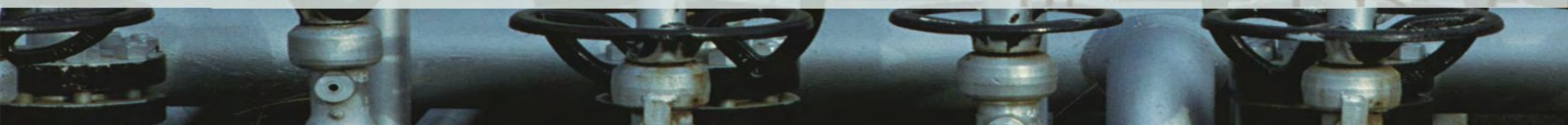
InstruCalc 9.1

Harness the Power of Over 70 Sizing Routines



Featuring over 70 routines associated with:

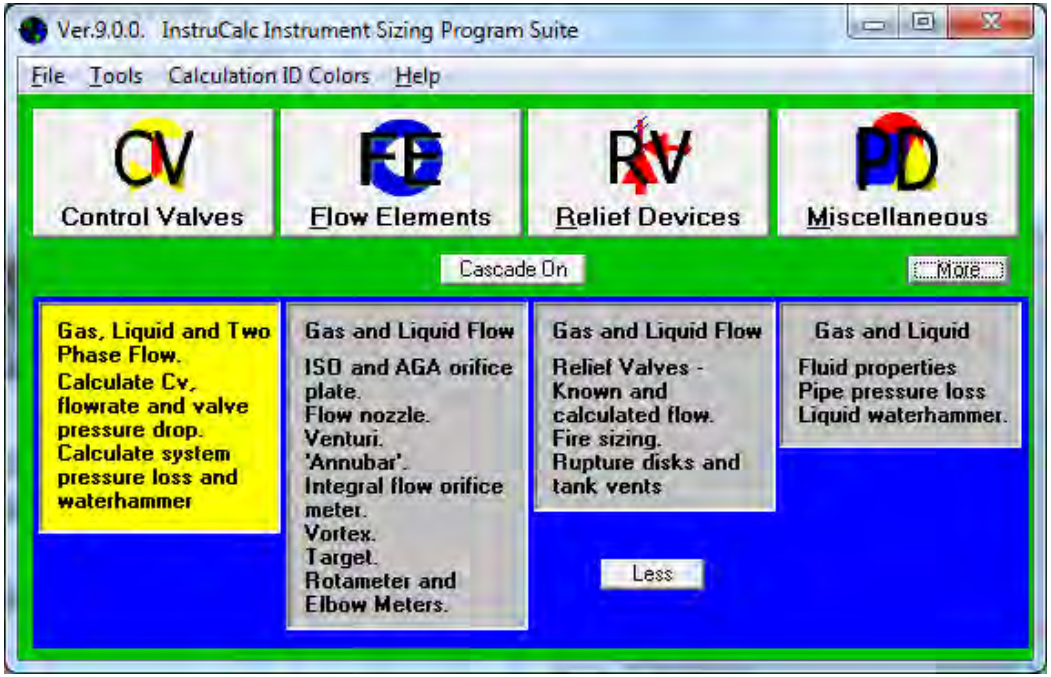
- Control valves
- Flow elements
- Rupture disks
- Relief valves
- and process data collections

InstruCalc is one of the industry's most popular and complete desktop applications for instrumentation calculations and analyses.

InstruCalc is a set of engineering programs capable of determining the basic engineering data and requirements for equipment.

The programs are conveniently divided into 4 modules:

1. Control Valves
2. Flow Elements
3. Relief Devices
4. Miscellaneous



Module 1- **Control Valves**

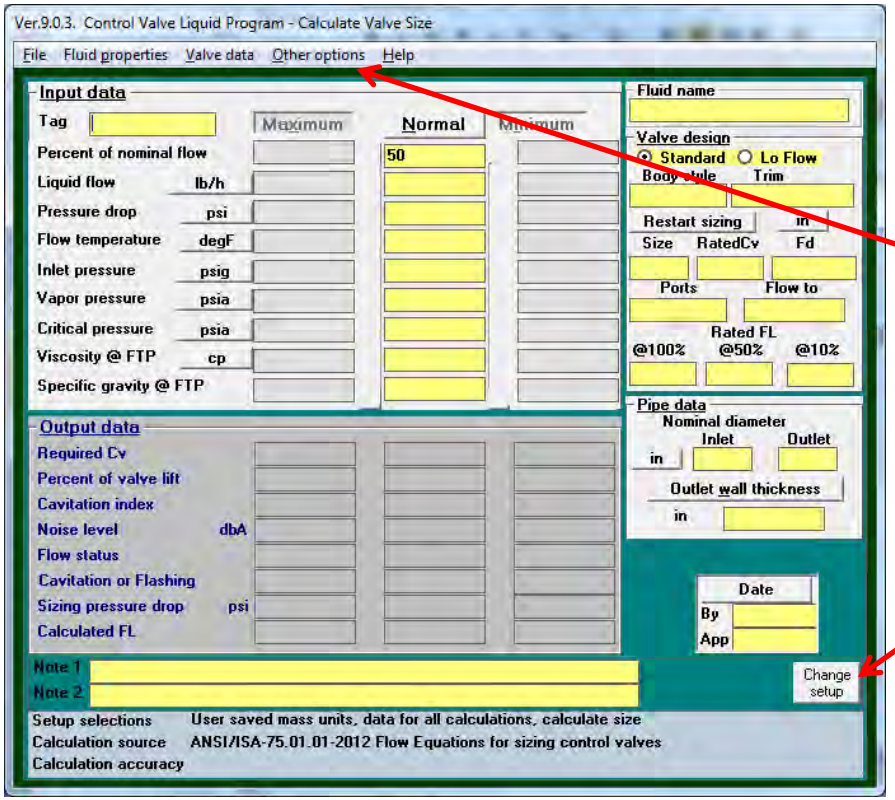
For liquid, gas, steam, and two-phase flow using the ISA formulas

Contains programs for calculating Cv and analyzing for cavitation within the valve, critical flow and flashing through the valve, and noise generated by the valve.

*Messages are displayed to guide you to an optimum valve selection

Module 1 – Control Valves

Calculation screen for valve sizing



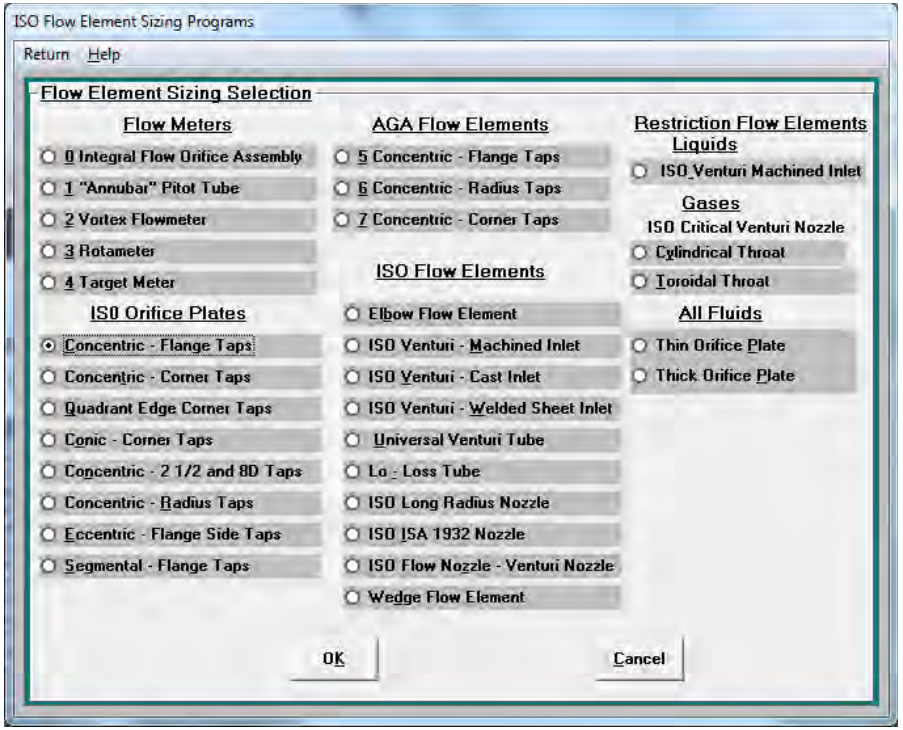
Required input fields highlighted.

Other options for calculate system pressure drop, water hammer (valve closing time), prepare data sheet and create graphs.

Change setup option to set units, select calculation from valve size, flowrate or pressure drop and other options.

Module 2- **Flow Elements**

For flow and restriction orifice plates; flow nozzles and venturies; gas, steam, vapor, and liquids; flange, radius, pipe, and corner taps.

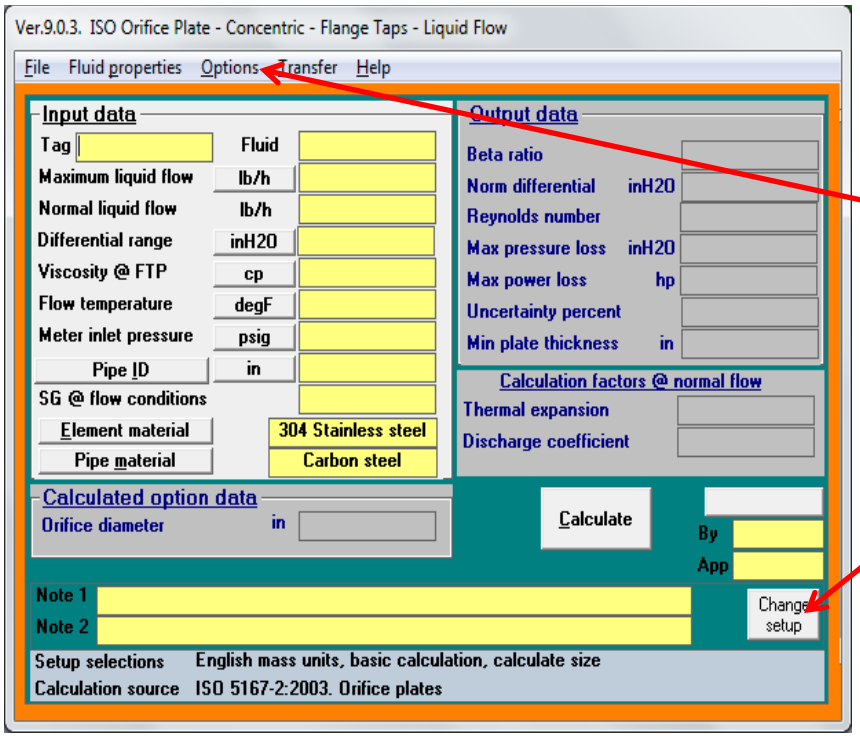


Uses concentric, eccentric, segmental, quadrant edge, and conical plates.

Calculates Beta ratio, orifice bore and flow for a selected bore.

Module 2 - **Flow Elements**

Calculation screen for Liquid Flow, Concentric Flange Taps

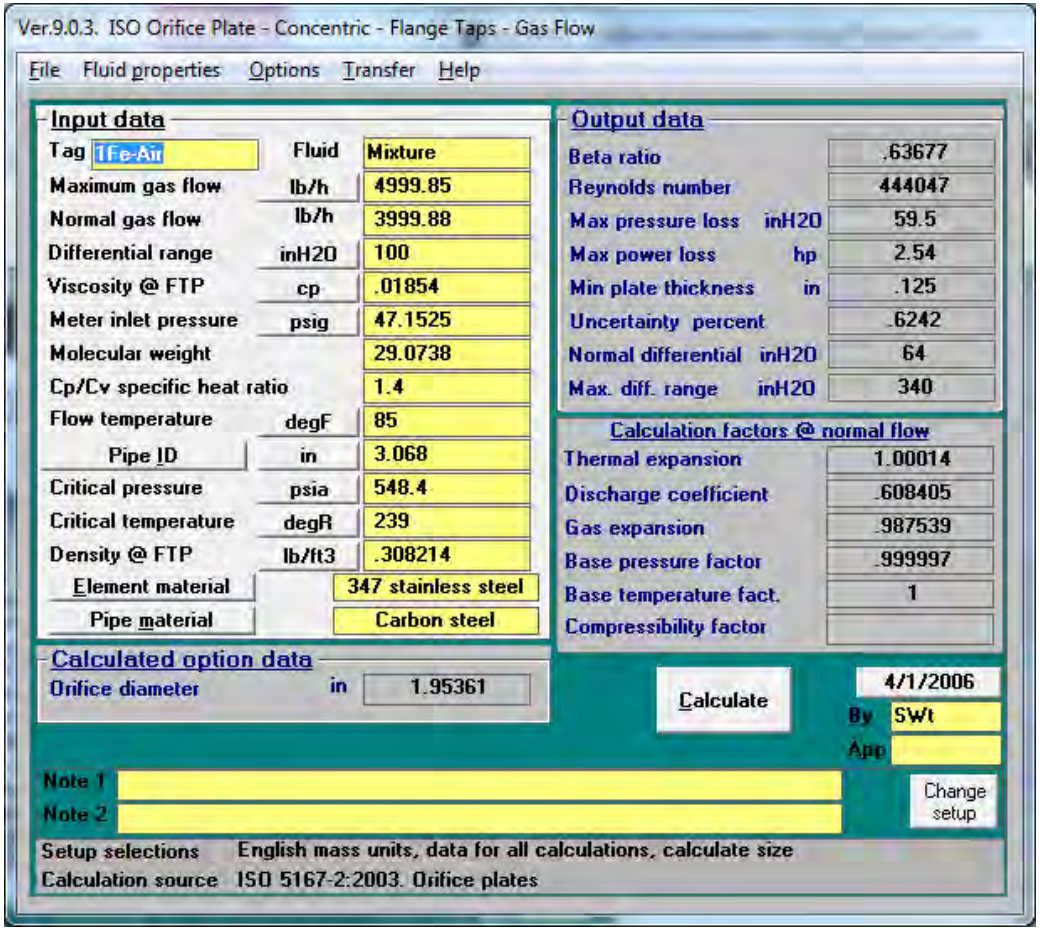


Required input fields highlighted.

Options for calculating inlet pressure, preparing data sheets and creating graphs.

Change setup option for setting units, selecting calculation options from orifice size, flowrate or differential range, selecting drain and vent hole and other available options.

Module 2 – Flow Elements

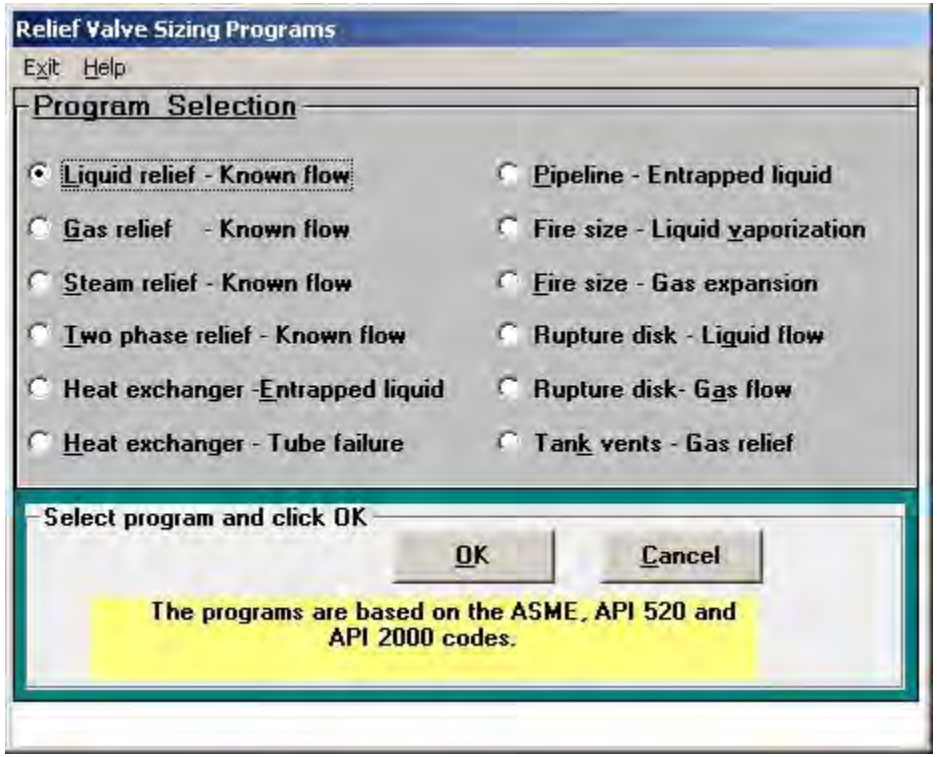


These programs determine the relationship between the flow rate, the pressure drop and the size of the hole.

They are based on ISO 5167 and follow the procedures described in The Flow Measurement Engineering Handbook by R. W. Miller.

Module 3- **Relief Devices**

For pressure-relief devices, rupture discs, and breather valves

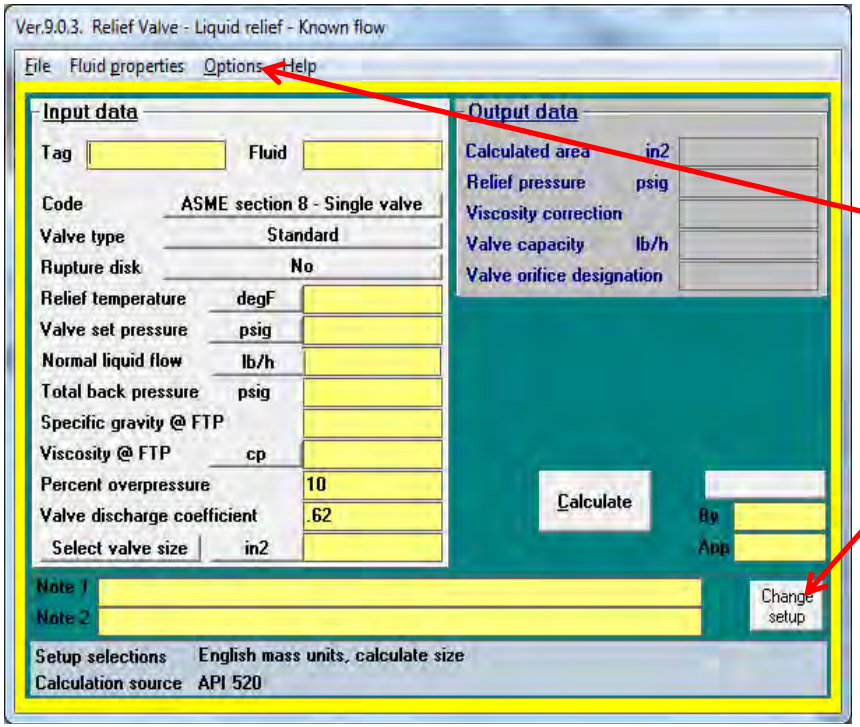


This liquid and gas application calculates API or ASME size for known flow, thermal expansion, and external fire.

The external fire program has the option of either the API or the NFPA heat input methods. It also calculates the maximum flow rate for the selected valve and the maximum back pressure, which maintains the required flow as well as the relieving forces.

Module 3- **Relief Devices**

Liquid relief known flow calculation screen



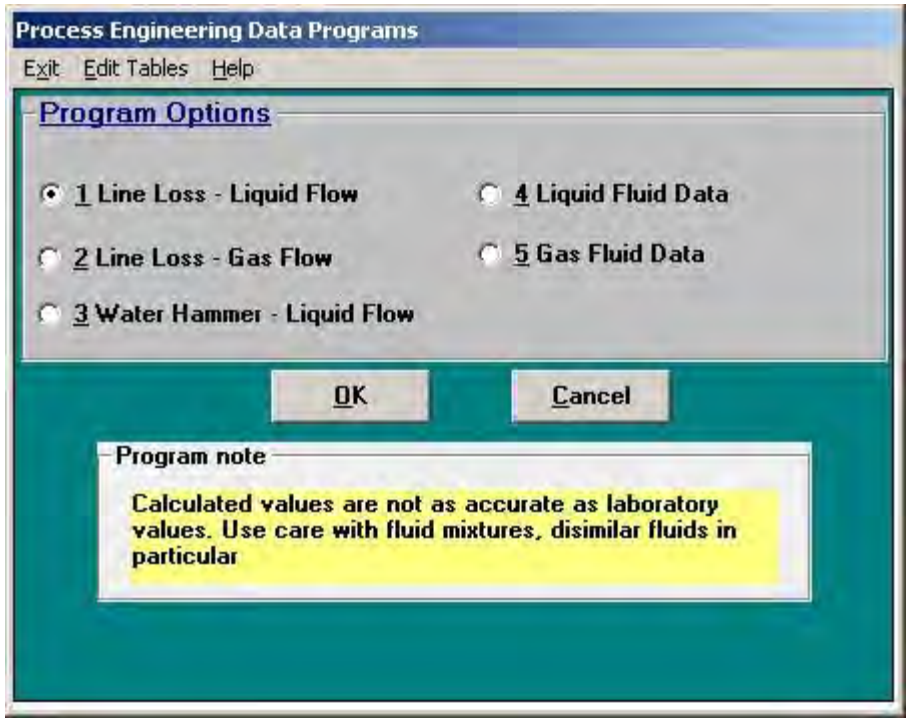
Required input fields highlighted.

Options for calculating pipe losses and preparing data sheets.

Change setup option for setting units, selecting calculation options from valve size or flowrate, and other available options.

Module 4- **Auxiliary Programs**

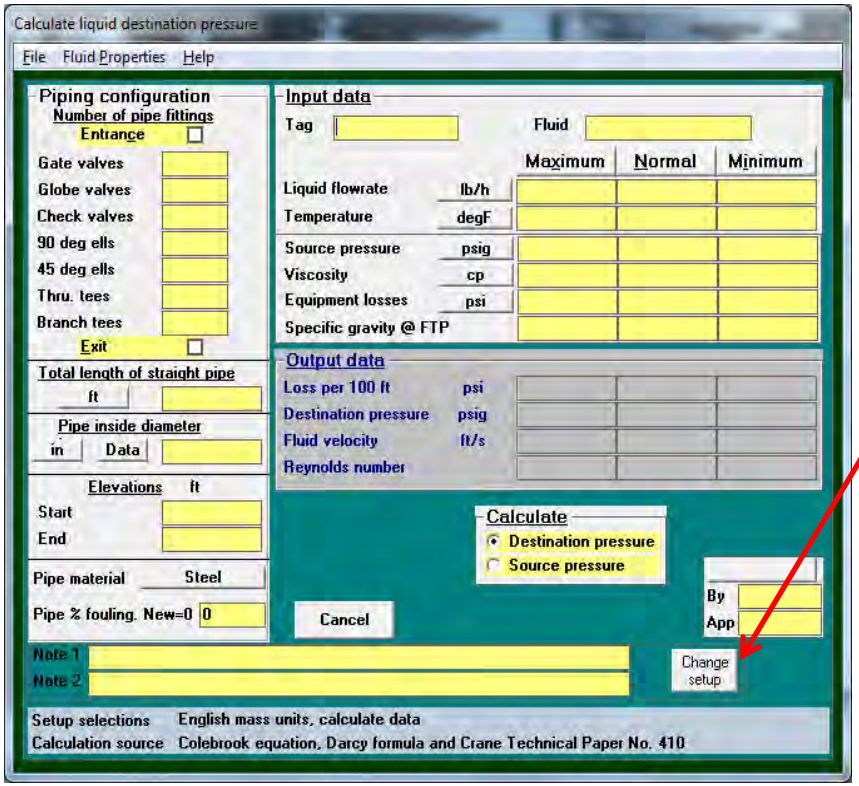
For determining line pressure drops for gas and liquids, calculates compressibility factor, flowing density, vapor pressure and temperature, latent heats at pressure and temperature, and physical properties of mixtures.



These programs are useful for many other engineering activities, such as centrifugal pump line loss calculations and determining pressure available for control valve pressure drop.

Module 4- **Auxiliary Programs**

Line loss – Liquid flow calculation screen



Required input fields highlighted.

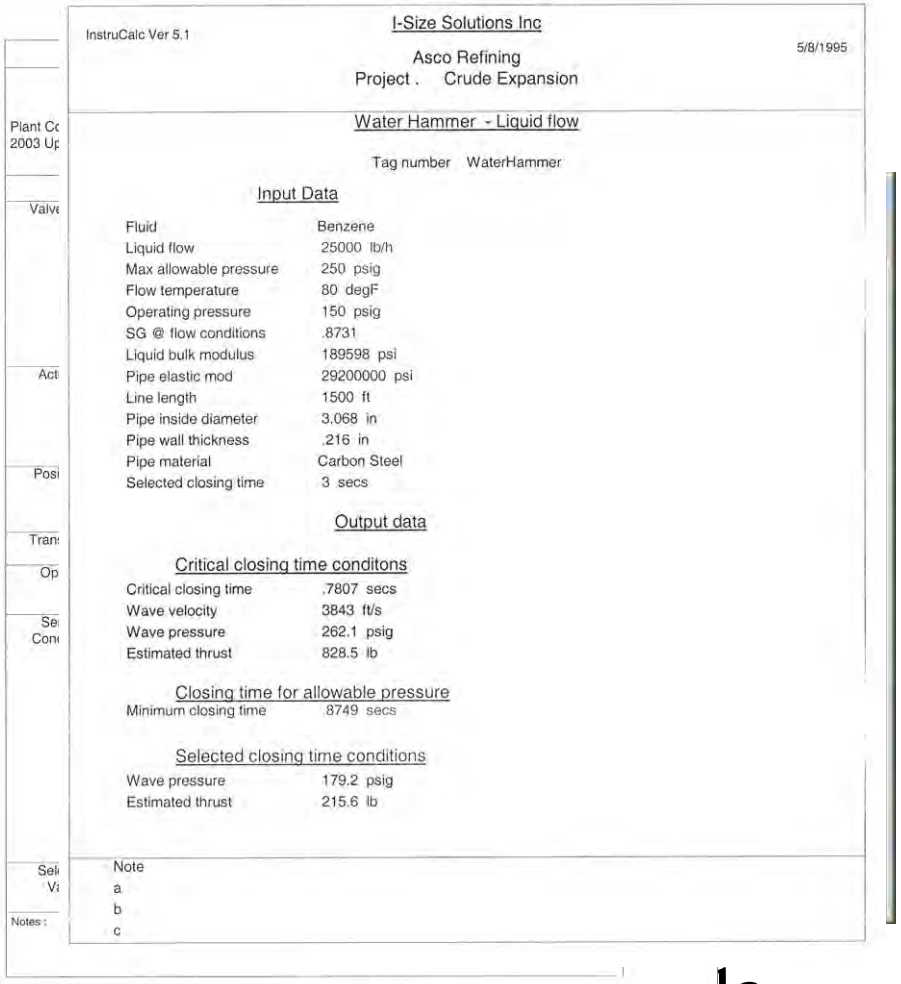
Change setup option for setting units, selecting fluid density options (density or specific gravity).

SPECIAL FEATURES

Multi-functional

Each program allows you to:

- make calculations
- prepare data sheets
- and/or produce summary sheets



InstruCalc Ver 5.1

I-Size Solutions Inc

5/8/1995

Asco Refining

Project . Crude Expansion

Water Hammer - Liquid flow

Tag number WaterHammer

Input Data

Fluid	Benzene
Liquid flow	25000 lb/h
Max allowable pressure	250 psig
Flow temperature	80 degF
Operating pressure	150 psig
SG @ flow conditions	.8731
Liquid bulk modulus	189598 psi
Pipe elastic mod	29200000 psi
Line length	1500 ft
Pipe inside diameter	3.068 in
Pipe wall thickness	.216 in
Pipe material	Carbon Steel
Selected closing time	3 secs

Output data

Critical closing time conditons

Critical closing time	.7807 secs
Wave velocity	3843 ft/s
Wave pressure	262.1 psig
Estimated thrust	828.5 lb

Closing time for allowable pressure

Minimum closing time	.8749 secs

Selected closing time conditions

Wave pressure	179.2 psig
Estimated thrust	215.6 lb

Note

a

b

c

lc

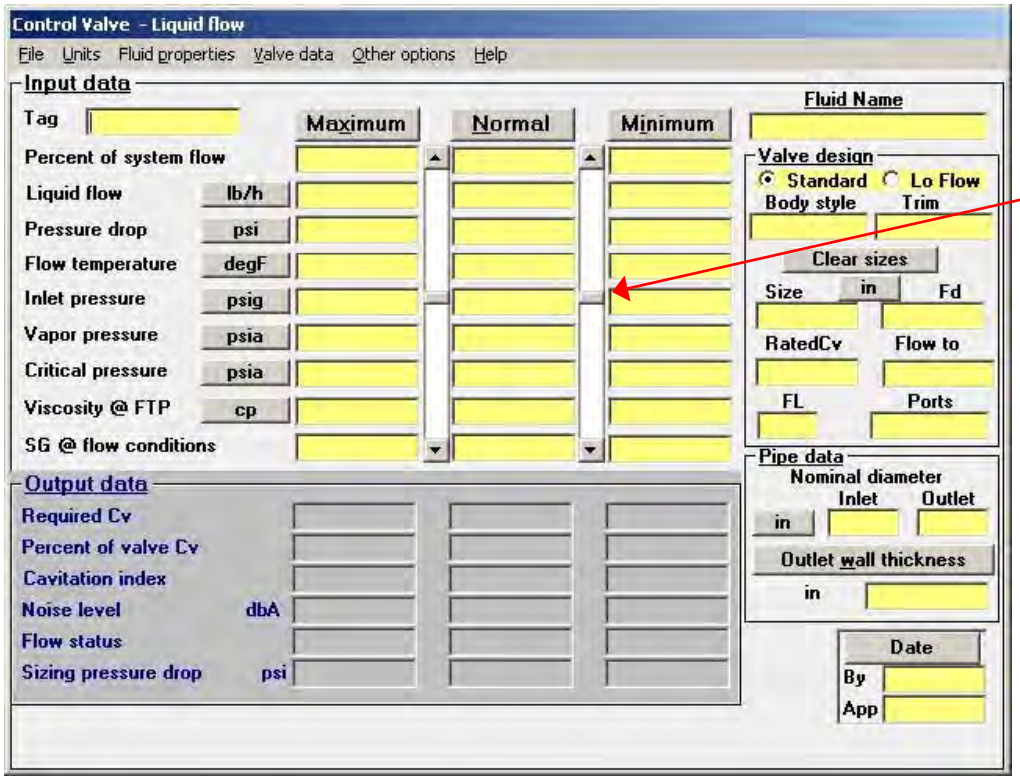
Customizable

User may tailor calculations to fit specific needs by:

- selecting any set of engineering units for a given calculation, including a customized set.
- mixing and matching units and changing units in the middle of a calculation.
- calculating process data at flow conditions for 64 fluids (included in the program), either mixtures or single component.
- fluids file can be edited and also updated with additional fluids
- Control valve sizing program includes a set of common valves and is editable for user to add valves.

Dynamic

Dynamic valve sizing is available for control valves.



Based on changing percentage of flow, the program has a scrolling system to instantly give a variety of data calculations.

Current References

Standards and references for Version 9 calculations.

- **Control Valves**
  - ANSI/ISA-S75.01.01, 2012
  - ISA 75.17 Control Valve Aerodynamic Noise Prediction
  - ISA Handbook for Control Valves- J.W. Hutchison
  - Masoneilan noise prediction formula
  - Pressure drop calculation - Crane Technical paper No 410
- **Flow Element Sizing**
  - ISO 5167 dated 2003
  - ISO 5168 Accuracy Standard
  - ISO 5024 Volumetric Standards (14.69595 psia & 59 F)
  - Principles and Practice of Flowmeter Engineering, L.K. Spink, The Foxboro Company.
  - The Flow Measurement Engineering Handbook, 3rd Ed. R. W. Miller, McGraw Hill, New York.

Current References cont'

- **Flow Elements Continued**
  - American Gas Association Report Number 3. "Orifice Metering of Natural Gas and Other Related Hydrocarbon Fluids".
  - AGA8 Natural Gas in Flow Elements
  - Annubar Flow Handbook, Dietrich Standard Corporation
  - Annubar no longer requires viscocity correction for liquids less than 250 cp.

- **Pressure Relief Valves**
  - API RP-520, parts 1 and 2, 9th Ed., 2014
  - ASME Code Section 8, Pressure Vessel Code, UG-132
  - ASME Code Section 1, Power Boiler Code Manufacturers
  - API or NFPA 30 data for fire generated flowrate

Current References cont'

- **Pressure Relief Valves continued**
  - ASME for new liquid trim valves, which is now mandatory for new work.
  - Option to use data published by National Fire Protection Association (NFPA 30)

- **Heat Exchanger, Piping Entrapped Liquid**
  - ASME Code, Section 8, Pressure Vessel Code, Summer 1984 addenda
  - API RP-520, parts 1 and 2, 9th Ed., 2014
  - ANSI B31
- **Tank Vents**
  - API 2000, 5th Edition 1998
  - API 620
  - API 650

Current References cont'…

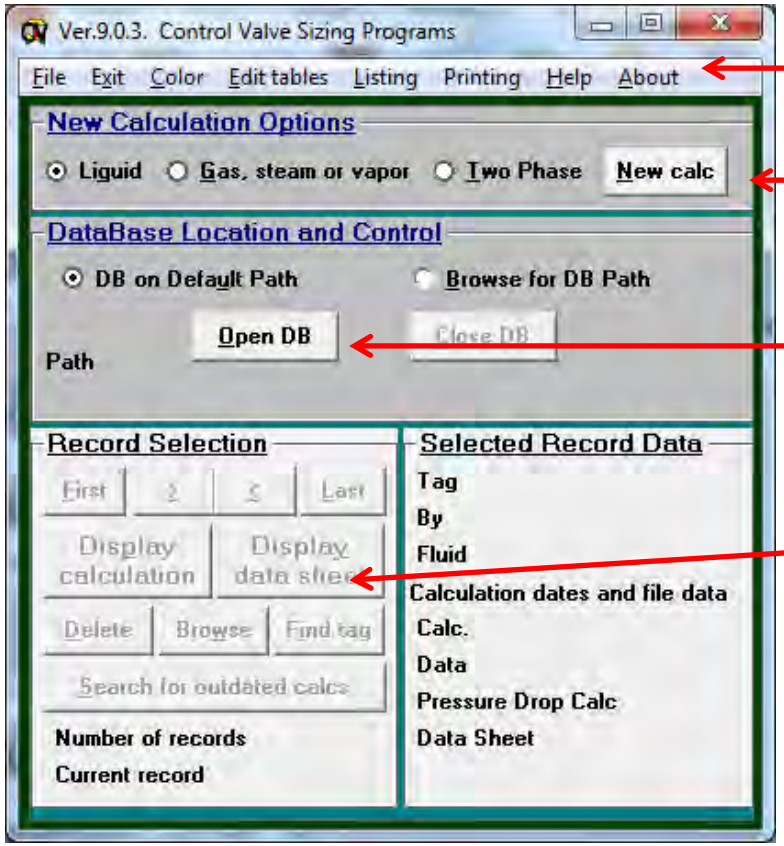
- **Rupture Disks**
  - ASME Code, Sections I and VIII.
  - Fike Metal Products Technical Bulletin, TB 8100-8102

- **Auxiliary Programs**
  - Line Pressure Drop- Crane Company Technical Paper, No. 410C
  - Compressibility Factor- Redlich-Kwong
  - Vapor Temperature- Lee and Kesler
  - Latent Heat of Vaporization- Watson

SAMPLE CALCULATIONS

Sample - **Control**

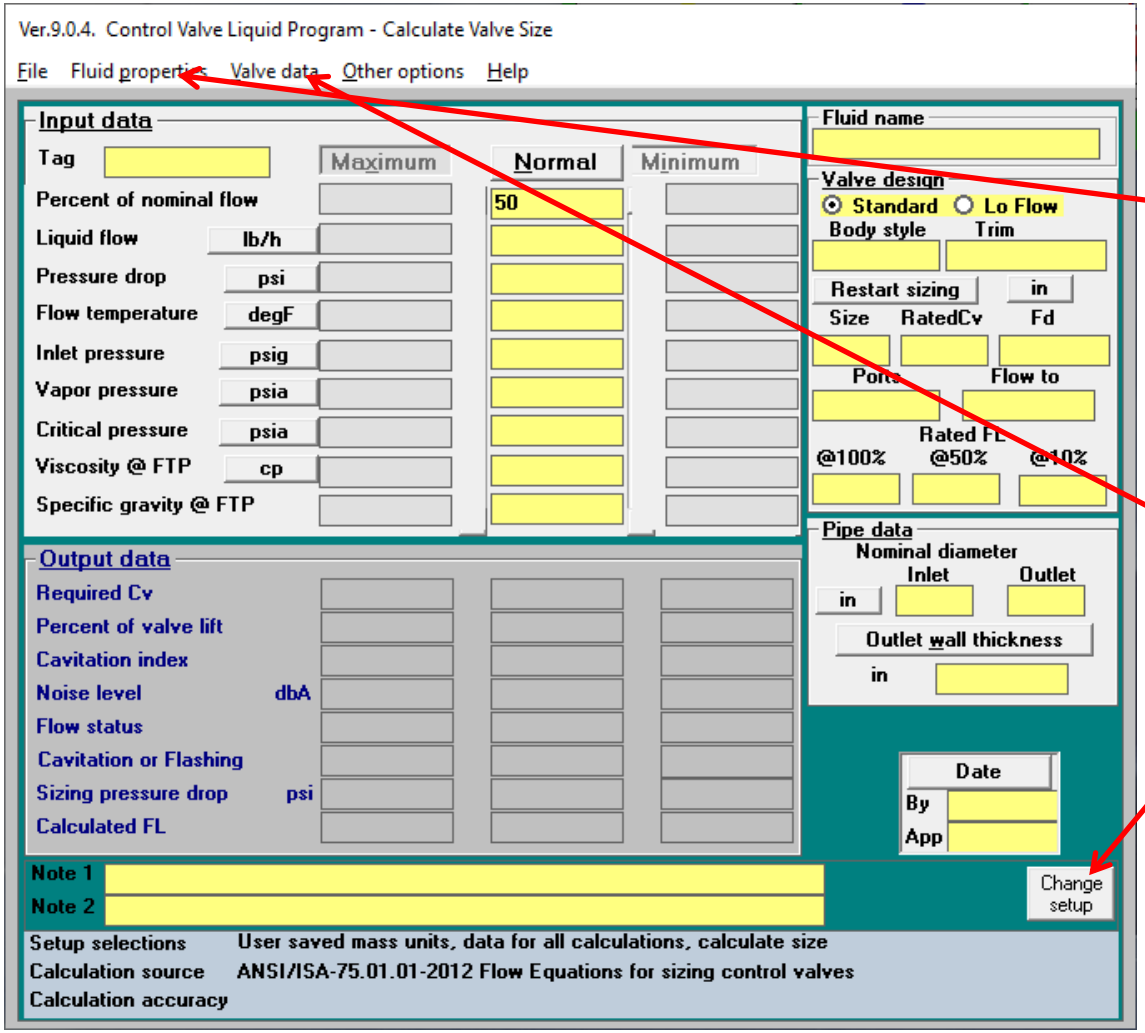
Main menu control valve module selection screen



- User editable options
- For new calculation select phase and click New Calc
- To access existing records select Open DB
- After database opens select desired existing calculation

*Messages are displayed to guide you to an optimum valve selection

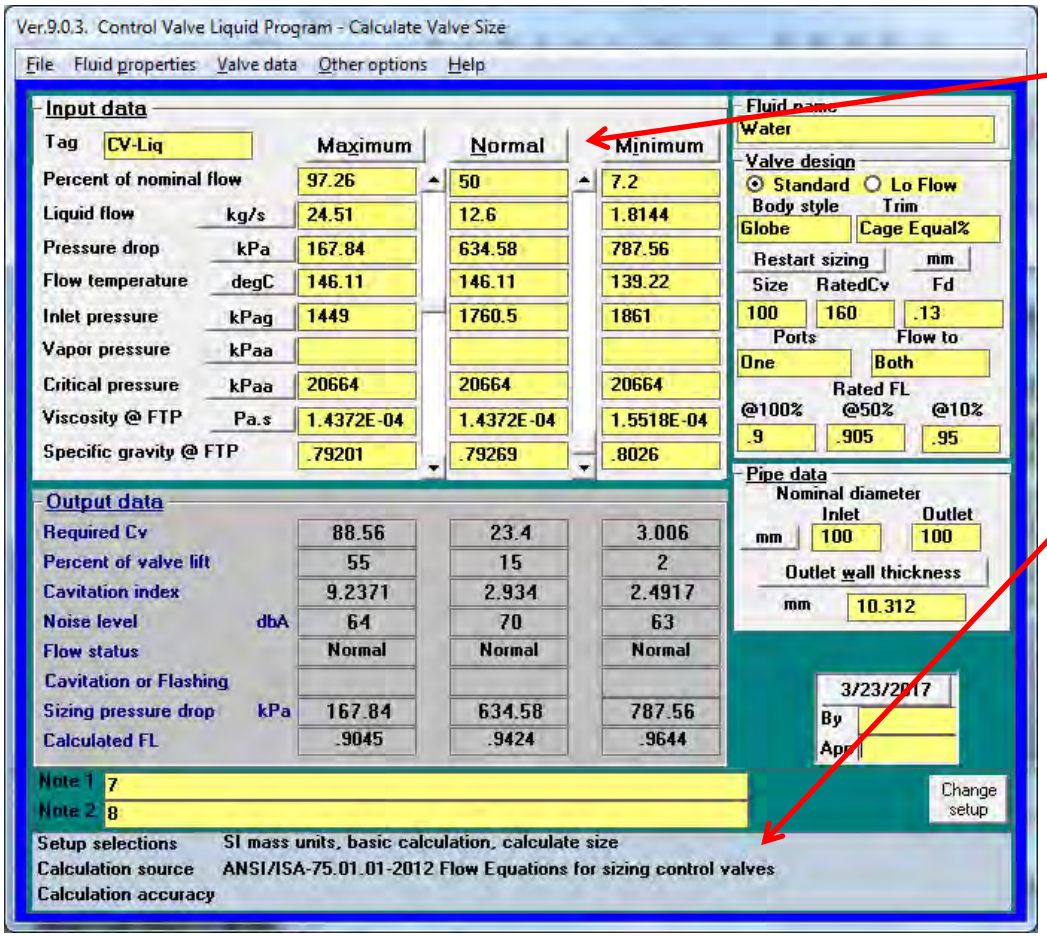
Control Valve—Valve Sizing Calculation



Required input data fields highlighted.

- Manually input fluid properties or select from included property database
- Select valve data from included selection of common valves
- Edit calculation options like units used, type of calculation, etc.

Control Valve—Valve Sizing Calculation

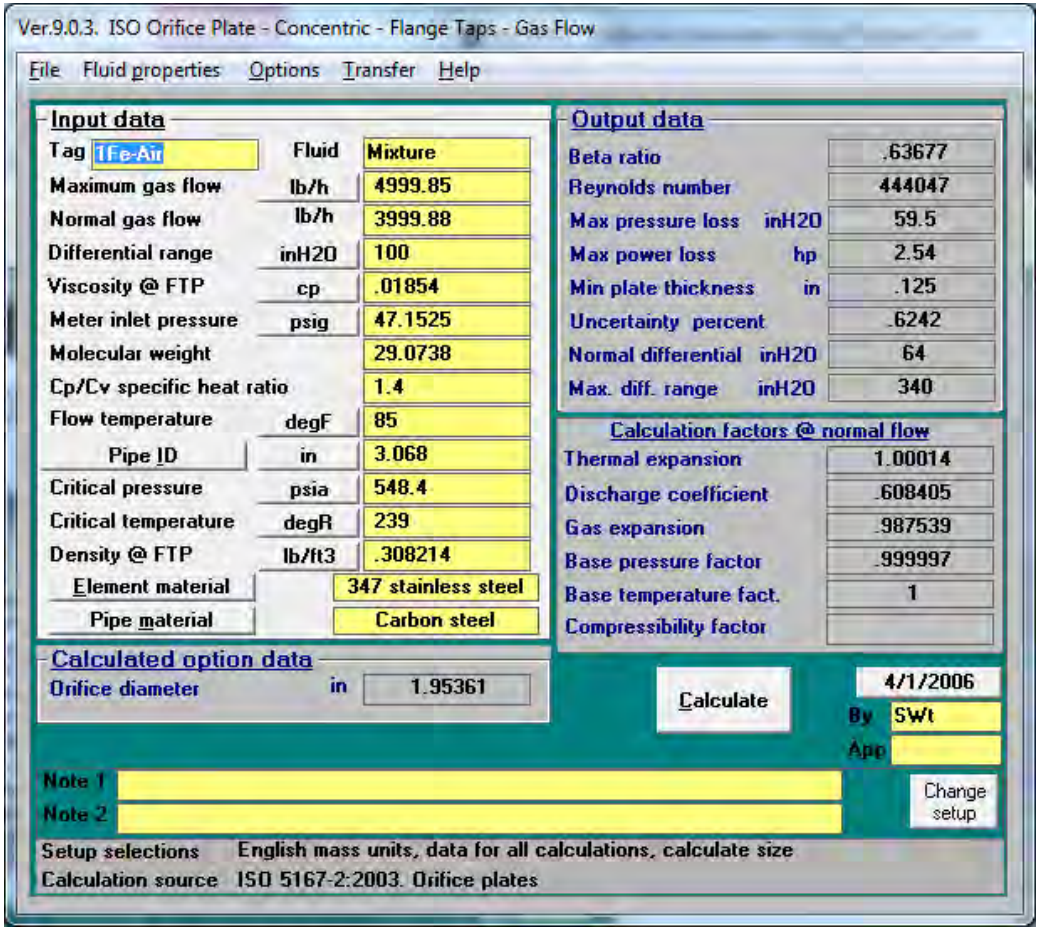


- Selecting Max, Norm or Min run the calculation

Calculation source identified on calculation form

- Masoneilan noise prediction method
- and incipient cavitation technique

ISO Orifice Plate Calculation



These programs determine the relationship between the flow rate, the pressure drop and the size of the hole.

They are based on ISO 5167 and follow the procedures described in The Flow Measurement Engineering Handbook by R. W. Miller.

ImageGrafix
Computer Solutions for Engineers

Overview

ImageGrafix, as a leading system integrator, digitalizes the entire lifecycle of industrial facilities and commercial buildings from inception to ongoing management, offering comprehensive planning, design and engineering, construction, operation, and maintenance solutions across diverse industry sectors such as Energy, Building & Infrastructure, and Manufacturing.

Our partnerships with top-tier technology providers are enriched by the finest talent, ensuring excellence in implementation, customization, managed services, and training. Our esteemed clientele includes Fortune 500 corporations within Energy, Process, Marine, Engineering, Procurement & Construction (EPC), Building & Construction, Automobile, Defense and Aerospace sectors across Middle East and India.

ImageGrafix Software Solutions Pvt. Ltd.

Chaitanya "EXOTICA", 4B, #51/24, Venkatanarayana Road,
T.Nagar, Chennai - 600 017,

+91 44 43486500 igss-energy@imagegrafix.com imagegrafix.com

Chennai New Delhi Mumbai Bengaluru Kolkata
Kozhikode Pune Hyderabad

InstruCalc 9.1

Harness the Power of Over 70 Sizing Routines