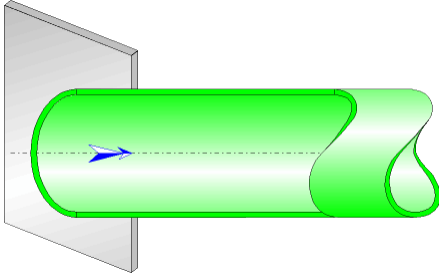# Flush-mounted sharp-edged entrance mounted at a distance Circular Cross-Section (IDELCHIK)

Model description:

This model of component calculates the minor head loss (pressure drop) generated by the flow in a flush-mounted sharp-edged entrance of piping mounted at a distance.

The head loss by friction in the piping is not taken into account in this component.

Model formulation:

Hydraulic diameter (m):

$$D_h = D_0$$

Pipe cross-sectional area (m²):

$$F_0 = \pi \cdot \frac{D_0^{\,2}}{4}$$

Mean velocity in pipe (m/s):

$$w_0 = \frac{Q}{F_0}$$

Mass flow rate (kg/s):

$$G = Q \cdot \rho$$
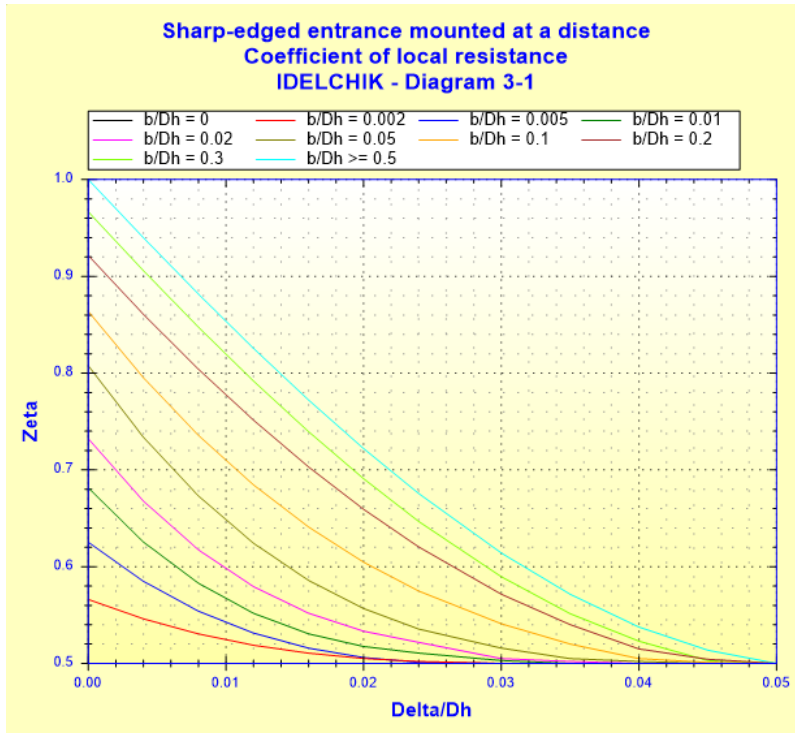
Reynolds number in pipe:

$$Re = \frac{w_0 \cdot D_0}{\nu}$$

Local resistance coefficient:

- $\delta_1 / D_h \leq 0.05$

$$\zeta_{loc} = f\left(\frac{\delta_1}{D_h}, \frac{b}{D_h}\right)$$

([1] diagram 3.1)

Sharp-edged entrance mounted at a distance
Coefficient of local resistance
IDELCHIK - Diagram 3-1

- $\delta_1/Dh > 0.05$

$$\zeta_{loc} = 0.5$$

([1] diagram 3.1)

Total pressure loss coefficient (based on mean velocity in pipe):

$$\zeta = \zeta_{loc}$$

Total pressure loss (Pa):

$$\Delta P = \zeta \cdot \frac{\rho \cdot w_0^2}{2}$$

Total head loss of fluid (m):

$$\Delta H = \zeta \cdot \frac{w_0^2}{2 \cdot g}$$

Hydraulic power loss (W):

$$Wh = \Delta P \cdot Q$$

Symbols, Definitions, SI Units:

D_h Hydraulic diameter (m)
D_0 Pipe diameter (m)
F_0 Pipe cross-sectional area (m²)
Q Volume flow rate (m³/s)
w_0 Mean velocity in pipe (m/s)

G	Mass flow rate (kg/s)
Re	Reynolds number in pipe ()
b	Distance from the wall (m)
δ_1	Pipe thickness (m)
ζ_{loc}	Local resistance coefficient ()
ζ	Total pressure loss coefficient (based on mean velocity in pipe) ()
ΔP	Total pressure loss (Pa)
ΔH	Total head loss of fluid (m)
Wh	Hydraulic power loss (W)
ρ	Fluid density (kg/m³)
ν	Fluid kinematic viscosity (m²/s)
g	Gravitational acceleration (m/s²)

Validity range:

- turbulent flow regime (Re ≥ 10^4)

Example of application:

References:

[1] Handbook of Hydraulic Resistance, 3rd Edition, I.E. Idelchik

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