

# HydrauCalc

2020a Release



[www.hydraucalc.com](http://www.hydraucalc.com)

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## APPLICATION DESCRIPTION

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## APPLICATION DESCRIPTION

HydrauCalc is a software application that allows accurate modeling and calculating of stabilized flows in piping elements as straight pipes, bends, changes of cross-section, tees, valves, orifices and more.

HydrauCalc is particularly suitable for pre-projects because it allows to estimate quickly the pressure losses of the components of a hydraulic installation, and thus to specify the characteristics of the pumps.

Friction Loss is calculated using the Darcy-Weisbach method, which provides accurate results for non-compressible fluids (liquids). This method also provides satisfactory results of reasonable accuracy for compressible fluids (gases) when the flow velocity is not very high.

HydrauCalc is mainly based on well-known and respected references in the field of fluid flow and pressure drop calculation.

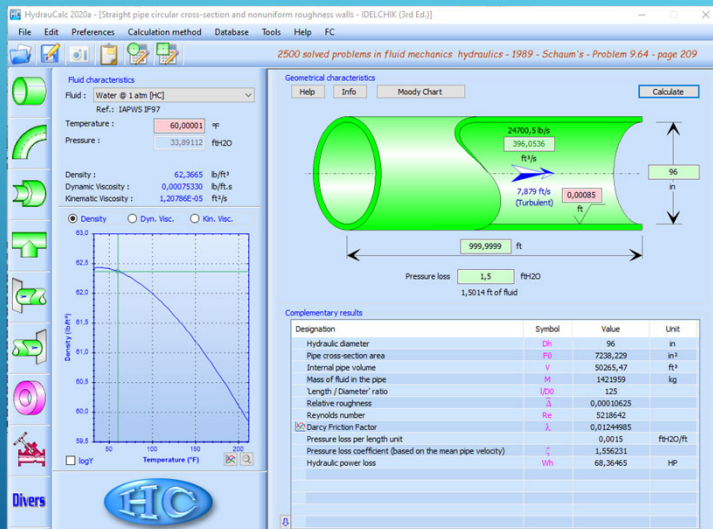
## THE REFERENCES

## MAINLY REFERENCES

- [1] Handbook of Hydraulic Resistance, I.E. Idelchik
- [2] Internal Flow System, D.S. Miller
- [3] CRANE - Flow of Fluids Through Valves, Fitting and Pipe - Technical Paper No. 410
- [4] Pipe Flow - A Practical and Comprehensive Guide, D. C. Rennels, H. M. Hudson

## THE GRAPHICAL USER INTERFACE

# GRAPHICAL USER INTERFACE



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The graphical user interface is available in English, French or Spanish. **New R2020a**

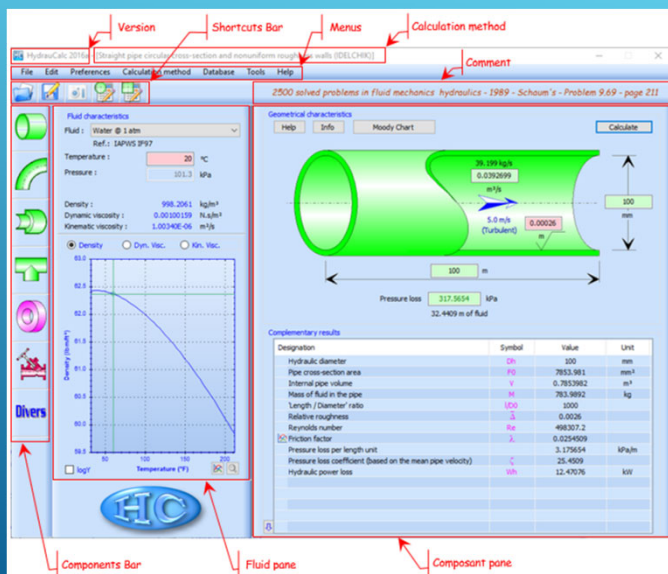
From this interface, the user selects the type of component he wants to calculate and the fluid carried in this component. It also provides the necessary input data (fluid and flow characteristics and component geometry).

This interface is intuitive and very easy-to-use.

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# GRAPHICAL INTERFACE STRUCTURE



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The graphical interface is structured in four main parts:

- The components bar
- The fluid pane
- The component pane
- The upper part which includes:
  - The information about release and calculation method chosen
  - Menus and shortcuts bar
  - The display area for a possible comment

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## COMPONENTS BAR

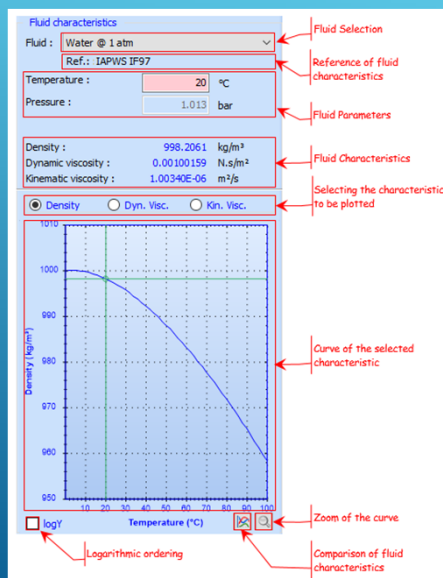


The vertical components bar makes it possible to select a family of components (straight pipes, bends, changes of cross-section, tees, pipeline entrances and discharges, restriction and measurement orifices, valves, ...)

Selecting a family displays the available components for that family in one or more horizontal bars.

The shaded components are under development and will be available in a future release.

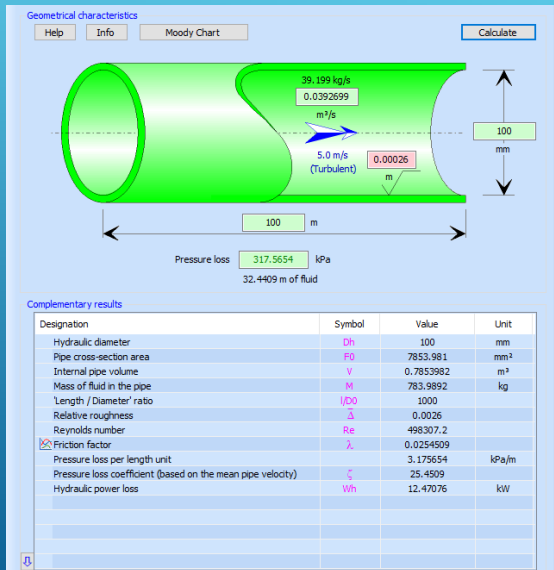
## FLUID PANE



The fluid pane mainly allows:

- ❑ Select the fluid
- ❑ Set the fluid according to the selected fluid type (temperature, pressure, salinity, quality, humidity, ...)
- ❑ Visualize the characteristics of the fluid (density, dynamic and kinematic viscosity)
- ❑ Visualize the evolution of the characteristics according to the temperature or the pressure (according to the type of selected fluid)

# COMPONENT PANE



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The component pane allows you to:

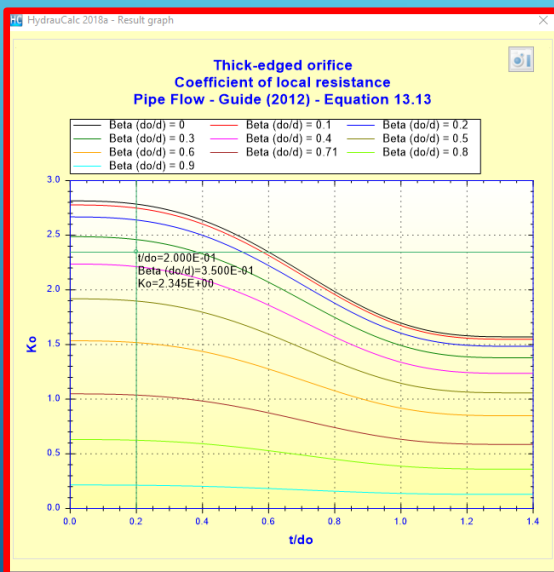
- Define the geometry of the component according to the selected component type (inside diameter, length, roughness, ...)
- Define flow (volume flow rate)
- Execute the calculation of the component
- Visualize the results
- Display the Moody diagram corresponding to the calculation with the calculated point (case of friction loss)
- Access information about the component:
  - Help (technical documentation of the component)
  - Info (information on the use of the component)
  - Other eventually


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# COMPLEMENTARY RESULTS



When, in the complementary results, the variable is preceded by the symbol , a simple click on this variable shows the evolution graph of the variable with the calculated point.

Example :

Designation	Symbol	Value	Unit
Pipe cross-section area	$A$	7853.981	mm²
Orifice cross-section area	$A_o$	962.1127	mm²
Diameters ratio (Do/d)	$\beta$	0.35	
Cross-sections area ratio	$A_o/A$	0.1225	
Thickness to orifice diameter ratio	$t/Do$	0.2	
Pipe Reynolds number	$NR_e$	498307.2	
Orifice Reynolds number	$NR_{e0}$	1423735	
Velocity in vena contracta	$V_c$	65.43075	m/s
Jet velocity ratio (Equation 13.4)	$\lambda$	1.603054	
Coefficient Cth (Equation 13.14)	$C_{th}$	0.9763061	
Coefficient of local resistance (Equation 13.13)	$K_o$	2.34488	
Pressure loss coefficient (based on the mean pipe velocity)	$K$	156.2602	
Hydraulic power loss	$Wh$	76.56641	kW

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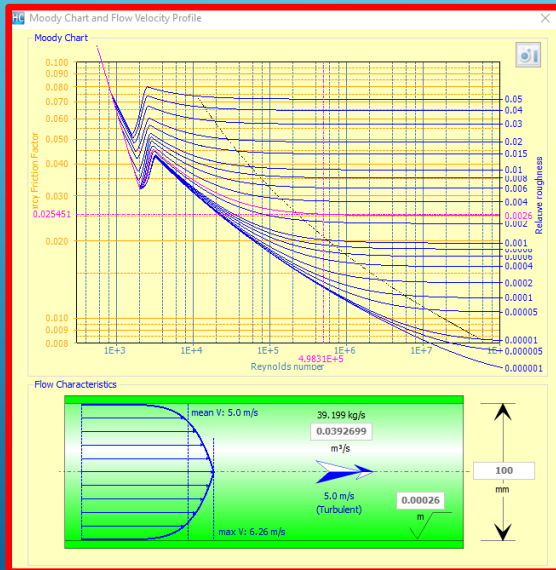
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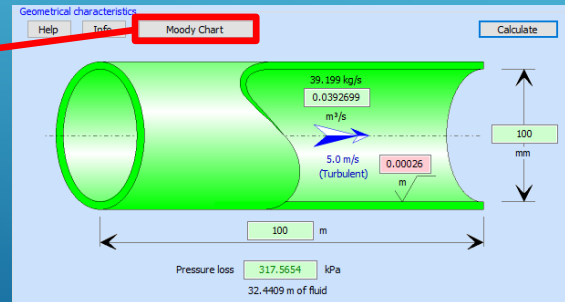


# MOODY DIAGRAM



When the component is subjected to friction, the Moody diagram can be consulted to observe the operating point (as well as the flow velocity profile).

Example of a straight pipe:

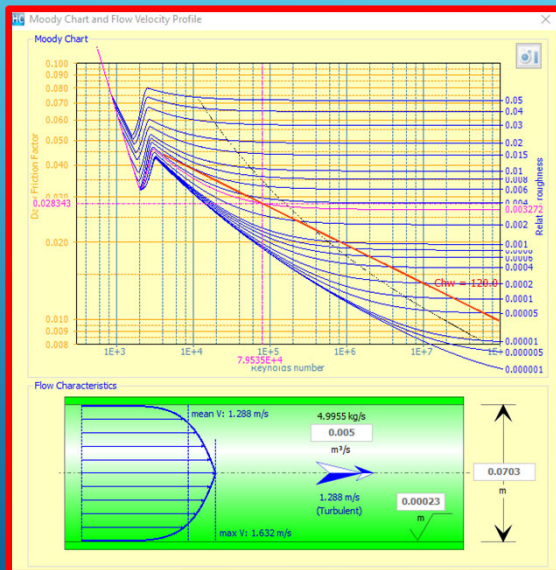


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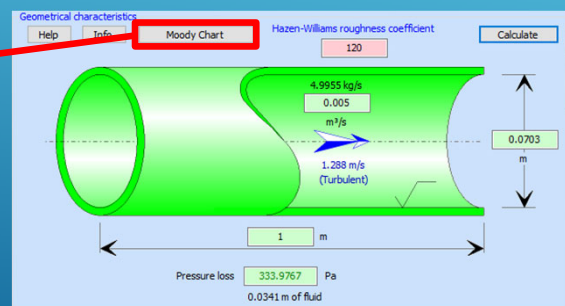
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# MOODY DIAGRAM AND HAZEN-WILLIAMS FORMULA



For the "Hazen-Williams" calculation method for circular cross-section straight pipes, the Moody diagram shows the relationship between the roughness coefficient of the Hazen-Williams formula and the friction coefficient of Darcy. The diagram also shows the limits of applicability of the Hazen-Williams formula.

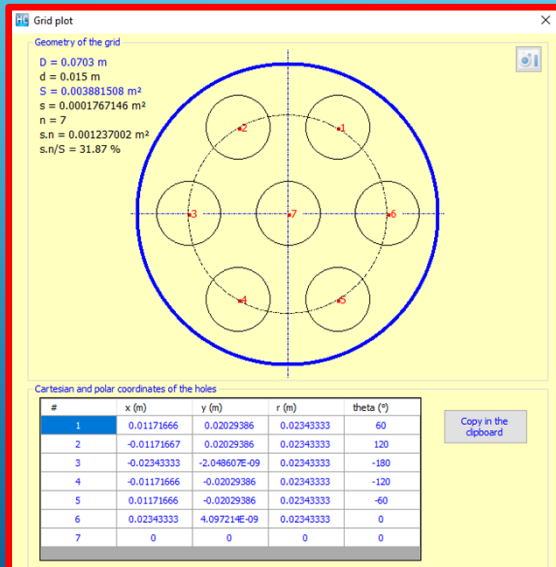


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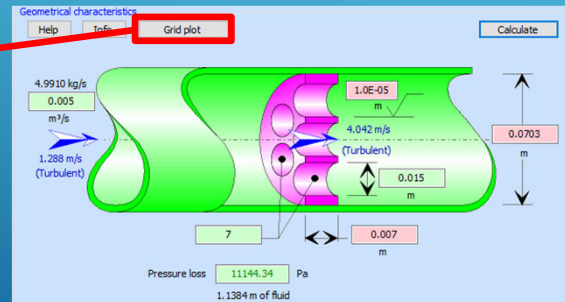
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# GRID PLOT



For "Grid" components (perforated plate), the application provides a grid plot with the coordinates of each hole.

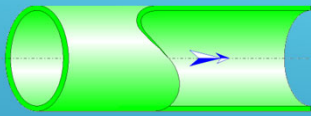
Example of a perforated plate plot:



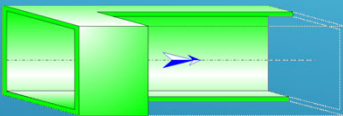
# THE COMPONENTS



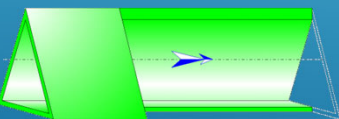
## STRAIGHT PIPES



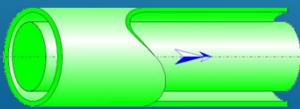
Circular cross-section



Rectangular cross-section



Triangular cross-section



Annular cross-section

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### The proposed calculation methods:

- IDELCHIK
  - Uniform roughness walls (Nikuradze equation)
  - Nonuniform roughness walls (Colebrook-White equation)
  - Smooth roughness walls (Filonenko and Althsul equation)
  - Explicit Darcy friction factor
- MILLER
  - Roughness walls (Swamee-Jain equation)
  - Explicit Darcy friction factor
- HAZEN-WILLIAMS (only circular cross-section)
  - Roughness walls (Hazen-Williams equation)

### The proposed calculations:

- Pressure loss
- Volume flow rate
- Length of pipe
- Inside diameter (circular cross-section)
- Height or width (rectangular cross-section)
- Height or base (triangular cross-section)

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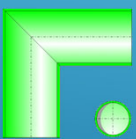
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## BENDS



Smooth bend with circular cross-section

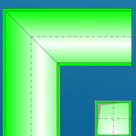


Miter bend with circular cross-section



Smooth bend with rectangular cross-section

**New R2020a**



Miter bend with rectangular cross-section

**New R2020a**

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### The proposed calculation methods:

- IDELCHIK
- MILLER
- CRANE
- Pipe Flow Guide

### The proposed calculations:

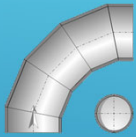
- Pressure loss
- Volume flow rate

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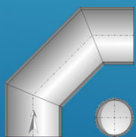
## BENDS



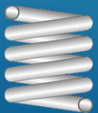
Composite bend 90° with circular cross-section (4 x 22.5°)



Composite bend 90° with circular cross-section (3 x 30°)



Composite bend 90° with circular cross-section (2 x 45°)



Helical tube

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The proposed calculation methods:

- ☐ IDELCHIK
- ☐ MILLER
- ☐ CRANE
- ☐ Pipe Flow Guide

The proposed calculations:

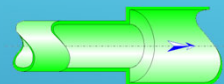
- ☐ Pressure loss
- ☐ Volume flow rate

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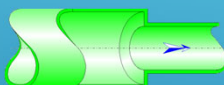
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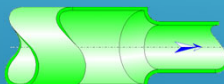
## CHANGES OF CROSS-SECTION



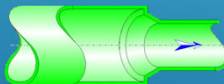
Sudden expansion



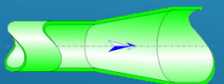
Sudden contraction sharp



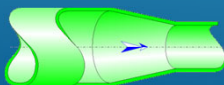
Sudden contraction rounded  
**New R2020a**



Sudden contraction bevelled  
**New R2020a**



Gradual expansion



Gradual contraction

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The proposed calculation methods:

- ☐ IDELCHIK
- ☐ MILLER
- ☐ CRANE
- ☐ Pipe Flow Guide

The proposed calculations:

- ☐ Pressure loss
- ☐ Volume flow rate

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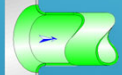
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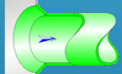
## ENTRANCE OF PIPELINE



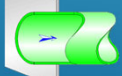
Flush-mounted sharp-edged entrance



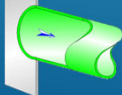
Flush-mounted rounded entrance



Flush-mounted bevelled entrance



Sharp-edged entrance mounted at a distance



Sharp-edged entrance mounted at an angle

HydrauCalc - © François Corre 2017-2020

The proposed calculation methods:

- ☐ IDELCHIK
- ☐ MILLER
- ☐ CRANE
- ☐ Pipe Flow Guide

The proposed calculations:

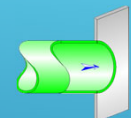
- ☐ Pressure loss
- ☐ Volume flow rate

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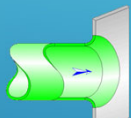
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## DISCHARGE OF PIPELINE



Flush-mounted sharp-edged discharge



Flush-mounted rounded discharge



Sharp-edged discharge mounted at a distance

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The proposed calculation methods:

- ☐ IDELCHIK
- ☐ MILLER
- ☐ CRANE
- ☐ Pipe Flow Guide

The proposed calculations:

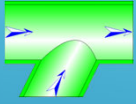
- ☐ Pressure loss
- ☐ Volume flow rate

22

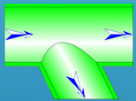
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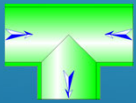
## JUNCTIONS



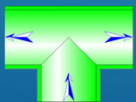
Combining sharp-edged junction



Dividing sharp-edged junction



Symmetric combining sharp-edged T-junction



Symmetric dividing sharp-edged T-junction

HydrauCalc - © François Corre 2017-2020

The proposed calculation methods:

- IDELCHIK
- MILLER
- CRANE

The proposed calculations:

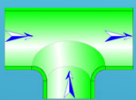
- Pressure loss in each branch

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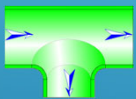
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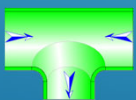
## JUNCTIONS (FOLLOWING)



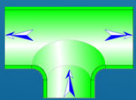
Combining radiused-edged T-junction



Dividing radiused-edged T-junction



Symmetric combining radiused-edged T-junction



Symmetric dividing radiused-edged T-junction

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The proposed calculation methods:

- MILLER
- Pipe Flow Guide

The proposed calculations:

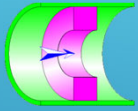
- Pressure loss in each branch

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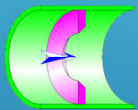
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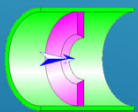
## RESTRICTION ORIFICES



Thick-edged orifice

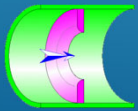


Sharp-edged orifice



Bevelled-edged orifice

**New R2020a**



Radiused-edged orifice

**New R2020a**

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The proposed calculation methods:

- ☐ IDELCHIK
- ☐ MILLER
- ☐ CRANE
- ☐ Pipe Flow Guide

The proposed calculations:

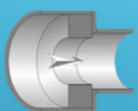
- ☐ Pressure loss
- ☐ Volume flow rate
- ☐ Orifice diameter

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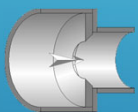
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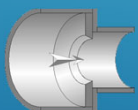
## RESTRICTION ORIFICES (FOLLOWING)



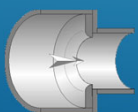
Thick-edged orifice  
(in transition section)



Sharp-edged orifice  
(in transition section)



Bevelled-edged orifice  
(in transition section)



Radiused-edged orifice  
(in transition section)

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The proposed calculation methods:

- ☐ IDELCHIK
- ☐ Pipe Flow Guide

The proposed calculations:

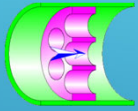
- ☐ Pressure loss
- ☐ Volume flow rate
- ☐ Orifice diameter

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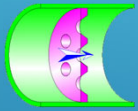
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## GRIDS

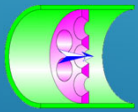


Thick-edged grid



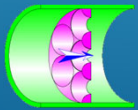
Sharp-edged grid

**New R2020a**



Bevelled-edged grid

**New R2020a**



Radiused-edged grid

**New R2020a**

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The proposed calculation methods:

- ☐ IDELCHIK
- ☐ MILLER
- ☐ Pipe Flow Guide

The proposed calculations:

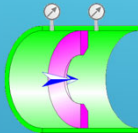
- ☐ Pressure loss
- ☐ Volume flow rate
- ☐ Holes diameter
- ☐ Holes number

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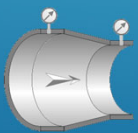
## MEASUREMENT ORIFICES



Orifice plate flowmeter



Nozzle and Venturi nozzle flowmeter



Venturi tube flowmeter

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The proposed calculation methods:

- ☐ ISO 5167:2003
- ☐ ISO 5167:1991
- ☐ CRANE 1999

The proposed calculations:

- ☐ Measured differential pressure
- ☐ Net pressure loss
- ☐ Volume flow rate
- ☐ Orifice diameter

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## VALVES



Y valve



Ball valve



Butterfly valve

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The proposed calculation methods:

- ☐ IDELCHIK
- ☐ MILLER
- ☐ Manufacturers

The proposed calculations:

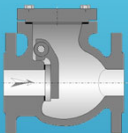
- ☐ Pressure loss

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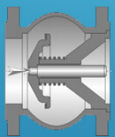
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## CHECK VALVES



Swing check valve



Lift check valve

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The proposed calculation methods:

- ☐ IDELCHIK
- ☐ Manufacturers

The proposed calculations:

- ☐ Pressure loss

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# THE MEASURE UNITS

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## UNIT SYSTEM SELECTION

Unit system selection

Length unit  
meter (m)

Diameter and radius unit  
millimeter (mm)

Thickness unit  
meter (m)

Absolute roughness unit  
meter (m)

Temperature unit  
degree Celsius (°C)

Pressure unit  
kilopascal (kPa)

Hydraulic load unit  
meter (m)

Velocity unit  
meter per second (m/s)

Volume flow rate unit  
cubic meter per second (m³/s)

Mass flow rate unit  
kilogram per second (kg/s)

Density unit  
kilogram per cubic meter (kg/m³)

Dynamic viscosity unit  
Newton second per square meter (N.s/m²)

Kinematic viscosity unit  
square meter per second (m²/s)

Mass unit  
kilogram (kg)

Power unit  
kilowatt (kW)

Load unit system  
SI unit  
SI unit (°C)  
SI unit (°C, bar)  
Imperial unit  
CGS unit  
MKgS unit  
MTS unit  
USCS unit  
User unit 1  
User unit 2  
User unit 3

Define unit system  
Define as user unit 1  
Define as user unit 2  
Define as user unit 3

OK  
Cancel

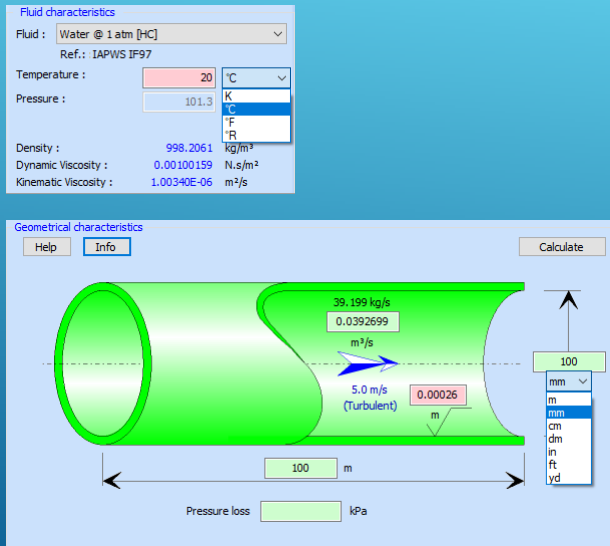
Units can be selected:

- individually
- by unit systems

The user can define his own systems of units (within the limit of three systems)

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# UNITS MODIFICATION



The application has a dynamic unit conversion engine.

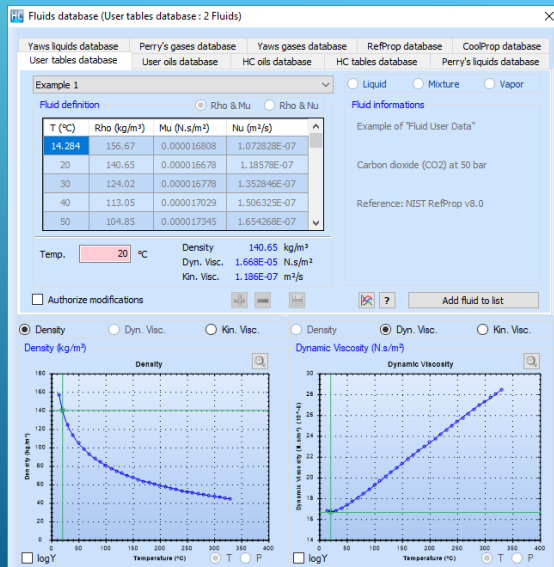
The units displayed in the Fluid Pane and Component Data Panes can be changed by simply clicking on the unit displayed.

After selecting a new unit, the value entered in the input box is automatically converted to the new unit.

The results will be displayed in the current units.

# THE DATABASES

# DATABASE - FLUIDS



HydrauCalc has a fluid characteristics database consisting of several hundred fluids based on recognized references:

- Perry's Handbook
- Oil products
- Yaws Handbook
- Coolprop
- Refprop (coming soon ...)

The user can also define his own fluids in the form of point tables as a function of temperature.

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# DATABASE - PIPINGS

DN	Outside diameter (mm)	Wall Thickness (mm)	Inside diameter (mm)	Area (mm²)
6	10.2	0.5	9.2	66.47626
6	10.2	0.6	9	63.6174
6	10.2	0.8	8.6	58.08818
6	10.2	1	8.2	52.8103
6	10.2	1.2	7.8	47.78374
6	10.2	1.4	7.4	43.0085
6	10.2	1.6	7	38.4846
6	10.2	1.8	6.6	34.21202
6	10.2	2	6.2	30.19078
6	10.2	2.3	5.6	24.63014
6	10.2	2.6	5	19.635
8	13.5	0.5	12.5	122.7188
8	13.5	0.6	12.3	118.8232
8	13.5	0.8	11.9	111.2205
8	13.5	1	11.5	103.8691
8	13.5	1.2	11.1	96.76913
8	13.5	1.4	10.7	89.92045
8	13.5	1.6	10.3	83.32309
8	13.5	1.8	9.9	76.97705
8	13.5	2	9.5	70.82235
8	13.5	2.3	8.9	62.21153
8	13.5	2.6	8.3	54.1062
8	13.5	2.9	7.7	46.56636
8	13.5	3.2	7.1	39.59201
8	13.5	3.6	6.3	31.17253
10	17.2	0.5	16.2	206.1204
10	17.2	0.6	16	201.0624
10	17.2	0.8	15.6	191.1349

HydrauCalc has a database defining the diameters of the main pipe standards.

- Steel piping
- Stainless steel piping
- Copper piping
- PVC piping
- Aluminium piping
- Cast iron piping
- Black and galvanized steel piping

The user can also add his own diameter tables.

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## DATABASE - WALL ROUGHNESSES

Tables of Surface Absolute Roughness

Miller (2nd Ed) ISO 5167-1 2003 Fluid Mechanics (7th Ed) Idelchik (2th Ed) Pipe Flow - Guide (2012)

Steel pipes

Type of tubes	Roughness (mm)
New smooth pipes	0.025
Centrifugally applied enamels	0.025
Mortar lined, good finish	0.05
Mortar lined, average finish	0.1
Light rust	0.25
Heavy brush asphalts, enamels and tars	0.5
Heavy rust	1
Water mains with general tuberculations	1.2

Back

HydrauCalc has a database of values of absolute roughness of pipe wall from recognized references:

- MILLER
- ISO 5167-1 2003
- Fluid Mechanics - F. White
- IDELCHIK
- Pipe Flow Guide

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## DATABASE - ROUGHNESS COEFFICIENT

Tables of Hazen-Williams Roughness Coefficient

Tables Hazen-Williams

Cast-iron pipes

Type of tubes	Coefficient
cast, plain	100
cast iron, old, unlined	40-120
cast iron (10 years old)	107-113
cast iron (20 years old)	85-100
cast iron (30 years old)	75-90
cast iron (40 years old)	64-83
cast iron, tar (asphalt) coated	100
cast iron, cement lined	140
cast iron, bituminous lined	140
cast iron, mastic	140-150
cast iron, sea-coated	100
Ductile Iron Pipe (DIP)	140
Ductile Iron, cement lined	120
galvanized, plain	120
wrought, plain	100

Back

HydrauCalc has a database of values of Hazen-Williams roughness coefficient from:

- Hydraulic Tables by GARDNER S. WILLIAMS and ALLEN HAZEN - 2nd Ed. (1914)

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# THE TOOLS

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## TOOL - CALCULATOR FOR CIRCULAR CROSS-SECTIONS

**General Head Drop Formulas for Steady State and Incompressible Fluid**

**Formulation**

$$\Delta P = 1/2 \cdot \zeta \cdot \rho \cdot V^2$$

$$\zeta = \lambda \cdot L / d$$

$$Q_v = V \cdot S$$

$$S = \pi \cdot d^2 / 4$$

$$Q_m = \rho \cdot Q_v$$

$$Re = V \cdot d / \nu$$

$$A_v = Q_v \cdot (\rho / \Delta P)^{0.5}$$

$$C_v = 41650 \cdot A_v$$

$$K_v = 36023 \cdot A_v$$

$$C_v = 1.15620 \cdot K_v$$

$$\zeta = 2 \cdot S^2 / A_v^2$$

$$\Delta h = \Delta P / (\rho \cdot g)$$

$$W_h = \Delta P \cdot Q_v$$

$$\nu = \mu / \rho$$

**Numerical application**

<input type="checkbox"/> $\Delta P$	=	1699.584	lbf/ft <sup>2</sup>
<input type="checkbox"/> $\zeta$	=	20.85395	
<input type="checkbox"/> $\lambda$	=	0.01737829	
<input checked="" type="checkbox"/> $L$	=	200	ft
<input checked="" type="checkbox"/> $V$	=	9.17	ft/s
<input type="checkbox"/> $Q_v$	=	0.2000584	ft <sup>3</sup> /s
<input checked="" type="checkbox"/> $d$	=	2	in
<input type="checkbox"/> $S$	=	3.141593	in <sup>2</sup>
<input type="checkbox"/> $Q_m$	=	5.659446	kg/s
<input type="checkbox"/> $Re$	=	126532.3	
<input type="checkbox"/> $A_v$	=	0.0006276798	m <sup>2</sup>
<input type="checkbox"/> $C_v$	=	26.14297	USG/min
<input type="checkbox"/> $K_v$	=	22.61094	m <sup>3</sup> /h
<input type="checkbox"/> $\Delta h$	=	27.25155	ft of fluid
<input checked="" type="checkbox"/> $W_h$	=	461	W

Check the input data Reset

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The application allows, from known input data and for circular cross-sections, to automatically calculate those that can be deduced.

It is thus possible to determine the volume flow rate corresponding, for example, to an imposed mean velocity, so as to inform the input data of the components.

## TOOL - CALCULATOR FOR RECTANGULAR CROSS-SECTIONS

General Head Drop Formulas  
for Steady State and Incompressible Fluid

Formulation

$$\Delta P = 1/2 \cdot \zeta \cdot \rho \cdot V^2$$

$$\zeta = \lambda \cdot L / dh$$

$$Qv = V \cdot S$$

$$S = a \cdot b$$

$$P = 2 \cdot (a + b)$$

$$dh = 4 \cdot S / P$$

$$Qm = \rho \cdot Qv$$

$$Re = V \cdot dh / \nu$$

$$Av = Qv \cdot (\rho / \Delta P)$$

$$Cv = 41650 \cdot Av$$

$$Kv = 36023 \cdot Av$$

$$Cv = 1.15620 \cdot Kv$$

$$\zeta = 2 \cdot S^2 / Av^2$$

$$\Delta h = \Delta P / (\rho \cdot g)$$

$$Wh = \Delta P \cdot Qv$$

$$\nu = \mu / \rho$$

Numerical application

☐  $\Delta P$  = 23.38326 Pa

☐  $\zeta$  = 0.8365216

☐  $\lambda$  = 0.02048625

☒  $L$  = 7 m

☐  $V$  = 6.985055 m/s

☐  $Qv$  = 0.2095516 m<sup>3</sup>/s

☒  $a$  = 15 cm

☒  $b$  = 20 cm

☐  $P$  = 69.99998 cm

☐  $S$  = 300 cm<sup>2</sup>

☐  $dh$  = 17.14286 cm

☐  $Qm$  = 0.2401094 kg/s

☒  $Re$  = 72490

☐  $Av$  = 0.04638713 m<sup>2</sup>

☐  $Cv$  = 1932.032 USG/min

☐  $Kv$  = 1671.006 m<sup>3</sup>/h

☐  $\Delta h$  = 2.080971 m of fluid

☒  $Wh$  = 4.9 W

Check the input data

The application also makes it possible, from known input data and for rectangular cross-sections, to calculate those that can be deduced from it.

It is thus possible to determine the volume flow rate corresponding, for example, to an imposed Reynolds number, so as to inform the input data of the components.

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## TOOL - UNITS CONVERSION

Units conversion factors

Unit name	Symbol	Value
S.I. unit : meter per second	m/s	1 m/s
millimeter per second	mm/s	0.001 m/s
decimeter per second	dm/min	0.1/60 m/s
centimeter per second	cm/s	0.01 m/s
meter per minute	m/min	1/60 m/s
decimeter per second	dm/s	0.1 m/s
decimeter per minute	dm/min	10/60 m/s
kilometer per hour	km/h	1000/3600 m/s
hectometer per minute	hm/min	100/60 m/s
decimeter per second	dam/s	10 m/s
kilometer per minute	km/min	1000/60 m/s
foot per minute	ft/min	0.00508 m/s
foot per minute	fpm	0.00508 m/s
yard per minute	yd/min	0.01524 m/s
yard per minute	ypm	0.01524 m/s
inch per second	in/s	0.0254 m/s
inch per second	ips	0.0254 m/s
foot per second	ft/s	0.3048 m/s
foot per second	fps	0.3048 m/s
mile per hour	mile/h	0.44704 m/s
mile per hour	mph	0.44704 m/s
yard per second	yd/s	0.9144 m/s
yard per second	yps	0.9144 m/s
mile per minute	mile/min	26.8224 m/s
mile per minute	mpm	26.8224 m/s

Conversion

from 3.25 inch per second (in/s)

to 0.08255 meter per second (m/s)

The application has a tool allowing:

- to view the conversion factors of the measurement units integrated in the application,
- to convert together units of measurement of the same physical size.

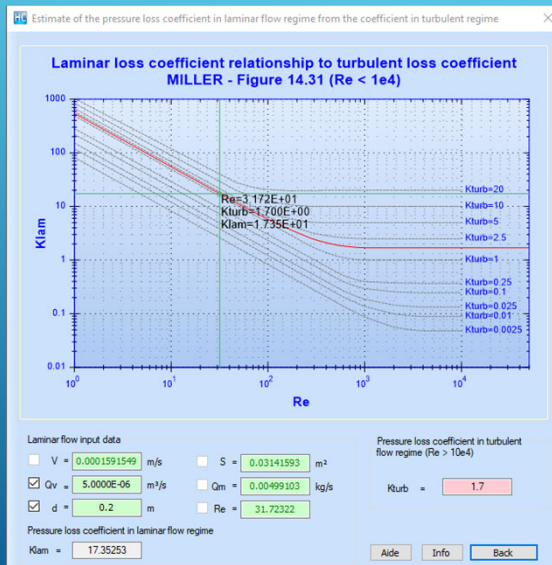
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## TOOL - ESTIMATE PRESSURE LOSS COEFFICIENT IN LAMINAR FLOW



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The application has a tool making it possible to obtain an estimate of the coefficient of pressure loss in the laminar flow regime, if the coefficient of pressure loss in the turbulent flow regime is known.

This method only applies to minor pressure losses (pipe fittings, valves, etc.) and is based on the following reference book:

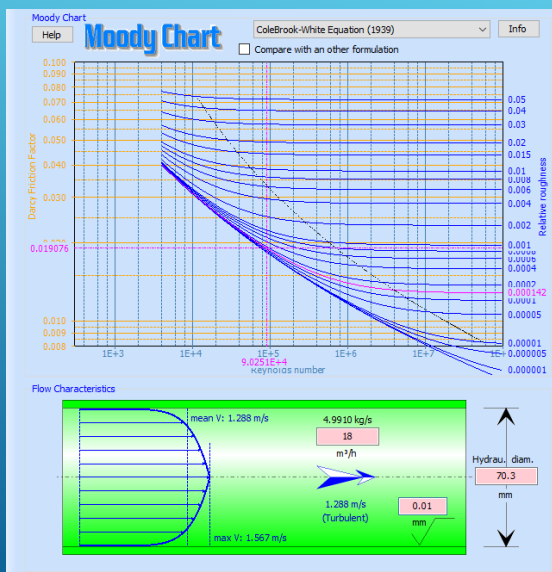
- Internal Flow System, D.S. Miller

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## TOOL - MOODY DIAGRAM



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The application has a tool to calculate the coefficient of friction from more than 40 other formulations published by recognized scientists. The curves of iso-values of relative roughness are plotted in a Moody diagram and the calculated point is presented.

The velocity profile of the flow corresponding to the calculation point is also plotted in a pipe of same hydraulic diameter as that of the component.

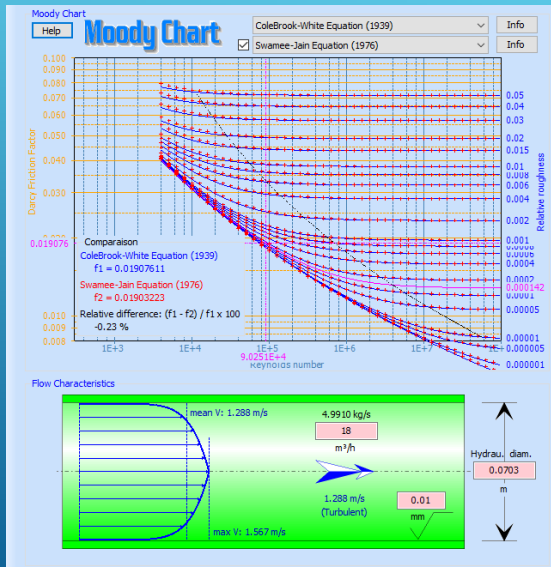
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## TOOL - MOODY DIAGRAM (FOLLOWING)



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This tool also makes it possible to compare two different formulations for determining the Darcy friction coefficient.

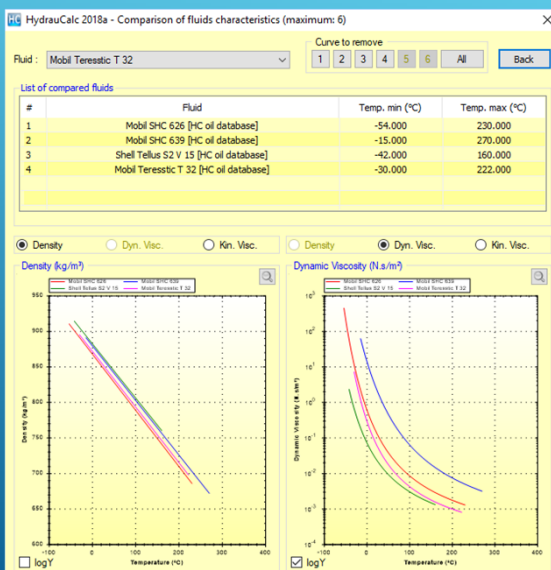
The relative difference found at the calculation point is calculated and displayed on the diagram.

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## TOOL - FLUID COMPARATOR



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The application has a tool to compare the characteristics of the fluids integrated in the application or defined by the user (density, dynamic viscosity and kinematic viscosity).

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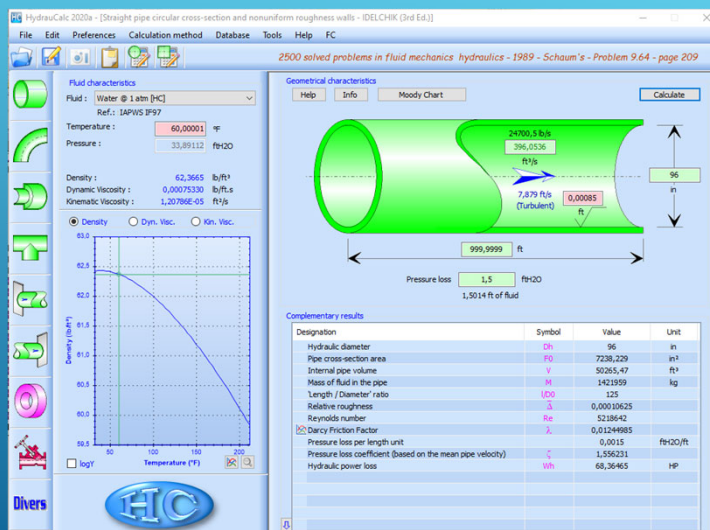
# THE CALCULATION REPORT


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## CALCULATION REPORT



To include a calculation result in a document, it is possible to copy the window using the button  and paste it into the document.

The screenshot contains all the data used for the calculation and the results:

- in the title bar:
  - the release of the application,
  - the type of component calculated and the calculation method used,
- in the fluid pane:
  - the characteristics of the fluid used,
- in the component pane:
  - the input data of the component,
  - the desired main result (value in green colour),
  - the additional results from the calculation.

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# THE DATA EXPORT

## DATA EXPORT

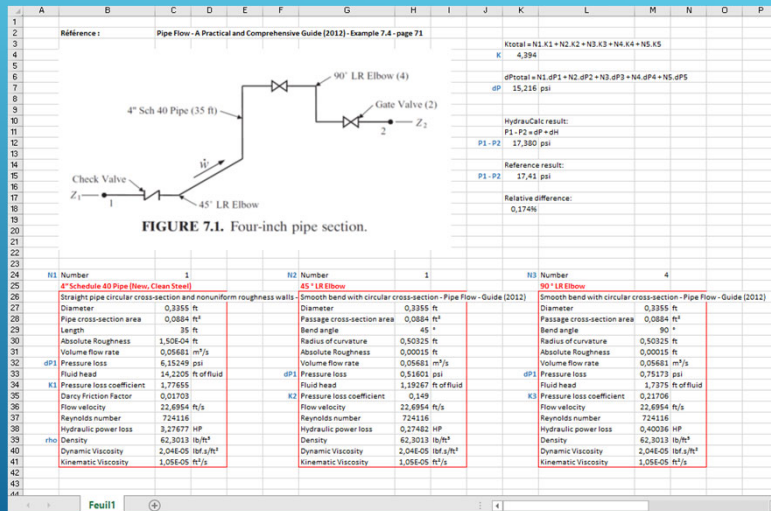
New R2020a

	A	B	C	D	E	F	G
1							
2							
3							
4		Straight pipe circular cross-section and nonuniform roughness walls - IDELCHIK (3rd Ed.)					
5		Diameter	0,3333598 m				
6		Pipe cross-section area	0,08728033 m²				
7		Length	609,6 m				
8		Absolute Roughness	4,60E-005 m				
9		Volume flow rate	25,57719 m³/s				
10		Pressure loss	1,00E+009 Pa				
11		Fluid head	102191,5 m of fluid				
12		Pressure loss coefficient	23,33955				
13		Darcy Friction Factor	0,01276324				
14		Flow velocity	293,0464 m/s				
15		Reynolds number	1,00E+008				
16		Hydraulic power loss	2,56E+010 W				
17		Density	997,9705 kg/m³				
18		Dynamic Viscosity	9,75E-004 N s/m²				
19		Kinematic Viscosity	9,77E-007 m²/s				
20							
21							

For each component, the input data and the main results can be copied to the clipboard, using the button , for reuse in another application, for example a spreadsheet.

# DATA EXPORT

New R2020a



Exporting the main data and results to a spreadsheet allows you to perform additional calculations such as:

- Calculation of the total pressure loss of the circuit by summing the pressure losses of each component.
- Search for the flow circulating in the circuit from the sum of the pressure loss coefficients and using the solver integrated into the spreadsheet.

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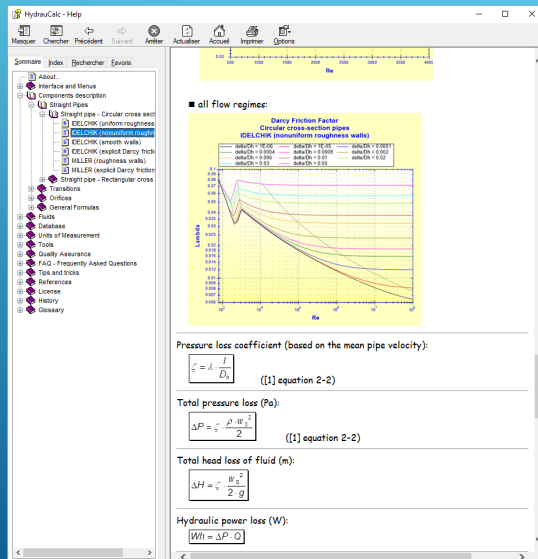
# THE ASSURANCE QUALITY

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# TECHNICAL DOCUMENTATION



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In general, each component has several calculation methods that come from different reference works. For all components, each calculation method is detailed in a technical document including:

- A description of the method used
- The mathematical formulation of the model
- The nomenclature used for the equations
- The range of the formulation
- An example of an application
- The bibliographic reference (s) used for modelling

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# COMPONENTS MODEL VALIDATION

HydraulCalc comes with a document that provides a comparison of software results with a series of examples published in well-known and respected references. Examples of hydraulic analysis include calculations of flow, pressure drop and pipe sizing for compressible and incompressible fluids.

The results obtained by the HydraulCalc application are very close to the published results.

At each new software release, a series of tests is performed to check the non-regression of the software features.

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# THE ROAD MAP

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## ROAD MAP

Next release (2020b release):

- Add new components.
- Creation of an Excel add-in for performing pressure loss calculations in an Excel spreadsheet.
- Development of a .NET class library (API) which can be used with different programming languages, including Managed C++, C#, F#, Visual Basic ...

Following releases:

- Gradual addition of new components.

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# HydraCalc

2020a Release

[www.hydraucalc.com](http://www.hydraucalc.com)