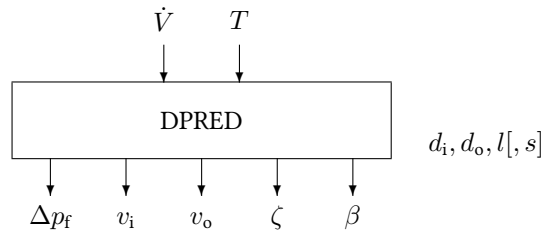


Block DPRED

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 $\dot{V} / \text{m}^3 \text{h}^{-1}$
- 2 Air temperature $T / ^\circ\text{C}$

Outputs

- 1 Pressure drop $\Delta p_f / \text{Pa}$
- 2 Inlet flow velocity $v_i / \text{m s}^{-1}$
- 3 Outlet flow velocity $v_o / \text{m s}^{-1}$
- 4 Zeta value ζ
- 5 Closing angle $\beta / ^\circ$

Parameters

- 1 Inlet diameter d_i / m
- 2 Outlet diameter d_o / m
- 3 Length l / m
- 4 Sharpness s (evaluated only if BP(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.

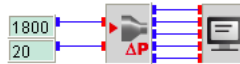
	A_o/A_i									
$\beta/^\circ$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
≤ 10	0	0	0	0	0	0	0	0	0	0
20	0.01	0.01	0.01	0.01	0.01	0.01	0	0	0	0
30	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0
40	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0
50	0.05	0.05	0.05	0.04	0.04	0.03	0.03	0.02	0.01	0
60	0.07	0.07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

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

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

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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 $1800 \text{ m}^3/\text{h}$ 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”.

0.00616 3.97887 10.18592 0.00010 8.57831