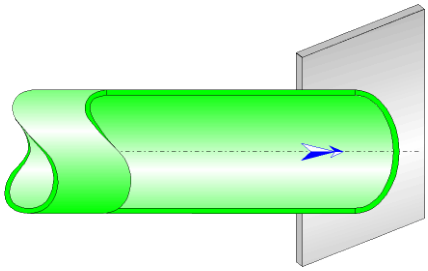
# Sharp-edged discharge mounted at a distance
# Circular Cross-Section
# (CRANE)



**Model description:**

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

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

**Model formulation:**

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Hydraulic diameter (m):

$$D_h = D$$

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Pipe cross-sectional area ($m^2$):

$$A = \pi \cdot \frac{D^2}{4}$$

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Mean velocity in pipe (m/s):

$$v = \frac{q}{A}$$

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Mass flow rate (kg/s):

$$G = q \cdot \rho$$

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Reynolds number in pipe:

$$Re = \frac{v \cdot D}{\nu}$$

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Local resistance coefficient ($Re \geq 10^4$):

$$K_1 = 1$$ ([1] Appendix A-29)

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

$$K = K_1$$

Total pressure loss (Pa):

$$\Delta P = K \cdot \frac{\rho \cdot v^2}{2}$$

Total head loss of fluid (m):

$$\Delta H = K \cdot \frac{v^2}{2 \cdot g}$$

Hydraulic power loss (W):

$$Wh = \Delta P \cdot q$$

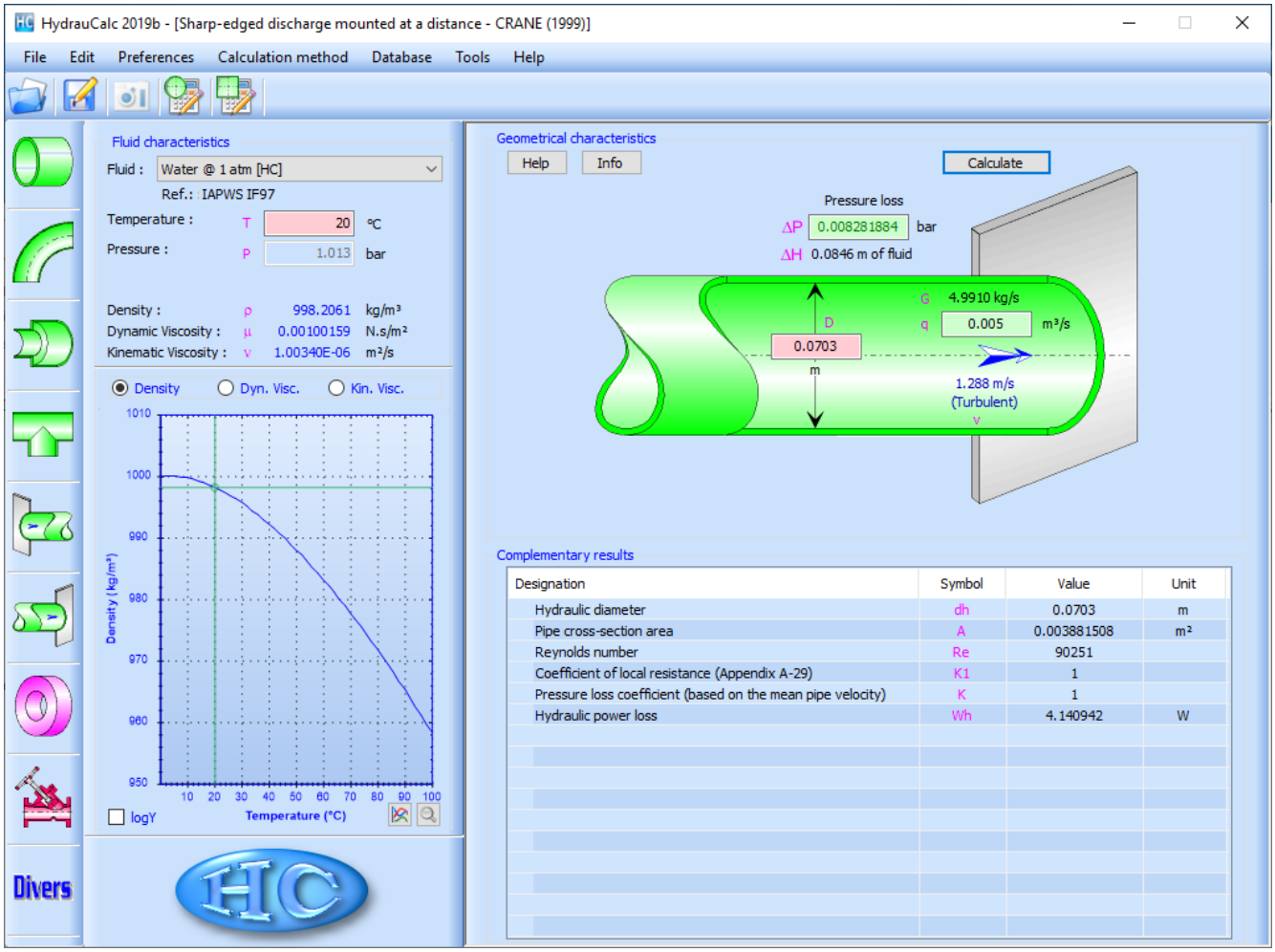
**Symbols, Definitions, SI Units:**

| | |
|---|---|
| $D_h$ | Hydraulic diameter (m) |
| D | Pipe diameter (m) |
| A | Pipe cross-sectional area ($m^2$) |
| q | Volume flow rate ($m^3/s$) |
| v | Mean velocity in pipe (m/s) |
| G | Mass flow rate (kg/s) |
| Re | Reynolds number in pipe () |
| $K_1$ | Local resistance coefficient () |
| K | Total pressure loss coefficient (based on mean velocity in pipe) () |
| $\Delta P$ | Total pressure loss (Pa) |
| $\Delta H$ | Total head loss of fluid (m) |
| Wh | Hydraulic power loss (W) |
| | |
| $\rho$ | Fluid density ($kg/m^3$) |
| $\nu$ | Fluid kinematic viscosity ($m^2/s$) |
| g | Gravitational acceleration ($m/s^2$) |

**Validity range:**

- turbulent flow regime in pipe ($Re \geq 10^4$)

**Example of application:**




**References:**

[1] CRANE - Flow of Fluids Through Valves, Fitting and Pipe - Technical Paper No. 410 – Edition 1999