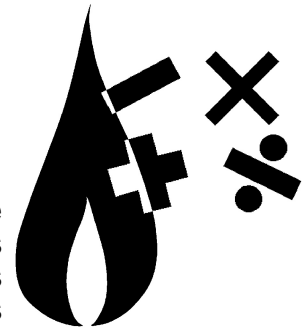


# GASCalc™



GASCalc™ is a Windows™ based suite of calculation tools for the natural gas professional. Routines are provided for calculating numerous parameters associated with the design and operation of natural gas gathering, transmission, distribution, plant, or fuel piping systems. Its robust set of calculation routines and features include...

<b>GASCalc Calculations &amp; Features</b>		
<b><i>GAS PROPERTY VALUES</i></b>		
<b>Physical Properties</b>	Calculates various physical properties including heating value, specific gravity (ideal or real), specific heat ratio, and viscosity for a specified gas composition.	Supported Heating Value Methods: AGA 8 - 1992 GPA 2172 - 1986 GPA 2172 - 2009 GPSA - 1998
<b>Thermodynamic Properties</b>	Calculates various thermodynamic property values including enthalpy, entropy, constant pressure and volume specific heat values for a specified gas composition at specified pressure and temperature conditions.	Supported Heating Value Methods: AGA 10 - 2003
<b>Compressibility Factor</b>	Calculates compressibility, density, and supercompressibility of a gas composition at specified pressure and temperature conditions. Automatically or individually calculated.	Supported Methods: AGA 8 - 1992 AGA 8 - 2017 (GERG 2008) AGA NX19 GERG - 1988 GPA 2145 - 2009 GPSA
<b>Sonic Velocity</b>	Calculates the speed of sound value for User specified pressure and temperature conditions and gas composition.	Supported Methods: AGA 10 - 2003 GPSA
<b>Hydrate Formation</b>	Calculates the pressure or temperature associated with hydrate formation in a User specified gas composition.	
<b>Pressure, Volume, Temperature (P, V, T)</b>	Calculates associated pressure, temperature, and volume values for specified conditions.	
<b>Atmospheric Pressure</b>	Calculates the atmospheric pressure for a given elevation or an elevation based on pressure value. Automatically or individually calculated.	Supported Methods: AGA Measurement ASHRAE - 2009 Handbook Of Chemistry & Physics ISHM NOAA - 1976
<b>Average Pressure</b>	Calculates the average pressure in a pipe segment or pair of values.	Supported Methods: Hydraulic Linear
<b>Average Temperature</b>	Calculates the average temperature in a pipe segment or pair of values.	
<b><i>METER VALUES</i></b>		
<b>Fixed Pressure Measurement Factor</b>	Calculates required adjustment factor for gas measured using a fixed pressure factor.	



## GASCalc Calculations & Features

<b>Standard Volume</b>	Calculates the equivalent standard (base) volume for a volume measured at non-standard conditions.	
<b>Base Conditions Conversion</b>	Converts a volume at one set of standard (base) conditions to the equivalent volume at another set of standard (base) conditions.	
<b>Volume Comparison</b>	Calculates the difference in volumes at different standard (base) conditions. Useful for calculating "lost and unaccounted for" values.	
<b>Orifice Meter</b>	Calculates values associated with measurement by an orifice meter. Includes calculation of orifice diameter, pressure differential, and flow values.	Supported Methods: AGA 3 - 1985 AGA 3 - 1992 AGA 3 - 2013 ISO 5167
<b>Diaphragm Meter</b>	Calculates values associated with sizing of the diaphragm displacement meters.	Supported Methods: GRI/SWRI Rockwell Sprague
<b>Rotary Meter</b>	Calculates values associated with sizing of the rotary meters.	
<b>Ultrasonic Meter</b>	Calculates values associated with sizing of the ultrasonic meters.	
<b>Turbine Meter</b>	Calculates values associated with sizing of the turbine meters.	
<b>Cone Meter</b>	Calculates values associated with measurement by a v-cone meter.	Supported Methods: McCrometer
<b>Pulse Output Meter</b>	Calculates values associated with measurement by a pulse output meter.	Supported Methods: AGA 7
<b>Meter MatchMaker</b>	Finds appropriate meters based on specified sizing criteria.	
<b>Flow Limiting Device</b>	Calculates values associated with sizing flow limiting orifices and nozzles.	Supported Methods: AGA 7
<b>PIPE VALUES</b>		
<b>Pipe Flow</b>	Calculates various values associated with flow through a single or series of pipe segments. Allows calculation of diameter, length, flow rate, roughness, pressure drop, and downstream temperature. Allows fittings to be attached.	Supported Equations: AGA partially and fully turbulent Colebrook - White Cox Darcy-Weisbach IAPMO high and low pressure IFGC high and low pressure IGE3 low, medium, general IGT-Improved IMC high and low pressure Mueller high and low pressure Oliphant OmegaFlex Tracpipe - CSST Panhandle A and B Pole low pressure Spitzglass high and low pressure Weymouth



## GASCalc Calculations & Features

<b>Service Line Sizing</b>	Calculates various values associated with flow through a service line - from main tap to termination riser. Allows fittings to be attached and inclusion of EFV. Calculates various EFV values including maximum protected length and reset time.	Supported EFV's: Dresser Elster Perfection Lyall UMAC
<b>Blowdown Time</b>	Calculates the estimated time required to vent a line to the atmosphere.	
<b>Pipe Volume</b>	Calculates the volume of gas contained in a single or series of pipe segments at specified beginning and ending conditions.	
<b>Pipe Fill Time</b>	Calculates various values associated with filling a single or series of pipe segments at specified beginning and ending conditions.	
<b>Pipe Vent Time</b>	Calculates various values associated with venting a single or series of pipe segments at specified beginning and ending conditions.	
<b>Pipe Purging &amp; Clearing</b>	Calculates various values associated with purging and/or clearing a pipe segment.	
<b>Steel Pipe Design Formula</b>	Calculates design values for steel pipe segments.	Supported Methods: ASME B31.8 CSA Z662-11 US DOT 192
<b>Plastic Pipe Design Formula</b>	Calculates design values for plastic pipe segments.	Supported Methods: API 15LE ASME B31.8 CSA Z662-11 PPI US DOT 192
<b>Maximum (Allowable) Operating Pressure (MAOP/MOP)</b>	Calculates the MAOP value for a pipe segment based on User specified values and conditions.	Supported Methods: ASME B31.8 CSA Z662-11 US DOT 192
<b>Bending Stress - Span</b>	Calculates values associated with a pipe span. Supports pinned and fixed end conditions.	
<b>Hoop Stress</b>	Calculates hoop stress and SMYS comparison for User specified conditions.	Supported Methods: API 1102 Traditional (Barlow)
<b>External Loading</b>	Calculates stress values associated with roadway, railway, and unclassified crossings.	Supported Methods: API 1102 ANSI GPTC Z380.1 PPI
<b>Thermal Expansion</b>	Calculates stress and change in length values associated with the temperature change of a pipe segment.	
<b>Total Pipe Stress</b>	Calculates the total combined stress for a pipe segment.	Supported Methods: ASME B31.8
<b>Buoyancy</b>	Calculates buoyancy and weight requirements for wet environment crossings.	
<b>Pipe Permeation</b>	Calculates the volume gas lost by way of permeation through a pipe wall.	



## GASCalc Calculations & Features

<b>Pipe Hydraulic Diameter</b>	Calculates the hydraulic diameter of plastic pipe based on dimensional values and tolerances.	Supported Methods: Generic PPI
<b>Pipe Flow Area</b>	Calculates the flow area of a pipe or opening based on User specified conditions.	
<b>VALVES &amp; FITTINGS</b>		
<b>Regulator Values</b>	Calculates sizing values associated with flow through a regulator.	Supported Equations: American Meter American Meter AFV Donkin Equimeter/Rockwell Fisher Grove 80, 83, 900 ISA - S75.01 Itron Mokveld Mooney Pietro Fiorentini Table Based Values Universal (Original 1964 ver)
<b>Regulator &amp; Monitor System</b>	Calculates sizing, flow, and pressure values associated with flow through a regulator and monitor pressure control station.	
<b>Regulator &amp; Relief Valve System / 2-Stage</b>	Calculates sizing, flow, and pressure values associated with flow through a regulator and relief valve pressure control station. Supports single or two stage stations.	
<b>Fitting Values</b>	Calculates sizing values associated with flow through a line fitting (elbow, tee, or valve) using equivalent length values.	Supported Equations: Crane 410 Rockwell
<b>Valve Values</b>	Calculates sizing values associated with flow through a line valve.	
<b>Relief Valve Values</b>	Calculates sizing values associated with flow through a relief valve.	Supported Equations: American Meter AFV Anderson Greenwood API 520 ASME BPV Equimeter/Rockwell Fisher Grove 80, 83, 900 ISA S75.01 Mooney
<b>Relief Valve &amp; Piping System</b>	Calculates sizing, flow, and pressure values associated with flow through a relief valve system.	
<b>Station MatchMaker</b>	Finds appropriate stations based on specified design and operating conditions.	
<b>Device MatchMaker</b>	Finds appropriate devices based on specified sizing criteria.	
<b>MISCELLANEOUS CALCULATIONS</b>		
<b>Gas Loss From Damage</b>	Estimates the volume of gas lost from a punctured or severed line.	
<b>Compressor Values</b>	Calculates various values associated with flow through a compressor unit.	



## GASCalc Calculations & Features

<b>Well Flow</b>	Calculates various values associated with flow through a well casing.	
<b>Line Heater</b>	Calculates various values associated with sizing an in-line heater.	
<b>Pipe Tap</b>	Calculates various values associated with flow through a pipe side wall tap.	
<b>Velocity</b>	Calculates the flow velocity through an opening.	
<b>Reynolds Number</b>	Calculates the Reynolds Number associated with User specified flow conditions.	
<b>Sacrificial Anodes</b>	Calculates various values associated with specifying and estimating sacrificial anode performance.	
<b>Remaining Strength</b>	Calculates various values associated with evaluation of a corroded pipe segment.	Supported Methods: ASME B31G - 1991 ASME B31G - 2012
<b>Container Volume</b>	Calculates the volume of various shaped containers.	

### UTILITY CALCULATIONS

<b>Unit Conversions</b>	Calculates dimensional equivalent of User specified value. Supports over 100 different dimensional units.	
<b>Energy Conversions</b>	Calculates energy equivalent of User specified energy unit. Supports 30 different energy types.	
<b>Value Interpolation</b>	Calculates an intermediate value from a set of specified table values. Automatically or individually calculated.	
<b>Value Extrapolation</b>	Calculates an extended value from a set of specified table values.	

### SELECTED PROGRAM FEATURES

**Dimensional Units** - Supports standard US, metric, and diverse unit systems. Includes a wide range of industry related units.

**Applications** - Allows external applications to be executed directly from the main menu.

**User Interface** - Provides intuitive and easy to understand and use fill-in-the-blank data screens for interacting with the many calculation routines.

**Pipe & Device Property Tables** - A comprehensive set of tables provides values required by the various pipe, fittings, devices and equipment calculations.

**Property Table Editor** - An extensive editor is provided for modifying the Anode, EFV, Fitting, Meter, Pipe, Regulator, Relief Valve, and Valve Property Tables which support the various calculation routines. The User can add, delete, and modify the models contained in the various Property Tables to meet their individual specific requirements.

**Value Selection Tables** - An extensive set of tables are provided to assist in the selection of certain required calculation values. Such as SMYS, HDB, HDS, MOE, Material Density, and Thermal Expansion Coefficients.

**Device Selector** - A handy device selection utility is provided to allow efficient selection of meters, regulators and relief valves by selecting the Manufacturer, Model, Size, Orifice etc.



Many of the calculation routines are also available through the GASCalc Application Program Interface (API). The API allows access to the supported calculation routines by way of programmatic function calls, allowing the User to create and access the calculation routines through their own custom user interface. The API is available at additional charge.

