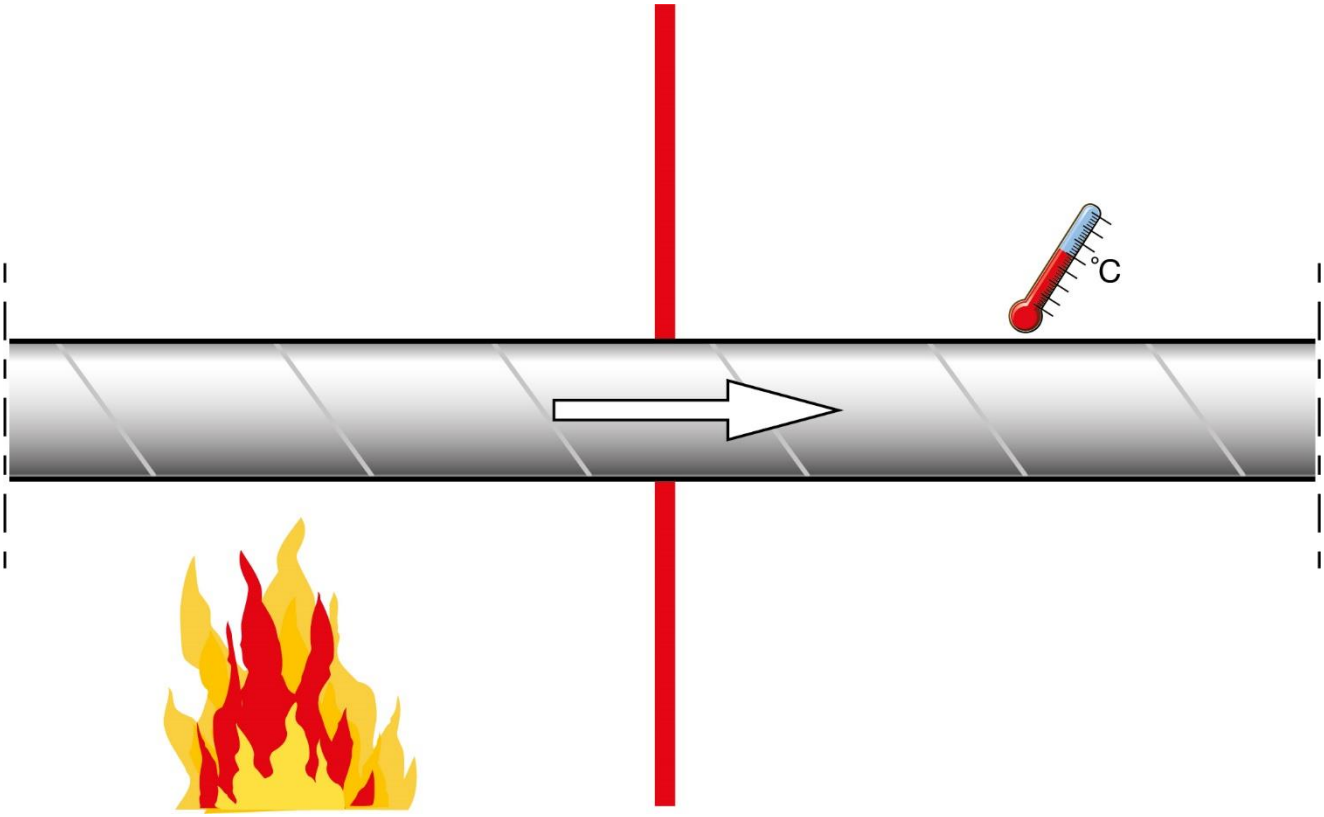
Contents

A1 - External and internal fire or external fire

This scenario is used to calculate an external fire affecting the duct system in the fire cell as well as crossing fire cells with certain surrounding temperatures. The user can specify the conditions for each part and calculate and analyse result.



Scenario A1-1 – no insulation – no velocity

- Fire in left fire cell, temperature 945˚C
- Circular duct, size 200 mm, length 3 m on each side of fire boundary
- 0 m/s in velocity (external fire)
- No insulation
- Surrounding temperature 20˚C in other fire cell

Setup in FEDS

Scenario A1-2 – partly insulation – no velocity

- Fire in left fire cell, temperature 945˚C
- Circular duct, size 200 mm, length 3 m on each side of fire boundary
- 0 m/s in velocity (external fire)
- EI 30 insulation, 1 m on each side of fire cell
- Surrounding temperature 20˚C in other fire cell

Setup in FEDS

Scenario A1-3, no insulation - fan operating during fire

- Fire in left fire cell, temperature 945˚C
- Circular duct, size 200 mm, length 3 m on each side of fire boundary
- 3 m/s in velocity, incoming air temperature 945˚C (external and internal fire. If you change this to 20˚C it´s only external fire). See **chapter E** "Air velocity temperature correction" to determine the velocity.
- No insulation
- Surrounding temperature 20˚C in other fire cell

Setup in FEDS

Scenario A1-4, partly insulation - fan operating during fire

- Fire in left fire cell, temperature 945˚C
- Circular duct, size 200 mm, length 3 m on each side of fire boundary
- 3 m/s in velocity, incoming air temperature 945˚C (external and internal fire. If you change this to 20˚C it´s only external fire) . See **chapter E** "Air velocity temperature correction" to determine the velocity.
- Surrounding temperature 20˚C in other fire cell

Setup in FEDS

Scenario A1-5, no insulation - fan operating during fire

- Fire in left fire cell, temperature 945˚C
- Circular duct, size 200 mm, length 3 m on each side of fire boundary
- -3 m/s in velocity, incoming air temperature 20˚C (external fire). See **chapter E** "Air velocity temperature correction" to determine the velocity.
- No insulation
- Surrounding temperature 20˚C in other fire cell

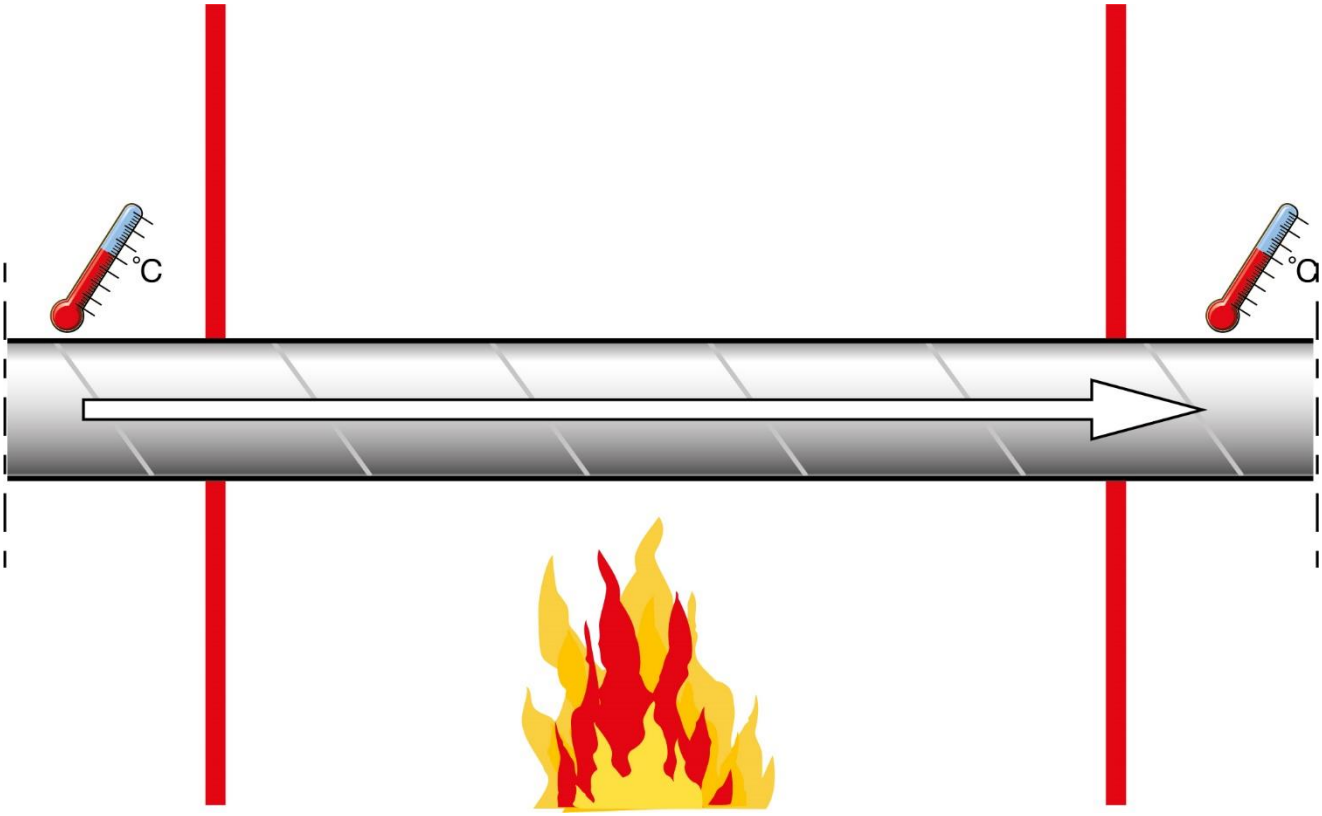
Setup in FEDS

Scenario A1-6, partly insulation - fan operating during fire

- Fire in left fire cell, temperature 945˚C
- Circular duct, size 200 mm, length 3 m on each side of fire boundary
- -3 m/s in velocity, incoming air temperature 20˚C (external fire). See **chapter E** "Air velocity temperature correction" to determine the velocity.
- EI 30 insulation, 1 m on each side of fire cell
- Surrounding temperature 20˚C in other fire cell

Setup in FEDS

A2 - External fire - in passing fire cell



Scenario A2-1, no insulation – no velocity

- Fire in passing fire cell, temperature 945˚C
- Circular duct, size 200 mm, length 3 m on each side of fire boundary
- 0 m/s in velocity (external fire)
- No insulation
- Surrounding temperature 20˚C in other fire cells

Setup in FEDS

Scenario A2-2, partly insulation – no velocity

- Fire in passing fire cell, temperature 945˚C
- Circular duct, size 200 mm, length 3 m on each side of fire boundary
- 0 m/s in velocity (external fire)
- EI 30 insulation, 1 m on each side of fire cell
- Surrounding temperature 20˚C in other fire cells

Setup in FEDS

Scenario A2-3, no insulation - fan operating during fire

- Fire in passing fire cell, temperature 945˚C
- Circular duct, size 200 mm, length 3 m on each side of fire boundary
- 3 m/s in velocity, incoming air temperature 20˚C (external fire). See **chapter E** "Air velocity temperature correction" to determine the velocity.
- No insulation
- Surrounding temperature 20˚C in other fire cells

Setup in FEDS

Scenario A2-4, partly insulation - fan operating during fire

- Fire in passing fire cell, temperature 945˚C
- Circular duct, size 200 mm, length 3 m on each side of fire boundary
- 3 m/s in velocity, incoming air temperature 20˚C (external fire). See **chapter E** "Air velocity temperature correction" to determine the velocity.
- EI 30 insulation, 1 m on each side of fire cell
- Surrounding temperature 20˚C in other fire cells

Setup in FEDS

Scenario A2-5, no insulation - fan operating during fire

- Fire in passing fire cell, temperature 945˚C
- Circular duct, size 200 mm, length 3 m on each side of fire boundary
- -3 m/s in velocity, incoming air temperature 20˚C (external fire). See **chapter E** "Air velocity temperature correction" to determine the velocity.
- No insulation
- Surrounding temperature 20˚C in other fire cells

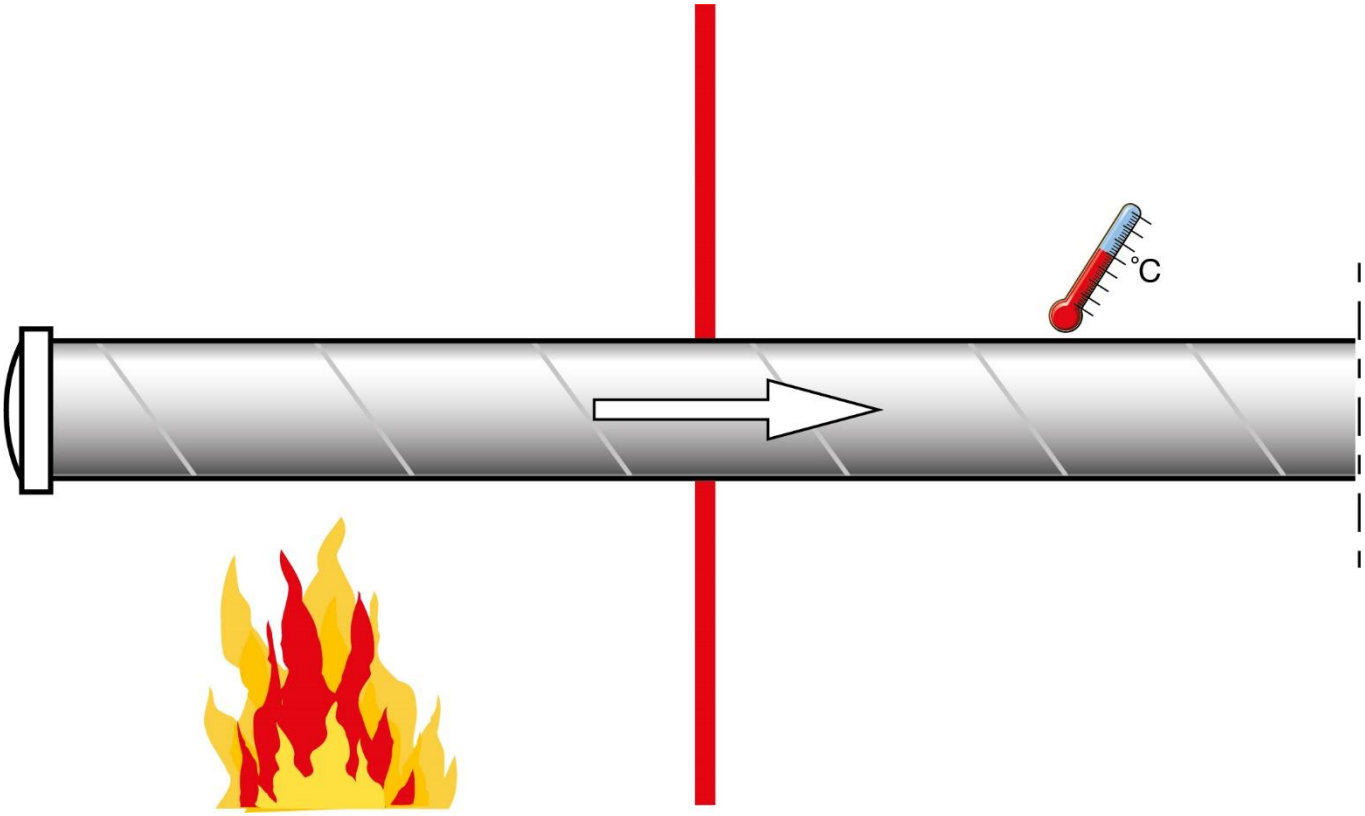
Setup in FEDS

Scenario A2-6, no insulation - fan operating during fire

- Fire in passing fire cell, temperature 945˚C
- Circular duct, size 200 mm, length 3 m on each side of fire boundary
- -3 m/s in velocity, incoming air temperature 20˚C (external fire). See **chapter E** "Air velocity temperature correction" to determine the velocity.
- EI 30 insulation, 1 m on each side of fire cell
- Surrounding temperature 20˚C in other fire cells

Setup in FEDS

B1 - External and internal fire or external fire



Scenario B1-1, no insulation – no velocity

- Fire in left fire cell, temperature 945˚C
- Circular duct, size 200 mm, length 3 m on each side of fire boundary
- 0 m/s in velocity (external fire)
- No insulation
- Surrounding temperature 20˚C in other fire cell

Setup in FEDS

Scenario B1-2, partly insulation – no velocity

- Fire in left fire cell, temperature 945˚C
- Circular duct, size 200 mm, length 3 m on each side of fire boundary
- 0 m/s in velocity (external fire)
- EI 30 insulation, 1 m on each side of fire cell
- Surrounding temperature 20˚C in other fire cell

Setup in FEDS

Scenario B1-3, no insulation - fan operating during fire

- Fire in left fire cell, temperature 945˚C
- Circular duct, size 200 mm, length 3 m on each side of fire boundary
- 3 m/s in velocity, incoming air temperature 945˚C (external and internal fire). See **chapter E** "Air velocity temperature correction" to determine the velocity.
- No insulation
- Surrounding temperature 20˚C in other fire cell

Setup in FEDS

Scenario B1-4, partly insulation - fan operating during fire

- Fire in left fire cell, temperature 945˚C
- Circular duct, size 200 mm, length 3 m on each side of fire boundary
- -3 m/s in velocity, incoming air temperature 20˚C (external fire). See **chapter E** "Air velocity temperature correction" to determine the velocity.
- EI 30 insulation, 1 m on each side of fire cell
- Surrounding temperature 20˚C in other fire cell

Setup in FEDS

Scenario B1-5, no insulation - fan operating during fire

- Fire in left fire cell, temperature 945˚C
- Circular duct, size 200 mm, length 3 m on each side of fire boundary
- - 3 m/s in velocity, incoming air temperature 20˚C (external fire). See **chapter E** "Air velocity temperature correction" to determine the velocity.
- No insulation
- Surrounding temperature 20˚C in other fire cell

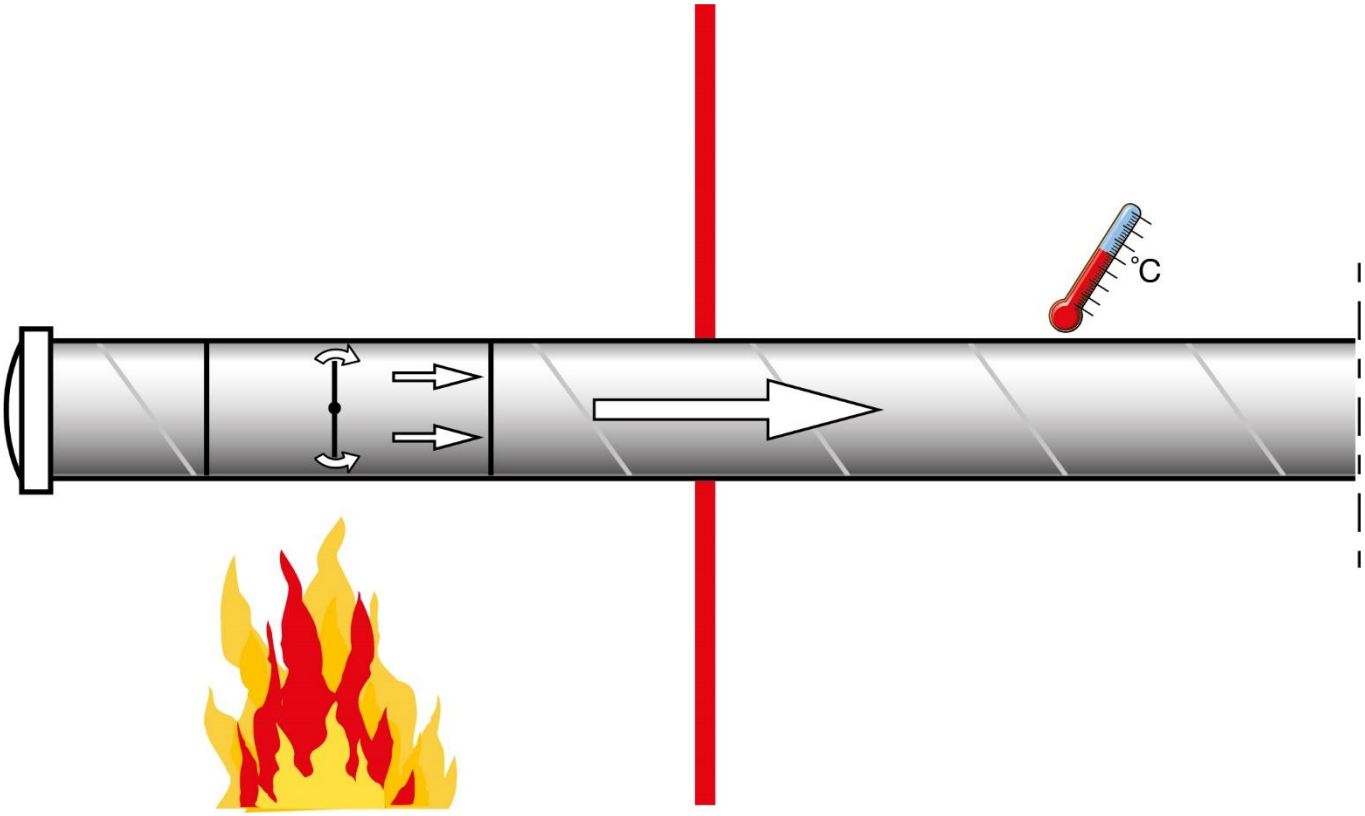
Setup in FEDS

Scenario B1-6, partly insulation - fan operating during fire

- Fire in left fire cell, temperature 945˚C
- Circular duct, size 200 mm, length 3 m on each side of fire boundary
- - 3 m/s in velocity, incoming air temperature 20˚C (external fire). See **chapter E** "Air velocity temperature correction" to determine the velocity.
- EI 30 insulation, 1 m on each side of fire cell
- Surrounding temperature 20˚C in other fire cell

Setup in FEDS

B2 - External fire - fire damper



Scenario B2-1, damper - no insulation – no velocity

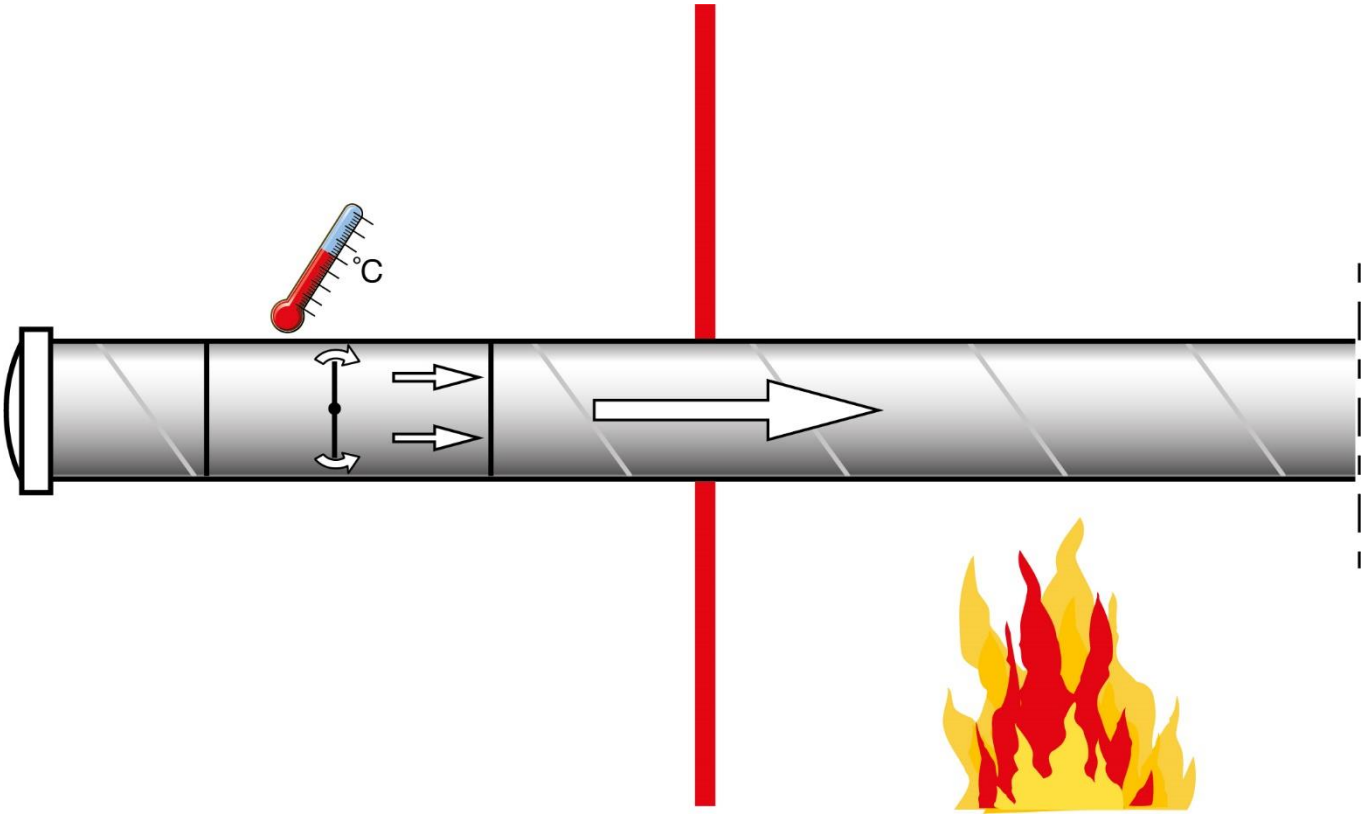
- Fire in left fire cell, temperature 945˚C
- Fire damper (E-S)
- Circular duct, size 200 mm, length 3 m on each side of fire boundary
- 0 m/s in velocity (no leakage assumed). By adding a leakage, it´s both external and internal fire
- No insulation
- Surrounding temperature 20˚C in other fire cell

Setup in FEDS

Scenario B2-2, damper – partly insulation – no velocity

- Fire in left fire cell, temperature 945˚C
- Fire damper (E-S)
- Circular duct, size 200 mm, length 3 m on each side of fire boundary
- 0 m/s in velocity (no leakage assumed). By adding a leakage, it´s both external and internal fire
- EI 60 insulation, 1 m on damper side
- Surrounding temperature 20˚C in other fire cell

Setup in FEDS



Scenario B2-3, damper – no insulation – no velocity

- Fire in right fire cell, temperature 945˚C
- Fire damper (E-S)
- Circular duct, size 200 mm, length 3 m on each side of fire boundary
- 0 m/s in velocity (no leakage assumed), external fire
- No insulation
- Surrounding temperature 20˚C in other fire cell

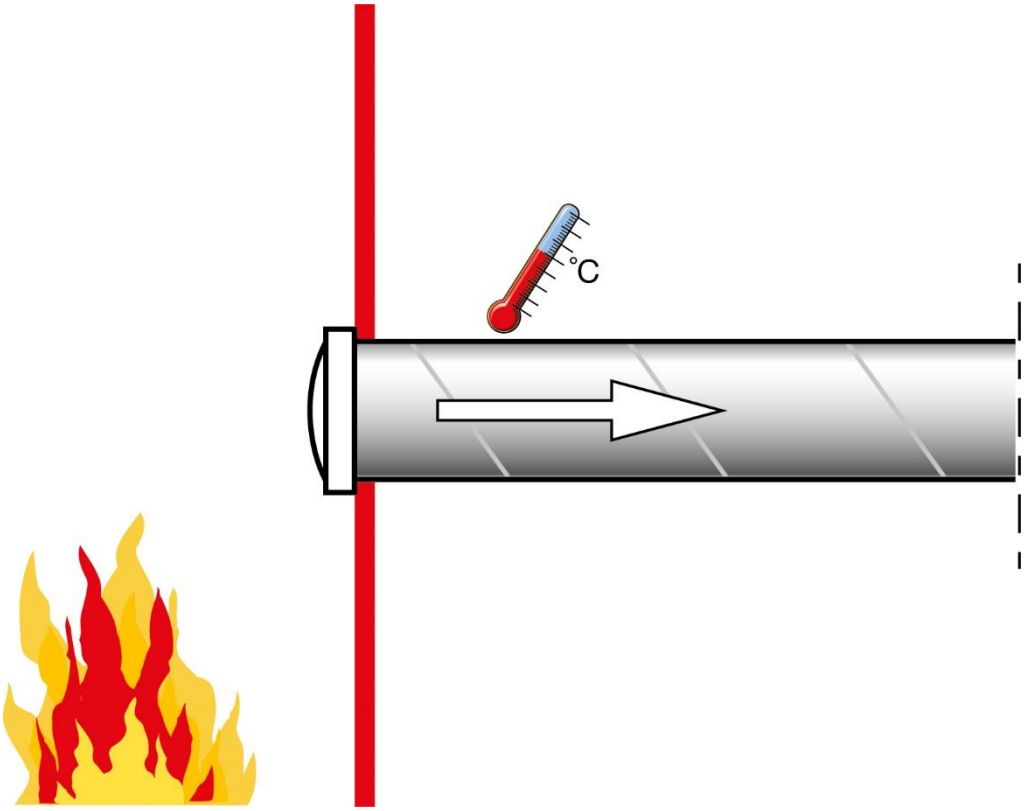
Setup in FEDS

Scenario B2-4, damper – partly insulation – no velocity

- Fire in right fire cell, temperature 945˚C
- Fire damper (E-S)
- Circular duct, size 200 mm, length 3 m on each side of fire boundary
- 0 m/s in velocity (no leakage assumed), external fire
- EI 60 insulation, 1 m on damper side
- Surrounding temperature 20˚C in other fire cell

Setup in FEDS

B3 External and internal fire or external fire



Scenario B3-1, air device - no insulation – no velocity

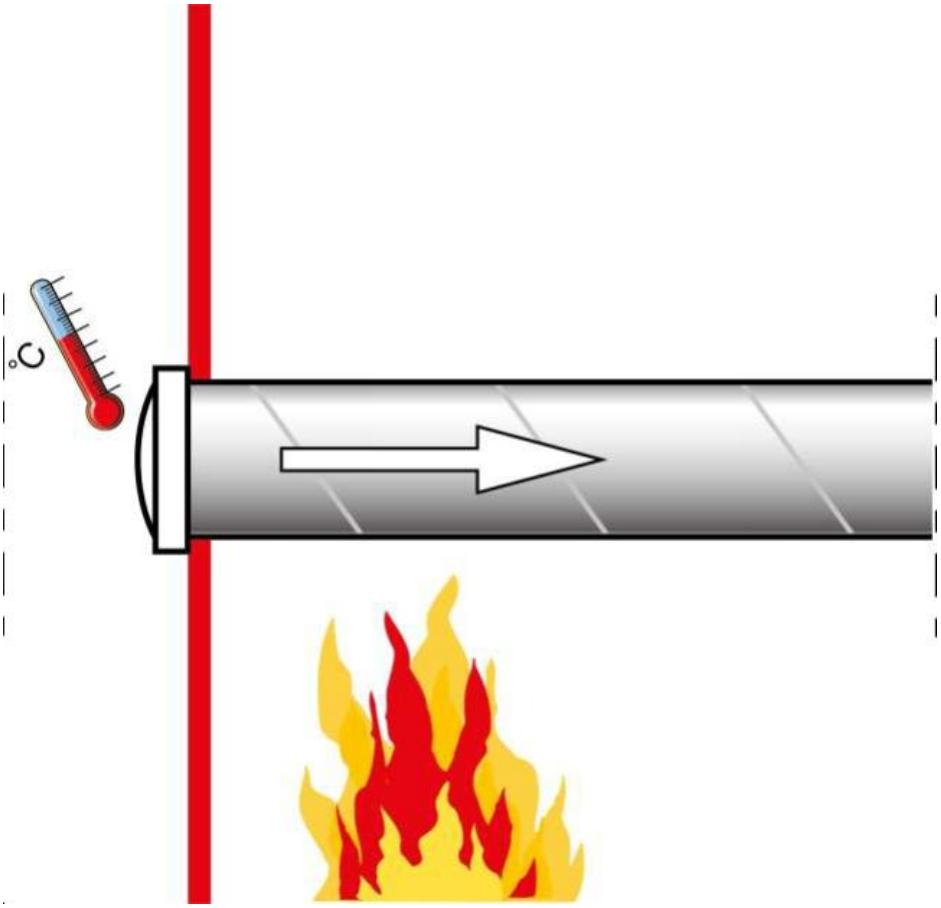
- Fire in left fire cell, temperature 945˚C
- Circular duct, size 200 mm, length 3 m
- 0 m/s in velocity (external fire)
- No insulation
- Surrounding temperature 20˚C in other fire cell

Setup in FEDS

Scenario B3-2, air device – partly insulation - fan operating during fire

- Fire in left fire cell, temperature 945˚C
- Circular duct, size 200 mm, length 3 m
- 3 m/s in velocity, incoming air temperature 945˚C (external and internal fire). See **chapter E** “Air velocity temperature correction” to determine the velocity.
- EI 30 insulation, 1 m on right side of fire boundary
- Surrounding temperature 20˚C in other fire cell

Setup in FEDS



Scenario B3-3, air device - no insulation – no velocity

- Fire in right fire cell, temperature 945˚C
- Circular duct, size 200 mm, length 3 m
- 0 m/s in velocity (external fire)
- No insulation
- Left Opening Screen Ei "Yes"
- Surrounding temperature 20˚C in other fire cell

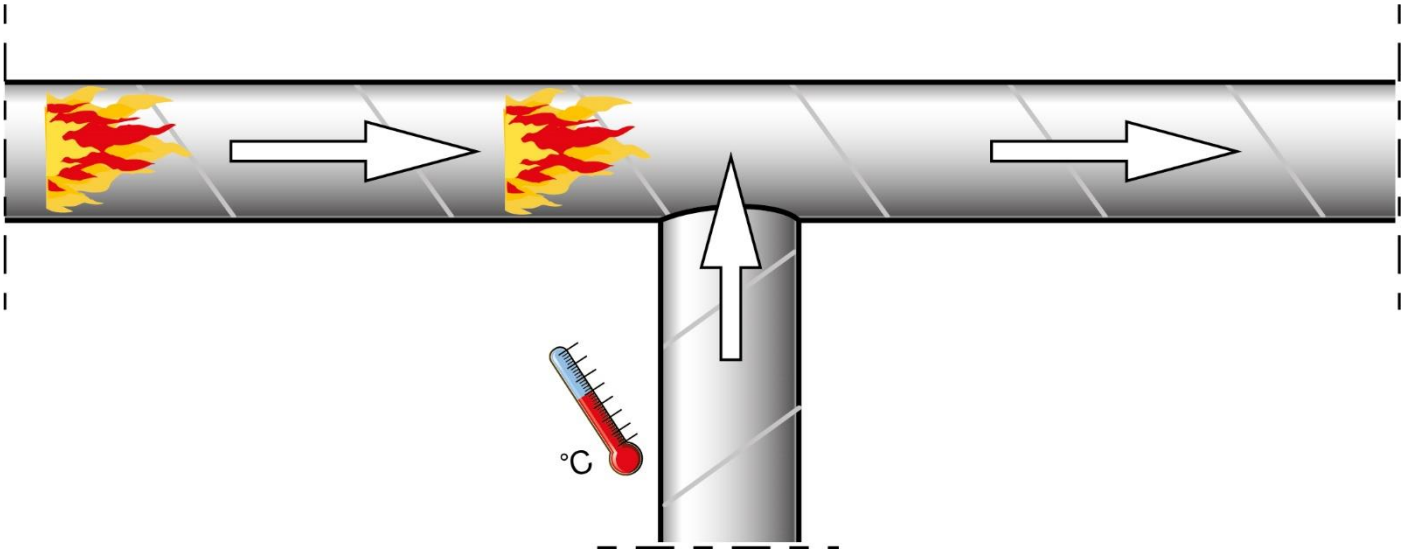
Setup in FEDS

Scenario B3-4, air device – partly insulation - fan operating during fire

- Fire in right fire cell, temperature 945˚C
- Circular duct, size 200 mm, length 3 m
- 3 m/s in velocity, incoming air temperature 20˚C (external fire). See **chapter E** "Air velocity temperature correction" to determine the velocity.
- EI 30 insulation, 1 m on right side
- Left Opening Screen Ei "Yes"
- Surrounding temperature 20˚C in other fire cell

Setup in FEDS

C1 - Junction



Scenario C1-1, junction – no insulation – no velocity

- Fire inside the duct, assumed air temperature, intersection, 945˚C
- Junction, circular duct, size 200 mm, length 3 m
- Junction, 0 m/s in velocity
- Junction, no insulation
- Junction, surrounding temperature 20˚C

Setup in FEDS

Scenario C1-2, junction – no insulation – fan operating during fire

- Fire inside the duct, assumed air temperature, intersection, 500˚C
- Junction, circular duct, size 200 mm, length 3 m
- Junction, -3 m/s in (incoming air temperature 20˚C). See **chapter E** “Air velocity temperature correction” to determine the velocity.
- Junction, no insulation
- Junction, surrounding temperature 20˚C

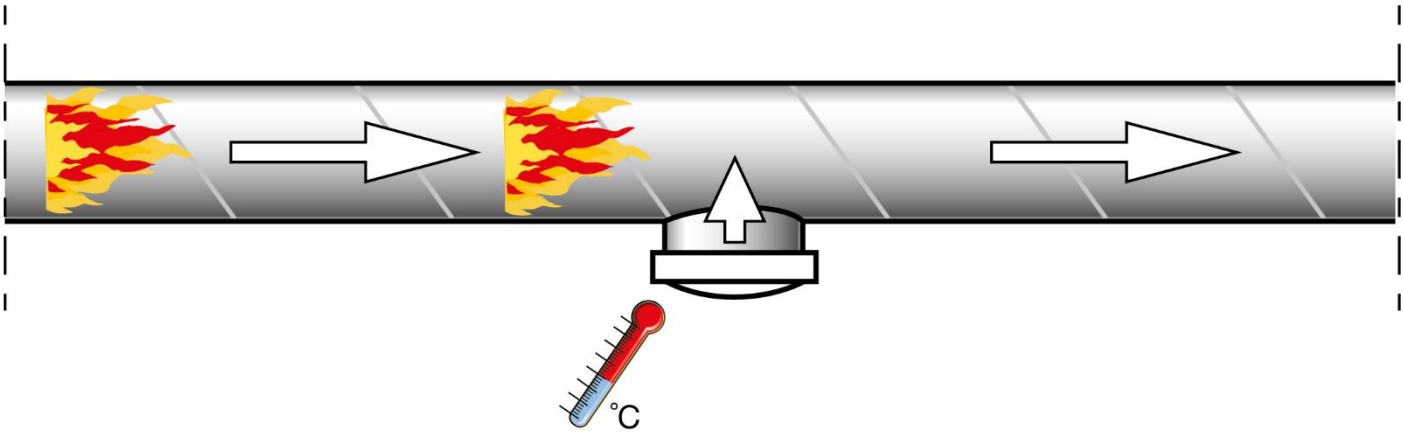
Setup in FEDS

Scenario C1-3, junction – partly insulation - fan operating during fire

- Fire inside the duct, assumed air temperature, intersection, 500˚C
- Junction, circular duct, size 200 mm, length 3 m
- Junction, -3 m/s in (incoming air temperature 20˚C). See **chapter E** "Air velocity temperature correction" to determine the velocity.
- Junction, EI 30 insulation, 1 m
- Junction, surrounding temperature 20˚C

Setup in FEDS

C2 - Junction - air valve in junction

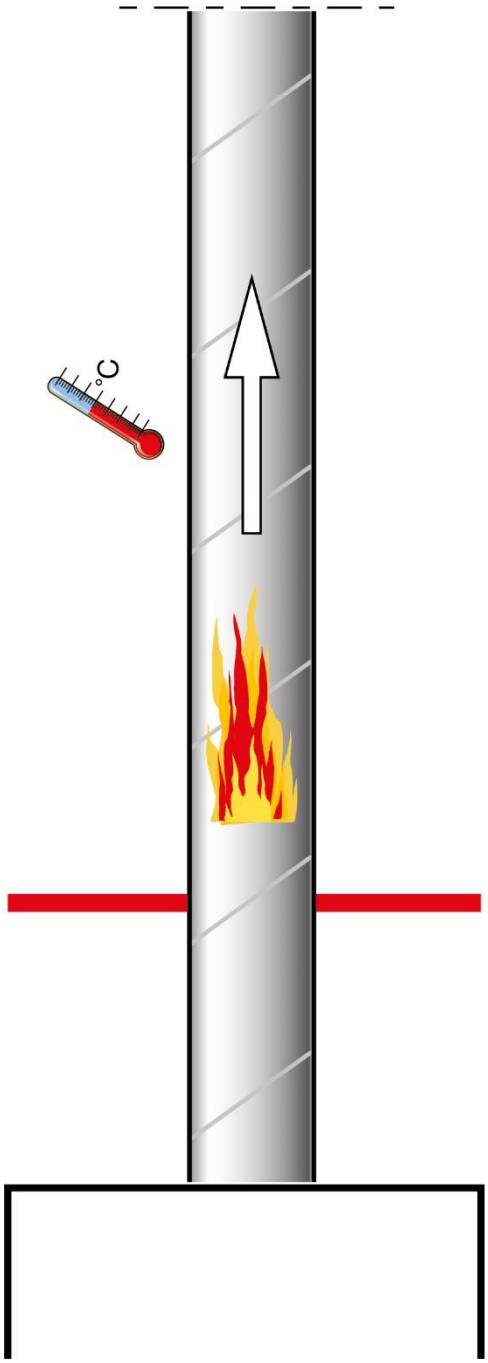


Scenario C2-1, junction – air device – no insulation - fan operating during fire

- Fire inside the duct, assumed air temperature, intersection, 500˚C
- Junction, circular duct, size 200 mm, 0.2 m
- Junction, -3 m/s in (incoming air temperature 20˚C). See **chapter E** “Air velocity temperature correction” to determine the velocity.
- Junction, no insulation
- Junction, Right Opening Screen Ei "Yes"
- Junction, surrounding temperature 20˚C

Setup in FEDS

D1 - Kitchen duct - fire inside duct



Scenario D1-1, fire inside duct – no insulation

- Fire inside duct
- Circular duct, size 200 mm, length 1 m in fire cell and 5 m in other fire cell
- Combustible deposits in duct, starts at 1 m and ends at 2 m
- Oxygen usage, 0.5
- Heat part to air, 0.8
- 3 m/s in velocity (incoming air temperature 20˚C)
- No insulation
- Surrounding temperature 20˚C in other fire cell

Setup in FEDS

Scenario D1-2, fire inside duct - insulation

- Fire inside duct
- Circular duct, size 200 mm, length 1 m in fire cell and 5 m in other fire cell
- Combustible deposits in duct, starts at 1 m and ends at 2 m
- Oxygen usage, 0.5
- Heat part to air, 0.8
- 3 m/s in velocity (incoming air temperature 20˚C)
- Insulation, EI 60 the last 5 m
- Surrounding temperature 20˚C in other fire cell

Setup in FEDS

E - Example – Air velocity temperature correction

See document “Air velocity temperature correction” under the tab “About”.

This correction factors can be applied on system with constant pressure. The correction factor goes from 0.5 to 2.2 depending on the temperatures T_a °C and T_i°C.

$$f_T = [T_a + 273)/(T_i + 273)]^{0.5} \quad (-) \quad (1)$$

$$v_c = f_T \, v_n \quad (m/s) \quad (2)$$

Internal fire, (exhaust air system) assumed main air temperature, +20˚C (T_i) (normal temperature). Assumed average duct air temperature, +100˚C (T_a), velocity correction factor 1.1 (f_T).

- This means if the normal velocity (+20°C) is 3 m/s (V_n), the velocity increase to 3 (m/s) x 1.13 (f_T) = 3.4 m/s (V_c). Use velocity 3.4 m/s in the FEDS program.

External fire, (exhaust air system) assumed main air temperature, +20˚C (T_i) (normal temperature). Assumed average duct air temperature, +50˚C (T_a), velocity correction factor 1.05 (f_T).

- This means if the normal velocity (+20°C) is 3 m/s (V_n), the velocity increase to 3 (m/s) x 1,05 (f_T) = 3.1 m/s (V_c). Use velocity 3.1 m/s in the FEDS program.

External fire, (supply air system) assumed main air temperature, +20˚C (T_i) (normal temperature). Assumed average duct air temperature, +30˚C (T_a), velocity correction factor 1.02 (f_T).

- This means if the normal velocity (+20°C) is 3 m/s (V_n), the velocity increase to 3 (m/s) x 1,02 (f_T) = 3.1 m/s (V_c). Use velocity 3.1 m/s in the FEDS program.

Ta	Ti	fT	Vn	Vc
100	20	1,13	3,0	3,4
50	20	1,05	3,0	3,1
30	20	1,02	3	3,1

You can also use the **PFS program** for proper values.