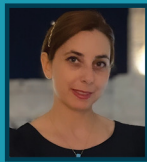


# DEDICATED VENTILATION APPLICATIONS

INDUSTRIAL - KITCHEN - SMOKE CONTROL - FILTERS



**ILIANA GEORGAKAKOU**

Senior Mechanical Engineer at LDK Consultants

"ASHRAE Design Guide for Commercial Kitchen Ventilation - Design Approach and Recommendations"



**REINER KELCH**

Bereichsleiter / Director Systems and Applications Systemair GmbH Germany

"Effect of new published standard 12101-6 on practical implementation"



**IOANNIS TZOURALAS**

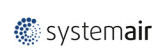
Senior Mechanical Engineer - Consultant MEP Installations Industrial & Building Sector

"HVAC Systems for Cleanrooms (Pharma)"

WEDNESDAY 11/10/2023 | @17:00-21:00

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EN12101-6:  
2022-11 on  
practical  
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# EN12101-6:2022-11 on practical implementation

- **EN12101-6:2022-11** Smoke and heat control systems - **Part 6**: Specification for pressure differential systems – Kits
- **EN 12101-13:2022** Smoke and heat control systems – **Part 13**: Pressure differential systems (PDS) – Design and calculation methods, installation, acceptance testing, routine testing and maintenance;

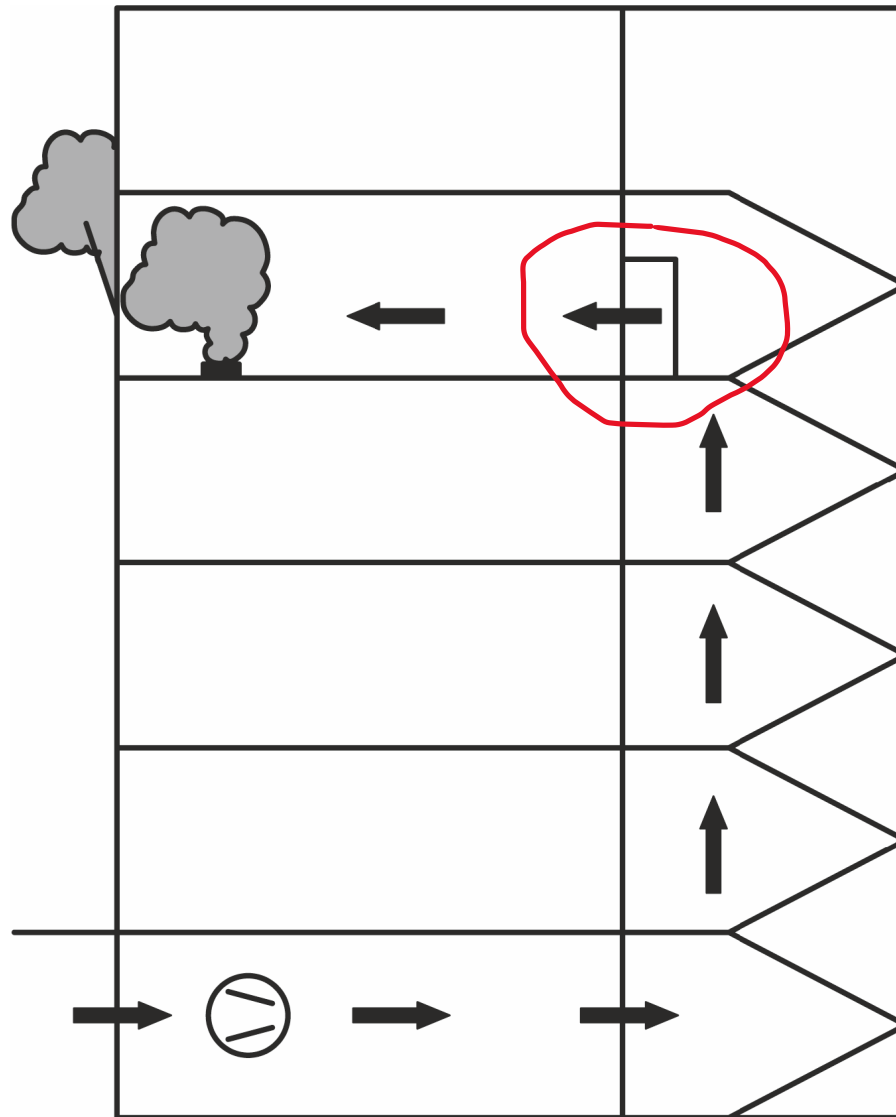
# EN12101-6:2022-11 on practical implementation

- **EN12101-6:2022-11** Smoke and heat control systems - **Part 6**: Specification for pressure differential systems – Kits
  - Part 6 specify the hardware
    - This means the test all electrical and mechanical parts, who create the volume & pressure in a specific time
- **EN 12101-13:2022** Smoke and heat control systems – **Part 13**: Pressure differential systems (PDS) – Design and calculation methods, installation, acceptance testing, routine testing and maintenance
  - Part 13 explain how to calculate the required the total volume to fulfil the velocity, pressure & time criteria.
  - This document contains information and requirements for the planning, design, installation, acceptance testing, functional tests, operation and maintenance of smoke suppression pressure systems (RDA, or pressure differential systems, RDA)

# EN12101-6:2022-11 on practical implementation

**The requirements and test methods for kits used in RDA are  
published in  
EN 12101-6:2022-11**

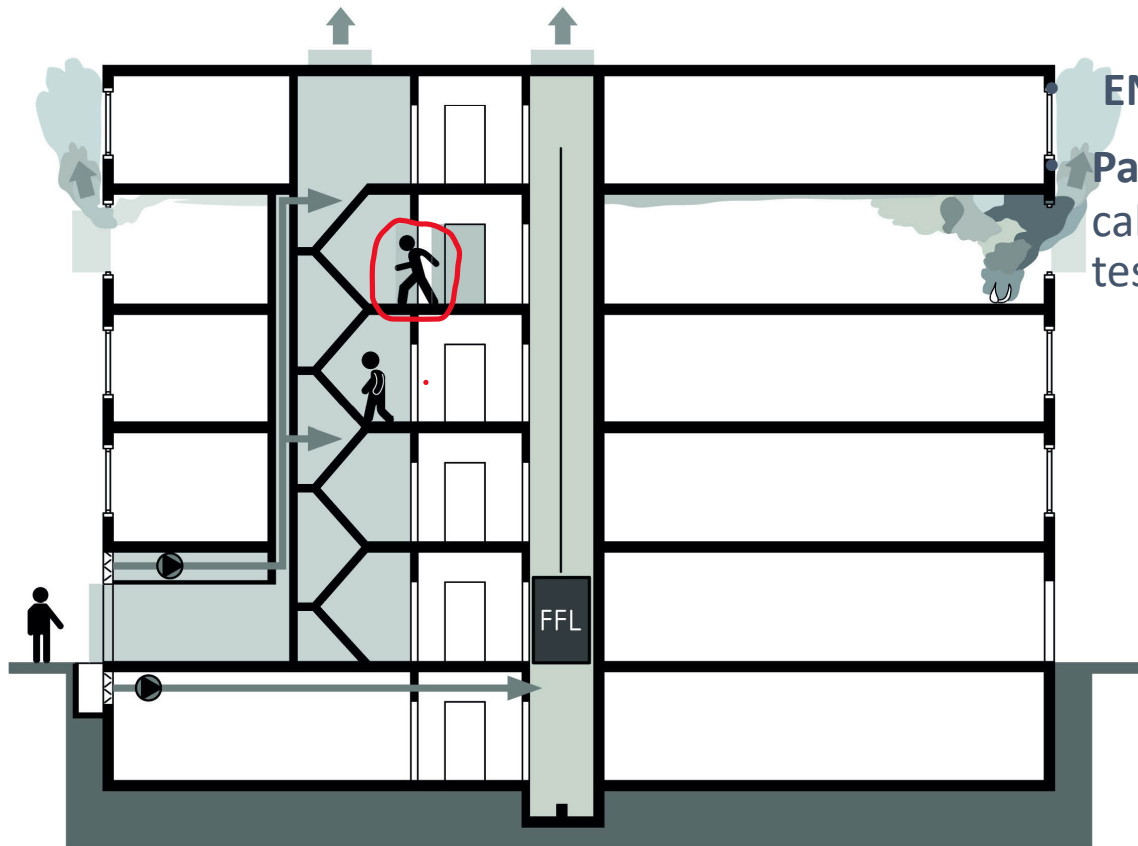
# EN12101-6:2022-11 on practical implementation



- **EN 12101-13:2022** Smoke and heat control systems –
- **Part 13:** Pressure differential systems (PDS) Design and calculation methods, installation, acceptance testing, routine testing and maintenance
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The requirements and test methods for kits used in RDA are published in EN 12101-6. For certain components in the kits, additional tests must be carried out in accordance with Part 6 before the kit test.

# EN12101-6:2022-11 on practical implementation

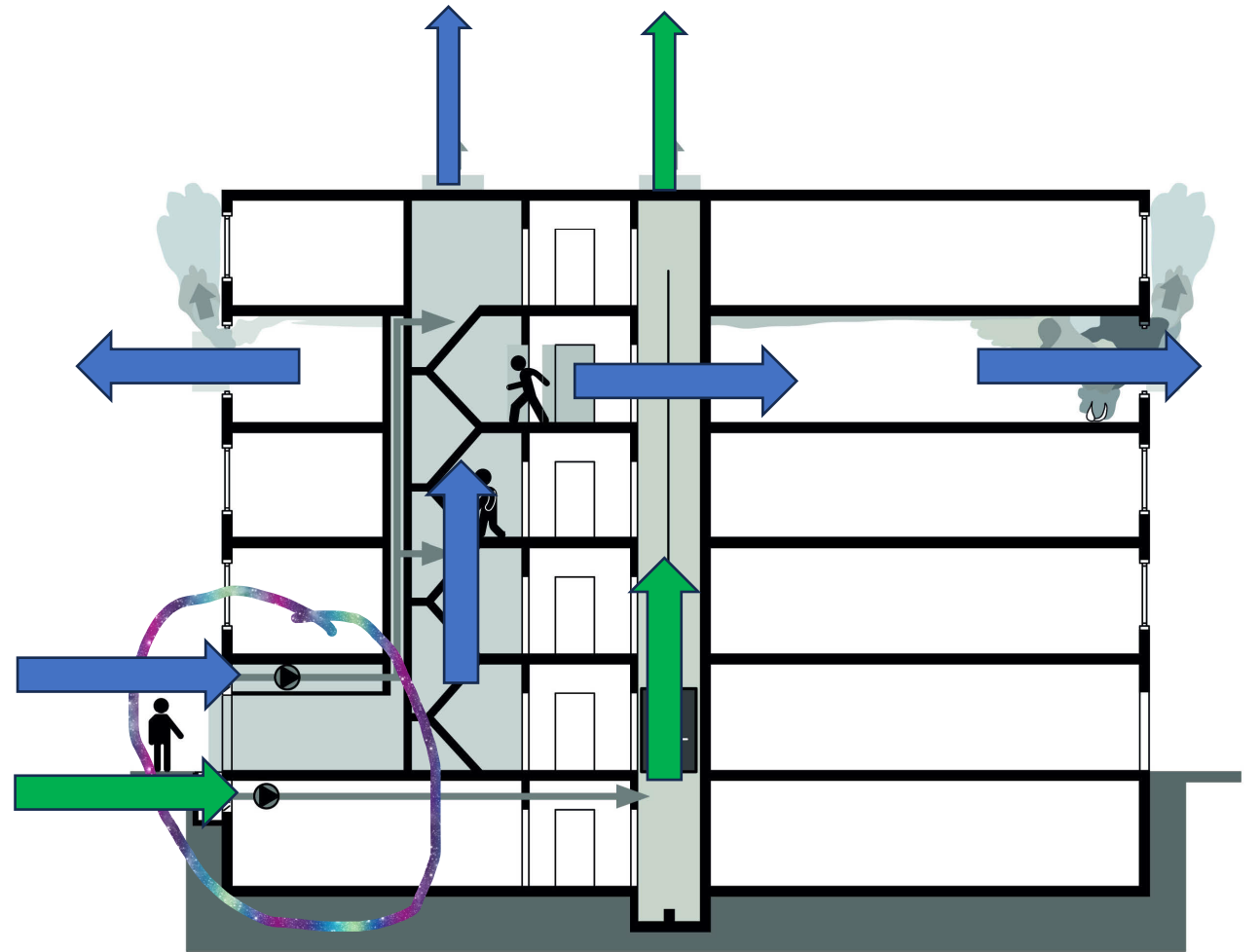


**EN 12101-13:2022** Smoke and heat control systems –

**Part 13:** Pressure differential systems (PDS) Design and calculation methods, installation, acceptance testing, routine testing and maintenance

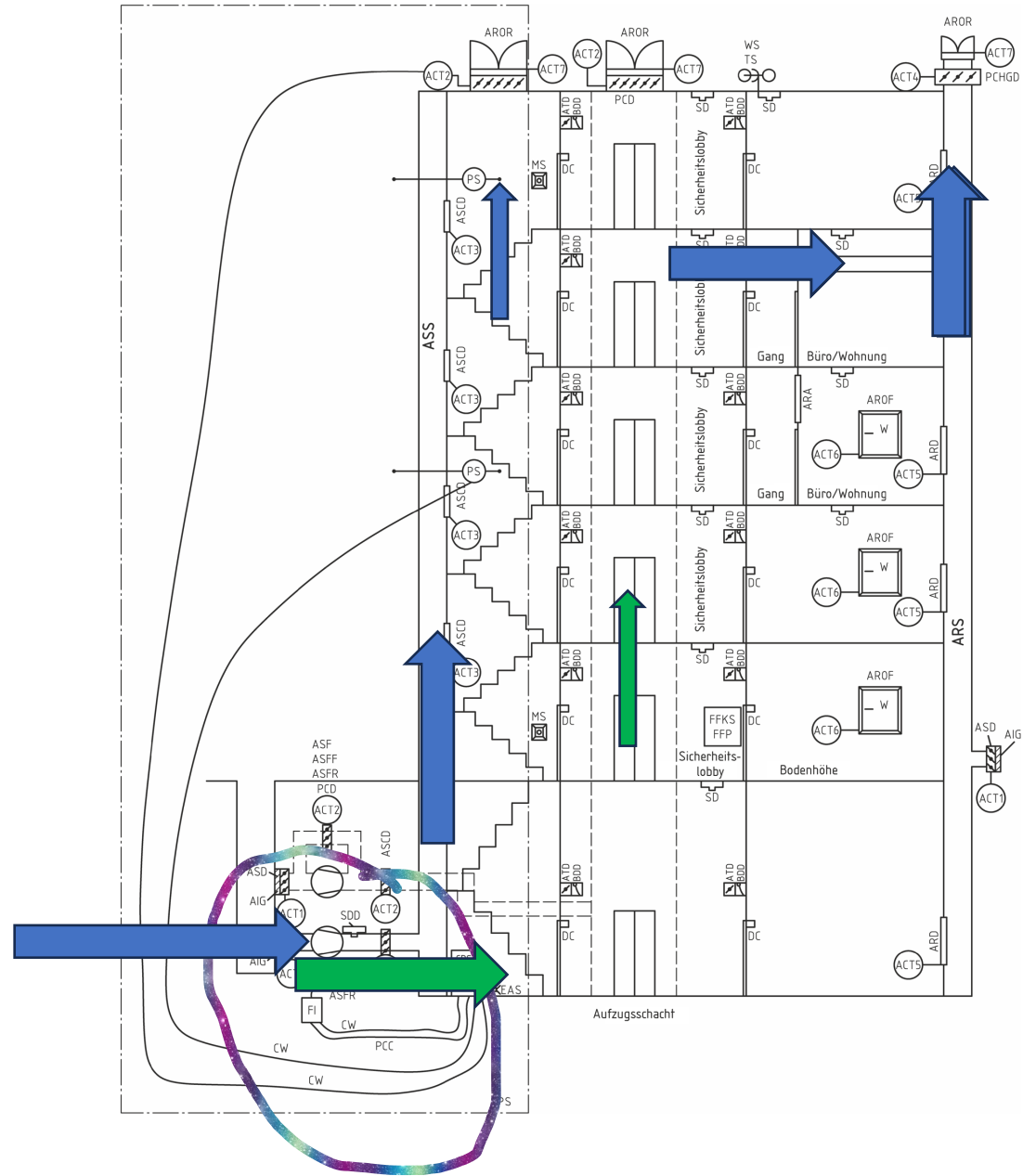
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# EN12101-6: 2022-11 on practical implementation



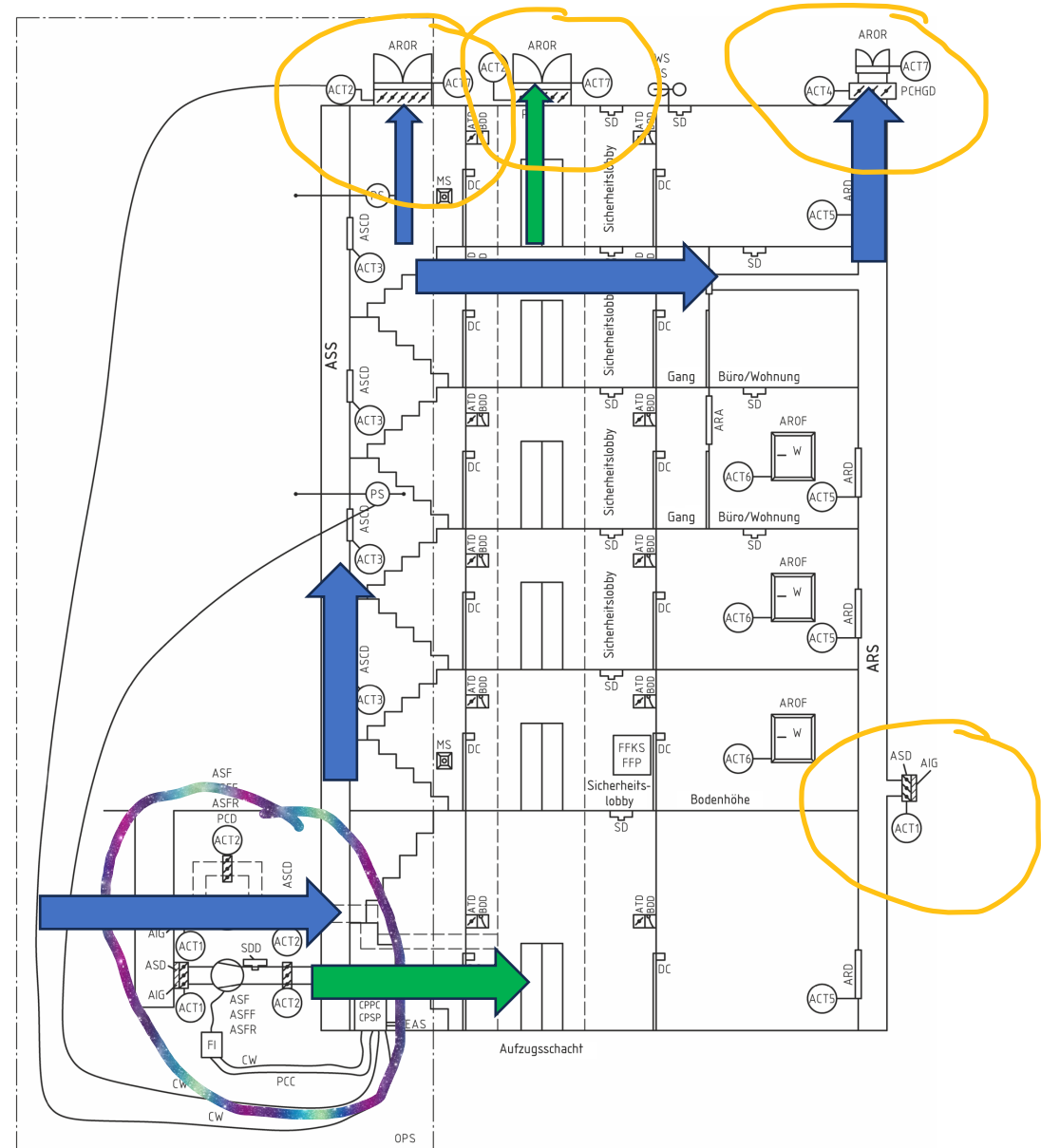


# EN12101-6: 2022-11 on practical implementation



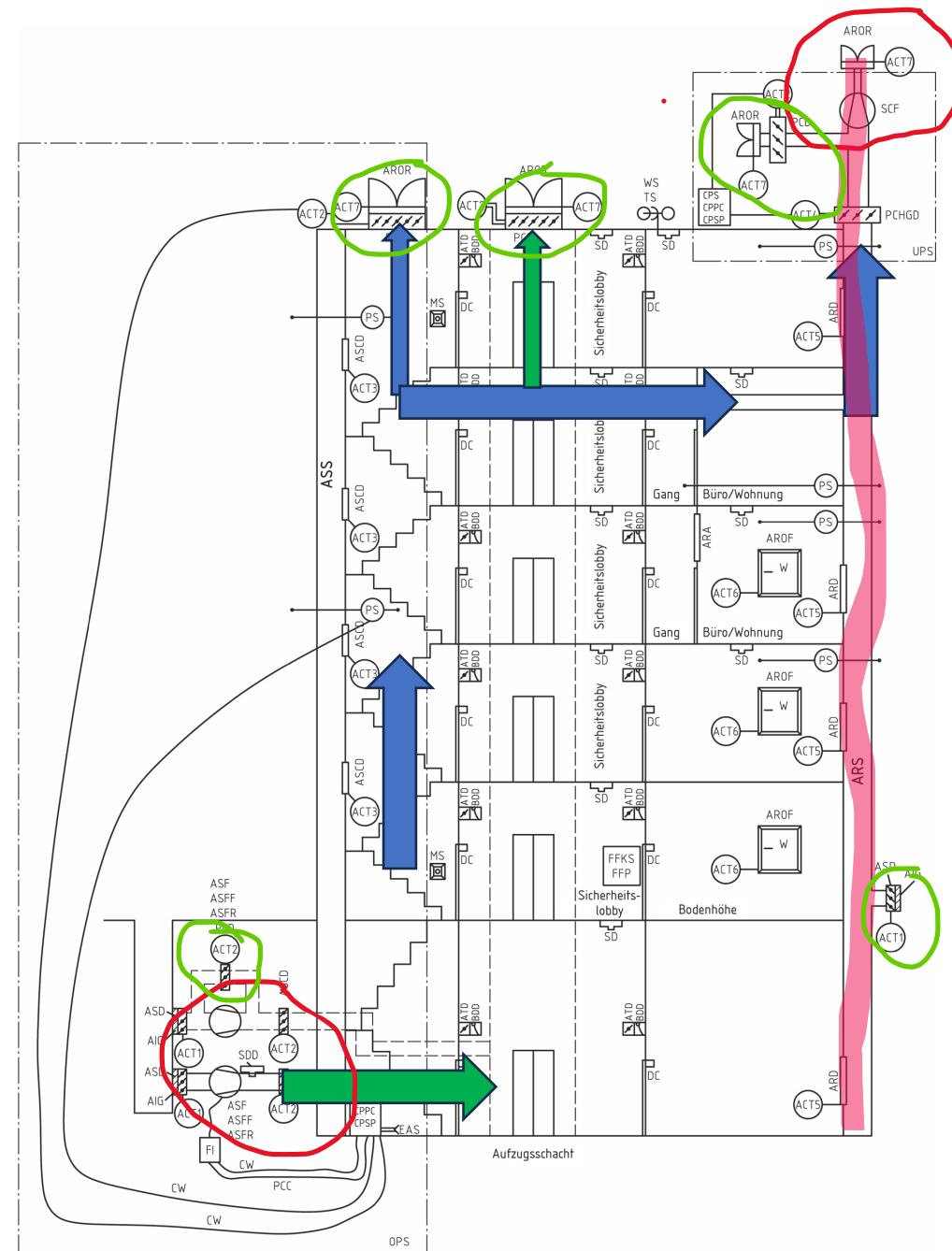
# EN12101-6: 2022-11 passive pressure control

Pressure control by air operated dampers with weights or spring



# EN12101-6: 2022-11 active pressure control

Pressure control by speed control  
from the supply & extract fan only  
Alternative with motorised  
dampers



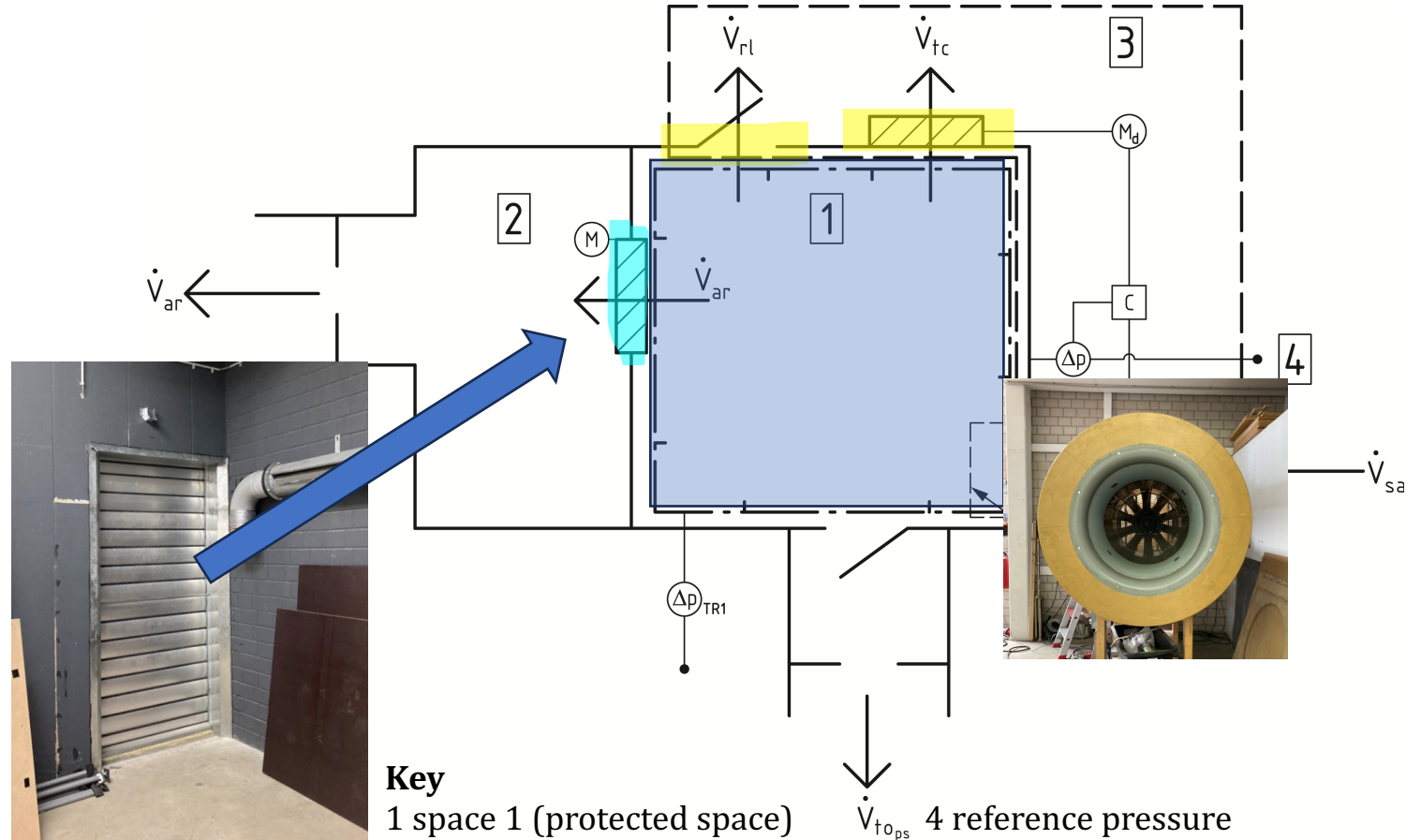
DEDICATED VENTILATION APPLICATIONS

# EN12101-6:2022-11 on practical implementation

- **EN12101-6:2022-11** Smoke and heat control systems - **Part 6**: Specification for pressure differential systems – Kits
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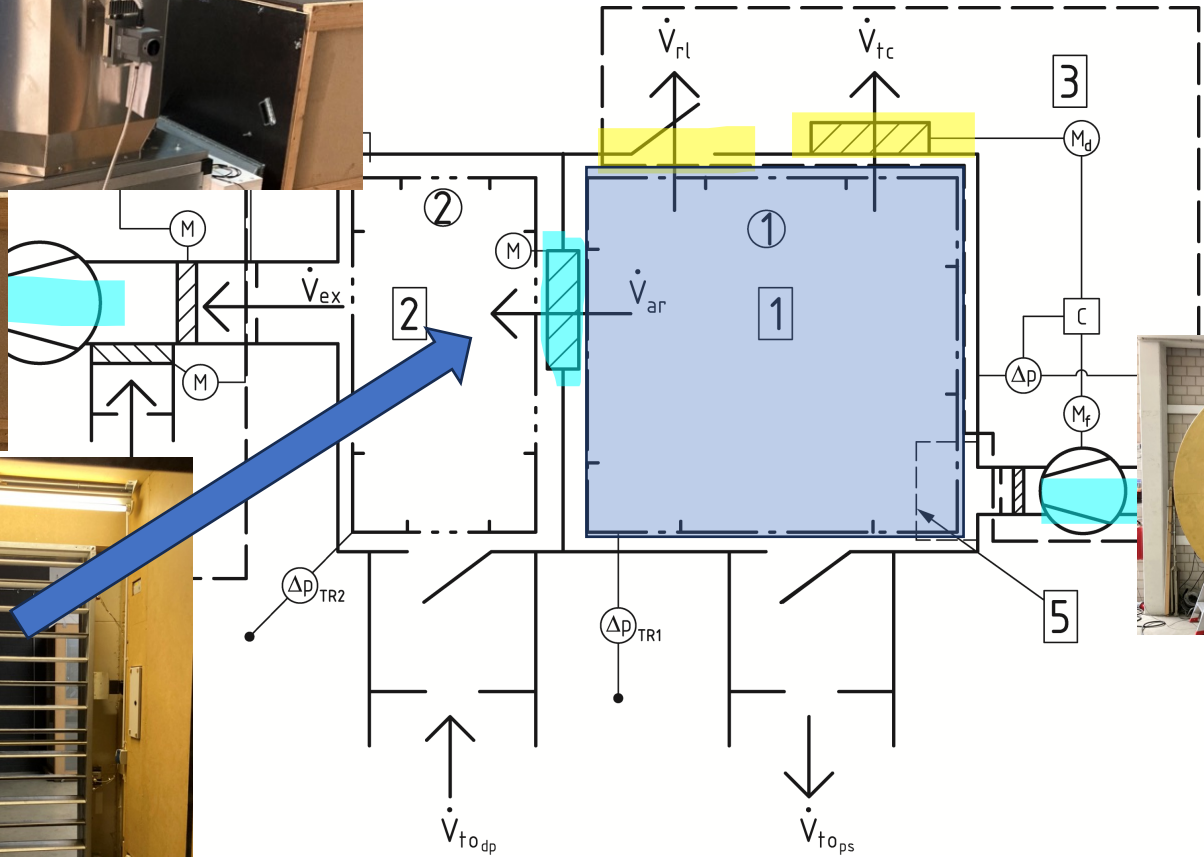
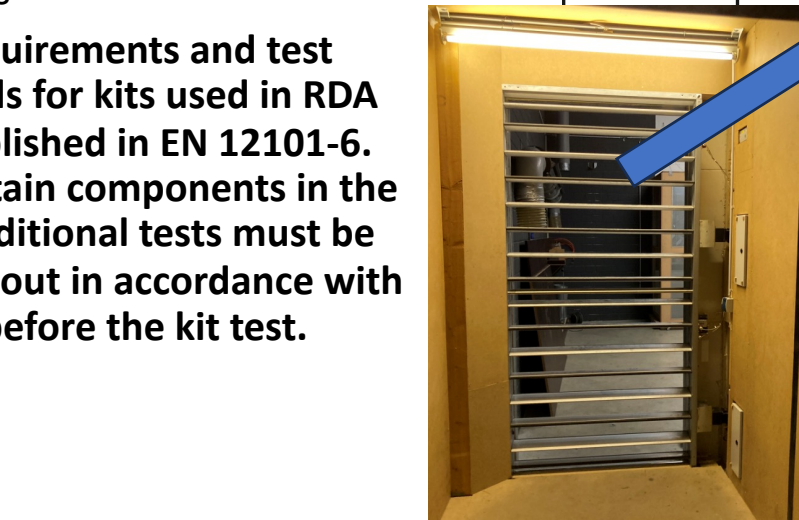
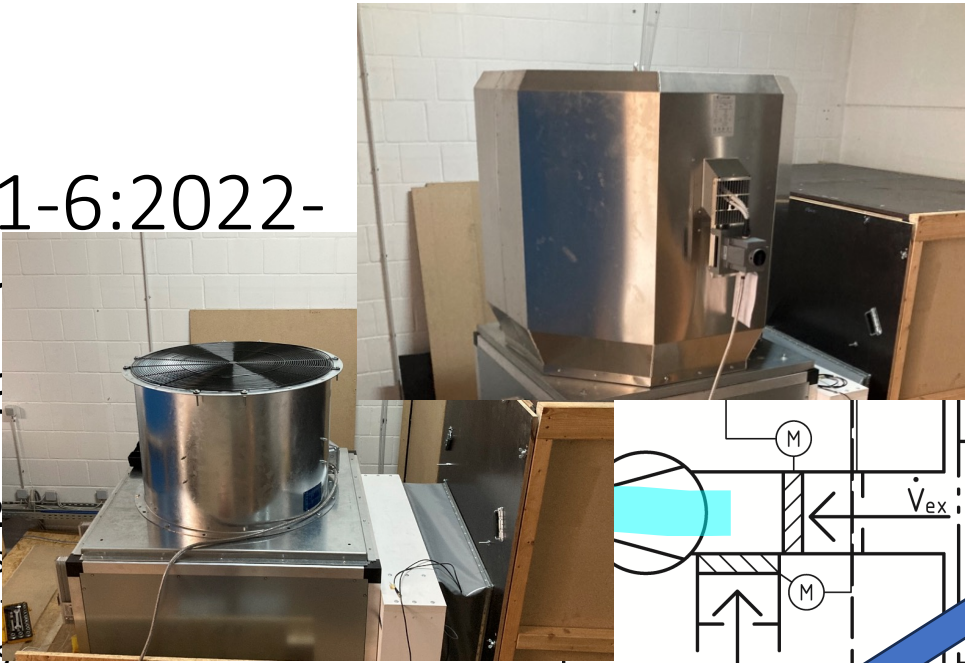
- Key**
- 1 space 1 (protected space)
  - 2 space 2 (unprotected space)
  - 3 system under test
  - 4 reference pressure
  - 5 flow straighteners

**Figure 1 — Schematic drawing of the test rig (pressurization)**

The system under test shall be mounted within a wall (vertically) or mounted on top of the test rig (horizontally).

# EN12101-6:2022-11 on pr implem

- EN12101-6:2022-11 on pr  
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- EN12101-6:2022-11 on pr  
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- The requirements and test methods for kits used in RDA are published in EN 12101-6. For certain components in the kits, additional tests must be carried out in accordance with Part 6 before the kit test.



(space) 4 reference pressure  
(d space) 5 flow straighteners

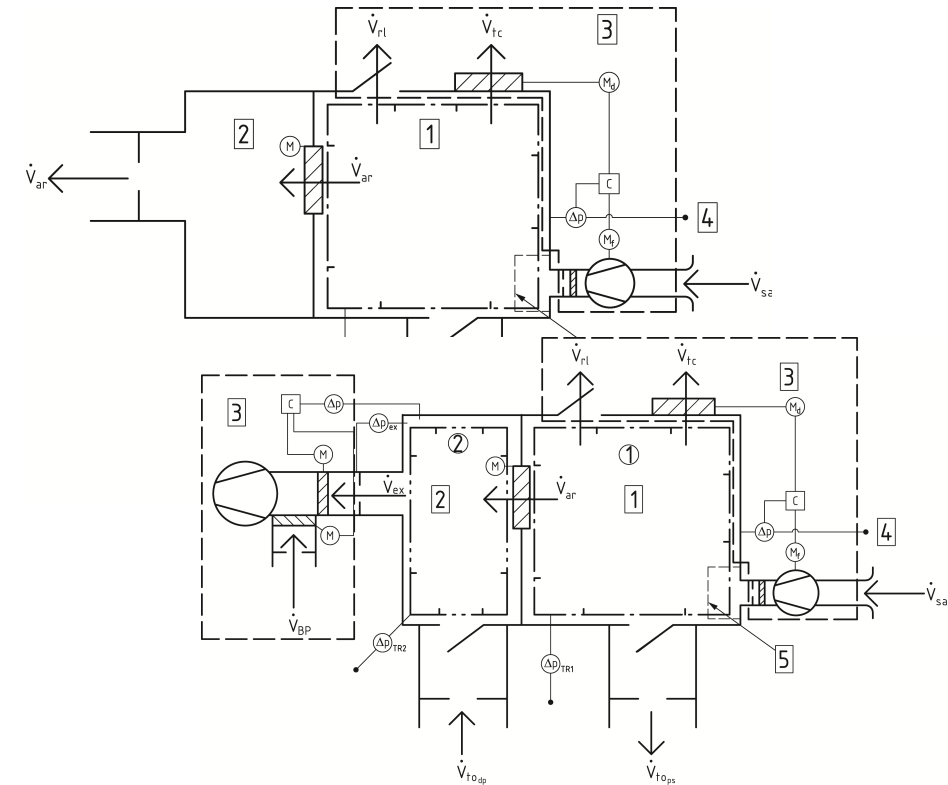
Figure 2 — Schematic drawing of the test rig (pressurization with powered air release)

# EN12101-6:2022-11 on practical implementation

## 5.4.1.5 Description of the tests

The tests shall be in following chronological order:

- a) first functionality test, FU;
- b) durability test, DU;
- c) second functionality test, FU;
- d) oscillating test, OSC.6 before the kit test.

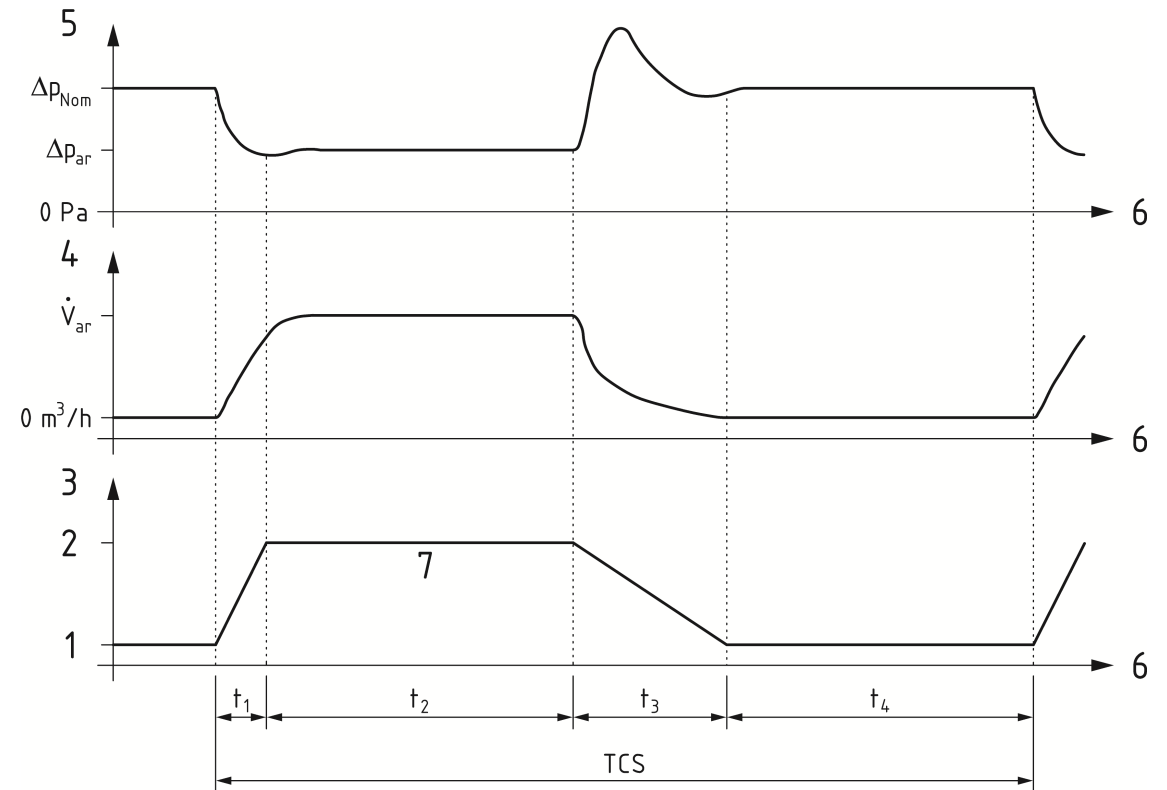


# EN12101-6:2022-11 on practical implementation

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- **a) first functionality test, FU;**
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### Key

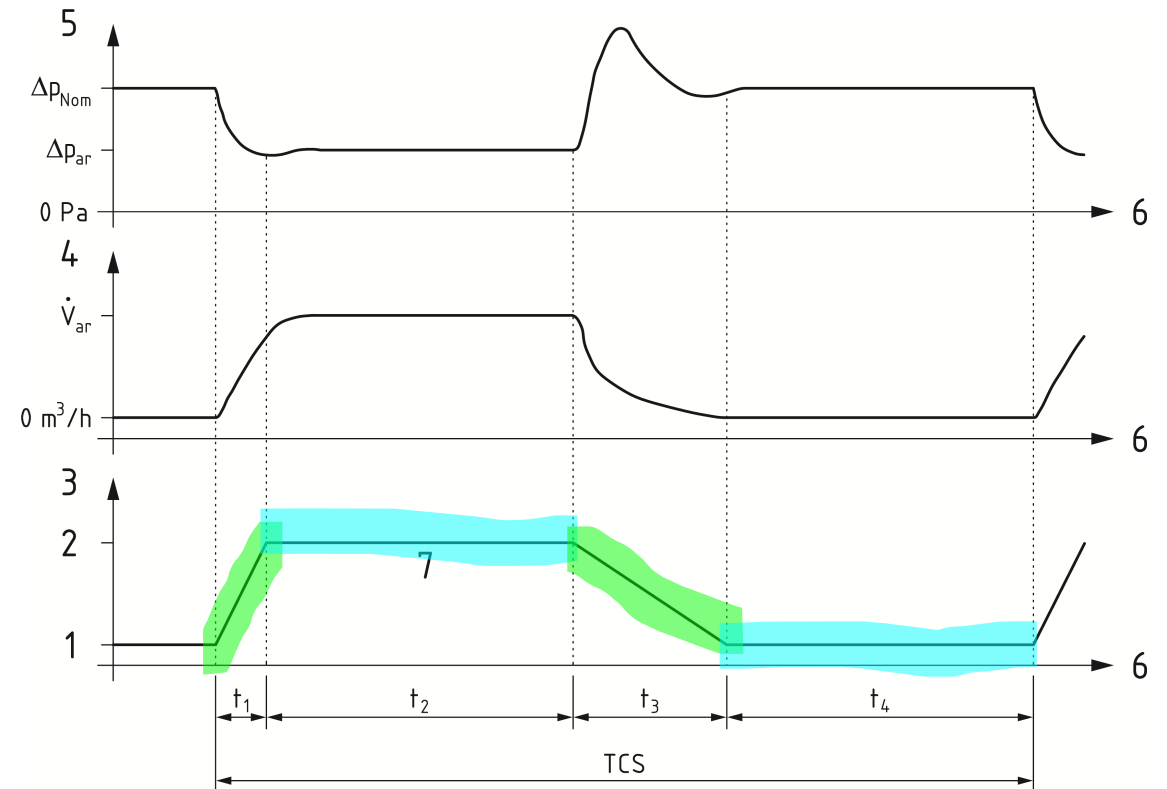
1 door closed	5 pressure
2 door open	6 time
3 door angle	7 door movement



# EN12101-6:2022-11 on practical implementation

## 5.4.1.7 Test cycle sequence

- **The test cycle sequence consists of:**
- **t1 1s ( $\pm 0,1s$ ) door opening time;**
- **t2 6s ( $+0,5s$ ) waiting time with open door**  
to establish volumetric flow  $\dot{V}_{ar}$  ;
- **t3 3s ( $\pm 0,1s$ ) door closing time;**
- **t4 6s ( $+0,5s$ ) waiting time with closed door**  
to control pressure  $\Delta p_{nom}$ .



### Key

1 door closed	5 pressure
2 door open	6 time
3 door angle	7 door movement

# EN12101-6:2022-11 on practical implementation

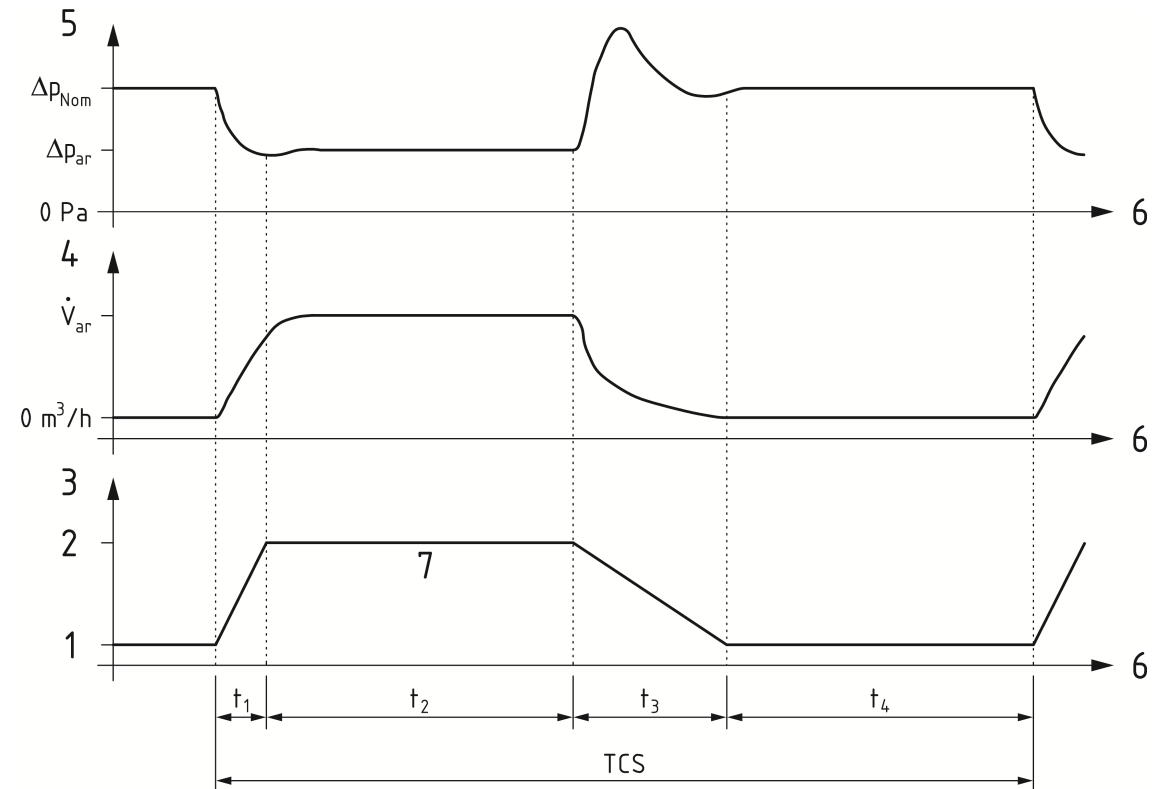
## 5.4.1.5 Description of the tests

The tests shall be in following chronological order:

- a) first functionality test, FU;
- b) **durability test, DU;**
- c) second functionality test, FU;
- d) oscillating test, OSC.6 before the kit test.

## 5.4.1.9 Durability test (DU)

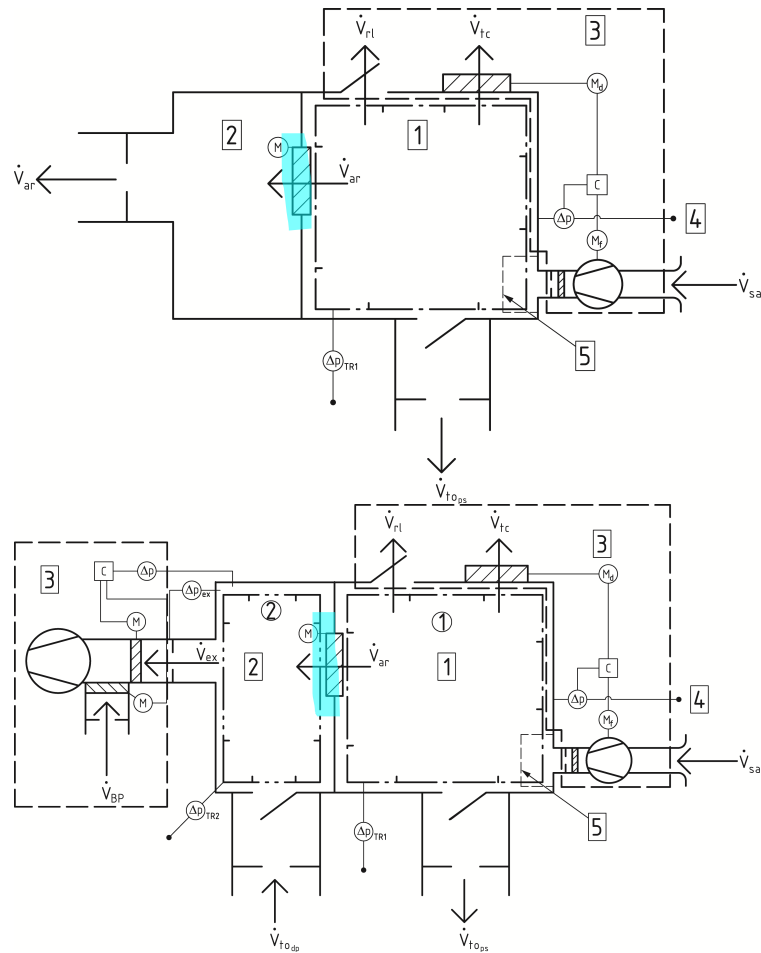
In the durability test for the kit the **test cycle sequence is run 10 000** times.



### Key

1 door closed  
2 door open  
3 door angle

5 pressure  
6 time  
7 door movement



## EN12101-6:2022-11 on practical implementation

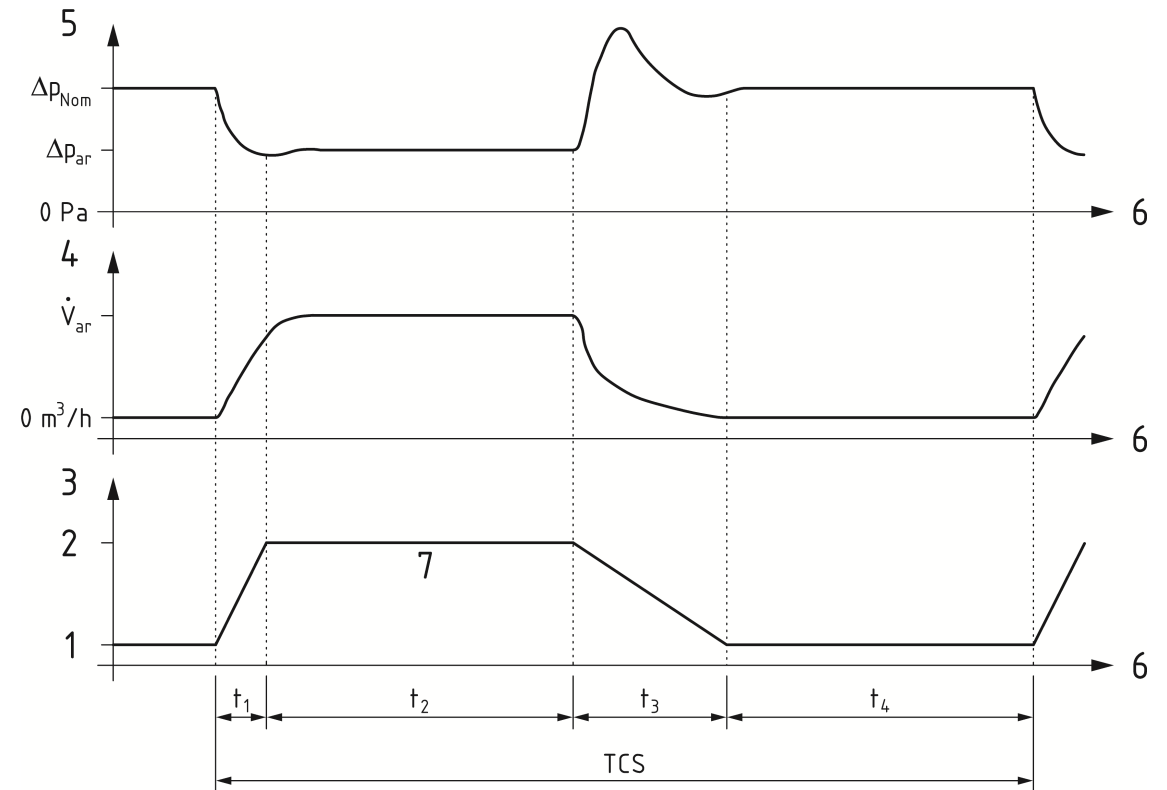
- **EN12101-6:2022-11** Smoke and heat control systems - **Part 6:** Specification for pressure differential systems – Kits
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# EN12101-6:2022-11 on practical implementation

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The tests shall be in following chronological order:

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- **d) oscillating test, OSC.6 before the kit test.**

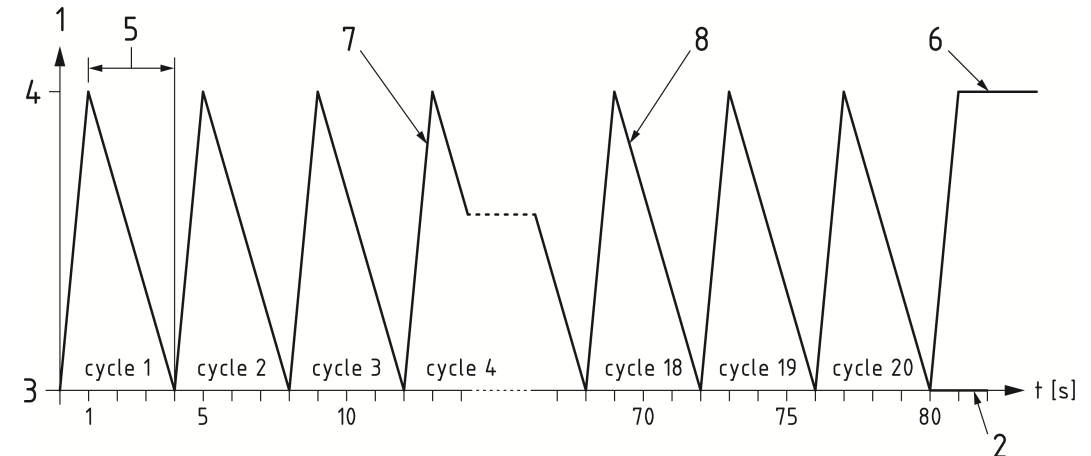


### Key

1 door closed	5 pressure
2 door open	6 time
3 door angle	7 door movement

# EN12101-6:2022-11 on practical implementation

- **5.4.1.10 Oscillating test (OSC)**
- The oscillating test (OSC) determines whether a control system is able to reestablish stable behaviour
- after a repeated cycling operation. This is tested by opening and closing the door repeatedly without any waiting times (compared with TCS:  $t_2 = 0 \text{ s} - t_4 = 0 \text{ s}$ ), called oscillating cycle. #
- This simulates a door which is passed by people on their escape with a small delay between each person, so that the door closes partly or in full.



**The opening and closing times are set to various values corresponding to door opening angles as follows:**

- 90° (door open) 60° 1,0 s
- 90° (door open) 45° 1,5 s
- 90° (door open) 30° 2,0 s
- 90° (door open) 15° 2,5 s
- 90° (door open) 0° 3,0 s

## Key

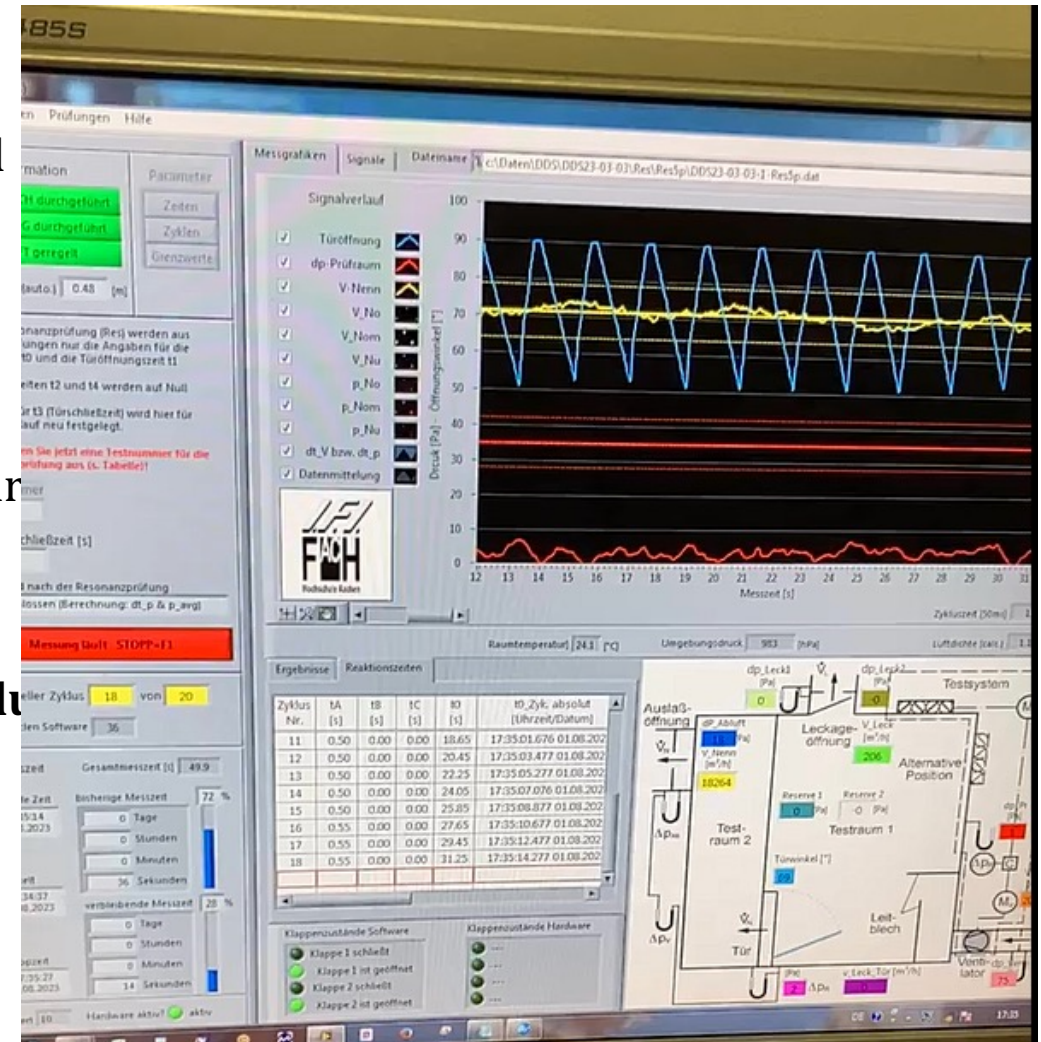
- |               |                 |
|---------------|-----------------|
| 1 door closed | 5 pressure      |
| 2 door open   | 6 time          |
| 3 door angle  | 7 door movement |

# EN12101-6:2022-11 on practical implementation

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# EN12101-6:2021

# Real implementation

- 5.4.1.10 Oscillating test (OSC)



Pressure must be latest in the limit after 3 seconds  
(here 1,8 sec.; 35Pa +/- 10%)

# EN12101-6:2022-11 on practical implementation

- Summary for active controlled pressure differential systems ventilators with frequency inverter and operated with variable speed
- **fan and all motorised dampers must be suitable for 10.000 cycle's**
- **motor power [KW] in relationship to the moment of inertia from the impeller must be high enough to fulfil the ramp time 2,6 seconds or below (above factor 7).**
- **Controller with pressure sensor must create a stable working point in 0,4 seconds or below**
- **the total reaction time max 3 sec.**
- **Extract fan must be tested before to 12101-3**



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INDUSTRIAL - KITCHEN - SMOKE CONTROL - FILTERS



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