

General Product Catalog



AMERICAN
METER COMPANY

Table of Contents

Introduction to Gas Measurement

Basics of Measurement3

Equipment to Measure, Control and Manage4

Gas Meters

Selecting the Correct Meter5

Diaphragm Meters6-7

RPM Series Rotary Meters8-9

Turbine Meters10-11

Selecting the Correct Pressure Regulator12

Pressure Regulators13-14

High-Pressure Regulators15

Overpressure Shutoff Safety Devices16

Repair Parts and Accessories17

TRACE VRT Mobile AMR System18-19

Remeter Services20

Sub-Meters/Laboratory Meters21

Test Equipment/Metrology Services22

Guide to Other Gases23

Basics Of Gas Measurement

American Meter products provide accurate, reliable and cost-effective measurement of gas flows in nearly every conceivable application. For industrial applications, there are products suitable for measuring gas consumption of a complete plant, a particular department, or a single piece of equipment. Measurement provides management with information needed to operate more efficiently. A comprehensive program of monitoring and controlling natural gas, LPG, compressed air and process gas consumption provides a number of benefits.

- Reduced energy waste and operating costs
- True cost accounting through accurate energy usage data
- Identification of inefficient equipment for more timely maintenance, overhaul or replacement
- Possible tax savings through documentation of gas used for manufacturing
- Accurate monitoring of transportation gas purchased from one supplier and delivered by the pipeline of a second company
- Warnings of possible equipment malfunction

Glossary

Standard (base) conditions 60° F (520°R or 15° C) temperature and 14.73 psia.

Actual cubic feet Volumetric measurement of gas at actual line conditions of temperature and pressure.

Standard cubic feet Volumetric measurement of gas at standard conditions of temperature and pressure.

Cubic feet per hour (cfh), Standard cubic feet per hour (scfh) Measurement of gas flow rate in actual or standard cubic feet per hour.

Uncorrected volume The volume of gas measured at line temperature and pressure.

Corrected volume The uncorrected volume measurement, which has been converted to the equivalent volume in standard cubic feet.

Atmospheric pressure The local or ambient pressure at a specific location. Near sea level, atmospheric pressure is approximately 14.7 psia.

Gage pressure The pressure above atmospheric pressure, normally expressed as psig.

Absolute pressure The pressure above a perfect vacuum. Absolute pressure is equal to the sum of atmospheric pressure and gage pressure, normally expressed as psia.

Inches of water column (w.c.) A unit of pressure measurement. One inch of water column equals 0.036 psi.

Rangeability The ratio of the maximum capacity to minimum capacity over which a meter will operate within a specified accuracy.

Factors Affecting Gas Measurement

Pressure and Temperature

Gas meters perform measurements at line conditions of pressure and temperature. This measurement is known as the uncorrected volume. In most applications, it's necessary to convert uncorrected volume to the equivalent volume at standard conditions (corrected volume). At line pressures above base pressure (typically 14.73 psia), the corrected volume will be greater than the uncorrected volume. The effect of pressure can be calculated as follows:

$$\text{Standard cubic feet} = \frac{\text{Actual cubic feet} \times (\text{Atmospheric pressure} + \text{Gage pressure})}{\text{Base Pressure}}$$

When actual flowing temperatures are above the standard condition of 60° F (15° C), corrected volume will be less than the uncorrected volume. Conversely, at temperatures below 60° F (15° C), corrected volume will be greater than uncorrected volume. The effect of temperature can be calculated as follows:

$$\text{Standard cubic feet} = \frac{\text{Actual cubic feet} \times (460^\circ \text{ F} + 60^\circ \text{ F})}{(460^\circ \text{ F} + \text{Flowing temperature})}$$

In actual practice, some type of correcting device is normally used with a meter to automatically convert to standard cubic feet. For diaphragm, rotary and turbine meters in an application where line pressure is stable, the meter can be supplied with an index that corrects for a constant pressure. Diaphragm and rotary meters can also be supplied with an integral continuous mechanical temperature-compensating device for temperature correction. For turbine meters and larger diaphragm meters, a correcting instrument is typically used.

Specific Gravity

Capacity data for the meters in this catalog are based on natural gas, with a specific gravity of 0.60. A change in specific gravity will not change the capacity of a turbine meter. However, specific gravity will affect the capacities of diaphragm and rotary meters. For data on gases with other specific gravities, see page 23 of this bulletin.

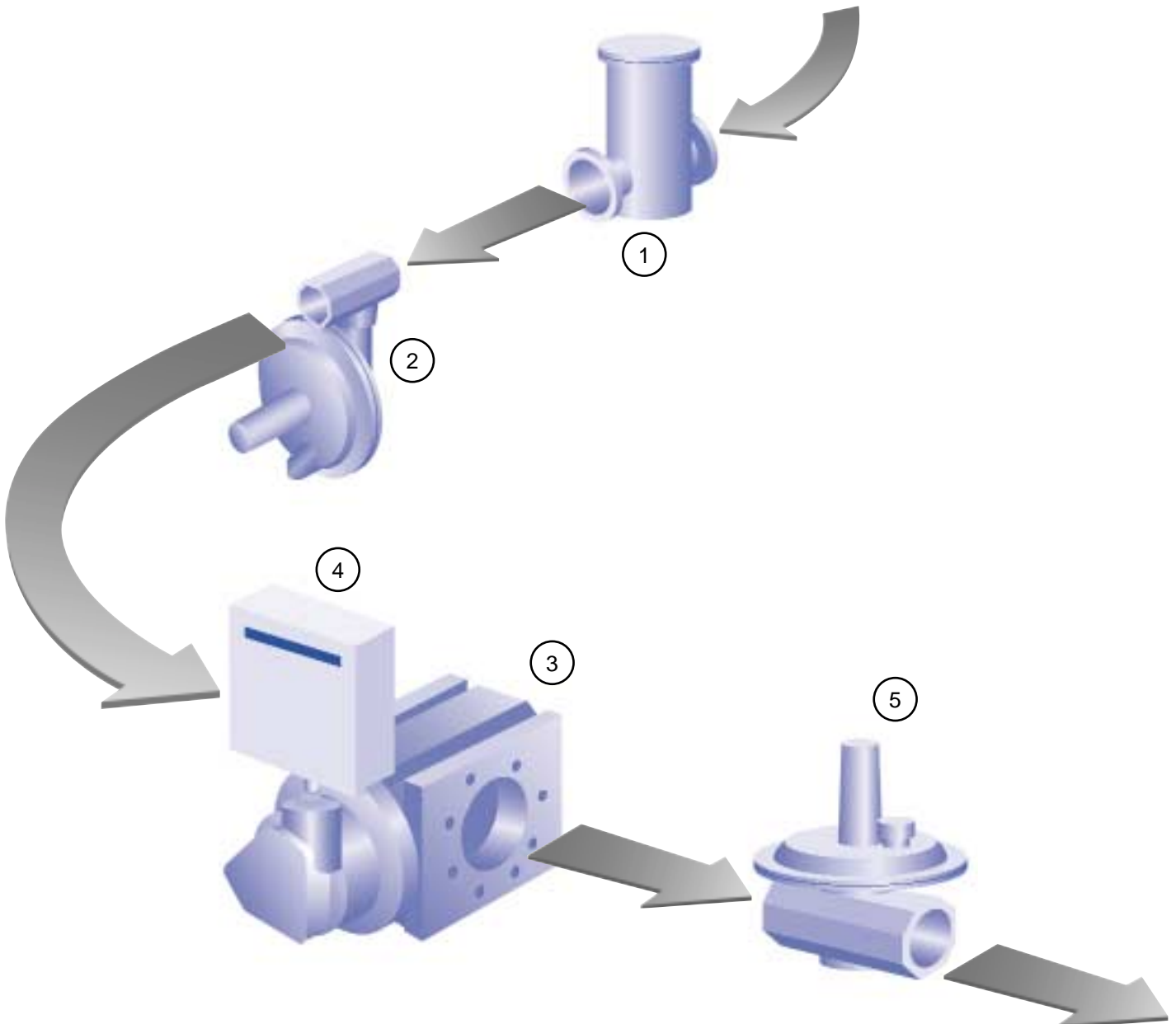
Equipment to Measure, Control and Manage

American Meter Company supplies the industry's broadest line of equipment for measurement, regulation (control) and data management in applications using natural gas, LPG and other dry industrial gases. This equipment can be used in virtually every application imaginable, from local measurement of gas consumption by a single burner, to monitoring complete transmission and distribution systems.

This catalog presents a very brief overview of the products available from American Meter. For more detailed product information, please request the data bulletin for that specific product or visit our web site at www.americanmeter.com. Should you have questions involving the measurement of gas, feel free to contact us.

This typical system illustrates the basic elements of a gas meter installation with the associated equipment normally included.

1. Filters remove particulate such as pipe scale, which could impair the operation or accuracy of regulators, meters or gas burning equipment.
2. An upstream pressure regulator reduces line pressure and provides a stable pressure to the meter.
3. The meter itself could be used to monitor the gas usage of an entire plant or a single piece of equipment.
4. An electronic flow computer, or correcting device, can be used to correct for variations in pressure and/or temperature.
5. A downstream regulator further reduces gas pressure as required by a specific piece of equipment.



Selecting the Correct Meter

American Meter supplies three types of meters – diaphragm, rotary and turbine.

Diaphragm meters are positive-displacement devices that have fixed-volume measurement compartments formed by a two-sided convoluted diaphragm. A small pressure drop across the meter causes it to cycle so these compartments alternately fill with gas at the inlet, and then empty at the outlet. By counting the number of cycles, the meter provides a measure of gas volume.

Rotary meters are also positive-displacement measurement devices. In this case, a pair of hourglass-shaped impellers form the fixed-volume compartments. When downstream demand initiates the flow of gas, the impellers rotate to receive a fixed volume of gas at the inlet and then discharge it at the outlet.

In place of fixed-volume compartments, a turbine meter has a rotor in the gas stream. As gas flows through the meter, the rotor turns at a speed that is proportional to the rate of gas. This type of meter is termed as an inferential meter.

Deciding which type of meter is the best choice for a particular application depends upon the following:

- the pressure of the gas being measured
- the maximum flow rate to be measured
- the minimum flow rate to be measured

Gas Pressure

The first consideration in selecting a gas meter is the pressure of the gas being measured. Depending on the specific model, diaphragm meters have pressure ratings up to 100 psig. Rotary meters can operate at pressures up to 285 psig. For applications above 285 psig, select a turbine meter.

Maximum Flow Rates

Capacity ratings for the various types of meters overlap as shown in the chart below. However, considering line pressures of 0.25 psig, the following meter choices are typical:

- Diaphragm Meter – max. flow rates of 10,000 scfh or less
- Rotary Meter – max. flow rates of 1,500-15,000 scfh
- Turbine Meter – max. flow rates of 1,000 and above

The overlap in capacity ratings allows for versatility when selecting the correct meter for differing applications. For example, an application’s maximum flow rate may fit into the “typical” selection shown above for a diaphragm meter, but the pressure of the gas being measured may be above 100 psig. In this case, a small rotary meter would be considered.

Rangeability

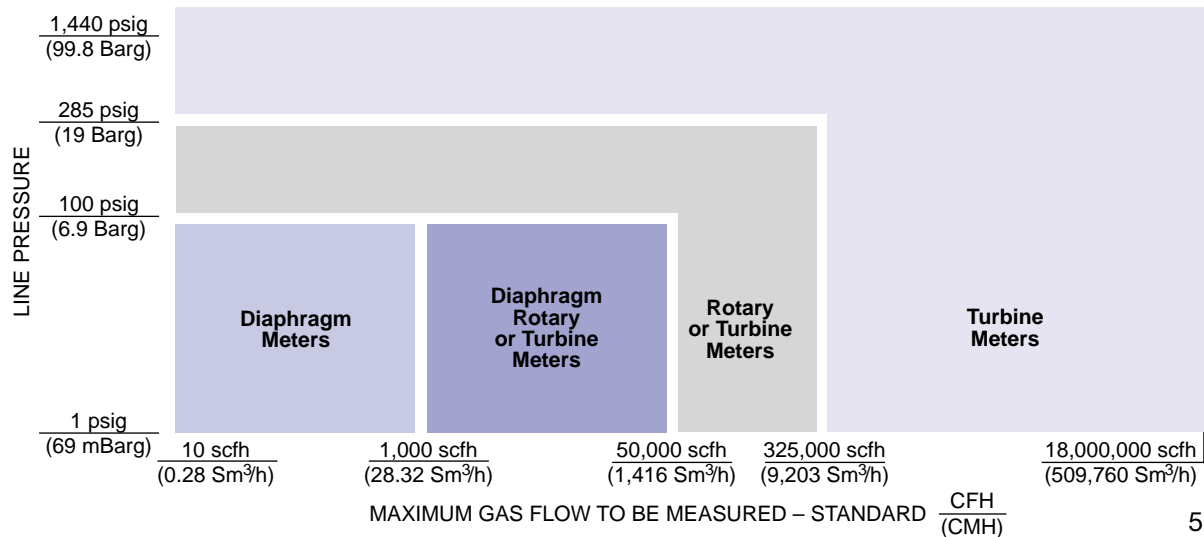
Another consideration to keep in mind when selecting a gas meter is the rangeability of the meter. Rangeability is the ratio of maximum flow rate to minimum flow rate that can be measured within the specified accuracy of the meter.

American Meter diaphragm meters provide an accuracy of ±1% of reading with a rangeability of *greater than* 100:1. Therefore, an AC-250 meter with a maximum rating of 250 scfh will provide ±1% accuracy for flow rates from 2.5 to 250 scfh.

For rotary meters, rangeability at ±1% accuracy ranges from 30:1 up to 120:1, depending on the specific meter size. For applications where ±2% accuracy is sufficient, rotary meters will provide rangeabilities up to 225:1.

A distinct feature of turbine meters is that the rangeability increases as the measuring pressure increases, providing a wider operating range at higher pressures. For example, a 3" GTS turbine meter operating at a line pressure of 0.25 psig has a rangeability of 12:1. The maximum rated capacity at this pressure is 10,000 scfh, providing an operating range of 833 to 10,000 scfh within the accuracy limitation of ±1% of reading. The same meter in an application with a line pressure of 100 psig has a rangeability of 33:1 and a maximum rated capacity of 78,000 scfh. Given this, the meter has a measuring range of 2,360 to 78,000 scfh within the accuracy limitation of ±1% of reading.

Meter Selection by Capacity and Pressure



Diaphragm Meters

American Meter is the industry's leading supplier of diaphragm meters with models for applications from domestic service to large industrial users. The housing consists of a one-piece cast aluminum alloy body and aluminum alloy top and covers. American Meter diaphragm meters have an outstanding record for durability and reliability. Features include:

- light, compact profiles
- durable valve material to minimize wear
- one-piece body design to eliminate the need for machined joints and gaskets, and the possibility of internal leakage
- molded, convoluted diaphragms for smooth operation and long life
- low-friction seals
- adjustable tangents
- rugged flag rods for positive alignment and sustained accuracy
- large, self-lubricating bearings
- two-part epoxy primer and acrylic finish coat

Diaphragm Meter Options

All diaphragm meters can be supplied with temperature compensation. This feature converts the volume of gas measured at actual (line) temperatures from -30° to +140° F (-34° to 60° C) to the equivalent volume at standard 60° F (15° C) base temperature.

Meters can also be supplied with your choice of a circle-type, odometer index, or pressure-compensating index.

AR-250

- Nominal capacity = 250 scfh (7.1 Sm³/h)
- Maximum pressure rating = 5 psig (345 mBarg)
- Top In–Top Out (TITO) or Bottom In–Top Out (BITO) Connections
- Sales Bulletin **SB 3580**



AT-210

- Nominal capacity = 210 scfh (5.9 Sm³/h)
- Maximum pressure rating = 5 psig or 10 psig (345 or 690 mBarg)
- Connections suited for tin case meter replacement
- Sales Bulletin **SB 3504**



AT-250

- Nominal capacity = 250 scfh (7.1 Sm³/h)
- Maximum pressure rating = 5 psig or 10 psig (345 or 690 mBarg)
- Connections suited for tin case meter replacement
- Sales Bulletin **SB 3580**

AC-250/AM-250

- Nominal capacity = 250 scfh (7.1 Sm³/h)
- Maximum pressure rating = 5 psig or 10 psig (345 or 690 mBarg)
- AC-250 – Top connections; AM-250 – Side connections
- AC-250 Sales Bulletin **SB 3535**
- AM-250 Sales Bulletin **SB 3537**



AL-425

- Nominal capacity = 425 scfh (12.0 Sm³/h)
- Maximum pressure rating = 10 psig or 25 psig (690 mBarg or 1.7 Barg)
- Top connections
- Sales Bulletin **SB 3520**



AC-630

- Nominal capacity = 630 scfh (17.8 Sm³/h)
- Maximum pressure rating = 25 psig (1.7 Barg)
- Top connections
- Sales Bulletin **SB 3550**



AL-800

- Nominal capacity = 800 scfh (22.6 or Sm³/h)
- Maximum pressure rating = 20 psig or 100 psig (1.4 or 6.9 Barg)
- Top connections
- Sales Bulletin **SB 3510**



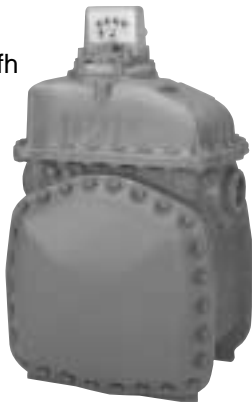
AL-1000

- Nominal capacity = 1,000 scfh (28.3 or Sm³/h)
- Maximum pressure rating = 25 psig or 100 psig (1.7 or 6.9 Barg)
- Top connections
- Sales Bulletin **SB 3510**

Diaphragm Meters *continued*

AL-1400

- Nominal capacity = 1,400 scfh (39.6 Sm³/h)
- Maximum pressure rating = 100 psig (6.9 Barg)
- Side connections
- Available as remanufactured meter only
- Sales Bulletin **SB 3510**



AL-5000

- Nominal capacity = 5,000 scfh (141.6 Sm³/h)
- Maximum pressure rating = 100 psig (6.9 Barg)
- Side connections
- Available as remanufactured meter only
- Sales Bulletin **SB 3510**



AL-2300

- Nominal capacity = 2,300 scfh (65.1 Sm³/h)
- Maximum pressure rating = 100 psig (6.9 Barg)
- Side connections
- Available as remanufactured meter only
- Sales Bulletin **SB 3510**



Meter Capacities

Diaphragm Meter Capacities * scfh (Sm ³ /h)									
Line Pressure	AT-210	AT-250 AC-250 AM-250 AR-250	AL-425	AC-630	AL-800	AL-1000	AL-1400	AL-2300	AL-5000
0.25 psig (17 mBarg)	210 (5.9)	250 (7.1)	425 (12.0)	630 (17.8)	800 (22.7)	1000 (28.3)	1400 (39.6)	2300 (65.1)	5000 (141.6)
2 psig (14 mBarg)	424 (12.0)	550 (15.6)	955 (27.0)	1390 (39.4)	1850 (52.4)	2400 (68.0)	3265 (92.5)	5440 (154.0)	12000 (339.8)
5 psig (345 mBarg)	462 (13.1)	593 (16.8)	1100 (31.1)	1515 (42.9)	2100 (59.5)	2700 (76.5)	3700 (104.8)	6200 (175.6)	13500 (382.3)
10 psig (690 mBarg)	—	—	1350 (38.2)	1710 (48.4)	2600 (73.6)	3400 (96.3)	4600 (130.3)	7700 (218.1)	1700 (481.4)
20 psig (1.4 Barg)	—	—	1700 (48.1)	2010 (56.9)	3200 (90.6)	4100 (116.1)	5600 (158.6)	9400 (266.2)	20600 (583.4)
25 psig (1.7 Barg)	—	—	1880 (53.2)	2160 (61.2)	3500 (99.1)	4600 (130.3)	6200 (175.6)	10400 (294.5)	23000 (654.4)
50 psig (3.4 Barg)	—	—	—	—	5100 (144.4)	6600 (186.9)	9000 (254.9)	15000 (424.8)	33000 (934.6)
75 psig (5.2 Barg)	—	—	—	—	6600 (186.9)	8540 (241.8)	11650 (329.9)	19400 (549.4)	42700 (1209.1)
100 psig (6.9 Barg)	—	—	—	—	7800 (220.9)	10100 (286.0)	13800 (390.8)	23000 (651.4)	50500 (1,430.2)

* Capacity data based upon natural gas with specific gravity of 0.60.

RPM Series Rotary Meters

American Meter's RPM Series Rotary Meters provide accurate flow measurement and outstanding performance for commercial and industrial measurement applications. These meters feature an extruded aluminum housing that provides superior strength, making them ideal for service where pipe stress and snap-acting loads can occur.

All RPM Series meters mount in either a horizontal or vertical position, depending on available space and convenience. Once installed, all standard and optional equipment can be easily positioned for convenient reading and quick service. All models have extremely good rangeability and are available in various pipe sizes to meet a variety of applications.

In-depth details of these various configurations can be found in the following sales bulletins:

SB 5500 *RPM Meter*

SB 5510 *RPM Meter with Mercury Corrector*

SB 5520 *RPM-CMTC*

RPM Series meters are available in the following configurations:

RPM-Std

Standard meter with uncorrected mechanical register



RPM-ETC

Meter with uncorrected mechanical register and battery powered electronic temperature compensator



RPM-ID

Meter with uncorrected mechanical register and instrument drive for mounting a pressure/temperature corrector

RPM-CMTC

Meter with continuous mechanical temperature compensator



RPM-CMTC-ID

Meter with continuous mechanical temperature compensator and instrument drive for mounting a pressure-compensating index or pressure-correcting instrument



RPM w/Mercury

Meter with integral Mercury Instrument for pressure/temperature correction



RPM Series Rotary Meters *continued*

A six-month history is available through the Electronic Temperature Compensator's (ETC) data files, which can easily be accessed using software (TCDAS 2000) via a laptop computer or Palm Handheld PDA connected to the unit's interface port. The ETC's memory stores corrected and uncorrected volume once a month at a user-designated day and time. This information is obtainable for the six previous months of operation in a separate data file.



Meter Capacities

RPM Series Rotary Meter Capacities *										
Line Pressure	8.0C	9.0C	11C	1.5M	2M	3.5M	5.5M	7M	11M	16M
0.25 psig (17 mBarg)	800 (22.4)	900 (25.2)	1,100 (30.8)	1,500 (42.0)	2,000 (56.0)	3,500 (98.0)	5,500 (154.0)	7,000 (196.0)	11,000 (308.0)	16,000 (448.0)
2 psig (1.4 mBarg)	891 (24.9)	1,002 (28.1)	1,225 (34.3)	1,670 (46.8)	2,227 (62.3)	3,897 (109.1)	6,124 (171.5)	7,794 (218.2)	12,247 (342.9)	17,814 (498.8)
5 psig (345 mBarg)	1,054 (29.5)	1,185 (33.2)	1,449 (40.6)	1,976 (55.3)	2,634 (73.8)	4,610 (129.1)	7,244 (202.8)	9,219 (258.1)	14,487 (405.6)	21,073 (590.0)
10 psig (690 mBarg)	1,325 (37.1)	1,491 (41.7)	1,822 (51.0)	2,485 (69.6)	3,313 (92.8)	5,798 (162.3)	9,111 (255.1)	11,595 (324.7)	18,221 (510.2)	26,504 (742.1)
25 psig (1.7 Barg)	2,140 (59.9)	2,407 (67.4)	2,942 (82.4)	4,012 (112.3)	5,350 (149.8)	9,362 (262.1)	14,711 (411.9)	18,724 (524.3)	29,423 (823.8)	42,797 (1,198.3)
50 psig (3.4 Barg)	3,498 (97.9)	3,935 (110.2)	4,809 (134.7)	6,558 (183.6)	8,744 (244.8)	15,302 (428.5)	24,046 (673.3)	30,604 (856.9)	48,092 (1,346.6)	69,952 (1,958.7)
75 psig (5.2 Barg)	4,855 (136.0)	5,462 (152.9)	6,676 (186.9)	9,104 (254.9)	12,138 (339.9)	21,242 (594.8)	33,381 (934.7)	42,485 (1,189.6)	66,762 (1,869.3)	97,108 (2,719.0)
100 psig (6.9 Barg)	6,213 (174.0)	6,990 (195.7)	8,543 (239.2)	11,650 (326.2)	15,533 (434.9)	27,183 (761.1)	42,716 (1,196.0)	54,365 (1,522.2)	85,431 (2,392.1)	124,263 (3,479.4)
150 psig (10.3 Barg)	8,929 (250.0)	10,045 (281.3)	12,277 (343.8)	16,741 (468.8)	22,322 (625.0)	39,063 (1,093.8)	61,385 (1,718.8)	78,126 (2,187.5)	122,770 (3,437.6)	178,574 (5,000.1)
175 psig (12.1 Barg)	10,286 (288.0)	11,572 (324.0)	14,144 (396.0)	19,287 (540.0)	25,716 (720.1)	45,003 (1,260.1)	70,720 (1,980.1)	90,007 (2,520.2)	141,439 (3,960.3)	205,730 (5,760.4)
200 psig (13.8 Barg)	11,644 (326.0)	14,585 (408.4)	17,826 (499.1)	24,308 (680.6)	32,411 (907.5)	56,719 (1,588.1)	89,130 (2,495.7)	113,439 (3,176.3)	178,261 (4,991.3)	259,288 (7,260.1)
250 psig (17.2 Barg)	14,360 (402.1)	16,155 (452.3)	19,745 (552.9)	26,925 (753.9)	35,900 (1,005.2)	62,824 (1,759.1)	98,724 (2,764.3)	125,648 (3,518.2)	197,447 (5,528.5)	287,196 (8,041.5)
285 psig (19.6 Barg)	16,261 (455.3)	18,293 (512.2)	22,358 (626.0)	30,489 (853.7)	40,652 (1,138.2)	71,141 (1,991.9)	111,792 (3,130.2)	142,281 (3,983.9)	223,585 (6,260.4)	325,214 (9,106.0)

* Capacity data based upon natural gas with specific gravity of 0.60.

Turbine Meters

American Meter supplies several variations of compact, high-performance turbine meters. Each of these variations is designed to provide accurate totalization of high volume gas flows.

GTS meters are available in line sizes from 3" to 12" and pressure ratings up to 1,440 psig. The 4", 6" and 8" sizes are available with extended capacity ratings (30° rotor), which can reduce the pipe size of an entire meter run, resulting in substantial savings.

GTX meters are available in line sizes from 4" to 8" and a pressure rating of 175 psig. These meters are a cost-reduced version of the GTS meter specifically designed for in-plant measurement or where reduced maintenance is a requirement.



GTS, GTX and AccuTest turbine meters are supported by low (350 cubic foot bell and large sonic-nozzle provers), medium (150 psia recirculating-air test loop with master turbine meters as a reference standard) and high (natural gas test pressures up to 1,000 psia with master turbine meters as reference standard) test facilities.

Designed for reliable, long-term service, these meters feature:

- flush-type bearing lubrication system (GTS and AccuTest);
- aluminum rotors for high-pressure models and meters with high-frequency pulse output (GTS and AccuTest);
- high-frequency RF pulser that monitors rotor condition (GTS and AccuTest);
- one output gear train for 3" to 8" meters reduces spare parts inventory;
- high-efficiency inlet flow conditioners;
- interchangeable pre-calibrated cartridges for easy maintenance/change out;
- optional electronic temperature compensation; and
- optional fixed-factor pressure compensation.

In-depth details of GTS and GTX turbine meters can be found in bulletin **SB 4510**.



3" GTS Meter



4" GTS Meter

Turbine Meters *continued*

AccuTest Transfer Proving Turbine Meters

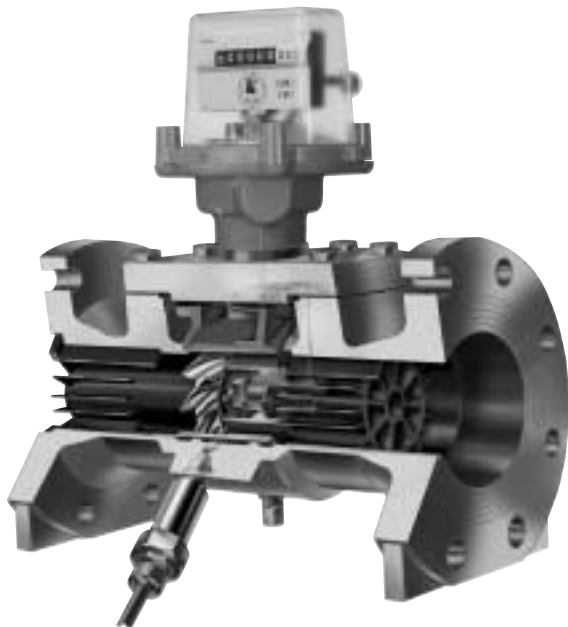
These innovative units combine all the features and benefits of American Meter's GTS turbine meters with an additional integral reference meter that provides on-site, in-line testing under actual operating conditions.

An AccuTest meter, with your laptop computer, becomes a transfer proving system, without removing the cartridge from the meter. AccuTest meters are available in 4", 6" and 8" sizes, with standard or extended capacity aluminum rotors.

In-depth details of the AccuTest turbine meter can be found in bulletin **SB 4515**.

Transfer proving has graduated to on-site, in-line turbine meter testing. On-screen diagnostics and one-minute test cycles assure precise accuracy and reduce the cost of periodic testing.

AccuTest meters combine a high-performance turbine meter with an integral test meter for on-site, in-line testing under actual operating conditions.



Meter Capacities

Turbine Meter Capacities * mscfh (Sm ³ /h)																
Line Pressure	3" GTS		4" GTS, GTX or AccuTest				6" GTS, GTX or AccuTest				8" GTS, GTX or AccuTest				12" GTS	
	Cap.	Range	45° Rotor		30° Rotor		45° Rotor		30° Rotor		45° Rotor		30° Rotor		Cap.	Range
0.25 psig (17 mBarg)	10 (280)	12:1	18 (504)	15:1	23 (644)	12:1	35 (980)	18:1	50 (1,400)	12:1	60 (1,680)	20:1	88 (2,464)	15:1	150 (4,200)	25:1
10 psig (690 mBarg)	17 (476)	15:1	30 (840)	19:1	38 (1,064)	15:1	58 (1,624)	23:1	93 (2,604)	15:1	100 (2,800)	26:1	146 (4,088)	19:1	250 (7,000)	32:1
25 psig (1.7 Barg)	27 (756)	20:1	48 (1,344)	25:1	62 (1,736)	20:1	94 (2,632)	29:1	134 (3,752)	25:1	161 (4,508)	33:1	237 (6,636)	25:1	404 (11,312)	41:1
50 psig (3.4 Barg)	44 (1,232)	25:1	80 (2,240)	31:1	102 (2,856)	25:1	154 (4,312)	38:1	220 (6,160)	25:1	265 (7,420)	42:1	388 (10,864)	31:1	662 (18,536)	52:1
100 psig (6.9 Barg)	79 (2,212)	33:1	142 (3,976)	42:1	182 (5,096)	33:1	276 (7,728)	50:1	395 (11,060)	33:1	474 (13,272)	56:1	695 (19,460)	42:1	1,185 (33,180)	70:1
500 psig (34.4 Barg)	379 (10,612)	71:1	695 (19,460)	89:1	872 (24,416)	71:1	1,328 (37,184)	106:1	1,897 (53,116)	71:1	2,276 (63,728)	118:1	3,339 (93,492)	89:1	5,691 (159,348)	148:1
1,000 psig (68.9 Barg)	814 (22,792)	100:1	1,466 (41,048)	124:1	1,873.0 (52,444)	100:1	2,851 (79,828)	149:1	4,072 (114,016)	100:1	4,887 (136,836)	166:1	7,167.0 (200,676)	124:1	12,217 (342,076)	207:1
1,400 psig (96.5 Barg)	1,197 (33,516)	118:1	2,154 (60,312)	147:1	2,754 (77,112)	118:1	4,190 (117,320)	176:1	6,041 (169,148)	118:1	7,184 (201,152)	196:1	10,536 (295,008)	147:1	17,959 (502,852)	245:1

Selecting the Correct Pressure Regulator

American Meter pressure regulators are used (a) upstream of a gas meter to reduce inlet pressure to the meter and eliminate fluctuations, which can affect meter accuracy and (b) downstream of the gas meter to provide reduced pressure for gas-operated equipment.

The three major factors that determine the selection of a pressure regulator are as follows:

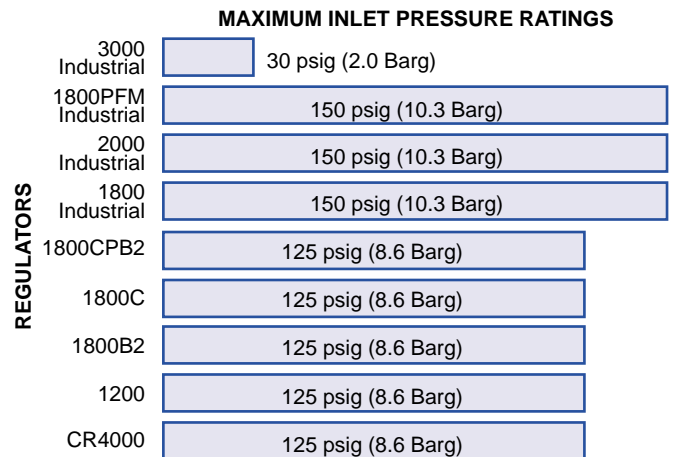
- inlet pressure to the regulator (minimum and maximum)
- outlet pressure that the regulator must maintain
- required capacity of the regulator in scfh (Sm^3/h)

American Meter offers a wide variety of regulators to meet almost any application as shown in the charts to the right.

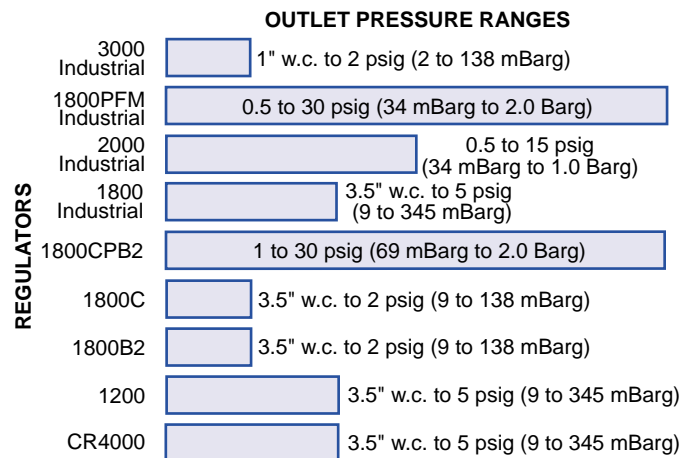
In addition to the three major factors above, there are various options available in regulators that should be considered. American Meter offers different regulator models that include options for protection against upset conditions. The most common of these options include:

- internal relief (partial or full) – the ability to vent excess gas to atmosphere in the event the outlet pressure rises above a predetermined value
- overpressure shut-off (OPSO) – the ability to shut down the gas supply if outlet pressure exceeds a predetermined value
- underpressure shut-off (UPSO) – the ability to shut down the gas if the outlet pressure falls below a predetermined value
- remote monitoring – the ability to control/monitor pressure at a specified location downstream of the regulator

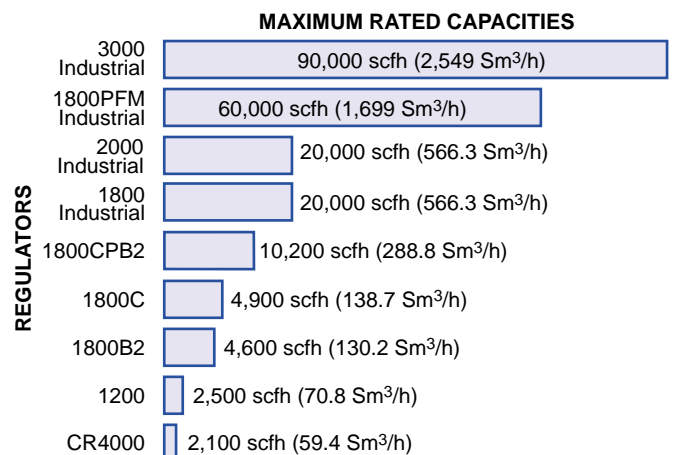
Maximum Inlet Pressure Ratings



Outlet Pressure Range



Maximum Rated Capacities



Pressure Regulators

Series CR4000 Regulators

- type: lever-type, spring-loaded
- maximum rated capacity: 2,100 scfh (59.4 Sm³/h)
- maximum inlet pressure: 125 psig (8.6 Barg)
- outlet pressure range: 3.5" w.c. to 5 psig (9 to 345 mBarg)
- connection sizes: 3/4" to 1" NPT or BSP-TR
- available options: full internal relief
- Bulletin **SB 8580**



1800C/1800C-HC Series Regulators

- type: lever-type, spring-loaded
- maximum rated capacity: 4,900 scfh (138.7 Sm³/h)
- maximum inlet pressure: 125 psig (8.6 Barg)
- outlet pressure range: 3.5" w.c. to 2 psig (9 to 138 mBarg)
- connection sizes: 3/4", 1" or 1-1/4" NPT or BSP-TR
- available options: full internal relief, OPSO, UPSO, USSA
- Bulletin **SB 8515**
- Bulletin **SB 8556** (USSA)



1200 Series Regulators

- type: lever-type, spring-loaded
- maximum rated capacity: 2,500 scfh (70.8 Sm³/h)
- maximum inlet pressure: 125 psig (8.6 Barg)
- outlet pressure range: 3.5" w.c. to 5 psig (9 to 345 mBarg)
- connection sizes: 1/2", 3/4" or 1" NPT or BSP-TR
- available options: full internal relief, OPSO, UPSO, USSA
- Bulletin **SB 8505** (Series 1200)
- Bulletin **SB 8506** (Model 1213B2)
- Bulletin **SB 8556** (USSA)



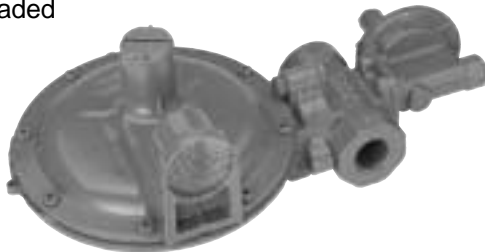
1800CPB2 Series Pilot-Loaded Regulators

- type: lever-type, pilot-loaded
- maximum rated capacity: 10,200 scfh (288.8 Sm³/h)
- maximum inlet pressure: 125 psig (8.6 Barg)
- outlet pressure range: 1 to 30 psig (69 mBarg to 2.0 Barg)
- connection sizes: 3/4", 1" or 1-1/4" NPT or BSP-TR
- available options: OPSO
- Bulletin **SB 8520**



1800B2/1800B2-HC Series Regulators

- type: lever-type, spring-loaded
- maximum rated capacity: 4,600 scfh (130.2 Sm³/h)
- maximum inlet pressure: 125 psig (8.6 Barg)
- outlet pressure range: 3.5" w.c. to 2 psig (9 to 138 mBarg)
- connection sizes: 3/4", 1" or 1-1/4" NPT or BSP-TR
- available options: full internal relief, partial internal relief, OPSO, UPSO, USSA
- Bulletin **SB 8510** (1800B2/1800B2-HC)
- Bulletin **TDB 8620** (1843B2-L)
- Bulletin **SB 8556** (USSA)



Pressure Regulators *continued*

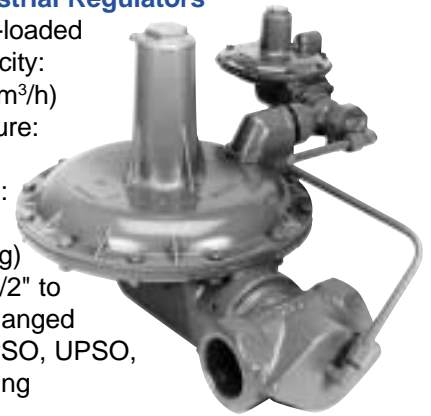
1800 Series Industrial Regulators

- type: lever-type, spring-loaded
- maximum rated capacity: 20,000 scfh (566.3 Sm³/h)
- maximum inlet pressure: 150 psig (10.3 Barg)
- outlet pressure range: 3.5" w.c. to 5 psig (9 to 345 mBarg)
- connection sizes: 1-1/2" or 2" NPT/BSP-TR, 2" flanged
- available options: full internal relief, partial internal relief, USSA, OPSO, UPSO, external sensing
- Bulletin **SB 8540**
- Bulletin **SB 8745 (USSA)**



1800PFM Series Industrial Regulators

- type: lever-type, pilot-loaded
- maximum rated capacity: 60,000 scfh (1,699 Sm³/h)
- maximum inlet pressure: 150 psig (10.3 Barg)
- outlet pressure range: 0.5 to 30 psig (34 mBarg to 2.0 Barg)
- connection sizes: 1-1/2" to 2" NPT/BSP-TR, 2" flanged
- available options: OPSO, UPSO, USSA, external sensing
- Bulletin **SB 8551**
- Bulletin **SB 8745 (USSA)**



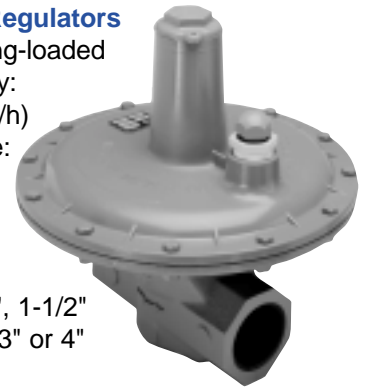
2000 Series Industrial Regulators

- type: lever-type, spring-loaded
- maximum rated capacity: 20,000 scfh (566.3 Sm³/h)
- maximum inlet pressure: 150 psig (10.3 Barg)
- outlet pressure range: 0.5 to 15 psig (34 mBarg to 1.0 Barg)
- connection sizes: 1/2" or 2" NPT/BSP-TR, 2" flanged
- available options: OPSO, UPSO, USSA, external sensing
- Bulletin **SB 8540**
- Bulletin **SB 8745 (USSA)**



Series 3000 Industrial Regulators

- type: direct-acting, spring-loaded
- maximum rated capacity: 90,000 scfh (2,549 Sm³/h)
- maximum inlet pressure: 30 psig (2.0 Barg)
- outlet pressure range: 1" w.c. to 2 psig (2 to 138 mBarg)
- connection sizes: 1-1/4", 1-1/2" or 2" NPT/BSP-TR, 2", 3" or 4" flanged
- available options: external sensing
- Bulletin **SB 8535**



High-Pressure Regulators

American Meter offers several variations of pilot-loaded pressure/flow control regulators for use in applications such as gas pipeline, transmission and distribution systems. These regulators are also capable of delivering gas to large industrial complexes that require high pressures and/or flow rates.

Both the Axial Flow Valve (AFV) and Radial Flow Valve (RFV) utilize a durable flexible element that opens or closes the valve, dependent upon the differential pressure across it. Integral to the valves are pilots that control the differential pressure across the flexible element by sensing downstream demand (or upstream pressure in relief/backpressure mode), making the complete system a pressure regulator. Because of this unique design, these regulators are extremely versatile and work in a variety of applications. The most common applications are as follows:

- pressure regulation
 - single-stage pressure reduction
 - two-stage pressure reduction
 - pressure reduction with monitor used for overpressure protection
 - two-stage pressure reduction with monitor override (working monitor)
- overpressure relief/backpressure
- underpressure shutoff
- flow control
- on/off valve

Axial and Radial Flow Valves

Principle of Operation

Axial and Radial Flow Valves are unique in that there is no mechanical connection to the control element. Instead, the valves use an elastomer sleeve or diaphragm, which expands or contracts depending on the pressure differential across the valve. This principle provides a valve that is extremely compact and lightweight with a streamlined flow path for quiet operation.

**Radial Flow Valve
with 60Series Pilot**



Standard flexible element materials provide a wide working temperature range and excellent resistance to abrasion and swelling. Specialized materials are also available for applications involving extreme temperatures, where additional chemical resistance is required and for specialized services such as water scarfing.

Control Pilots

Various spring-loaded pilot regulators are utilized to balance the pressure applied to the control port of the Axial Flow Valve. It is actually the choice of pilot that determines the function (pressure reduction or back-pressure) and outlet pressure or relief setting.

Further information about the Axial Flow Valve can be found in **SB 9509** and **TDB 9610**. The Radial Flow valve is featured in **SB 9530** and **TDB 9630**. Information on the 60Series Pilot is in **SB 9800**.

60Series Pilot

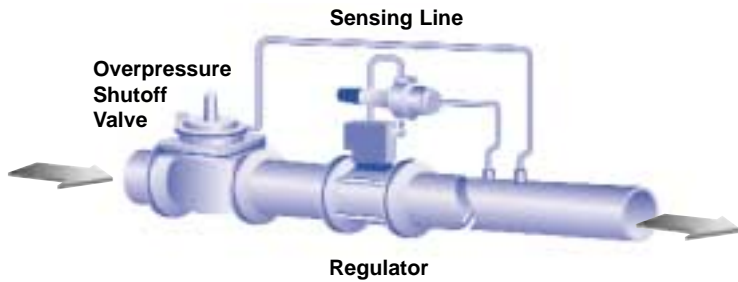


**Axial Flow Valve
with 60Series Pilot**



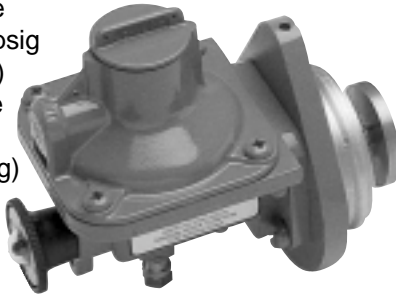
Overpressure Shutoff Safety Devices

Overpressure shutoff valves are typically placed upstream of a pressure regulator. In the event of a regulator failure, these units provide rapid automatic and positive shutoff of gas service, protecting the regulator, meter and other downstream equipment.



Universal Safety Shutoff Assembly (USSA)

- maximum inlet pressure: 150 psig (10.3 Barg)
- OPSS shutoff pressure range: 7.5" w.c. to 35 psig (19 mBarg to 2.4 Barg)
- UPSS shutoff pressure range: 3" to 60" w.c. (7 mBarg to 149 mBarg)
- connection sizes: 1-1/2" or 2" NPT/BSP-TR; 2" flanged
- available options: overpressure shutoff (OPSS), underpressure shutoff (UPSS), OPSS/UPSS or external sensing
- Bulletin **SB 8745**



Series 100 Slamshut

- maximum inlet pressure: 235 psig (16.2 Barg)
- OPSS shutoff pressure range: 14" w.c. to 87 psig (35 mBarg to 6.0 Barg)
- connection sizes: 2", 3" or 4" flanged
- available options: external sensing (standard)
- Bulletin **SB 8575**



Filters

American Meter filters effectively remove dirt, pipe scale and other particulate from gas lines, protecting meters, regulators and downstream gas equipment. Filters with either screwed or flanged connections for medium to high flow rates are available to meet nearly any gas filtration application. In addition, pilot-type filters are available for protection of pilot-loaded regulators where particulate can cause variances in system pressures.

Pilot-Type Filters

- maximum inlet pressure: 1,000 psig (69 Barg)
- filter element: 5 micron
- connection sizes: 1/4" x 90° or 1/4" x 180°
- Bulletin **SB 12521**



Screwed Filters

- maximum inlet pressure: 160 psig (11 Barg)
- filter element: 5 micron
- connection sizes: 3/4", 1", 1-1/2" or 2" NPT/BSP-TR
- Bulletin **SB 12521**



Flanged Filters

- maximum inlet pressure: 1,440 psig (99.2 Barg)
- filter element: 10 (standard) or 25 micron
- connection sizes: 2" NPT, 2", 3", 4", 6", 8", 10" or 12" flanged
- special designs available upon request
- Bulletin **SB 12521**



Repair Parts and Accessories



Quality OEM parts should always be used when repairing or upgrading American Meter equipment to ensure proper performance and longevity

of service life. All repair components meet original manufacture specifications and strictly adhere to our internal quality assurance program.

American Meter also offers various meter and regulator accessories for use in a wide variety of gas measurement and control applications. For in-depth details on these products, see the individual data sheets pertaining to each product.

Meter Connections

American Meter's connections are used to connect diaphragm meters to pipe sizes up to 2". A wide variety of swivel connections simplify connection into rigid piping systems. These units, available in straight and offset configurations, also adapt between different connections on pipe and meter. Insulated types protect against electrolytic corrosion by preventing induced currents from reaching pipelines.

For more information, see **Bulletin SB 3910**.



Meter Bars

Meter bars prevent stress from being transferred from piping to a gas meter and simplify the installation of pressure regulators. The bar has a threaded connector for the meter outlet piping and clamps around the outlet of the pressure regulator, providing a rock-solid installation. For further information, see **Bulletin SB 6565**.



Needle Valves

Needle valves are used for applications such as orifice meter gage line connections, shut-off valves for pressure gages, odorizers, sampling devices and other high-pressure control applications. American Meter needle-valve bodies are constructed of stainless steel (with electro-polish finish) or carbon steel (with nickel-plated finish) bar stock. These high-pressure valves are rated for 10,000 psig at 200°F and utilize a chemical resistant viton o-ring and Teflon back-up ring. For more information, see **Bulletin DS 11521**.



Regulator Vent Splashguards

When regulator vents freeze over, the top diaphragm chamber may be prevented from breathing, resulting in high fluctuations in outlet pressures. The use of American Meter splashguards is a quick and simple solution to this problem and assures constant and reliable gas service.

For further information, see **Bulletin 90710**.





TRACE

AUTOMATED METER READING SYSTEMS

TRACE™ VRT™ Mobile AMR System from AMCO Automated Systems

The TRACE VRT (virtual real time), mobile AMR system, processes and stores real-time data at the electric, gas or water meter transponder (Meter Interface Unit or MMI) for retrieval as required during a normal in-cycle read. Stored data includes 35 days of daily index readings (each in a separate electronic index [e-index]), up to six time-of-use (TOU) e-indexes (four for gas and water applications and six for electric) and a leak-detection alarm (water). A real-time clock in the transponder allows time-based data collection.

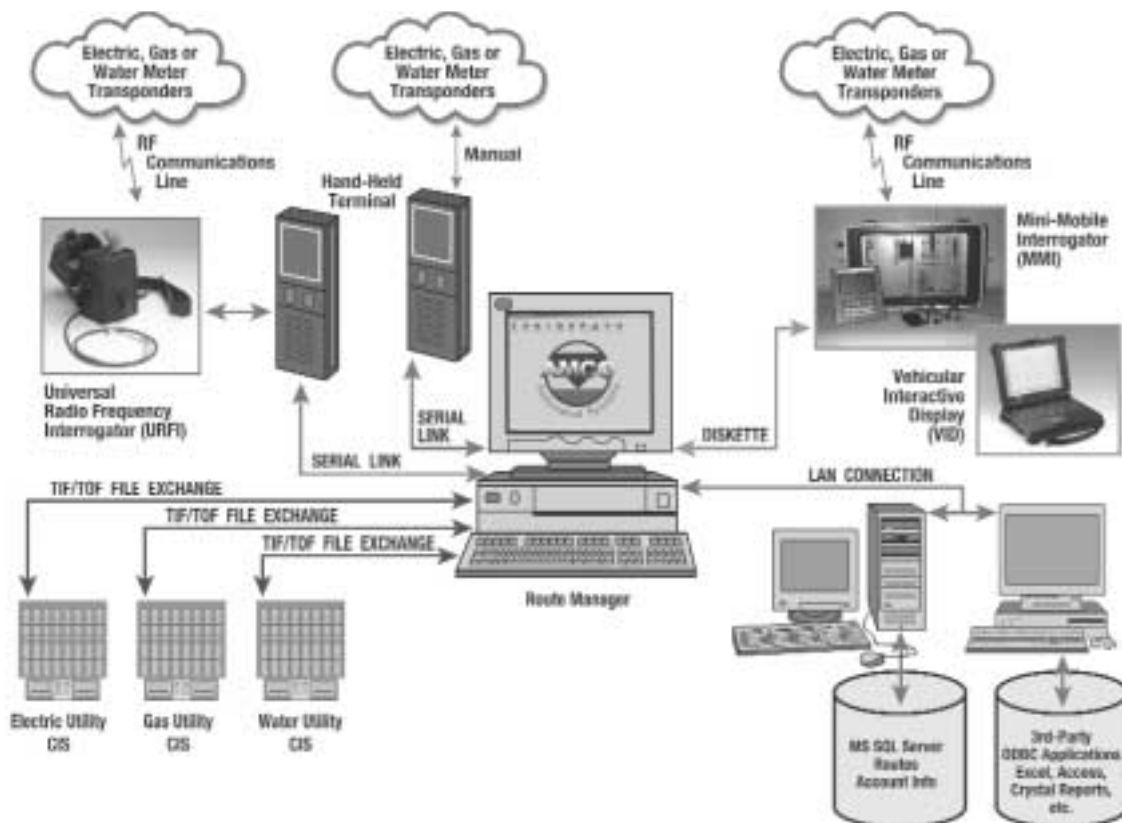
The daily index-read-time is factory and field programmable, as is the start and stop times of each TOU e-index and the duration of the leak-detection monitoring interval and threshold level. Data is read from mobile interrogators, using two-way RF communication technology. TRACE VRT transponders are addressed individually by serial number, followed by a series of commands to retrieve specific daily readings and time-of-use data, as well as the usual accumulated volume and alarms.

As shown below, TRACE VRT is a complete system, comprised of meter transponders, hand-held and or vehicle-mounted interrogators and host software that integrate utility CIS systems with metering data in the field.

TRACE VRT host software, Route Manager VRT:

- accepts customer account and route data files from one or more electric, gas and/or water utility Customer Information Systems (CIS)
- stores the CIS data in a MS SQL server database
- supports the management of the read routes stored in the SQL database
- assigns and downloads read routes to interrogation devices
- uploads meter data from interrogation devices
- stores up to 13 months of meter data in the SQL database for local validation, editing and analysis using built-in ODBC applications or Microsoft Office applications such as Excel
- uploads meter-data files to one or more utility CIS's

Hand-held interrogators are used to read electric, gas or water routes following address-sequenced routes with each meter reading initiated by an operator. The Mini-Mobile Interrogator (MMI) is a vehicle-transported device that can be used to read electric, gas and/or water routes automatically based on the geographical location of the vehicle and individual meters. The Vehicle Interactive Display (VID) displays real-time vehicle and meter locations, as well as the reading status of each meter.





TRACE

AUTOMATED METER READING SYSTEMS



Direct Gas Transponder (DGT)

The DGT is designed for use with most residential and small commercial diaphragm meters from American Meter Company®, Rockwell/Equimeter/Invensys®,

and Sprague/Schlumberger/Actarus®. The DGT mounts directly on a meter, incorporating the mechanical index and index cover supplied as part of the meter. **PDB-14600**



Pit Water Transponder (PWT)

The PWT is designed for use with water meters installed below grade in pits and is compatible with most AMCO/ABB, Senus/Rockwell, Neptune, Badger, Hersey and

Metron-Farnier water meters. The PWT is extremely compact and is installed on the underside of the pit lid with the antenna extending through the standard 1-3/4" hole and held in place by a low-profile cap from the top-side of the lid. **PDB-14611**



Remote Water Transponder (RWT)

The RWT is designed for use with water meters installed above grade. It can be wall mounted indoors or outdoors and is compatible with most AMCO/ABB, Senus/Rockwell,

Neptune, Badger, Hersey and Metron-Farnier water meters. **PDB-14610**



Direct Electric Transponder (DET)

The DET is designed for use with most residential, single-phase, Form-2S watt-hour meters from Elster Electric/ABB, Schlumberger/Sangamo, General Electric and

Landis and Gyr. The DET directly mounts in the meter (under glass). **PDB-14620**



Mini-Mobile Interrogator (MMI) VRT

The MMI is a Radio Frequency (RF), drive-by interrogator that establishes two-way communications with electric, gas and water meters equipped with TRACE and TRACE VRT

transponders based on the geographical location of the MMI and the meters that are within range of the MMI. **PDB-14545**



Vehicular Interactive Display (VID) VRT

The VID displays real-time street maps marking the location of the meters and the MMI as the vehicle moves through the route. As each

meter is read by the MMI, the graphical representation of the meter on the VID display changes to show that it has been read. **PDB-14550**



Universal Radio Frequency Interface (URFI) VRT

The URFI is a plug-in adapter that allows most DOS-compatible, hand-held data terminals (HHDT) to function as a walk-by RF interrogator

that can establish two-way communications with electric, gas and water meters equipped with TRACE and TRACE VRT transponders. **PDB-14540**



Short-Range Programmer (SRP) VRT

The SRP is a hand-held programmer/interrogator intended for use during the installation of electric, gas and water TRACE and TRACE VRT

transponders. The SRP is used to: (1) verify that a transponder is functioning correctly and (2) initialize the starting values of various transponder indexes (e-indexes) and associated settings. **PDB-14555**



Route Manager VRT

The Route Manager VRT is software that integrates TRACE VRT transponders and interrogators into an AMR system and provides the interface between the TRACE VRT AMR system and a utility company's

customer-information system. **PDB-14640**



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Remeter Services

American Meter Company, the largest supplier of gas measurement and control equipment in North America offers the broadest product portfolio in the industry. North American Services Group (NASG), through its offering of full-service solutions from REverification through REmanufacturing, is the largest meter service provider.

Today's utility companies demand accountability and efficiency. Our comprehensive and strategic programs allow you to maximize your purchasing, manpower, and logistical resources.

NASG brings together the management, engineering, manufacturing, and information systems expertise of both the American Meter and Canadian Meter group of companies to provide an unparalleled value proposition to North American utility companies.

Remetering Program

The Remetering Program includes several different levels to accommodate your needs.

REverify

The REverify program provides the customer with a standard process (similar to "Pass Thru" utility processes) which confirms the measurement and pressure integrity of the meter.

Meters only qualify for REverify if in-test accuracy results are within $\pm 1.0\%$ with a spread not to exceed 1%. A "theft awareness" inspection is also performed at this point. Meters passing these integrity inspections are then processed to completion, primed and finish painted, and have a new index box installed. Standard processes include:

- visual inspection
- pressure wash
- index test
- prove, bar code and document
- additional services as requested

REverify/Adjust

Meters qualify for the REverify and Adjust program if their in-test accuracy results are within $\pm 2.0\%$ with a spread not to exceed 1%. The REverify and Adjust program offers all the same processes as REverify with the addition of making adjustments to the meter's accuracy to bring it within acceptable limits.

REfurbish

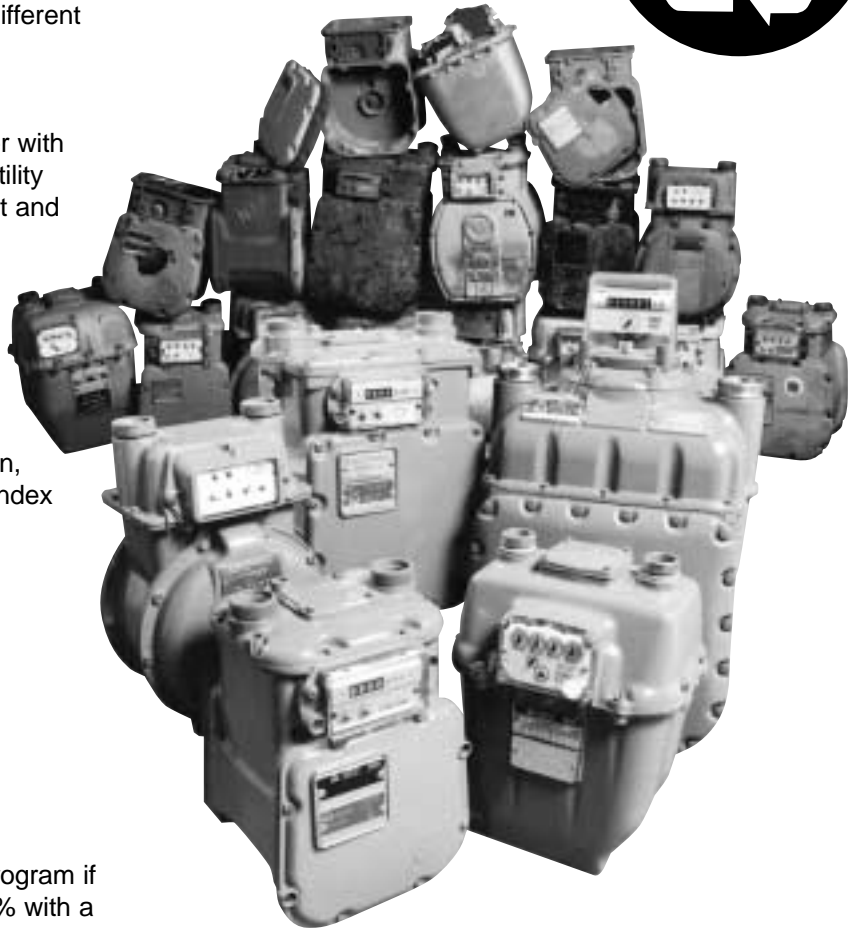
The REfurbish program addresses all makes of meters that are 20 years old and newer. Processes included are as follows:

- all REverify and Adjust processes
- general "above-the-table" cleanup
- inspection, installation of new stuffing box and lubrication
- valve grinding

REfurbish Plus

REfurbish Plus refers to all makes of meters that are 30 years old and newer. Processes included are as follows:

- all REfurbish processes
- additional replacement parts and services such as pressure testing at badged maximum pressure and more as requested



Sub-Meters

QA Turbine Meters

- nominal capacities up to 14,000 scfh (396 Sm³/h)
- maximum pressure rating = 175 psig (12.1 Barg)
- connections: 1" and 1-1/2" NPT, 2", 3", 4" flanged (wafer-style)
- **Bulletin DS 4650**



QA Turbine Meter

USM Ultrasonic Meters

For the measurement of non-flammable gases only

- nominal capacities up to 56,000 scfh (1,586 Sm³/h)
- maximum pressure rating = 175 psig (12.1 Barg)
- connection sizes: 2", 3", 4" or 6" flanged
- standard low- and high-frequency output
- **Bulletin SB 6530**



USM Ultrasonic Meter

BK-G4 Diaphragm Meters

- nominal capacity = 200 scfh (5.7 Sm³/h)
- maximum pressure rating = 5 psig
- top connections
- **Bulletin SB 3600**



BK-G4 Diaphragm Meter

Laboratory Meters

Dry-Test Meter

These meters are used for extremely accurate measurement of low volumes of any gas that is unsaturated with water vapor. Volume is read on a large, 6" circular dial with sweep hand and four totalizing hands. Units are available with dial subdivisions as small as 0.001 CF for very low-volume measurement. For further information, see **Bulletin SB 7510**.

Wet-Test Meter

These laboratory instruments are extremely precise positive-displacement meters which are individually calibrated under controlled conditions. Using a liquid-sealed rotating drum as the measuring element, these meters provide large, easy-to-read dials with subdivisions as low as 0.0005 CF. Models are available calibrated in CF or liters. For further information, see **Bulletin SB 7520**.



Dry-Test Meter

Test Equipment

Sub-Meters/In-Plant Measurement Devices

SNAP® Sonic Nozzle Auto Prover

SNAP combines state-of-the-art electronics with precisely machined sonic nozzles to provide unparalleled speed and accuracy in gas meter proving. SNAP provers:

- dramatically increase productivity by reducing proving time
- provide bell-prover accuracy with better repeatability
- eliminate the need for environmental controls
- automate data collection and reduce operator errors
- occupy about one-half the space of a bell prover
- accommodate all meter brands

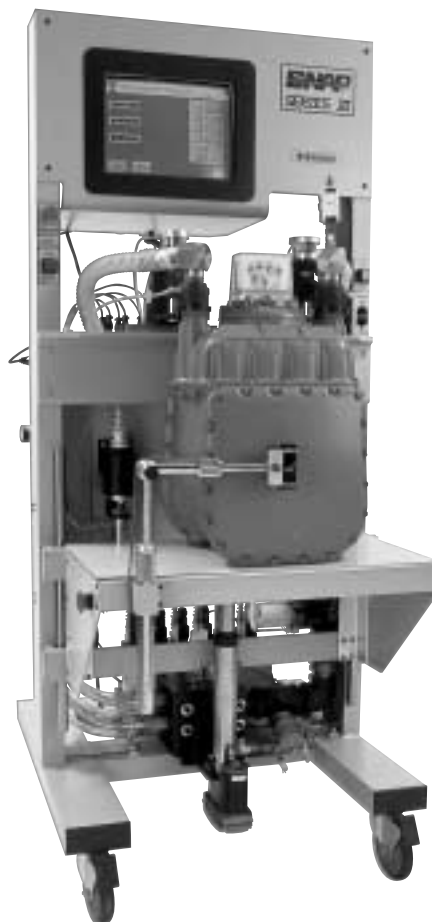
For further information, see **Bulletin SB 6557**.

SNAP/Bell Interface Kit

With the kit, you simply connect the SNAP to any two-foot or five-foot manual bell prover and compare the SNAP's proof to the bell. The kit eliminates the need for a reference (Green Hornet) meter. For further information, see **Bulletin SB 6556**.

Sonic-Flow Nozzles

By passing gas or air through a sonic nozzle and meter, and using a stopwatch to determine the time needed for the meter to register the volume, the meter proof can be calculated. For test pressures from 3.6 to 1000 psig (24.8 mBar to 69.0 Bar) and flow rates to 6000 SCFH (169.9 SCMH) of gas. For further information, see **Bulletin SB 6640**.



SNAP® Series III Prover

Metrology Services

Metrology services are offered through North American Services Group to better help your meters retain accuracy. The following proving services are available.

SNAP Provers

- New prover commissioning and training
- Basic service and recertification
- SNAP to master bell interface
- Custom software
- Networking and data collection systems

Bell Provers

- Refurbish – polish bell, oil filtration or change out
- Strapping/bottling
- Master bell certification
- Calibration of automated proving systems
- Regulatory compliance audits

Transfer Provers

- Master meter certification
- Transfer prover upgrades

In addition to proving services, NASG Metrology Services department offers training in generic meter proving practices, proving-equipment maintenance and in-house measurement training programs. Meter-shop consultations are also available.



Bell Mate™

Guide to Other Gases

The meters in this catalog may be used to measure a wide variety of gases in addition to natural gas. When using a diaphragm meter, you must account for the fact that the maximum capacity of the meter will vary with the specific gravity of the gas being measured.

To accurately size a diaphragm meter, the rated capacity must be multiplied by a capacity conversion factor (Fg).

Since capacity data for American meters is based on natural gas, the following table includes capacity conversion factors which can be used to convert from natural gas to the specific gas shown.

For example, the conversion factor for propane is:

$$F_g = \sqrt{\frac{\text{S.G. of gas on which rated capacity is based}}{\text{S.G. of gas to be measured}}}$$

$$F_g = \sqrt{\frac{\text{S.G. of natural gas}}{\text{S.G. of propane}}}$$

$$F_g = \sqrt{\frac{0.60}{1.53}}$$

$$F_g = 0.63$$

Table of Measurable Gases

Gas	Specific Gravity (S.G.)	Specific Gravity Conversion Factor (Fg)	Aluminumcase Diaphragm Meters	Turbine Meters	Rotary Meters
Air	1.00	0.77	A	A	A
Aliphatic Hydrocarbons	—	(1)	A	A	A
Argon	1.38	0.66	A	A	A
Butane	2.01	0.55	B	B	B
Carbon Dioxide (dry)	1.52	0.63	A	A	A
Carbon Monoxide (dry)	0.97	0.79	B	B	B
Cyclopropane	1.45	0.64	B	B	B
Ethane	1.04	0.76	A	A	A
Ethylene	0.98	0.78	B	A	B
Helium	0.14	1.15 (2)	A	A	A
Hexafluoropropylene (3)	5.18	0.34	B	B	B
Isobutylene	2.00	0.55	B	B	B
Krypton	2.82	0.46	A	A	A
Methane (pure)	0.55	1.04	A	A	A
Natural Gas	0.60	1.00	A	A	A
Neon	0.70	0.92	A	A	A
Nitrogen	0.97	0.79	A	A	A
Propane	1.53	0.63	A	A	A
Propylene	1.48	0.64	B	A	B
Sulfur Hexafluoride	5.11	0.34	B	B	B
Xenon	4.53	0.36	A	A	A

Category A

Under normal use, service life is comparable to natural-gas service, depending on presence of contaminants.

Category B

Service life varies according to deleterious effects of the specific gas and any contaminants.

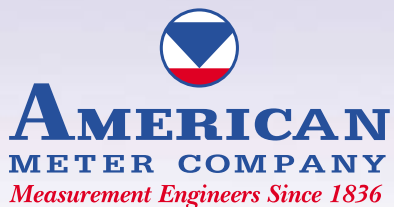
NOTES:

Do not use American meters to measure oxygen. For gases not listed and high-purity gas applications, consult your local distributor or contact American Meter.

(1) Conversion factor varies with the specific gravity of the particular gas.

(2) For very light gases such as hydrogen and helium, the conversion factor method of calculating maximum capacity may result in excessive mechanical speeds of the meter. Therefore, the maximum conversion factor is calculated based on a specific gravity of 0.45.

(3) Also known as perfluoropene.



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