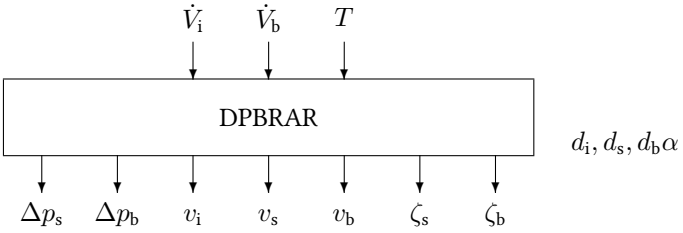
Block DPBRAR

The DPBRAR block calculates the pressure drop of a round branch.





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Inputs

1 Inlet volume flow $\dot{V}_\mathrm{i}$ / $\mathrm{m^3\,h^{-1}}$
2 Branch volume flow $\dot{V}_\mathrm{b}$ / $\mathrm{m^3\,h^{-1}}$
3 Air temperature T / °C

Outputs

1 Pressure drop Δp_s / Pa
2 Pressure drop Δp_b / Pa
3 Flow velocity v_i / $\mathrm{m\,s^{-1}}$
4 Flow velocity v_s / $\mathrm{m\,s^{-1}}$
5 Flow velocity v_b / $\mathrm{m\,s^{-1}}$
6 Zeta value ζ_s
7 Zeta value ζ_b

Parameters

1 Inlet tube diameter d_i / m
2 Straight tube diameter d_s / m
3 Branch tube diameter d_b / m
4 Branch angle α / °

Strings

None

Description

In air-conditioning it is common practise to separate the pressure drop in branches into two parts: One for the straight tube outlet and another one for the branch tube outlet. The advantage is that the two pressure drops then may be assigned to the two connected part channels.

The ζ value for the straight connection is found from

$$\zeta_s = k_c \left(1 - \frac{v_i}{v_s}\right)^2$$

where v_i denotes the flow velocity of the inlet air into the straight tube, and v_s the velocity out of the straight tube. The constant k_c is approximated by 0.4. The pressure drop is then equal to

$$\Delta p_s = \zeta_s \frac{\rho}{2} {v_s}^2$$

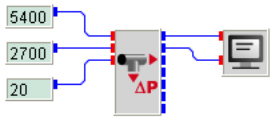
The ζ value for the branch connection is found from

$$\zeta_b = k_a \left(1 + \left(\frac{v_s}{v_b}\right)^2 - 2 \frac{v_s}{v_b} \cos(\alpha)\right)$$

where v_b denotes the flow velocity out of the branch tube. The constant k is approximated by 0.9 for $v_b/v_s > 0.8$ and $k = 1$ else. The pressure drop is then equal to

$$\Delta p_b = \zeta_b \frac{\rho}{2} {v_b}^2$$

dpbrar.vseit



The inlet volume flow of the DPBRAR block is set to 5400 m^3/h assumed equally distributed to the straight tube and the branch tube as defined by two CONST blocks. The air temperature is 20 °C as defined through the third CONST block.

The SCREEN block displays the pressure drops in the two branches in Pascal.

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5.942  74.273
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