PRESSURISATION OF ESCAPE ROUTES

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PRESSURISATION OF ESCAPE ROUTES

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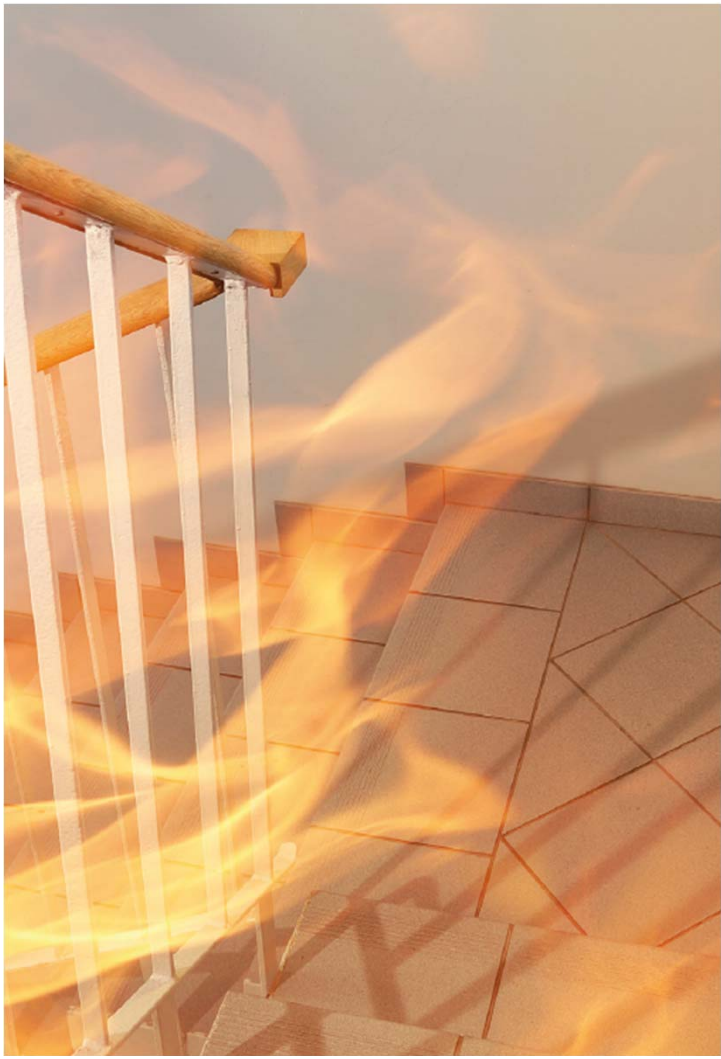


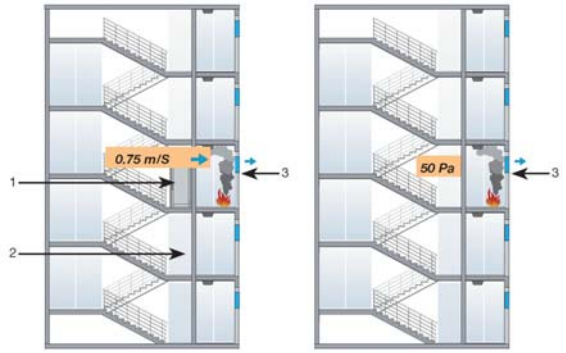
EN 12101-6:2005 Smoke and heat control systems -

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

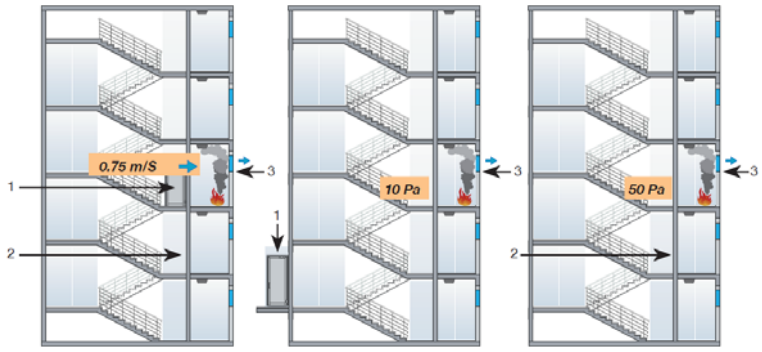
Class A System: Defend in place



Air flow criterion

Differential pressure criterion (all the doors closed)

Class C System: Simultaneous evacuation

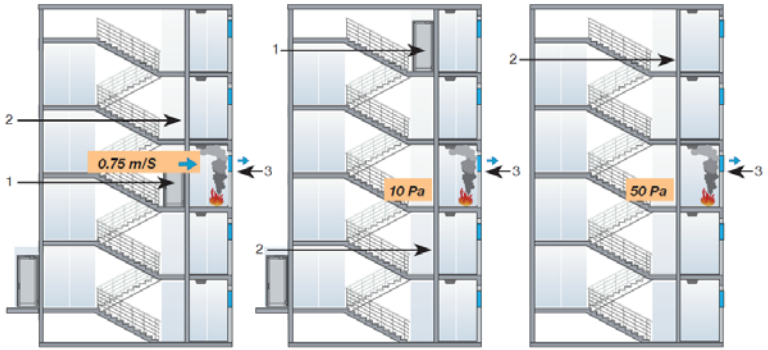


Air flow criterion

Differential pressure criterion

Differential pressure criterion (all the doors closed)

Class D System: Sleeping risk

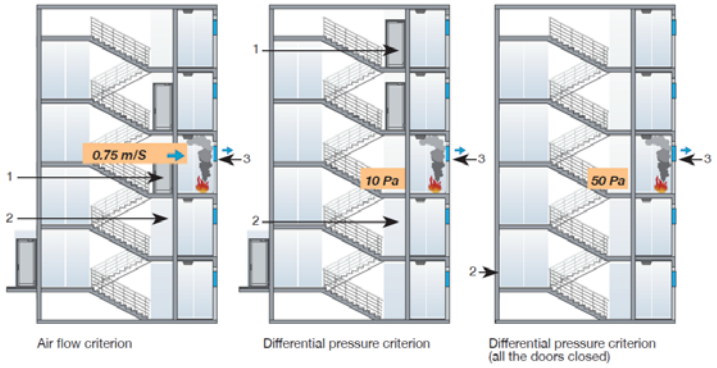


Air flow criterion

Differential pressure criterion

Differential pressure criterion (all the doors closed)

Class E System: For means of escape phased evacuation

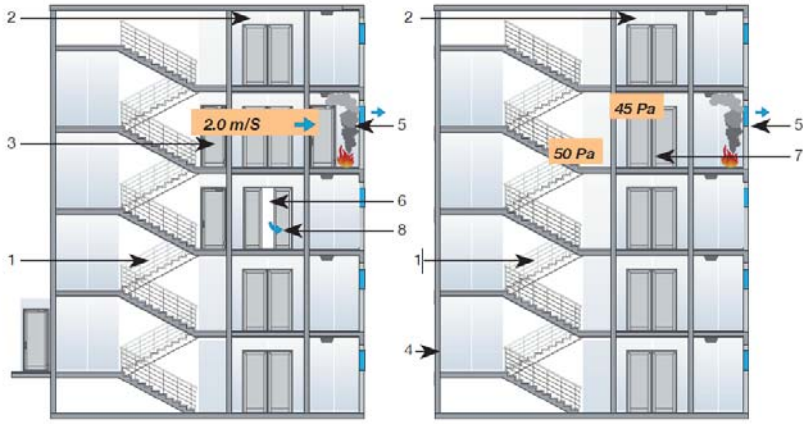


Air flow criterion

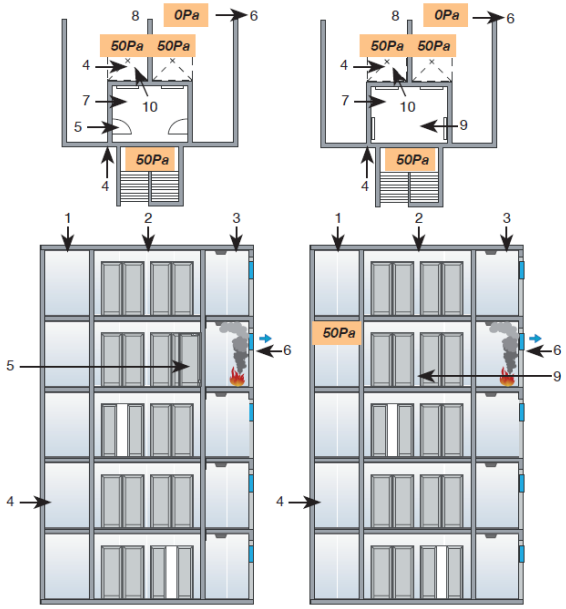
Differential pressure criterion

Differential pressure criterion (all the doors closed)

Class B System: For means of escape and firefighting



Class F System: For firefighting and means of escape

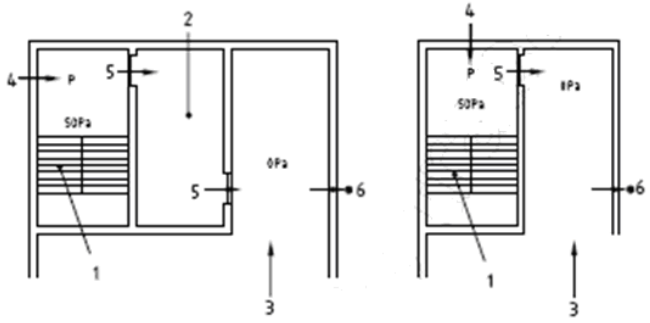


AIRFLOW SUPPLY TO A STAIRCASE. COMPARISON

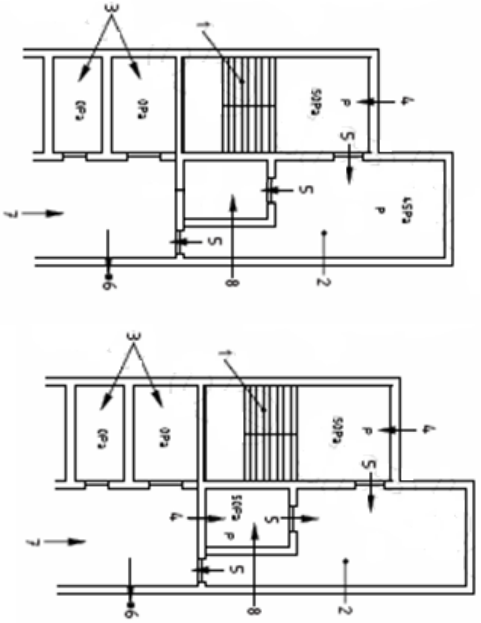
	Pressure difference criterion 50 Pa	Pressure difference criterion 10 Pa	Airflow criterion 0,75 m/s
CLASS A Defend in place	1,24 m^3/s	----------	1,83 m^3/s
CLASS C Simultaneous evacuation	1,24 m^3/s	5,99 m^3/s	1,83 m^3/s
CLASS D Sleeping risk	1,24 m^3/s	11,42 m^3/s	7,51 m^3/s

Spaces to be pressurised

Only the stairwell



Stairwell and lobby



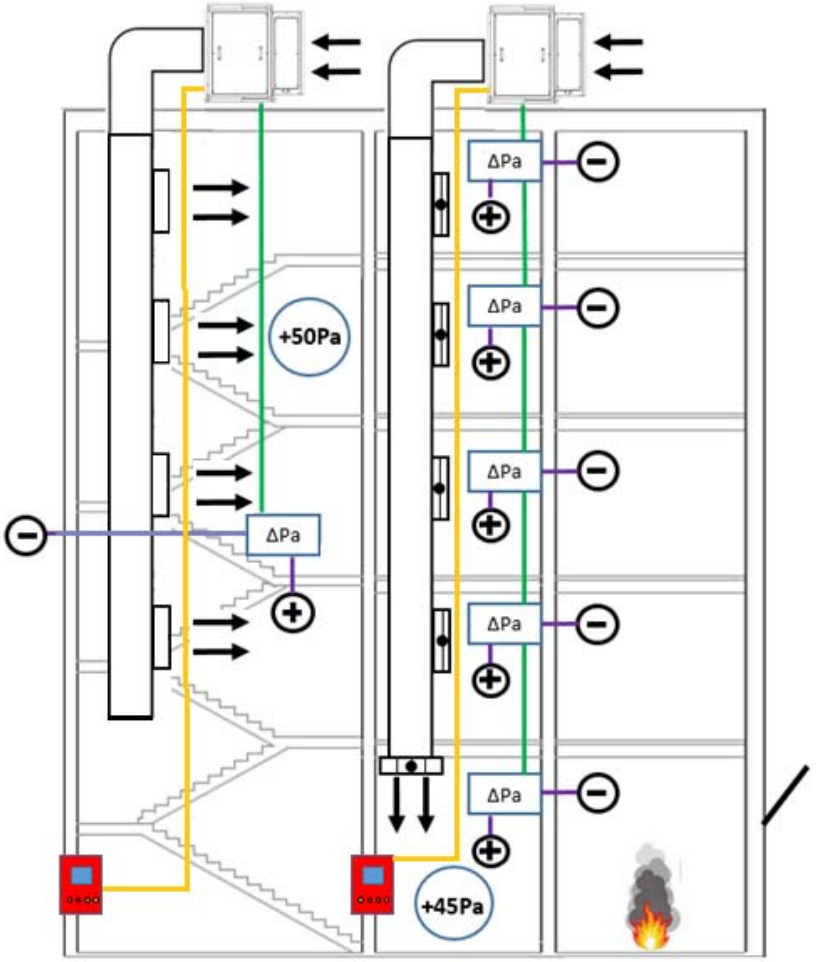
Spaces to be pressurised

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

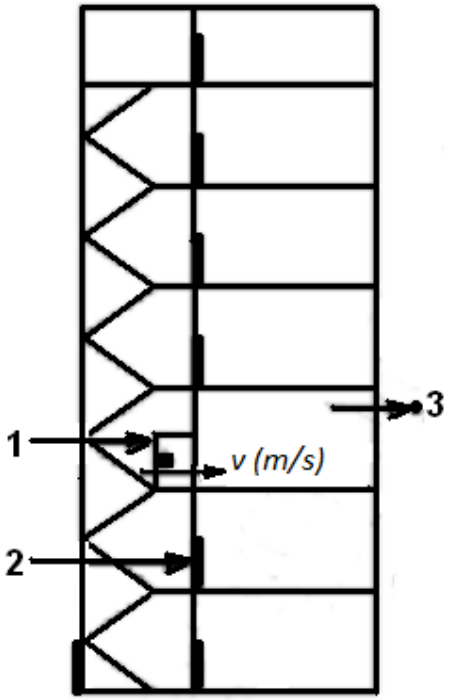


EN 12101-13:2022 Smoke and heat control systems -

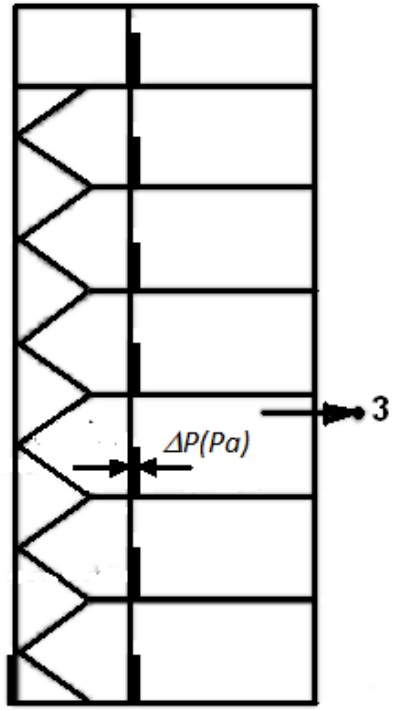
Part 13: Specification for pressure differential systems

- 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	

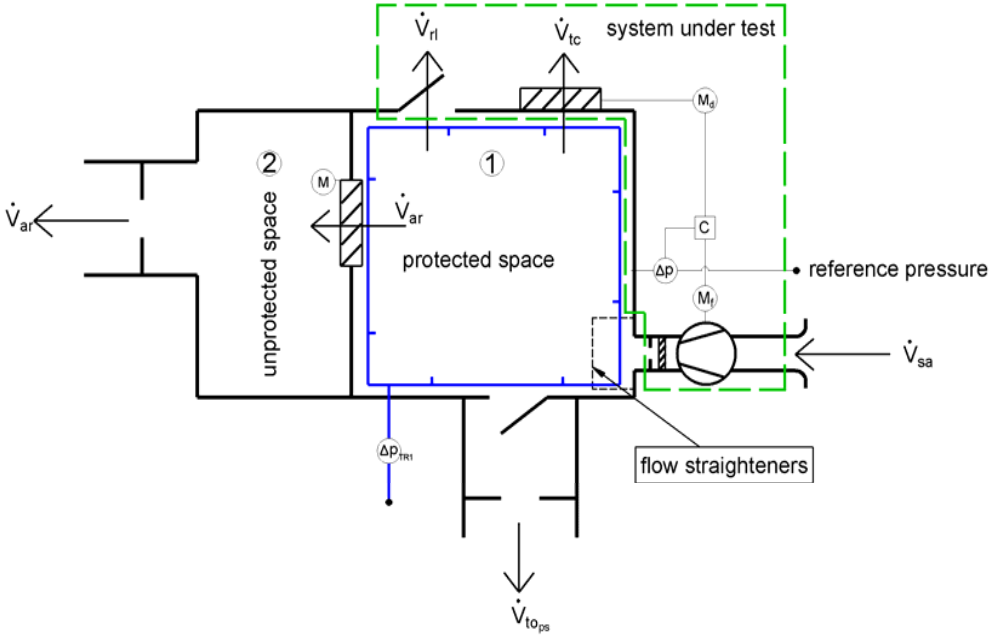


EN 12101-6:2022 Smoke and heat control systems -

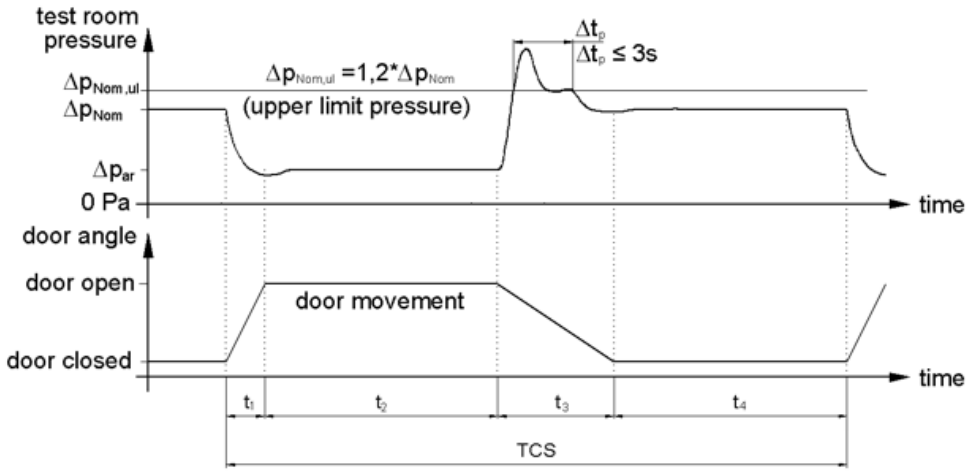
Part 6: Specification for pressure differential systems

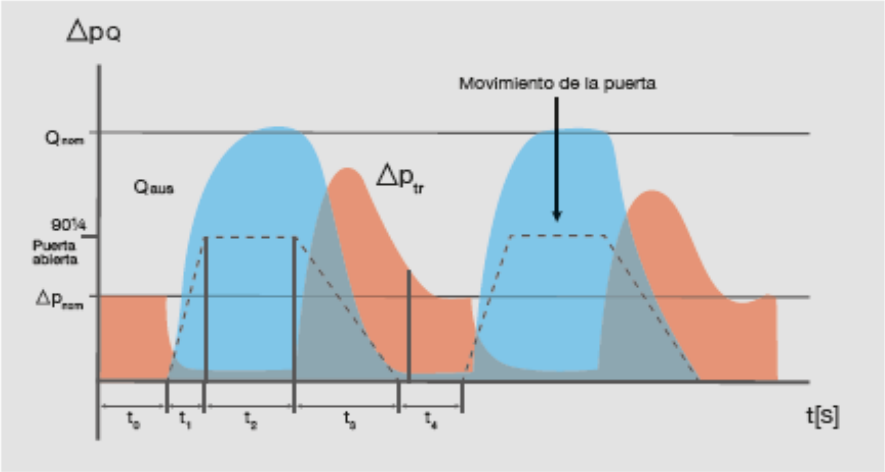
PRODUCTS: EN 12101-6:2005 ? → *pr EN 12101-6:2022*

TESTIG AND CERTIFICATION OF PRESSURE DIFERENTIAL KITS



Functionallity test acording 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 $\dot{V}_{ar}$
t_3	3s (+/-0.1s)	door closing time
t_4	6s (+ 0.5s)	waiting time with closed door to control pressure Δp_{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 respnose 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.

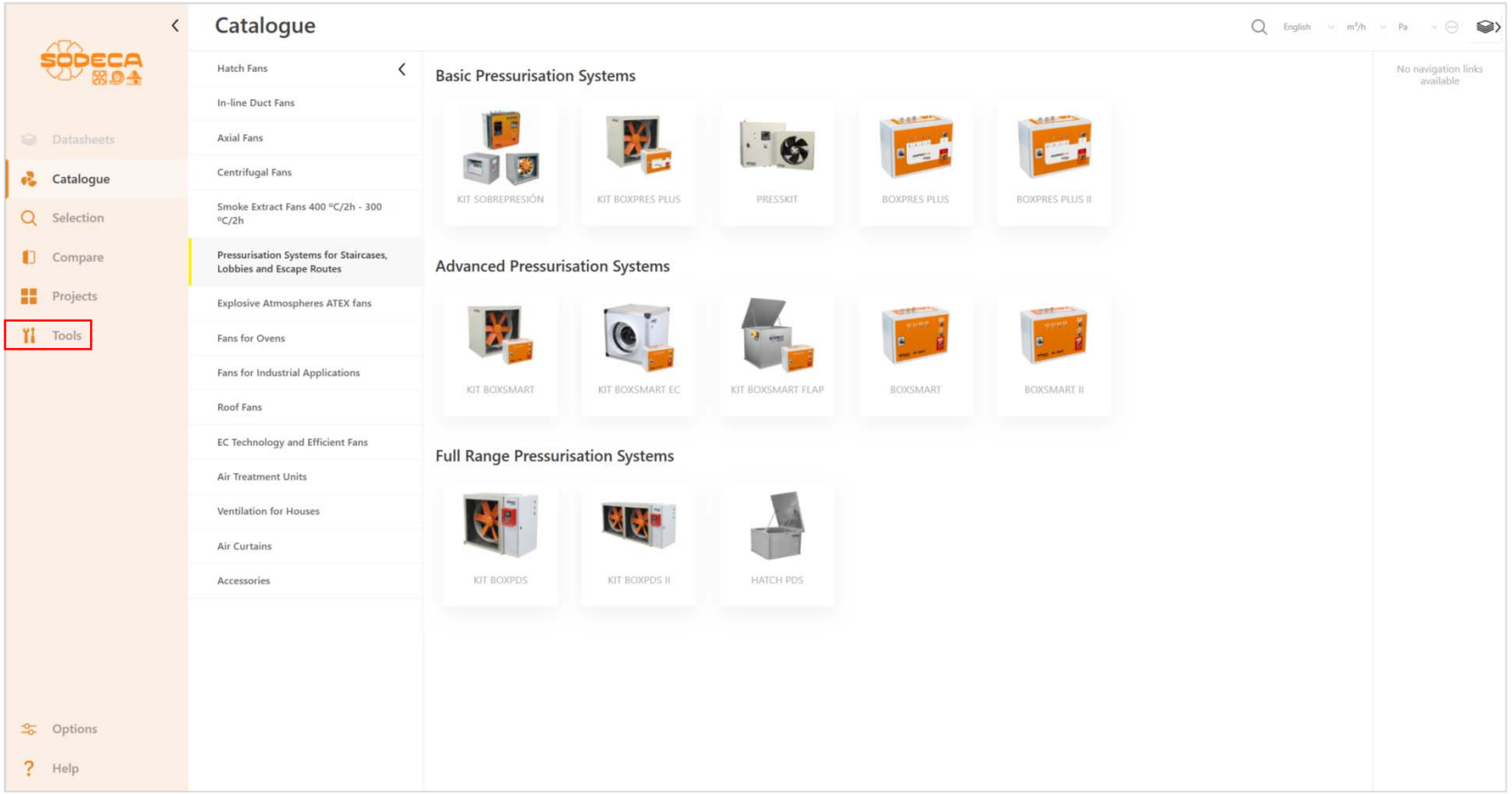
Closed door scenario airflow

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.

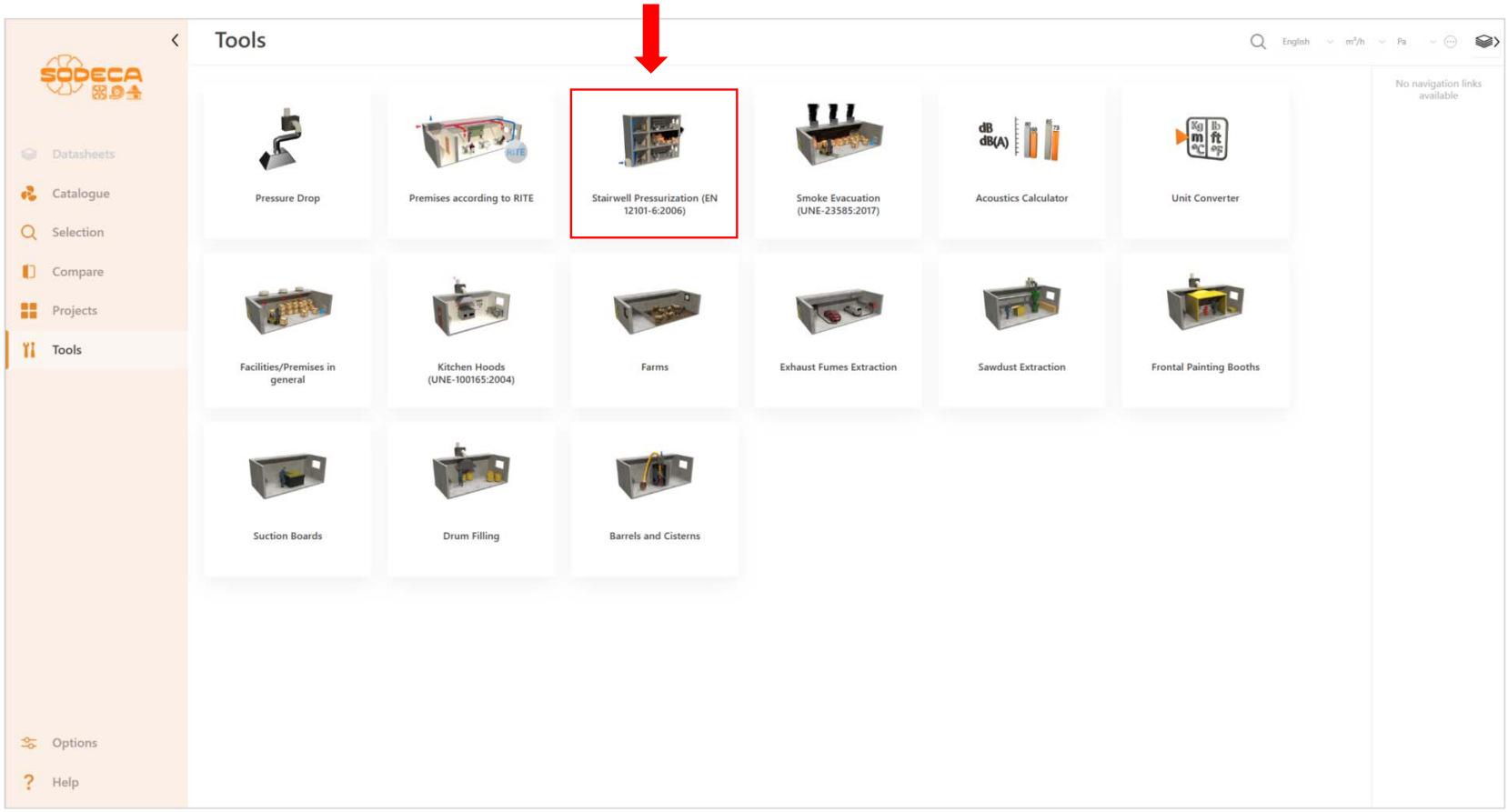
Open door scenario airflow

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.

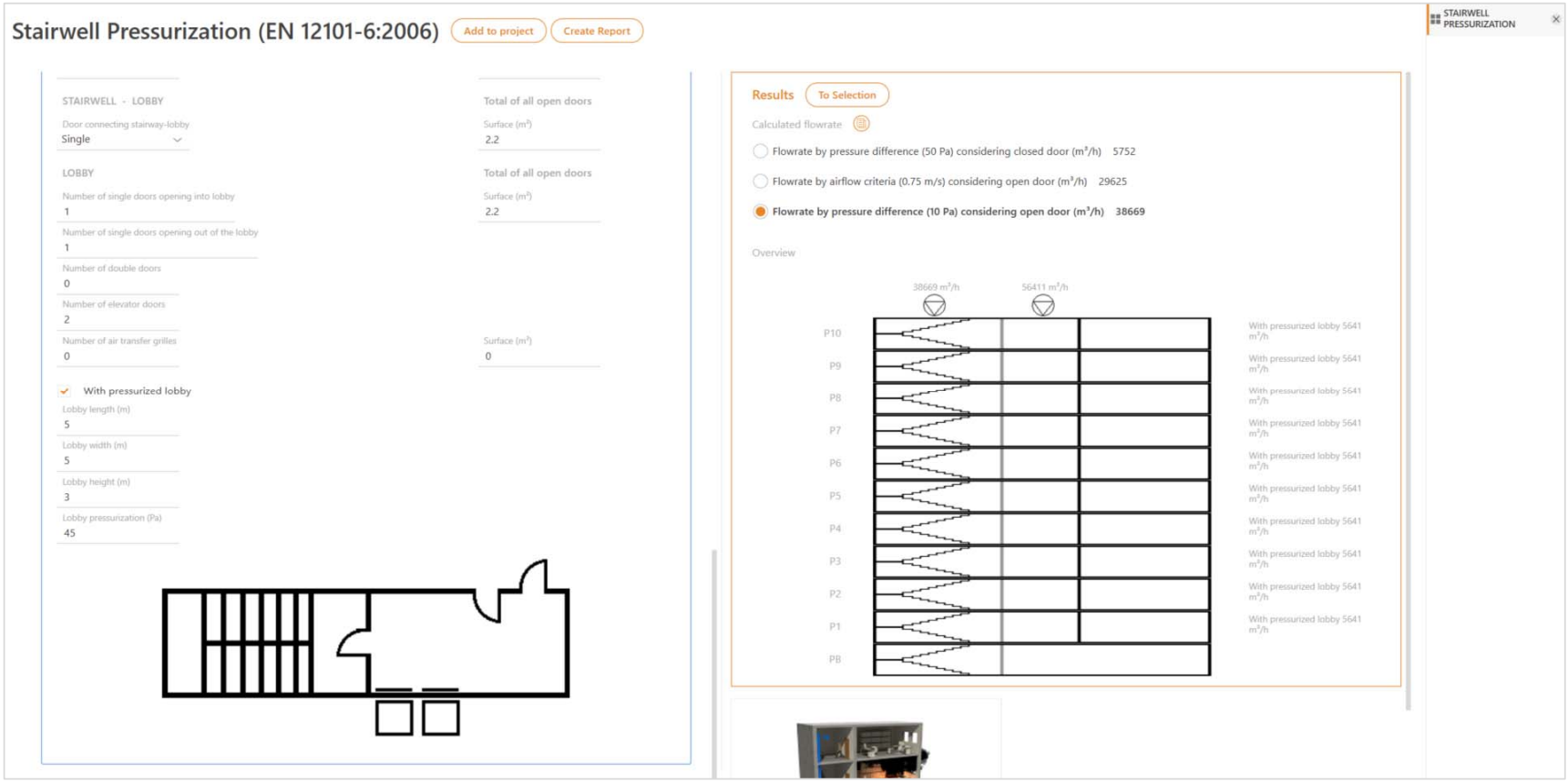
6. CALCULATION USING QUICKFAN



6. CALCULATION USING QUICKFAN



6. CALCULATION USING QUICKFAN

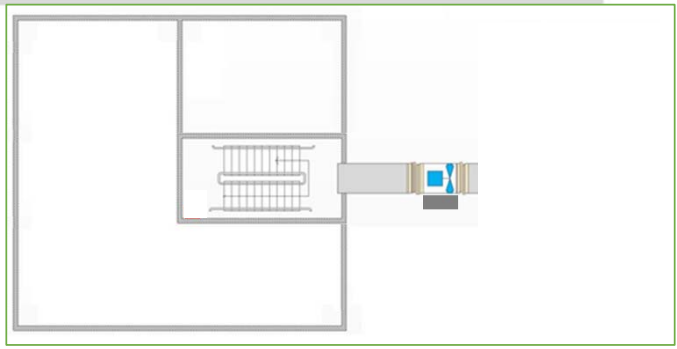


PRESSURE CONTROL

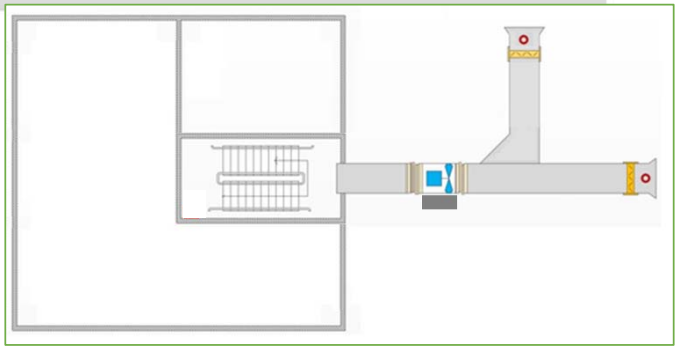
To control the differential pressure in the pressurised areas, one of the following methods should be used:

- 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.

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



System components:
- Supply Fan
- Variable Frequency Drive
- Differential Pressure Sensor



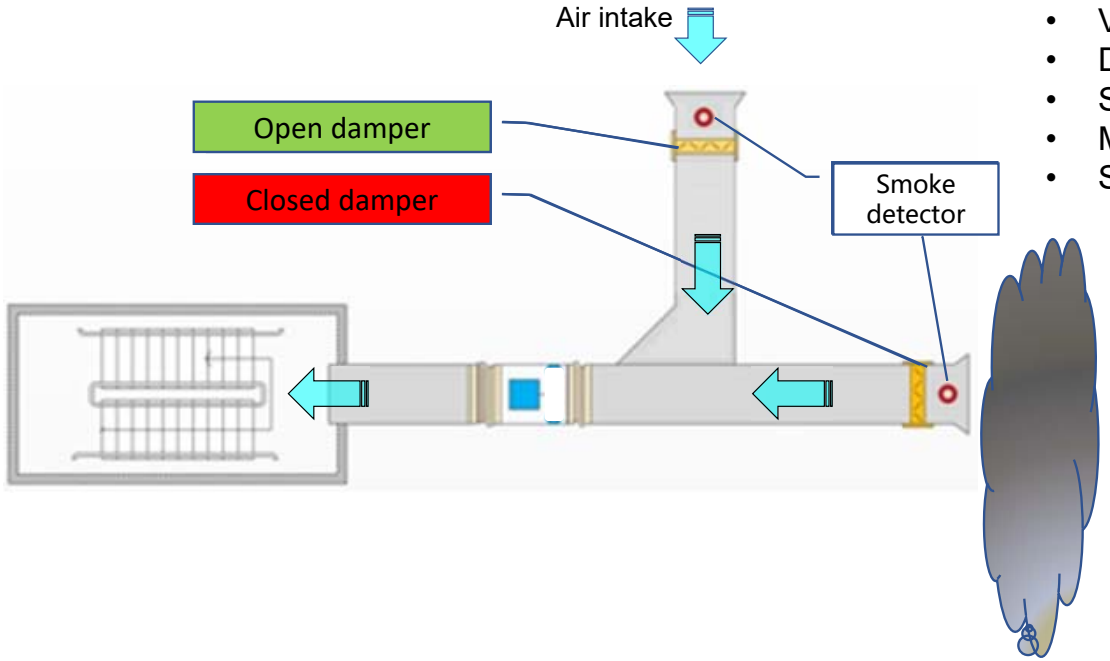
AIR INTAKE

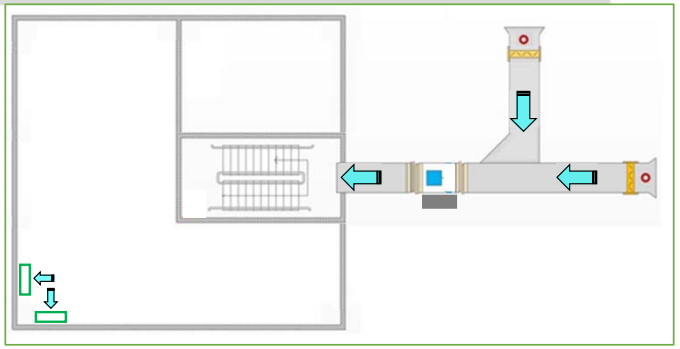
The air intake shall always be located away from any potential fire hazards. Air intakes shall be located on or near ground level to avoid contamination by rising smoke. If this is not possible, air intakes shall be positioned at roof level with smoke detection in order to close the damper affected by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

System components:

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

KIT DAMPER





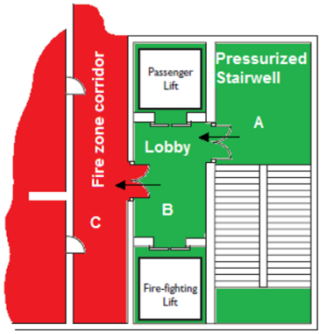
AIR RELEASE

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:

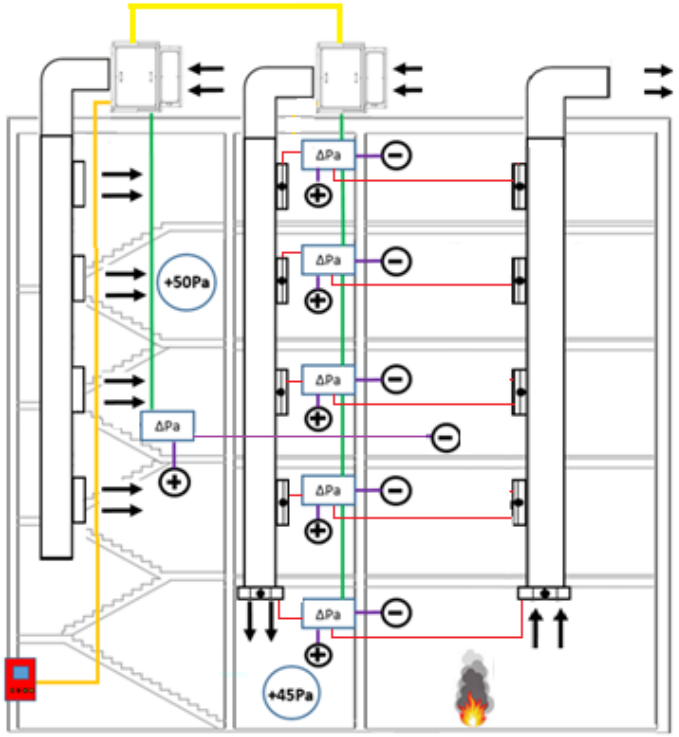
- Supply Fan
- Variable Frequency Drive
- Differential Pressure Sensor
- Stand-by Fan when needed
- Motorised Damper
- Smoke Detector
- Air release points



AIR RELEASE

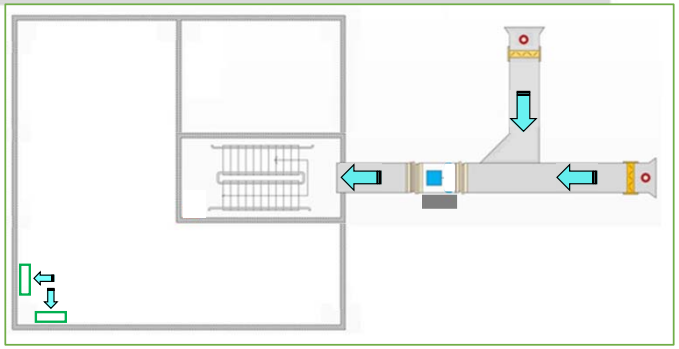
During operation of the system, pressurizing air will flow from the pressurized space into the accommodation.

Natural vertical shafts with multicompartment smoke dampers at every level.



SCDML-MA
SMOKE CONTROL
DAMPER

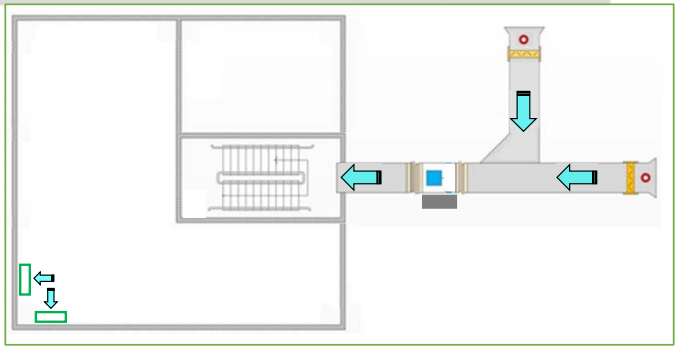
PDS LOBBY
CONTROL



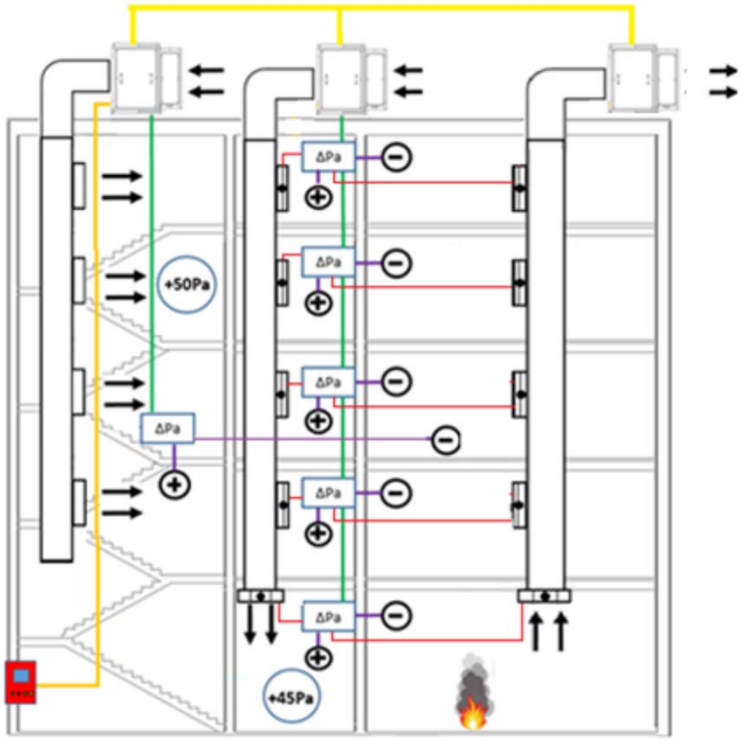
System components:

- 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.

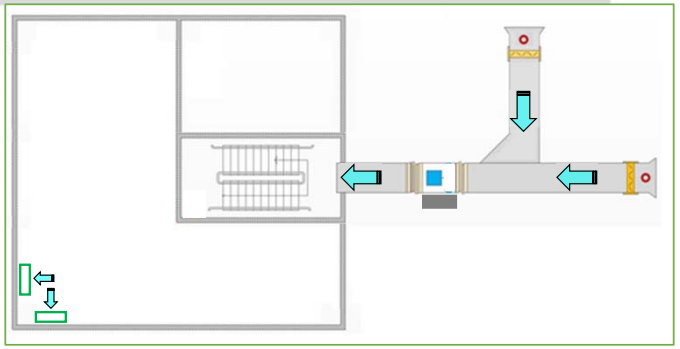


SCDML-MA
SMOKE CONTROL
DAMPER

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



MANUAL CONTROL

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

Automatic / manual switch.

Green ligth: Supply OK
Yellow ligth: Failure Unit Alarm
Red ligth: Fire Alarm activated
Blue: Run

Fire brigade control panel with display for overpresure, 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	ADVANCED	FULL RANGE

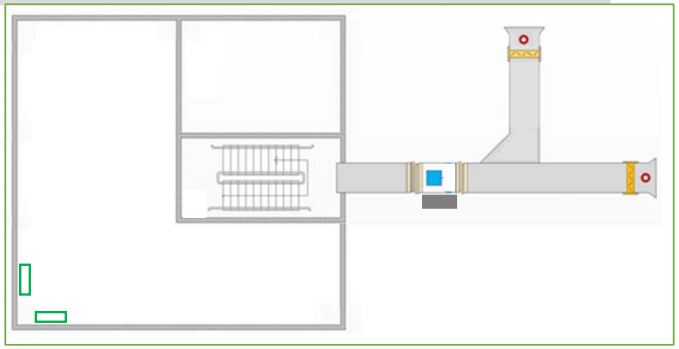
KIT SOBREPRESIÓN

KIT BOXPRES PLUS

KIT BOXSMART
KIT BOXSMART II

KIT BOXPDS
KIT BOXPDS II

KIT BOXPDS
KIT BOXPDS SMART



FAN	BOXPDS BOXPDS SMART	DAMPERBOX DAMPERBOX SMART	REMOTE CONTROL PANEL	PDS LOBBY CONTROL (OPTION)
Fan CJHCH	Includes electronic control, pressure sensor, inverter and power supply 230/24VDCwith batteries according to EN-12101-10.	Motorized damper (2,5 secons opening / closing time) and smoke sensor.	External control panel with presure display, state of the unit, alarms, and manual activation of the system (firefighters).	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.

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

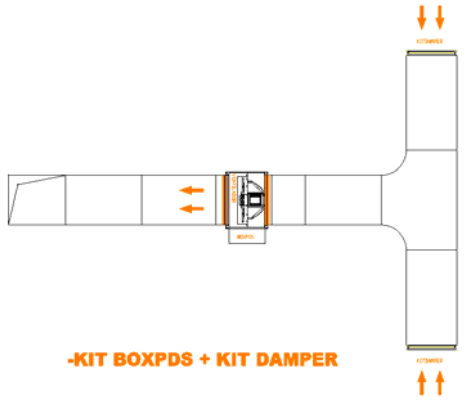
Version BOXPDS II for duty/Stand-by Fan automatic operation.

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

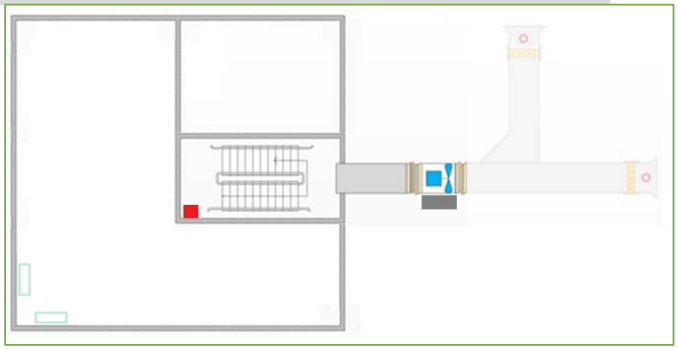
- Lobbies air supply motorised dampers management, to open the lobby motorised damper at the fire level.
- Pressure control in the lobby at the fire level. The PDS LOBBY CONTROL can be connected to the BOXPDS panel via MODBUS, so that the fan speed is regulated.
- Air release smoke dampers management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



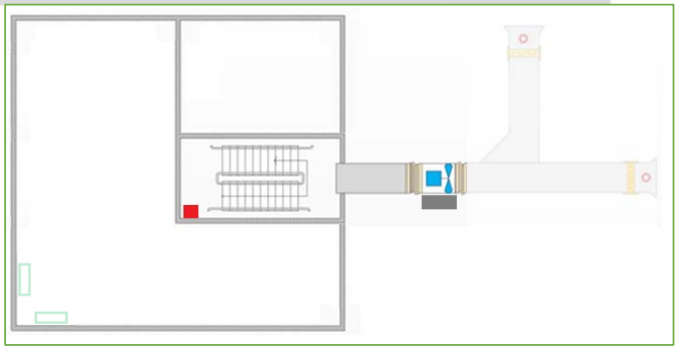
FAN	BOXSMART PANEL	EXTERNAL CONTROL PANEL (OPTIONAL)
?		
Fan according to pressurisation kit	Includes pressure sensor, inverter and thermal-magnetic protection. Internal memory to save the last status in case of power loss. Confirmation signals for communicating with fire detection system. SI-CALENDAR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

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

8. PRESSURISATION EQUIPMENT



FAN	BOXPRES PLUS PANEL	EXTERNAL CONTROL PANEL (OPTIONAL)
?		
Fan according to pressurisation kit	Includes pressure sensor, inverter and thermal-magnetic protection. Strong, rigid boxes with vandal-proof metal casing and IP66 rating.	External control panel with indication lights 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
- Remote control panel

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

THANK YOU

FOR YOUR ATTENTION!

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