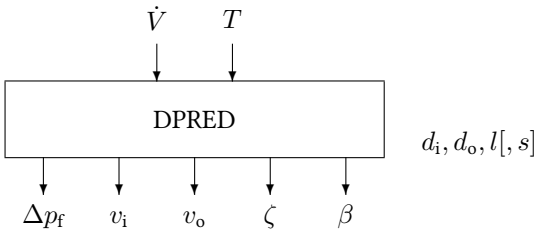
Block DPRED

The DPRED block calculates the pressure drop in a reducer due to friction of an incompressible one-phase turbulent tubular flow.





Name	DPRED
Function	st0020
Inputs	2
Outputs	5
Parameters	3 . . . [4]
Strings	0
Group	S

Inputs

1 Volume flow $\dot{V}$ / $\mathrm{m^3\,h^{-1}}$
2 Air temperature T / °C

Outputs

1 Pressure drop Δp_f / Pa
2 Inlet flow velocity v_i / $\mathrm{m\,s^{-1}}$
3 Outlet flow velocity v_o / $\mathrm{m\,s^{-1}}$
4 Zeta value ζ
5 Closing angle β / °

Parameters

1 Inlet diameter d_i / m
2 Outlet diameter d_o / m
3 Length l / m
4 Sharpness s (evaluated only if PARAMS(3) = 0)
  0 Sharp edge
  1 Broken edge
  2 Round edge

3 Smooth, round edge

Strings

None

Description

For the reducer no analytical equation is available in the current version. An empirical table is used instead. Since the ζ values are rather small, no interpolation between the values is made.

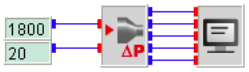
	A_o/A_i									
$\beta/°$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
≤ 10	0	0	0	0	0	0	0	0	0	0
20	0.01	0.01	0.01	0.01	0.01	0.01	0	0	0	0
30	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0
40	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0
50	0.05	0.05	0.05	0.04	0.04	0.03	0.03	0.02	0.01	0
60	0.07	0.07	0.06	0.06	0.05	0.04	0.04	0.03	0.01	0

For angles greater than 60° an abrupt change in diameter is assumed and the following equation is used for the calculation of the ζ value:

$$\zeta = \zeta'(1 - \frac{A_o}{A_i})$$

where ζ' dependes on the sharpness of the edge. For sharp edges ζ' is equal to 0.5, for broken edges ζ' = 0.2, for round edges ζ' = 0.12, while for smooth, round edges ζ' is equal to 0.03.

dpred.vseit



A reducer with length 1 m is simulated with an inlet diameter of 0.4 m and an outlet diameter of 0.25 m. The volume flow is set to 1800 m^3/h at an air temperature of 20 °C as defined through two CONST blocks.

The SCREEN block displays all outputs of the DPRED block for the sharpness “Broken edge”.

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0.00616   3.97887  10.18592   0.00010   8.57831
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