

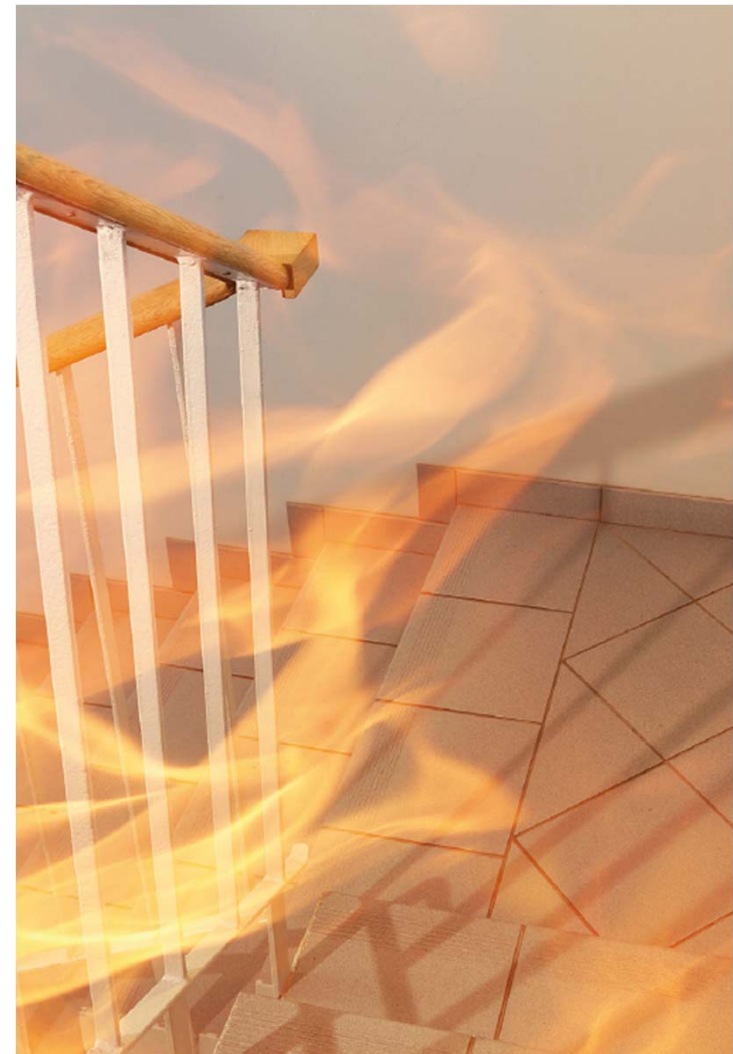
# PRESSURISATION OF ESCAPE ROUTES



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## PRESSURISATION OF ESCAPE ROUTES

1. EN 12101-6:2005
2. SPACES TO BE PRESSURISED
3. EN 12101-13:2022
4. EN 12101-6:2022
5. INTRODUCTION TO CALCULATION
6. CALCULATION USING QUICKFAN
7. DESIGN AIRFLOW
8. SYSTEM COMPONENTS
9. PRESSURISATION EQUIPMENT



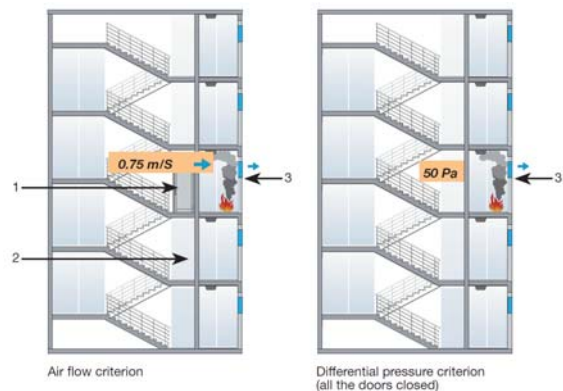
## **EN 12101-6:2005 Smoke and heat control systems - Part 6: Specification for pressure differential systems**



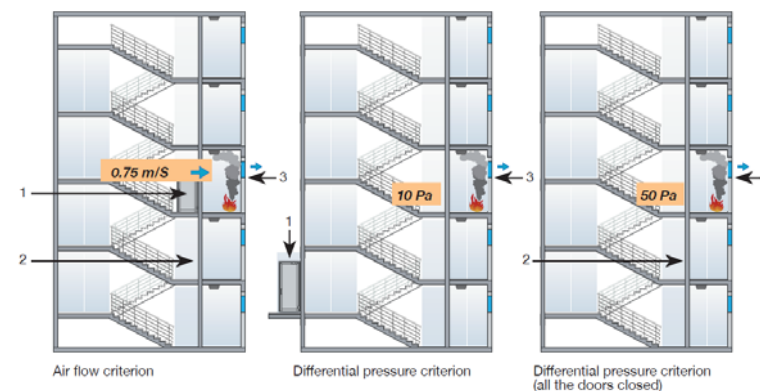
- 6 different systems, Classes A to F
- Depending on building use and associated risk level

## For means of escape

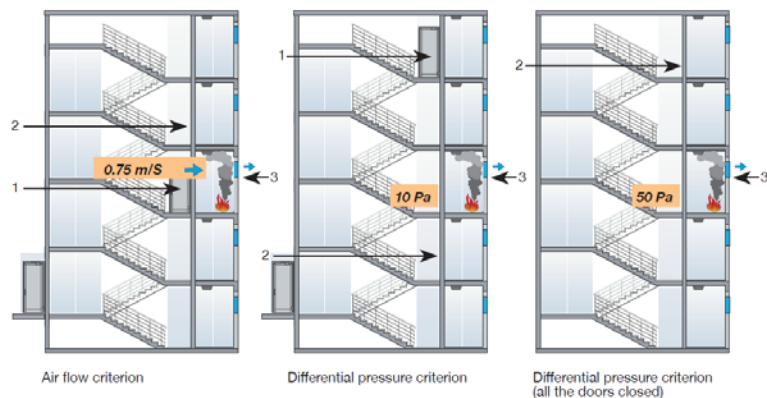
### Class A System: Defend in place



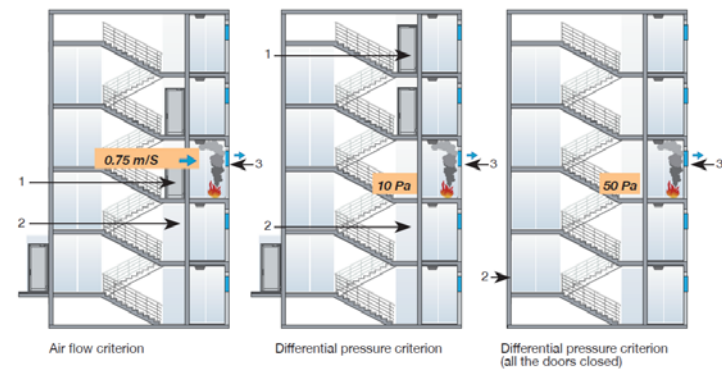
### Class C System: Simultaneous evacuation



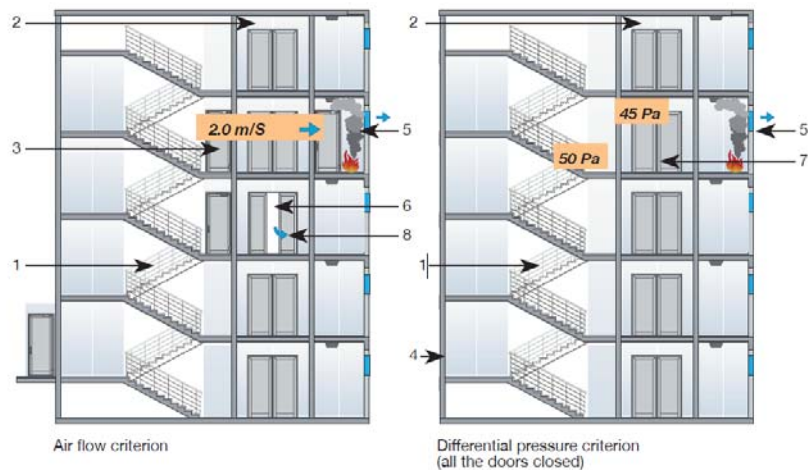
### Class D System: Sleeping risk



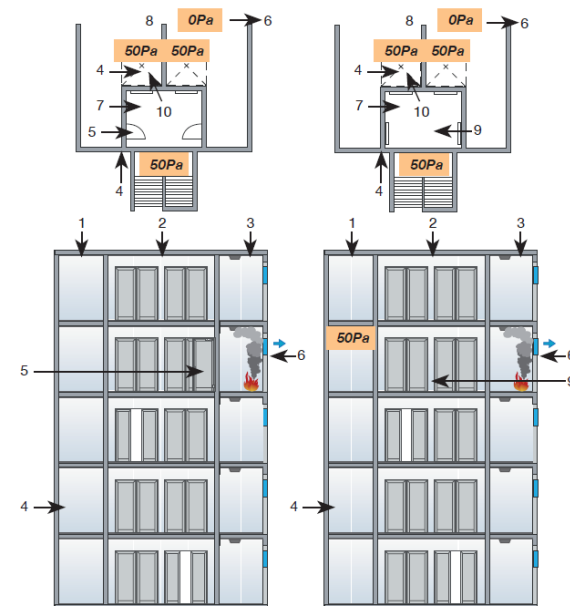
### Class E System: For means of escape phased evacuation



### Class B System: For means of escape and firefighting



### Class F System: For firefighting and means of escape

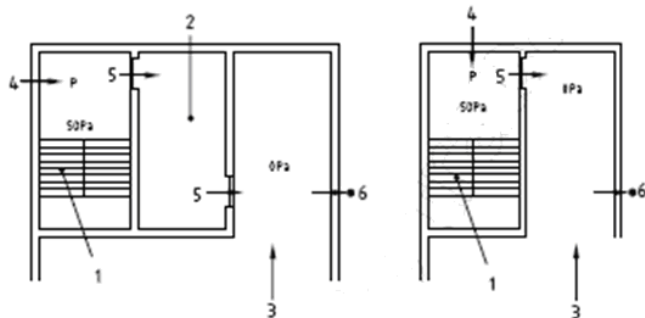


## AIRFLOW SUPPLY TO A STAIRCASE. COMPARISON

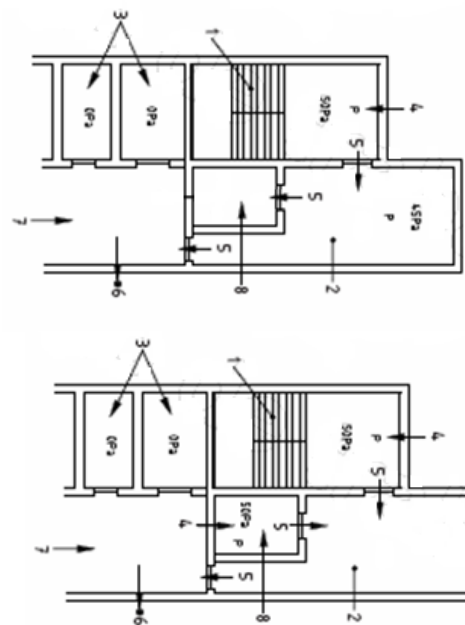
	Pressure difference criterion 50 Pa	Pressure difference criterion 10 Pa	Airflow criterion 0,75 m/s
CLASS A Defend in place	1,24 m <sup>3</sup> /s	-----	1,83 m <sup>3</sup> /s
CLASS C Simultaneous evacuation	1,24 m <sup>3</sup> /s	5,99 m <sup>3</sup> /s	1,83 m <sup>3</sup> /s
CLASS D Sleeping risk	1,24 m <sup>3</sup> /s	11,42 m <sup>3</sup> /s	7,51 m <sup>3</sup> /s

### Spaces to be pressurised

Only the stairwell



Stairwell and lobby



### Spaces to be pressurised

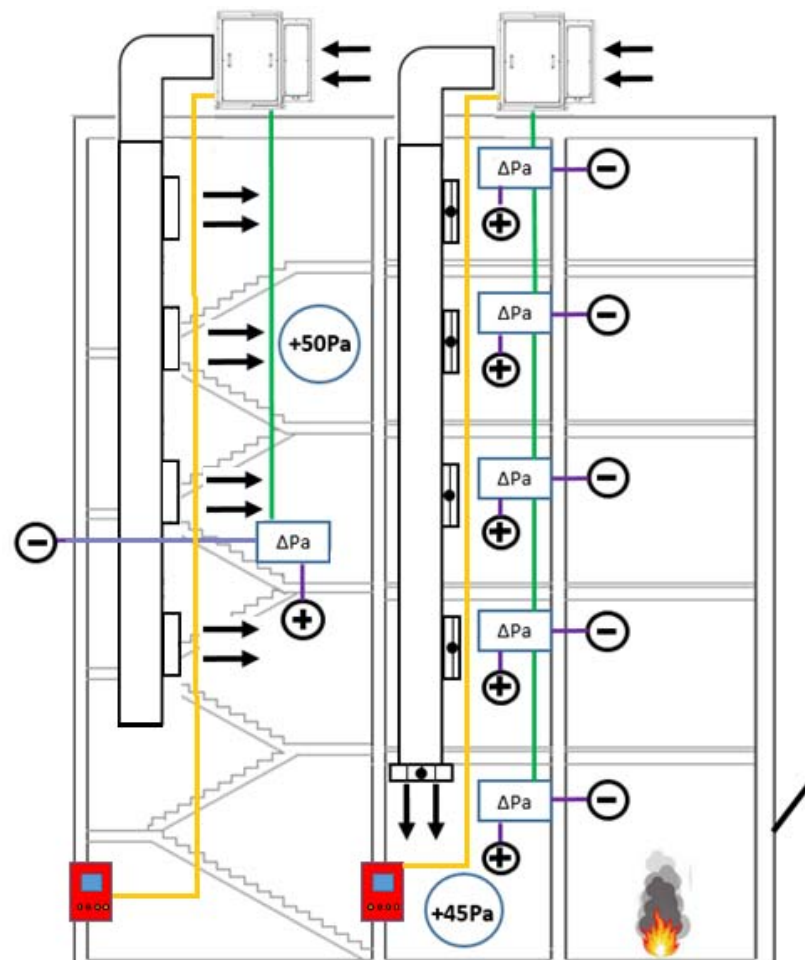
- a) Pressurising the stairwell and the lobbies of all stories at the same time.
- b) Pressurising the stairwell and only the lobby at the fire storey.



Pressure differential sensor MODBUS



PDS Lobby Control





## **EN 12101-13:2022 Smoke and heat control systems - Part 13: Specification for pressure differential systems**

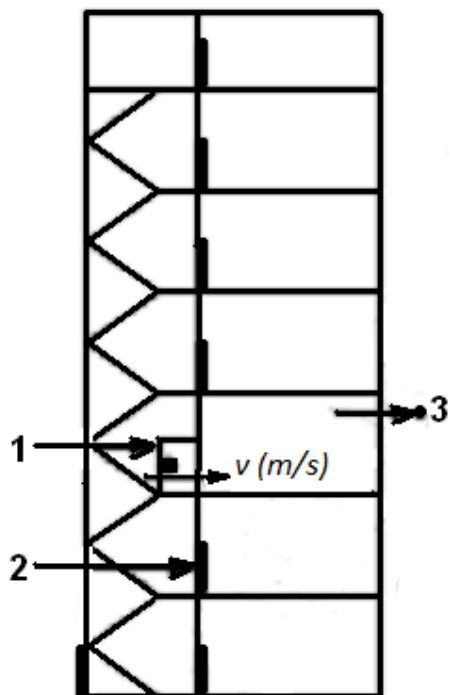


- 2 different systems, Classes 1 & 2

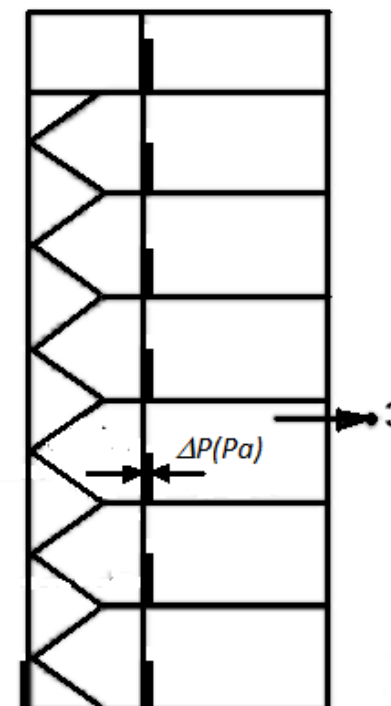
DESIGN: EN 12101-6:2005



pr EN 12101-13:2022



Parameter	Class 1	Class 2
Door opening force	≤ 100 N	
Pressure differential	≥ 30 Pa	
Airflow velocity	≥ 1 m/s	≥ 2 m/s
Initiation time	≤ 60 s	
Operation time	≤ 120 s	
Response time	≤ 5 s	

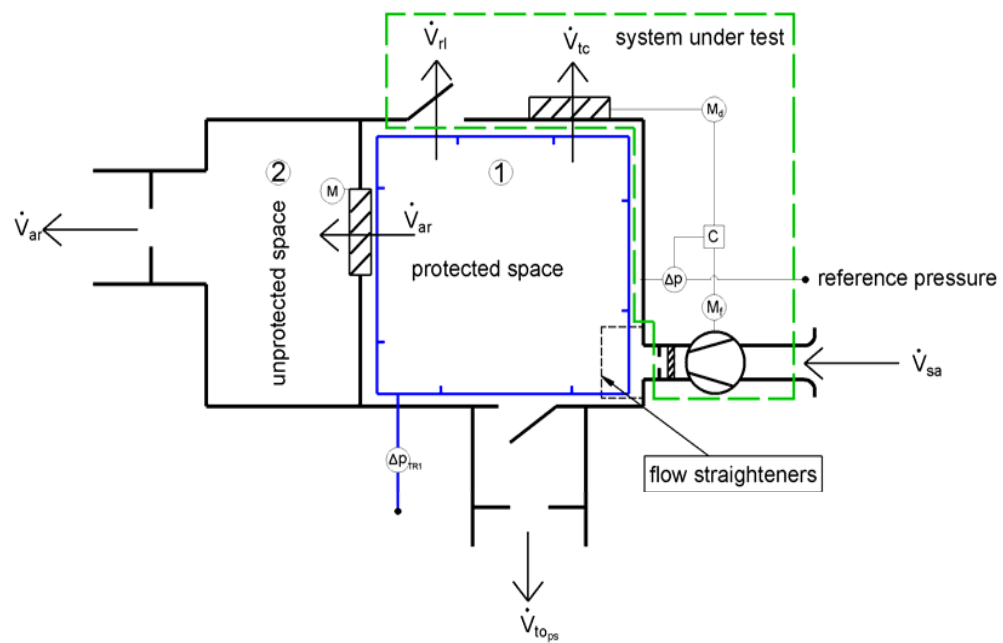


**EN 12101-6:2022 Smoke and heat control systems -  
Part 6: Specification for pressure differential systems**

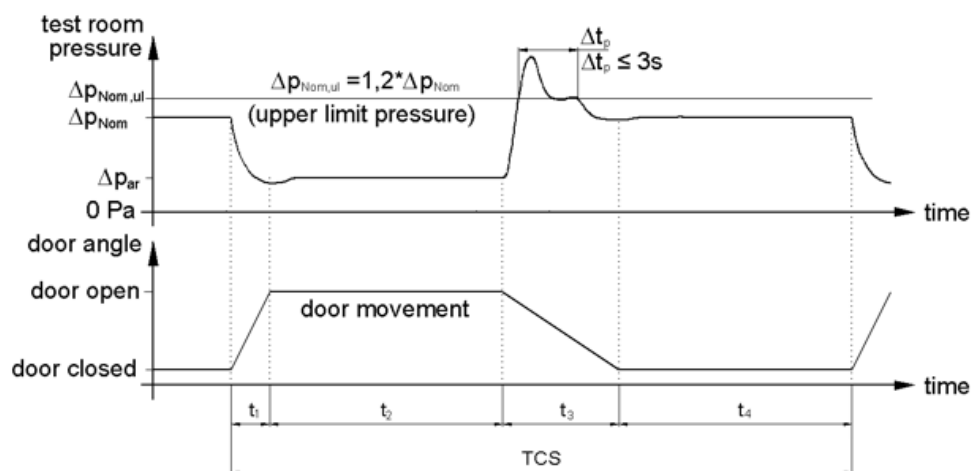


PRODUCTS: EN 12101-6:2005 ? pr EN 12101-6:2022

TESTING AND CERTIFICATION OF PRESSURE DIFFERENTIAL KITS



## Functionality test according to EN12101-6:2022

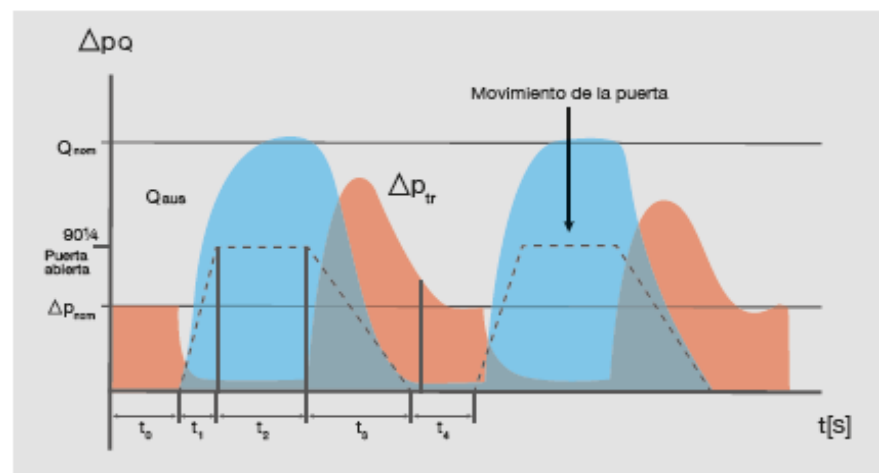


The test cycle sequence consists of:

$t_1$	1s (+/- 0.1s)	door opening time
$t_2$	6s (+ 0.5s)	waiting time with open door to establish volumetric flow $\dot{V}_{er}$
$t_3$	3s (+/- 0.1s)	door closing time
$t_4$	6s (+ 0.5s)	waiting time with closed door to control pressure $\Delta p_{nom}$

### 5.4.1.2 Functionality test (Fu)

In the functionality test (Fu) the test cycle sequence is run 20 times.



- SODECA developed the control based in the future requirements at the standards in Europe.
- Fast response to the caothic situations and the changes in the situation of the doors (open/closed)



### **DESIGN AIRFLOW**

Basic concept: Air flows from higher pressure zones to lower pressure zones through any opening: open doors, gaps around closed doors, lift doors, construction cracks in walls, floors, etc

Design airflow for closed door scenario and open door scenario must be calculated, using the greater for the fan selection.

#### **Closed door scenario airflow**

Calculate the total airflow required with all the doors closed, plus a factor of 50% for unknown leakages and plus an allowance of 15 % for ductwork losses.

#### **Open door scenario airflow**

Identify which doors are open referring to the classes of systems. Calculate the total airflow required with these doors open, plus an allowance of 15 % for ductwork losses.



## 6. CALCULATION USING QUICKFAN

The screenshot displays the SODECA product catalogue interface. On the left is a navigation sidebar with the SODECA logo and menu items: Datasheets, Catalogue, Selection, Compare, Projects, Tools (highlighted with a red arrow), Options, and Help. The main content area is titled 'Catalogue' and features a search bar and language/unit settings (English, m³/h, Pa). The catalogue is organized into three main sections:

- Basic Pressurisation Systems:** Includes KIT SOBREPRESIÓN, KIT BOXPRES PLUS, PRESSKIT, BOXPRES PLUS, and BOXPRES PLUS II.
- Advanced Pressurisation Systems:** Includes KIT BOXSMART, KIT BOXSMART EC, KIT BOXSMART FLAP, BOXSMART, and BOXSMART II.
- Full Range Pressurisation Systems:** Includes KIT BOXPDS, KIT BOXPDS II, and HATCH PDS.

A sidebar on the left lists various fan types and applications, such as Hatch Fans, In-line Duct Fans, Axial Fans, Centrifugal Fans, Smoke Extract Fans, Pressurisation Systems for Staircases, Lobbies and Escape Routes, Explosive Atmospheres ATEX fans, Fans for Ovens, Fans for Industrial Applications, Roof Fans, EC Technology and Efficient Fans, Air Treatment Units, Ventilation for Houses, Air Curtains, and Accessories.



## 6. CALCULATION USING QUICKFAN

The screenshot shows the SODECA Tools interface. A red arrow points to the 'Stairwell Pressurization (EN 12101-6:2006)' tool. The interface includes a sidebar with navigation options and a main grid of tool cards.

Tool Name	Icon Description
Pressure Drop	Microphone icon
Premises according to RITE	3D building model with RITE label
<b>Stairwell Pressurization (EN 12101-6:2006)</b>	<b>3D staircase model</b>
Smoke Evacuation (UNE-23585:2017)	3D smoke extraction unit
Acoustics Calculator	dB dB(A) bar chart
Unit Converter	Conversion unit icons (kg, m, ft)
Facilities/Premises in general	3D industrial facility model
Kitchen Hoods (UNE-100165:2004)	3D kitchen hood model
Farms	3D farm structure model
Exhaust Fumes Extraction	3D exhaust extraction unit
Sawdust Extraction	3D sawdust extraction unit
Frontal Painting Booths	3D painting booth model
Suction Boards	3D suction board model
Drum Filling	3D drum filling model
Barrels and Cisterns	3D barrel/cistern model

Navigation sidebar (left):

- Datasheets
- Catalogue
- Selection
- Compare
- Projects
- Tools**
- Options
- Help

Top right: English, m<sup>3</sup>/h, Pa, search, home icons.

Right side: No navigation links available





## 6. CALCULATION USING QUICKFAN

### Stairwell Pressurization (EN 12101-6:2006)

[Add to project](#) [Create Report](#)

STAIRWELL PRESSURIZATION

#### STAIRWELL - LOBBY

Door connecting stairway-lobby  
Single

#### LOBBY

Number of single doors opening into lobby  
1

Number of single doors opening out of the lobby  
1

Number of double doors  
0

Number of elevator doors  
2

Number of air transfer grilles  
0

#### With pressurized lobby

Lobby length (m)  
5

Lobby width (m)  
5

Lobby height (m)  
3

Lobby pressurization (Pa)  
45

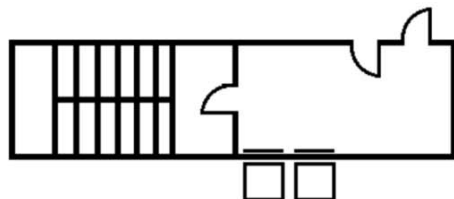
#### Total of all open doors

Surface (m<sup>2</sup>)  
2.2

#### Total of all open doors

Surface (m<sup>2</sup>)  
2.2

Surface (m<sup>2</sup>)  
0

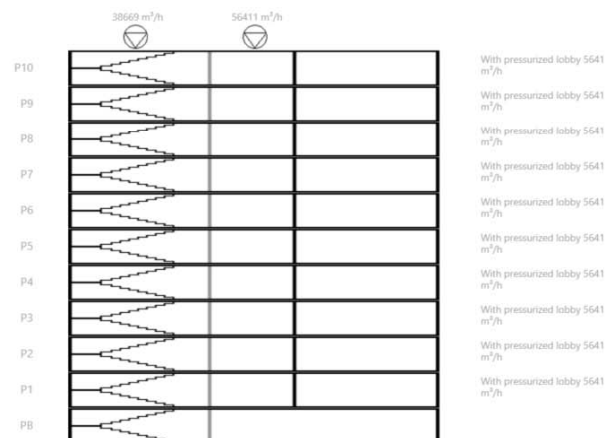


#### Results [To Selection](#)

Calculated flowrate

- Flowrate by pressure difference (50 Pa) considering closed door (m<sup>3</sup>/h) 5752
- Flowrate by airflow criteria (0.75 m/s) considering open door (m<sup>3</sup>/h) 29625
- Flowrate by pressure difference (10 Pa) considering open door (m<sup>3</sup>/h) 38669

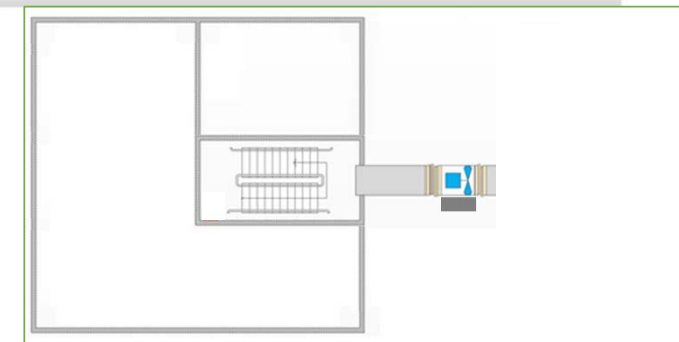
#### Overview



### PRESSURE CONTROL

To control the differential pressure in the pressurised areas, one of the following methods should be used:

- Dampers opening to the outside, to vent excess airflow (the airflow rate of the fan remains steady )
- Dampers in ducts, to create a by-pass.
- Inverter to control the fan speed, to maintain a setpoint of 50 Pa via signal from a pressure sensor.



System components:

- Supply Fan
- Variable Frequency Drive
- Differential Pressure Sensor



Situation	Pressure	Fan speed	Airflow
Doors closed	50 Pa	Modulated	Modulated
Door open	Resulting	50 Hz	Maximum

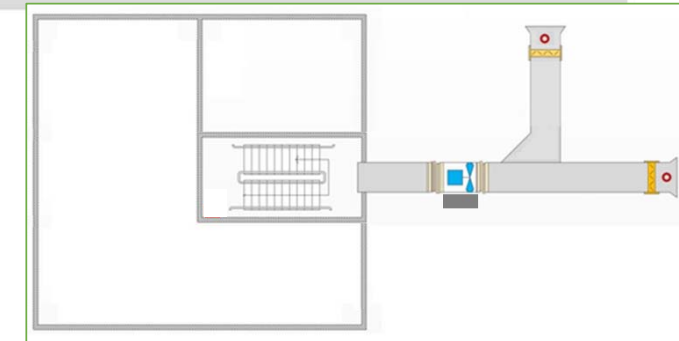




## 7. SYSTEM COMPONENTS

### AIR INTAKE

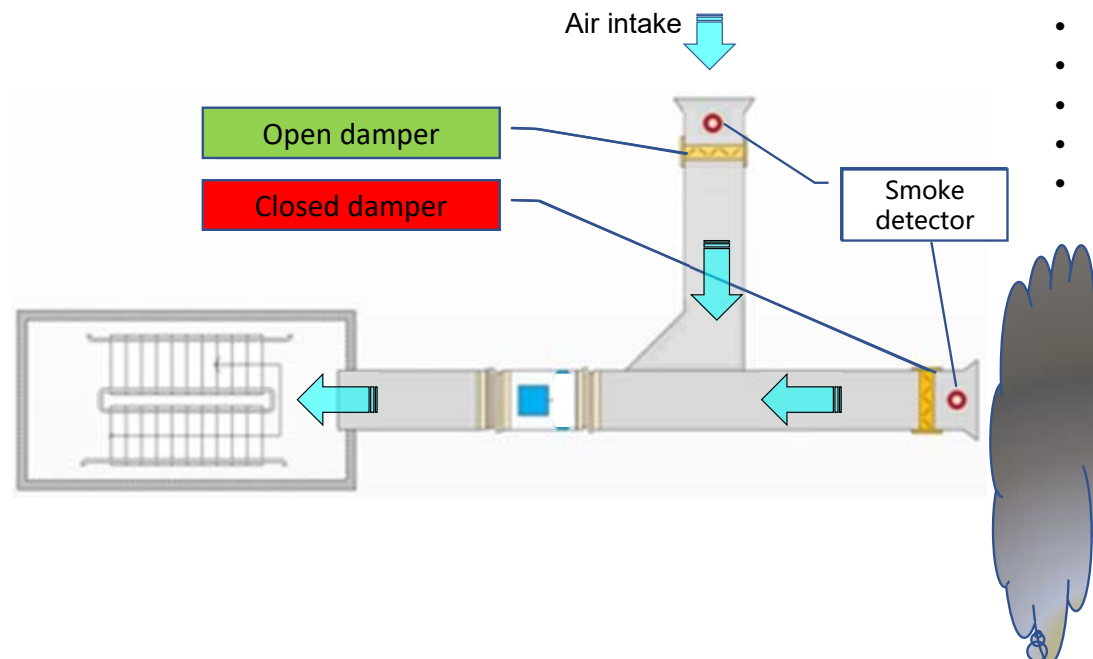
The air intake shall always be located away from any potential fire hazards. Air intakes shall be located on or near ground level to avoid contamination by rising smoke. If this is not possible, air intakes shall be positioned at roof level with smoke detection in order to close the damper affected by the smoke.



System components:

- Supply Fan
- Variable Frequency Drive
- Differential Pressure Sensor
- Stand-by Fan when needed
- Motorised Damper
- Smoke Detector

### KIT DAMPER

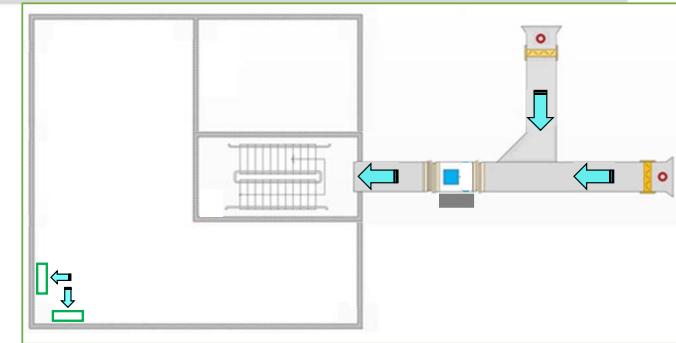


## 7. SYSTEM COMPONENTS

### AIR RELEASE

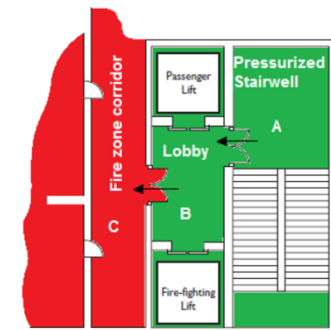
Provision must be made on the fire storey for the air that has leaked into the unpressurized spaces to escape from the building.

This is essential in order to maintain the pressure differential between the pressurized spaces and the accommodation in closed door scenario, and to ensure the air speed across the door in open door scenario.



System components:

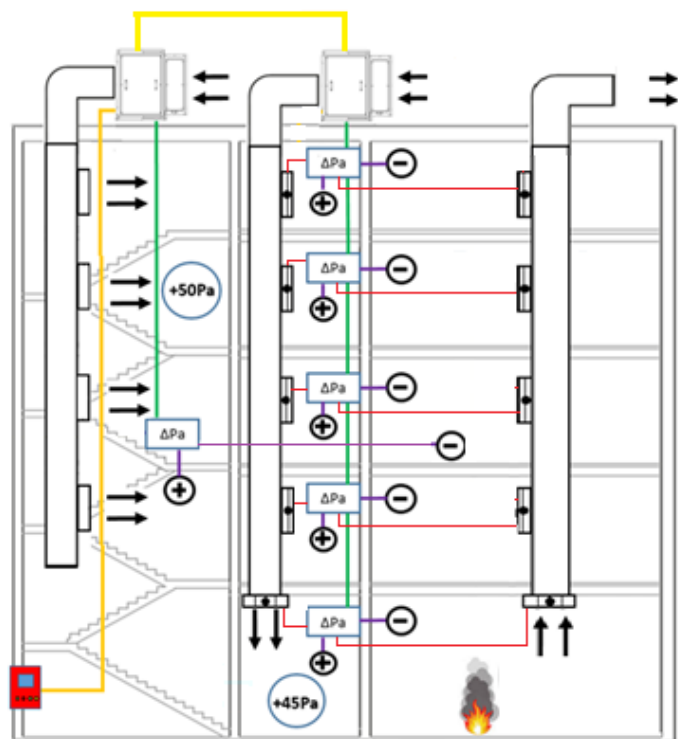
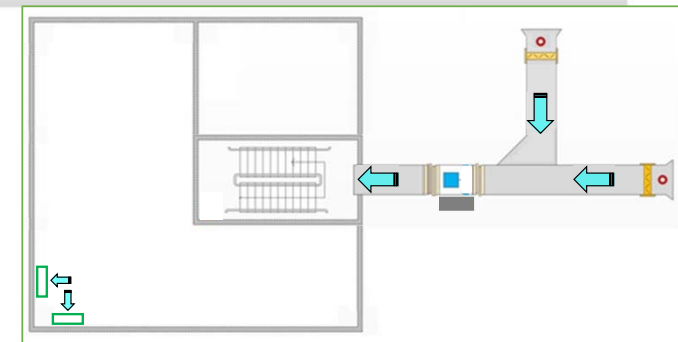
- Supply Fan
- Variable Frequency Drive
- Differential Pressure Sensor
- Stand-by Fan when needed
- Motorised Damper
- Smoke Detector
- Air release points



### AIR RELEASE

During operation of the system, pressurizing air will flow from the pressurized space into the accommodation.

Natural vertical shafts with multicompartment smoke dampers at every level.



SCDML-MA  
SMOKE CONTROL  
DAMPER



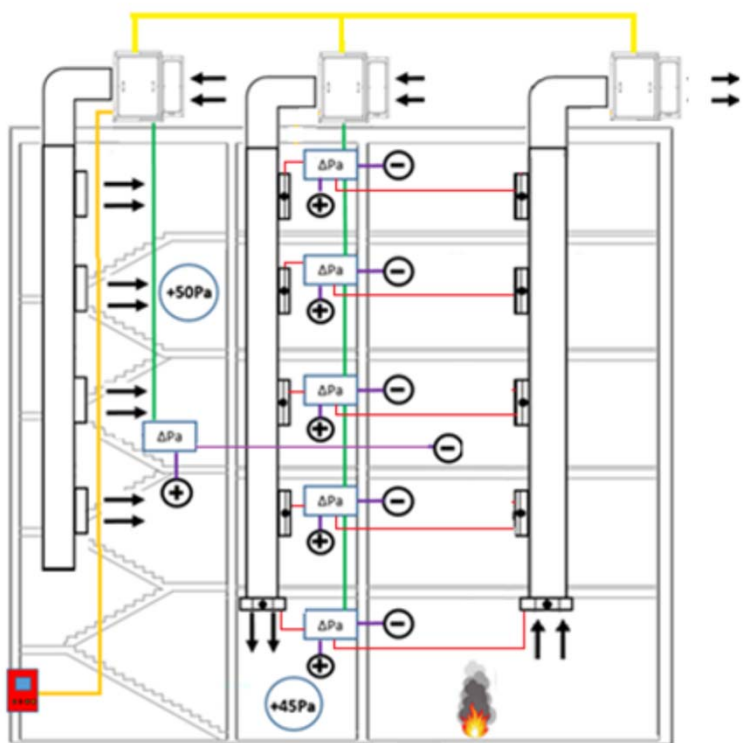
PDS LOBBY  
CONTROL

System components:

- Supply Fan
- Variable Frequency Drive
- Differential Pressure Sensor
- Stand-by Fan when needed
- Motorised Damper
- Smoke Detector
- Air release points

## AIR RELEASE

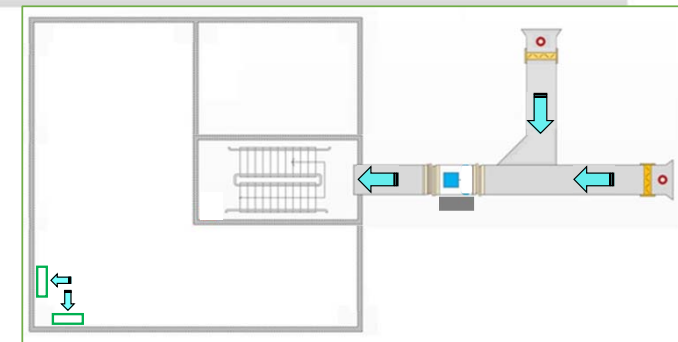
Mechanical extraction from the fire level.



SCDML-MA  
SMOKE CONTROL  
DAMPER



PDS LOBBY  
CONTROL



System components:

- Supply Fan
- Variable Frequency Drive
- Differential Pressure Sensor
- Stand-by Fan when needed
- Motorised Damper
- Smoke Detector
- Air release points



## 7. SYSTEM COMPONENTS

### MANUAL CONTROL

The manual control shall be located at the firefighters' main access, or close to the building entrance.



Automatic / manual switch.

**Green light:** Supply OK

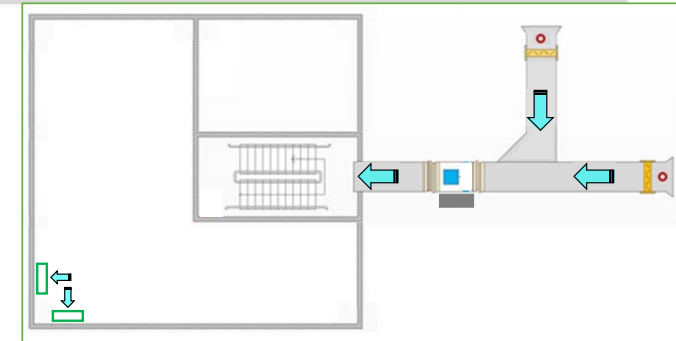
**Yellow light:** Failure Unit Alarm

**Red light:** Fire Alarm activated

**Blue:** Run



Fire brigade control panel with display for overpressure, unit state, alarms, and manual activation of the system.



System components:

- Supply Fan
- Variable Frequency Drive
- Differential Pressure Sensor
- Stand-by Fan when needed
- Motorised Damper
- Smoke Detector
- Air release points
- Automatic activation
- Remote control panel

### SOLUTIONS



#### VISIBILITY

Visibility is ensured



#### EVACUATION

Safe evacuation of occupants



#### SAFETY

Easy access for the fire-fighters



When selecting and classifying a system for a specific project, it is necessary to consider the building use, size and evacuation instructions in the event of fire. These criteria will help determine the necessary flow rate delivered by the pressurisation equipment.

The choice of system is very important as, this will also determine flow rates depending on the class.



**SOLUTIONS**

**BASIC**



**KIT SOBREPRESIÓN**

**ADVANCED**



**KIT BOXPRES PLUS**



**KIT BOXSMART  
KIT BOXSMART II**

**FULL RANGE**

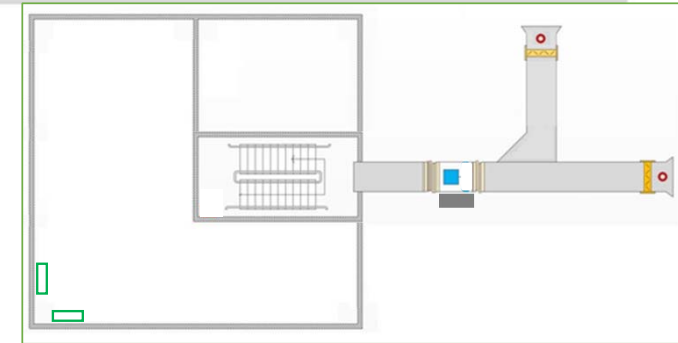



**KIT BOXPDS  
KIT BOXPDS II**

## 8. PRESSURISATION EQUIPMENT



### KIT BOXPDS KIT BOXPDS SMART



FAN	BOXPDS BOXPDS SMART	DAMPERBOX DAMPERBOX SMART	REMOTE CONTROL PANEL	PDS LOBBY CONTROL (OPTION)
				
<p>Fan CJHCH</p>	<p>Includes electronic control, pressure sensor, inverter and power supply 230/24VDC with batteries according to EN-12101-10.</p>	<p>Motorized damper ( 2,5 secs opening / closing time) and smoke sensor.</p>	<p>External control panel with pressure display, state of the unit, alarms, and manual activation of the system (firefighters).</p>	<p>Independent automatic regulation panel with pressure differential sensor. It can be connected to the BOXPDS panel. It can manage two open/closed dampers and one proportional damper.</p>

#### System components:

- Supply Fan
- Variable Frequency Drive
- Differential Pressure Sensor
- Stand-by Fan when needed
- Motorised Damper
- Smoke Detector
- Air release points
- Remote control panel

Version BOXPDS II for duty/Stand-by Fan automatic operation.

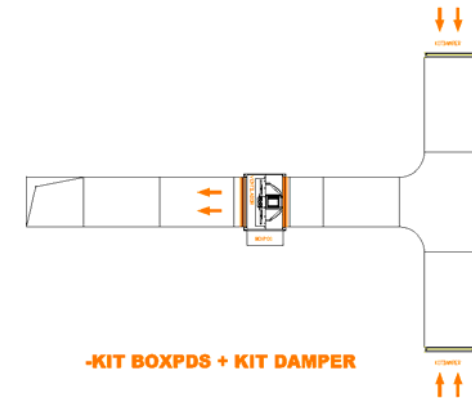
### DAMPER BOX / DAMPER BOX SMART

Maintains the air inlet closed when the unit is on stand-by to maintain the heating/cooling inside the building.

Avoids the smoke entering inside the protected space.

**Air intake at roof level.** Where air intakes are positioned at roof level there shall be two air intakes, spaced apart and facing different directions, and with smoke detection system.

**Air intake at ground floor level.** Only one air intake point is needed



### PDS LOBBY CONTROL

- Lobbies air supply motorised dampers management, to open the lobby motorised damper at the fire level.
- Pressure control in the lobby at the fire level. The PDS LOBBY CONTROL can be connected to the BOXPDS panel via MODBUS, so that the fan speed is regulated.
- Air release smoke dampers management to open the smoke damper at the fire level
- Proportional damper management in order to control the pressure in the staircase or a lobby.

The activation can be carried out via signal of the building fire panel, or via point detectors on each floor, specially provided for the overpressure system.



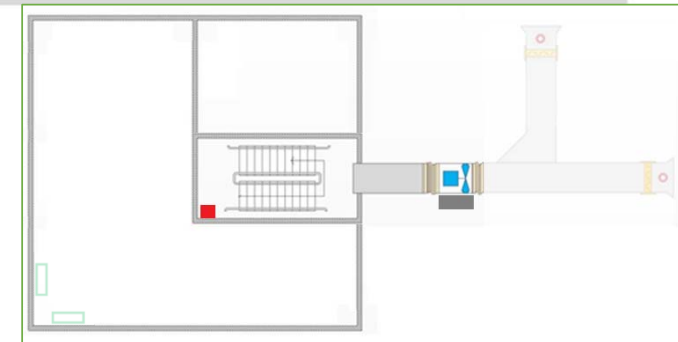
## 8. PRESSURISATION EQUIPMENT






**KIT BOXSMART  
KIT BOXSMART II**



**ANCILLARY**



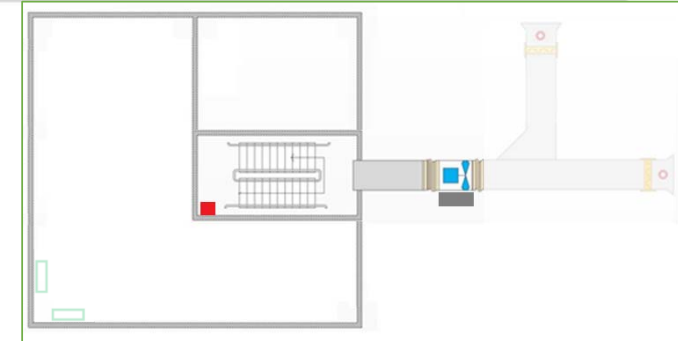
FAN	BOXSMART PANEL	EXTERNAL CONTROL PANEL (OPTIONAL)
		
<p>Fan according to pressurisation kit</p>	<p>Includes pressure sensor, inverter and thermal-magnetic protection. Internal memory to save the last status in case of power loss. Confirmation signals for communicating with fire detection system. SI-CALENDAR connection</p>	<p>External control panel with indication lights and manual activation of the system.</p>

### System components:

- Supply Fan
- Variable Frequency Drive
- Differential Pressure Sensor
- Stand-by Fan when needed
- Motorised Damper
- Smoke Detector
- Air release points
- Remote control panel

Version BOXSMART II for duty/Stand-by Fan automatic operation.

## 8. PRESSURISATION EQUIPMENT



FAN	BOXPRES PLUS PANEL	EXTERNAL CONTROL PANEL (OPTIONAL)
<p>Fan according to pressurisation kit</p>	<p>Includes pressure sensor, inverter and thermal-magnetic protection. Strong, rigid boxes with vandal-proof metal casing and IP66 rating.</p>	<p>External control panel with indication lights and manual activation of the system.</p>

- System components:
- Supply Fan
  - Variable Frequency Drive
  - Differential Pressure Sensor
  - Stand-by Fan when needed
  - Motorised Damper
  - Smoke Detector
  - Air release points
  - Remote control panel

Version BOXPRES PLUS II for duty/Stand-by Fan automatic operation.

**THANK YOU**  
**FOR YOUR ATTENTION!**



**HEADQUARTERS**  
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