appropriate hub or a multi serial line Operating System Platform (as per Windows NT or Windows 2000), up to 99 serial lines



### 6.4.3. THE SOFTWARE

Here under there is a sample page of the standard control software:



Data are available in the simplest and friendly way.

Every addressed FFU can be started, stopped, set with a different flow and checked.

Every serial line can be activated or not by using a simple keyboard or mouse click.

Software isn't close: Customer can freely add or delete FFU as per cleanroom changes in every moment.

Special software can be developed under Customer request and communication protocols are available.