DRESSER

ROOTS Meters & Instruments

PRODUCTS and SERVICES


ROOTS® METER
GAS FLOW
MODEL
CFH MAX
B/M
m3/h MAX
S/N
I/D
PSIG
kPa
DMD
MEASUREMENT OPERATION
HOUSTON, TEXAS U.S.A.
NON-COMPENSATED VOLUME
00118
READING X 100
CU. FT.
MODEL 8C
RATIO 1350:1
U.S. PATENT
Do not use solvents.

For almost a century, ROOTS® meters have been used for billing of commercial and industrial gas loads. Accuracy, dependability, and low maintenance are of key importance in custody transfer measurement applications. The time-proven ROOTS® meter is the preferred rotary positive displacement gas meter in distribution, transmission and production segments for accurate measurement of gas from the well to the burner.

To meet the evolving needs of our customers, our product line has expanded to include a large variety of control and measurement equipment. ROOTS Meters & Instruments is much more than just a meter supplier. We offer a wide range of ROOTS® products and services.

ISO9001

- Rotary Meters
- Electronic Instrumentation
- Transfer Provers
- Product Remanufacturing Services
- Test Equipment
- Meter Stations
- Meter Sets
- Meter Set Components
- On-Site Field Training Courses
- Factory Training Schools

The ROOTS® Meter Advantage

Proven Accuracy

- Volumetric accuracy is permanent and non-adjustable
- Measuring characteristics established by the precision machined contours of non-wearing fixed and rotating parts
- Durable components ensure a long life expectancy under normal operating conditions
- Wide rangeability is maintained throughout the meter's operating range, regardless of pressure and flow

Meters For Commercial & Industrial Applications

- Line Mount Meters
- Foot Mount Meters
- High Pressure Meters

Magnetically Coupled Accessory Units

- Large variety of readout and output options
- Non-pressurized and interchangeable modular design simplifies conversion between meter versions
- Permanently lubricated Series 3 Accessories combine a long life expectancy with a reduction in maintenance
- Commonality of Series 3 Accessory components reduces inventory requirements

Full Line of Electronic Instrumentation

- Pressure (P), Temperature (T), and PT Correctors
- Temperature or Temperature with Fixed Pressure Factor (FF) Compensators
- Solid State Pulsers to interface with Automated Meter Reading (AMR) devices and for remote readings
- Loggers for Pressure, Volume and Temperature

Customer Service

Our unsurpassed customer service is provided through the combined efforts of our Customer Service, Technical Support, and Product Services Departments. Each department takes pride in their ability to deliver courteous and professional care to all customers in a timely manner. As described below, the departments are structured to efficiently support all customer service requirements:

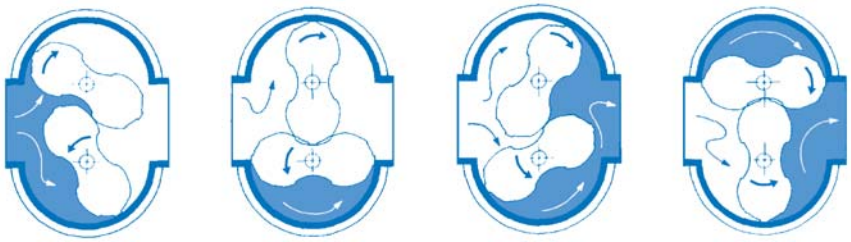
- Customer Service representatives for inquiries and order placement
- Technical Services staff for product application assistance and training
- Product Services Department for remanufacturing and testing services

The ROOTS® Meter Operating Principle

The ROOTS® meter is designed to measure the volume of gases and gas mixtures with a high degree of accuracy. The industry accepted rotary type positive displacement operating principle ensures permanent, non-adjustable accuracy by using precision machined two-lobe impellers encased within a rigid measuring chamber.

Unlike other meter types, measurement accuracy is not affected by changes in gas specific gravity, pressure, or fluctuating flow. ROOTS® meters may be used from a few ounces to full capacity up to the meter's maximum pressure rating with highly accurate measurement over a wide operating range. This equates to a lower total cost.

The condition of a ROOTS® rotary meter can be verified by performing a differential rate test while the meter is still in service. This simple and cost-effective preventive maintenance procedure contributes to a significant reduction in the wholelife cost of the meter.



Precision machined for exceptional accuracy

As shown in the picture, two contra-rotating impellers of two-lobe or "figure 8" contour are encased within a rigid measuring chamber, with inlet and outlet connections on opposite sides. Precision machined timing gears keep the impellers in correct relative position. Optimal operating clearances between the impellers, cylinder and headplates provide a continuous, non-contacting seal.

ROOTS® Meter Product Line

A complete line of rotary meter sizes are available to measure a wide range of gas volumes for the majority of commercial and industrial applications in custody transfer applications. Refer to the Meter Sizing Chart in this brochure to determine the correct meter size for cost effectiveness and accurate measurement.

ROOTS® meters are suitable for handling most types of clean, common gases at either constant or varying flow rates and pressure. They are ideal for applications throughout the meter's operating range, from a few ounces to full maximum allowable operating pressure.

Our meters are widely recognized for their highly accurate measurement capabilities at both the low and high end of their rated capacity. The meter's rangeability (ability to measure gas over a wide flow range within a specified accuracy) provides the best over-all measurement accuracy on a "day-after-day" basis.

ROOTS® Series B3 Line Mount Meters

8C/11C/15C

2M/3M/5M

7M/11M/16M

23M/38M/56M
(23M/38M pictured)

Four Inch 23M232

Right Size the Meter to the Application

Series B3 meters are designed to provide accurate gas measurement over widely fluctuating flow, pressure, and temperature conditions. For further versatility, the five smallest meter sizes (8C through 3M) have 2" (50 mm) flanged connections, and a 6-3/4" (171 mm) flange-to-flange dimension. If application requirements change, this unique, cost-effective feature allows a quick and easy meter exchange without the need to re-pipe the meter set. Other key features include:

- Capacity ratings from 800 CFH to 56,000 CFH (22,6 m^3/h to 1,600 m^3/h)
- Maximum operating pressure rating of 175 PSIG (12 Bar).
- Models 8C through 2M are available with a 200 PSIG (13,8 Bar) rating upon request.
- Operating temperature range from -40° to +140F (-40°C to +60°C)

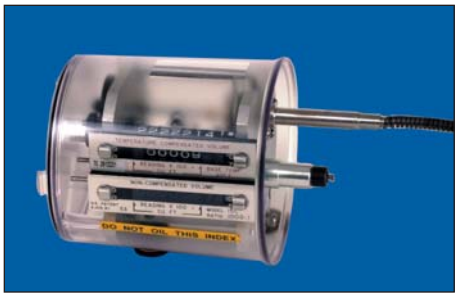
For operating requirements beyond those listed, please contact your Roots Meters & Instruments representative.

Four Inch 23M232 Meter

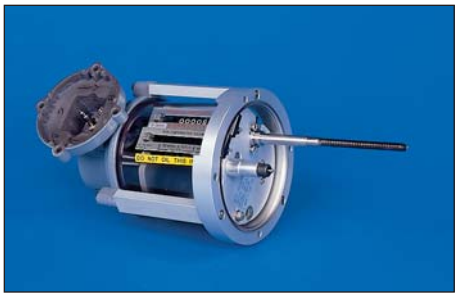
Our new 23M232 includes four inch flanged connections and a 232 PSIG (16 bar) maximum working pressure. This new design complements our standard six inch 23M175. With a maximum capacity of 385 MSCFH (10,895 Nm^3 per hour) the new 23M is an ideal measurement solution for a wide array of applications.

ROOTS® Series 3 Accessory Units

CTR



TC



CD/TD

Solid State Pulser

Designed for low maintenance and a long service life

- Interchangeability among Series B meter bodies of the same size
- Permanently lubricated for long life and virtually maintenance-free operation
- Modular design allows a quick-change to a different version at a lower overall cost
- Durable, weather resistant cover with improved sealing capability
- Versatile and configurable odometer masking
- Universal Instrument Drive (ID) assembly – one size fits all 8C-56M Series B Meters
- Quick and easy field installation of the low cost Solid State Pulser
- Available with factory pre-installed magnets for quick installation of the Solid State Pulser or Model 5 Prover Field Counter Pulser Module

Counter (CTR)

An 8 digit non-compensated index registers displaced volume in Actual Cubic Feet (ACF) or in Actual Cubic Meters (m^3).

Temperature Compensated (TC)

Temperature compensation, available in meter sizes 8C-16M, is accomplished by a mechanical computer with a spiral bi-metallic thermocouple (probe) located in a sealed temperature well at the meter inlet. Series 3 TC Units provide corrected gas volume readings to a 60˚F (15˚C) base temperature for readout in Standard Cubic Feet (SCF) or Normal meters Cubed (Nm^3) between flowing temperatures of -20˚F and +120˚F (-29˚C and + 49˚C).

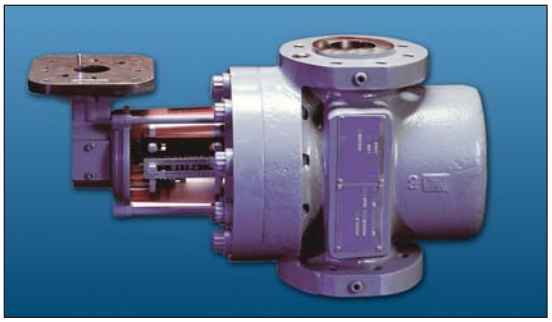
Counter or Temperature Compensated with Instrument Drive (CD/TD)

The Universal Instrument Drive (ID) Assembly adapts to the CTR and TC Accessory for installation of a corrector, chart recorder, or other externally mounted, mechanically driven device. The ID Assembly is mechanically linked to the CTR/TC mechanical gear reduction unit. One revolution of the instrument drive dog represents a specific displaced volume measured by the meter.

Solid State Pulser

The ROOTS® solid state pulser mounts directly to a CTR/TC Unit, generating low frequency pulses representing volumetric information for remote reading. Mechanical switches have been eliminated for maximum reliability. No battery or maintenance is required.

ROOTS® High Pressure Meters



Series B3-HPC

Removeable B3-HPC Cartridge

Series B3-HP

7M1440

Series B3-HPC (High Pressure Cartridge) Meters

This meter line features a common cast-steel housing for the 1M (1000 ACFH) and 3M (3000 ACFH) sizes of aluminum cartridges. The meters are available with either an ANSI Class 300# flange (740 PSIG) or an ANSI Class 600# flange (1480 PSIG).

The cartridges are field replaceable and are interchangeable between housings regardless of the pressure rating on the housing. As an option, a self-resetting full flow internal bypass is available on new meters and on replacement cartridges. Since this meter utilizes the Series 3 Accessory Units, a full line of index options are available.

Series B3-HP (High Pressure) Meters

For lower pressure loads, the 1M300 (1000 ACFH) and 3M300 (3000 ACFH) are viable alternatives for pressures up to 300 PSIG. Based on the B3 meter line, the B3-HP meters offer extremely low start and stop rates and a compact design with a 6-3/4" flange-to-flange dimension and a much lower weight than traditional high pressure meters. This is achieved by using aluminum for all major meter components. The Series B3-HP meters mate with ANSI 300# flanges and are easily installed by one person without the need for a lift or hoist.

7M1440 High Pressure Meter

7M1440 meters are designed for higher capacity applications (7000 ACFH) with a maximum allowable operating pressure of 1440 PSIG. The materials of construction are cast ductile iron and cast steel to meet the demands of the higher flow rates and pressures.

ROOTS® Expanded Meter Line

Series Z

Series A (LM-MA)

Series A1

B3-VRM

Series Z Compact Meters

Ideal for small commercial loads at pressures up to 15 PSIG (1 Bar), the aesthetically pleasing 5C15 (500 ACFH) and 8C15 (800 ACFH) meters are easy to install and conceal. Series Z meters provide excellent measurement accuracy starting at "pilot loads" and continuing throughout the range of the meter. To match the meter configuration to the application, the user selects the following parameters when ordering:

- Dial or Odometer type Index
- Sealed or Vented Index
- Standard (Atmospheric) or 2 PSIG Compensated Index
- Top or Bottom Inlet
- Sprague 4 (male), 45 Light (male), or 1–1/2 inch NPT (female) Connections
- Optional Inlet Strainer / Screen

Series A (LM-MA) Meters

The 8C175 compact meter, like the Series Z, is also ideal for small commercial applications, but with a higher pressure rating. This meter is rated for a 175 PSIG (12 Bar) working pressure.

Series A1 Foot Mount Meter

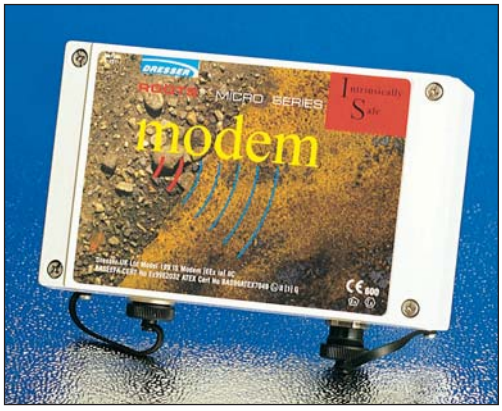
The 102M125 Foot Mount meter is used for the measurement of high volume industrial gas loads for capacities up to 965.3 MSCFH at 125 PSIG (27,941 Nm^3/h at 8,6 Bar).

B3-VRM Vapor Recovery Meter

Rated for a maximum capacity of 3000 actual cubic feet per hour, the B3-VRM meters are specifically designed and tested for vapor recovery applications and conform to the California Air Resources Board specifications TP-201.1, TP-201.1A, TP-201.2, and TP-201.5, as applicable. The extremely low pressure drop associated with the ROOTS positive displacement meter makes this meter ideal for the accurate measurement in low pressure recovery systems. Odometers on the vapor recovery meters are marked at 0.02 cubic foot increments, which allows accurately estimated readings in increments of 0.01 cubic feet. All B3-VRM meters are supplied with a 7 point certified accuracy curve for reference.

ROOTS® Instruments

1D Mount Version



Micro Modem

Micro Logger

ROOTS® Micro Corrector

The ROOTS® Micro Corrector is part of the Micro series line of electronic products from Dresser. The Micro Corrector, Model PTZ+Log, calculates corrected volume by measuring live temperature (T), pressure (P) and supercompressibility (Z). The unit has data logging capability of 35 days of hourly data, 48 days of daily and 15 months of monthly, as well as a 128 entry audit trail which records any unit configuration changes that affect the measurement equation.

Also, available in P+Log and T+Log models, the ROOTS® Micro Corrector is designed to be the best value in the industry. It is available in a variety of mounting styles including instrument drive, wall mount and pipe mount. The ROOTS® Micro Corrector offers versatility at a competitive price.

Micro Modem

- A full-duplex, two wire, 300-2400 baud dial-up modem
- Compatible with CCITT V.22bis / V.22 / V.21, and Bell 212A / 103 data communications standards
- 5 to 15 VDC input power
- 75 mA (typical) current
- Operating temperature range of -40˚F to 185˚F (-40˚C to 85˚C)

Micro Logger

The ROOTS Micro logger represents an exciting addition to the Dresser electronic instrumentation product line. Utilizing proven technology pioneered in the Dresser Micro Corrector, the Micro Logger offers value, accuracy and a safe solution to your gas network monitoring needs.

- Pressure: 3 transducers up to 1450 PSIG
- Temperature: standard 4-wire PRT 100
- Flows: 2 LF pulses

ROOTS® Instruments

ROOTS® instruments offer the latest technology in electronic pressure and temperature correction. As an added benefit, the ROOTS® volume temperature compensator and ROOTS® volume correction computer can be mounted integral to most ROOTS® meters.

IMC/W

IMC/C

ROOTS® Micro Corrector Model IMC/W

The ROOTS® Micro Corrector model IMC/W is an integrally mounted version of the Micro series of electronic correctors from Dresser. You can directly mount the IMC/W onto Series A or Series B ROOTS® meter bodies, and the IMC/W accessory unit can be rotated 355 degrees to allow for multiple viewing angles. The IMC/W includes all features found with the meter mounted ID version. Additionally the IMC/W has the capability to sense forward and reverse gas flow. Temperature and volume are sensed internally, while pressure sensing can be either internal or external to the unit.

The IMC/W is also available in a temperature only version as an alternative to mechanical rotary meter TC devices. The IMC/W-T measures live temperature and allows the user to configure a fixed factor pressure. With pulse outputs as standard, the IMC/W-T is a value-added option to mechanical TC.

ROOTS® Meter with Integral Micro Corrector Model IMC/C

The ROOTS® Micro Corrector, Model IMC/C incorporates the same proven electronics and capability of the Micro Corrector, in an integral mount configuration that can be mounted on the ROOTS® Series B meters, sizes 8C through 16M. The IMC/C has an uncorrected mechanical counter, and additionally – temperature, pressure and volume are all sensed internally to the system. This offers a lower cost alternative to the instrument drive meter/corrector combination. Internal mounting of sensors also helps to eliminate the possibility of tampering with these sensors. The IMC/C is available in Models PTZ+Log and T+Log.

Model 5 ROOTS® Provers

Model 5 Transfer Provers feature an integrated computer controlled system for verification and testing of rotary, diaphragm, and turbine gas meters. After the field meter is connected to the Prover and the test sequence is selected, the remainder of the operation is "hands-off." Test sequencing is automatically controlled by the software settings and the test results are displayed on the computer screen.

For ease of testing and recording, the Model 5 Prover system will:

- Store unlimited predetermined field meter test configurations
- Perform and display all calculations at the end of each test and allow for saving to disk
- Provide user-friendly menu prompts
- Run a system self-check prior to each test
- Allow easy access to extensive Help Files

The primary components for all Model 5 Prover systems include highly accurate ROOTS® master meters as measurement standards, a personal computer (not included) for operation of the system software, easy-to-use Windows®-based software, and a blower system to provide a stable air flow through the system.

2M/10M

10M or 2M/10M Prover

- 10M or 2M/10M master meters

  Capacities:

  10M: 100 to 10,000 ACFH (11 to 283 m^3/h)

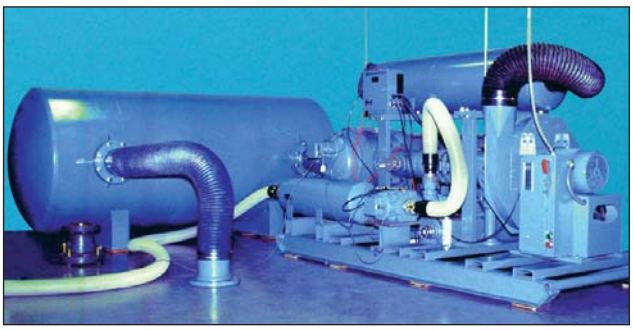
  2M: 35 to 2,300 ACFH (1 to 57 m^3/h)
- 2M Meter mounted in a "Piggy-Back" configuration
- Suitable for both field and shop use
- Easily transported in a van or truck

20M5M Prover

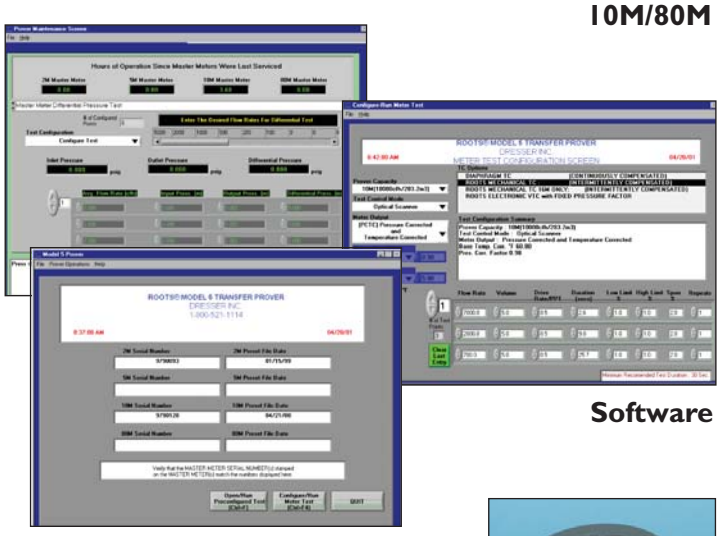
The cart-mounted prover gives you the increased capability to prove rotary, turbine and diaphragm meters up to 20,000 acfh, while occupying minimal floor space.

20M/5M

ROOTS® Provers & Accessories



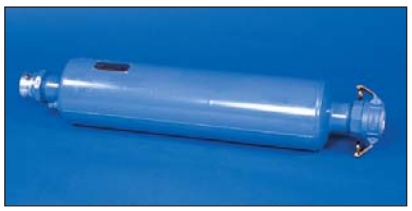
10M/80M



Software

Field CTR Pulser

RS-PB



Acoustic Filter

10M80M Proving System

10M and 80M master meters

Capacities:

80M: 1,600 to 80,000 ACFH (45 to 2,265 m^3/h)

10M: 100 to 10,000 ACFH (11 to 283 m^3/h)

- Skid Mounted Shop System
- Ideal for testing large capacity rotary and turbine-type gas meters

Windows®-based Software

Easy-to-use software with icons and menus typical of Windows-based programs allow you to increase your productivity and work more intuitively with the computer. The new software is designed for all Model 5 Prover Systems and is compatible with Windows® 95, 98, 200, ME, XT and NT 4.0.

Field CTR Pulser Module

When prover testing a Series B3 CTR Version "pulser ready" meter, this module can be quickly snapped onto the Lexan® cover and connected to the prover Field Junction Box. The set-up time for the Module is much quicker than the RS Optical Scanner and the human inaccuracies of a manual test are eliminated.

RS Optical Scanner

The optional RS Optical Scanner is used to facilitate meter testing using an automatic testing sequence. This eliminates the potential for human error associated with a manual test. The Scanner can be used on dial indexes and odometers with black and white graduated marks.

Acoustic Filter

When testing turbine-type gas meters with a transfer prover, an Acoustic Filter should be installed between the Field Meter (meter under test) and the ROOTS® master meter. The Acoustic Filter reduces or eliminates the resonance phenomena induced by pulsation from the master meter at most flow rates. An Acoustic Filter is ideal for shop use with a Model 5 ROOTS® prover.

ROOTS® Optional Electronic Products

XMTR

Solid State Transmitter (XMTR)

- High frequency pulse output
- 100 pulses per input shaft revolution
- Solid State circuitry provides a long life expectancy
- Mounts on any standard Instrument Drive
- 10 to 15 VDC

EC-2

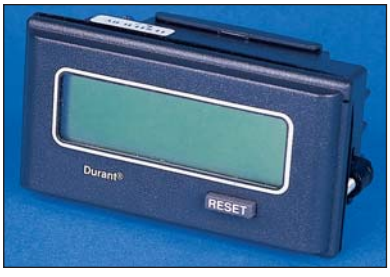
EC-2

- Utilizes analog temperature, pressure, and flow inputs to yield corrected volume
- Displays compensated rate and total flow
- Flow rate, temperature, and pressure alarms
- Pulse, 4-20 mA, and RS-232 outputs available
- 110 VAC or 220 VAC available

DM-2

DM-2

- Totalizes analog flow inputs
- Displays Rate and Total
- Corrects for fixed pressures
- 4-20 mA or RS-232 outputs available
- 110 VAC or 220 VAC available



Model 400/405

Model 400 Totalizer

- Totalizes and displays analog flow inputs
- 3 volt lithium battery
- Manufactured by Eaton

Model 405 Totalizer/Ratemeter

- Totalizes analog flow inputs
- Displays Rate and Total
- 3 volt lithium battery
- Manufactured by Eaton

ROOTS® Test Equipment

Manometer

Smart Manometer

The Smart Manometer is the first pressure measuring instrument with an accuracy of ± 0.025% of full scale at a truly low cost. As a replacement for glass manometers, this microprocessor based system, manufactured by Meriam Instrument, has been designed for the measurement of differential pressures across a rotary meter.

Pulse Loop Tester

Pulse Loop Tester

The ROOTS® pulse loop tester is a battery-powered instrument designed for testing and troubleshooting one and two channel pulse output systems. LED indicators display the contact state of one or two Form A or Form C switches. An internal buzzer can also be enabled to sound when a pulse occurs through selected channels.

Leak Tester

Accessory Unit Leak Tester

Performing a leak test on a newly installed ROOTS® accessory unit allows a user to verify proper installation by applying a static pressure load inside the accessory. A properly installed unit will maintain the selected pressure for a minimum of 60 seconds. The test equipment attaches easily to any of the ROOTS® Series 1 (LM-MA) or Series 2 (TQM) accessories.

ROOTS® Meter Sets & Mooney Regulators

Pre-Fabricated Sets

A full line of meter set components are available for a one-stop-shopping approach to meter set design and installation. Reduce your installation cost with a professionally designed and tested ROOTS® meter set.

Pre-Fabricated Meter Sets

Dresser offers both Standard and Customer Specified designs. These modular meter sets are packaged for economical shipping and storage. Benefits include design standardization, reduced inventories, and lower overhead costs.

Quick Change Kits

Quick-Change Kits

Quick-Change kits provide an easy, cost-effective method of changing from a diaphragm to a ROOTS® meter. Each kit provides all the necessary piping and hardware required for a fast and smooth change over.

Mooney Regulators

Mooney Regulators

High Performance, ease of maintenance, low minimum differential and versatility are important characteristics of the FLOWGRID™ Regulator. This complete line of pilot-operated regulators is ideal for pressure reducing, back-pressure and flow control applications. Mooney, a recognized name in the gas industry, is an operation of Roots Meters & Instruments division.

ROOTS® Accessories

Ultraseal® Valve

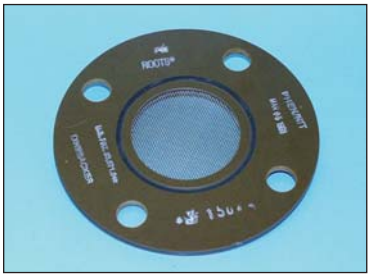
ROOTS® Ultraseal® Gas Meter Valves

Ultraseal® valves are permanently lubricated and bi-directional. They meet NPFA standards and continue to maintain a bubble-tight seal after qualification testing to over 10,000 cycles. Torque values remain low even at subzero temperatures. Locking plates are also available.

Pipeline Strainer

ROOTS® Pipeline Strainers

These strainers are designed to protect meters and other precision devices from the damaging effects of entrained system debris. A low pressure drop is achieved through a large element area and venturi port design. The debris bowl is tapped for cleaning.



Gasket Strainer

ROOTS® Gasket Strainers

Using a 20 mesh stainless steel screen, the Gasket Strainer helps protect against potential damage to precision pipeline measurement and regulation equipment caused by occasional introduction of weld slag, plastic pipe shavings, or other debris.

Restricting Orifice Plates

Restricting Flow Orifice Plates

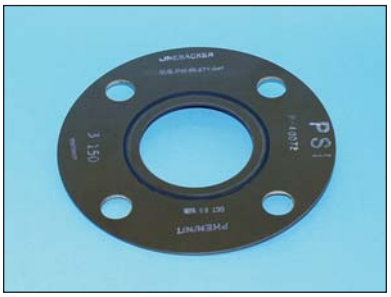
Sized orifice plates provide low cost protection against meter overspeed. The plates are designed to choke gas flow at 100% for meters rated over 300 psig. Plates are installed 2 to 4 pipe diameters downstream for maximum effectiveness.

Companion Flange Assemblies

Companion Flange Assemblies

These kits include all the equipment necessary for mounting a meter in a pipeline. The kit consists of flanges, coated flange bolts, and gaskets.

ROOTS® Accessories



Gaskets

Flange Gaskets

LineBacker™ gaskets, with their unique sealing element, use the lowest possible clamp and compressive load to eliminate flange leaks. The patented design also reduces the problems involved in sealing misaligned flanges.

Bolts

Coated Flange Bolts

These bolts have a lubricious, polymer-based coating to help prevent galling of the threads in the meter body.

Pete's Plug II®

Pete's Plug II® Test Plug

Allows user to take pressure and temperature readings quickly while eliminating the cost of leaving gauges or temperature indicators in line. Pete's Plug II® test plug is still the only pressure and temperature test plug with two self-closing valves and is rated to a maximum pressure of 500 psig at 200°F.

Meter Oil

ROOTS® Meter Oil

Approved for use in all ROOTS® meters. The oil is packaged in quantities from 4 ounces to 55 gallons.

Thermowell

Thermowell

Thermowells provide protection for temperature measurement devices inserted in a gas stream. Available in 4 and 6 inch lengths with a 1 inch NPT insertion connection and a 1/2 inch NPT opening.

ROOTS® Services

Product Services

Our Product Services Department offers repair, remanufacturing, testing and calibration service for all ROOTS® meters, provers, and instrumentation. At Roots Meters & Instruments, our focus is on customer satisfaction. Let the experts handle your ROOTS® products repair and calibration needs.

The overall cost effectiveness of factory service is enhanced by:

- Standardized and competitive service levels
- Specialization in contract services
- Inspection for warranty and upgrades
- Line Mount Meters returned freight prepaid to the first point of delivery within the United States.

Educational Services

Training Is An Investment In Your Company's Future

The down time associated with servicing a ROOTS® meter or instrument can be drastically reduced by ensuring qualified personnel are available to perform the necessary work. A variety of educational programs are available on topics ranging from General Meter Maintenance to Model 5 ROOTS® prover training. One and two day on-site training is available as well as a three-day factory training school at the Roots Meters facility. All of these programs are designed to expand the capabilities of operations and maintenance personnel.

Roots On-Site Field Training Courses and Factory Training Schools are available to users of ROOTS® products in the Natural Gas Industry (Local Distribution, Transmission, & Production companies).

Industrial users and accounts covered by an authorized DRESSER Distributor should contact their supplier for all training and service requirements.

FLOSystems

This business unit of Roots Meters & Instruments Division offers complete design and market services for meter and regulator stations worldwide. Backed by many years of experience, we can design a meter station to customer specifications, or provide a complete meter station ready for installation.

Imperial Sizing Charts

LINE MOUNTED — Foot Mount

MODEL	8C175*	11C175*	15C175*	2M175	3M175	5M175	7M175	11M175	16M175	23M175	38M175	56M175	102M125
*Also available in 200 PSIG Rating													
RATING	800	1100	1500	2000	3000	5000	7000	11000	16000	23000	38000	56000	102000
PSIG	**Corrected Capacity at Metering Pressure – in MSCFH**												
1	0.84	1.15	1.57	2.09	3.1	5.2	7.3	11.5	16.7	24.0	39.7	58.5	106.6
3	0.94	1.30	1.77	2.60	3.5	5.9	8.3	13.0	18.9	27.2	44.9	66.1	120.5
5	1.05	1.45	1.98	2.63	4.0	6.6	9.2	14.5	21.1	30.3	50.0	73.8	134.3
10	1.32	1.82	2.48	3.31	5.0	8.3	11.6	18.2	26.5	38.1	62.9	92.7	168.9
15	1.60	2.20	2.99	3.89	6.0	10.0	14.0	22.0	31.9	45.9	75.8	111.8	203.6
20	1.87	2.57	3.50	4.67	7.0	11.7	16.3	25.7	37.4	53.7	88.7	130.8	238.2
25	2.14	2.94	4.01	5.35	8.0	13.4	18.7	29.4	42.8	61.5	101.7	149.8	272.9
30	2.41	3.32	4.52	6.03	9.0	15.1	21.1	33.2	48.2	69.3	114.5	168.8	307.4
40	2.95	4.06	5.54	7.35	11.1	18.5	25.9	40.6	59.1	84.9	140.3	206.8	376.7
50	3.50	4.81	6.56	8.74	13.1	21.9	30.6	48.1	70.0	100.6	166.1	244.8	445.9
60	4.04	5.56	7.58	10.10	15.2	25.3	35.4	55.6	80.8	116.2	191.9	282.9	515.2
70	4.58	6.30	8.60	11.50	17.2	28.7	40.1	63.0	91.7	131.8	217.7	320.9	584.5
80	5.13	7.05	9.61	12.80	19.2	32.0	44.9	70.5	102.5	147.4	243.5	358.9	653.7
90	5.67	7.80	10.63	14.20	21.3	35.4	49.6	78.0	113.4	163.0	269.3	396.9	723.0
100	6.21	8.54	11.65	15.50	23.3	38.8	54.4	85.4	124.3	178.6	295.1	434.9	792.1
110	6.76	9.29	12.67	16.93	25.3	42.2	59.1	92.9	135.1	194.2	320.9	472.9	861.4
120	7.30	10.04	13.69	18.25	27.4	45.6	63.9	100.4	146.0	209.9	346.7	510.9	930.6
125	7.57	10.41	14.20	18.90	28.4	47.3	66.2	104.1	151.4	217.7	359.6	530.0	965.3
135	8.11	11.16	15.21	20.33	30.4	50.7	71.0	111.6	162.3	233.3	385.4	568.0	
150	8.93	12.28	16.74	22.30	33.5	55.8	78.1	122.8	178.6	256.7	424.1	625.0	
175	10.29	14.15	19.29	25.70	38.6	64.3	90.0	141.5	205.8	295.8	488.7	720.2	
200	11.64	16.01	21.83										

HIGH PRESSURE METERS

MODEL	1M300	1M740	1M1480	3M300	3M740	3M1480	5M1480	7M1480
RATING	1000	1000	1000	3000	3000	3000	5000	7000
PSIG	**Corrected Capacity at Metering Pressure — in MSCFH**							
125	9.5	9.5	9.5	28.4	28.4	28.4	47.3	66.2
150	11.2	11.2	11.2	33.5	33.5	33.5	55.8	78.1
175	12.9	12.9	12.9	38.6	38.6	38.6	64.3	90.0
200	14.6	14.6	14.6	43.7	43.7	43.7	72.8	102
250	18.0	18.0	18.0	53.9	53.9	53.9	89.8	126
300	21.3	21.3	21.3	64.0	64.0	64.0	107	149
350		24.7	24.7		74.2	74.2	124	173
500		34.9	34.9		105	105	175	244
600		41.7	41.7		125	125	209	292
740		51.2	51.2		154	154	256	359
800			55.3			166	276	387
900			62.1			186	310	435
1200			82.4			247	412	577
1480			102			305	508	711

NOTE: All capacities listed are Standard Cubic Feet per Hour (SCFH) and based upon Average Atmospheric Pressure (14,4 PSIA), Base Pressure (14,73 PSIA), and Base Temperature (60°F). Tables do not take into account Supercompressability. Please refer to RM-135 for futher information on the Application of Temperature and/or Pressure Correction Factors in Gas Measurement.

SIZING INSTRUCTIONS

To select the proper meter size, use the Minimum Operating Pressure and the Maximum Instantaneous Hourly Flow Rate. Do not exceed meter's maximum allowable operating pressure.

To prevent oversizing of a meter, sizing should be based upon the total connected load giving consideration to the load diversity. When using this method to size a meter, a selected diversity factor times the total connected load will be used as the Maximum Instantaneous Flow Rate for sizing purposes.

A diversity factor of 0,85 is commonly used for a single application where two or more major appliances are in use (i,e, boilers, furnaces, space heaters, etc,).

As the number of appliances considered when determining a connected load increases, the diversity factor will typically decrease. For applications such as multiple ranges and water heaters, some examples of commonly used diversity factors are:

Qty	Factor	Qty	Factor*
0-5	1	6	0.9
7	0.85	8	0.83

* The diversity factors listed above are estimates. For proper sizing, consult your company or industry standards for determining accepted values.

ENERGY VALUE

Gas	BTU/Cu, Ft,
Acetylene	1498
Butane	3200
Ethane	1758
Ethylene	1606
Methane	997
Natural	965/1055
Propane	2550

LINE MOUNTED

Foot Mount

MODEL			8C175*	11C175*	15C175*	2M175	3M175	5M175	7M175	11M175	16M175	23M175	38M175	56M175	102M125
			*Also Available with 200 PSIG Rating (13,8 BAR); (1379 Kpa); (14,1 kg/cm2)												
RATING			22,6	31	42	57	85	142	200	310	450	650	1000	1600	2885
PSIG	**Bar**	**kPa**	**Corrected Capacity at Metering Pressure – in Nm³/H**												
1	0,07	7	23,7	32,6	44,4	59,2	88,8	148,0	207,2	325,5	473,5	680,7	1124,6	1657,3	3018,6
3	0,21	21	26,8	36,8	50,2	66,9	100,3	167,2	234,1	367,9	535,1	769,3	1270,9	1873,0	3411,5
5	0,34	34	29,8	41,0	55,9	74,6	111,9	186,5	261,1	410,3	596,8	857,8	1417,3	2088,7	3804,3
10	0,69	69	37,5	51,6	70,3	93,8	140,7	234,5	328,3	515,9	750,4	1078,7	1782,1	2626,3	4783,6
15	1,03	103	45,2	62,2	84,8	113,1	169,6	282,6	395,7	621,8	904,4	1300,1	2148,0	3165,5	5765,7
20	1,38	138	52,9	72,7	99,2	132,3	198,4	330,6	462,9	727,4	1058,0	1520,9	2512,8	3703,1	6745,0
25	1,72	172	60,6	83,3	113,6	151,5	227,3	378,8	530,3	833,3	1212,1	1742,4	2878,7	4242,3	7727,1
30	2,1	207	68,3	93,9	128,0	170,7	256,1	426,8	597,5	938,9	1365,7	1963,2	3243,5	4780,0	8706,4
40	2,8	276	83,7	115,0	156,9	209,2	313,8	522,9	732,1	1150,4	1673,4	2405,5	3974,3	5856,8	10667,7
50	3,4	345	99,1	136,2	185,7	247,6	371,4	619,1	866,7	1362,0	1981,0	2847,7	4705,0	6933,6	12629,1
60	4,1	414	114,4	157,3	214,6	286,1	429,1	715,2	1001,3	1573,5	2288,7	3290,0	5435,7	8010,5	14590,5
70	4,8	483	129,8	178,5	243,4	324,5	486,8	811,4	1135,9	1785,0	2596,4	3732,3	6166,4	9087,3	16551,9
80	5,5	552	145,2	199,7	272,3	363,0	544,5	907,5	1270,5	1996,5	2904,0	4174,6	6897,1	10164,2	18513,3
90	6,2	621	160,6	220,8	301,1	401,5	602,2	1003,7	1405,1	2208,1	3211,7	4616,8	7627,8	11241,0	20474,7
100	6,9	689	175,9	241,9	329,9	439,9	659,8	1099,7	1539,5	2419,3	3518,9	5058,5	8357,5	12316,3	22433,2
110	7,6	758	191,3	263,1	358,7	478,3	717,5	1195,8	1674.1	2630,8	3826,6	5500,7	9088,2	13393,1	24394,6
120	8,3	827	206,7	284,2	387,6	516,8	775,2	1292,0	1808,7	2842,3	4134,3	5943,0	9818,9	14469,9	26356,0
125	8,6	862	214,4	294,8	402,0	536,0	804,1	1340,1	1876,1	2948,2	4288,3	6164,5	10184,8	15009,1	27338,1
135	9,3	931	229,8	315,9	430,8	574,4	861,7	1436,1	2010,6	3159,4	4595,5	6606,1	10914,4	16084,4	
150	10	1034	252,9	347,7	474,1	632,2	948,2	1580,4	2212,6	3476,9	5057,3	7269,8	12011,0	17700,5	
175	12	1207	291,4	400,6	546,3	728,4	1092,6	1821,0	2549,4	4006,1	5827,1	8376,5	13839,4	20394,9	
200	14	1379	329,6	453,3	618,1										

HIGH PRESSURE METERS

MODEL			1M300	1M740	1M1480	3M300	3M740	3M1480	5M1480	7M1480
RATING			28	28	28	85	85	85	142	200
PSIG	**Bar**	**kPa**	**Corrected Capacity at Metering Pressure - in Nm³/H**							
125	8,6	862	268,0	268,0	268,0	804,1	804,1	804,1	1340,1	1876,1
150	10	1034	316,1	316,1	316,1	948,2	948,2	948,2	1580,4	2212,6
175	12	1207	364,2	364,2	364,2	1092,6	1092,6	1092,6	1821,0	2549,4
200	14	1379	412,1	412,1	412,1	1236,2	1236,2	1236,2	2060,3	2884,4
250	17	1724	508,3	508,3	508,3	1525,0	1525,0	1525,0	2541,7	3558,4
300	21	2068	604,3	604,3	604,3	1813,0	1813,0	1813,0	3021,7	4230,4
350	24	2413		700,6	700,6		2101,9	2101,2	3503,2	4904,5
500	34	3447		988,9	988,9		2966,8	2966,8	4944,7	6922,5
600	41	4137		1181,2	1181,2		3543,7	3543,7	5906,1	8268,6
740	51	5102		1450,6	1450,6		4351,7	4351,7	7252,8	10153,9
800	55	5516			1565,8			4697,4	7829,1	10960,7
900	62	6205			1758,1			5274,3	8790,5	12306,7
1200	83	8274			2334,7			7004,1	11673,5	16342,9
1480	102	10204			2874,5			8623,4	14372,4	20121,4

LINE MOUNTED													
MODEL				G16	G25	G40	G65	G100	G160	G250	G400	G650	G1000
BASE RATING (m³/h)				25	40	65	100	160	250	400	650	1000	1000
METER OPERATING PRESSURE													
Bar	kPa	kg/cm2	PSIG										
0,07	6,9	0,07	1	26,1	41,8	67,9	104,5	167,2	270,7	418,0	679,3	1045	1672
0,21	20,7	0,21	3	29,5	47,2	76,8	118,1	189,0	305,9	472,4	767,7	1181,0	1889,6
0,34	34,5	0,35	5	32,9	52,7	85,6	131,7	210,7	329,3	526,8	8560,5	1317,0	2107,2
0,69	69,0	0,70	10	41,4	66,2	107,6	165,6	265,0	414,0	662,4	1076,4	1656,0	2649,6
1	100	1,02	14.5	48,9	78,2	127,1	195,5	312,8	488,8	782,0	1270,8	1955	3128
1,5	150	1,53	22	61,5	98,4	159,8	245,9	393,5	614,8	983,7	1598,5	2459,2	3934,7
2	200	2,04	29	73,7	117,8	191,5	294,6	471,4	736,5	1178,4	1914,9	2946	4713,6
3	300	3,06	44	98,5	157,6	256,0	393,9	630,2	984,7	1575,5	2560,2	3938,8	6302,0
4	400	4,08	58	122,9	196,6	319,5	491,5	786,4	1228,8	1966,0	3194,8	4915	7864
5	500	5,10	73	147,8	236,5	384,3	591,2	945,9	1477,9	2364,6	3842,5	5911,6	9458,5
6	600	6,12	87	172,1	275,4	447,5	688,4	1101,4	1721,0	2753,6	4474,6	6884,0	11014,4
7	700	7,14	102	197,1	315,4	512,5	788,4	1261,5	1971,1	3153,7	5124,8	7884,4	12615,0
8	800	8,16	116	221,3	354,1	575,4	885,3	1416,5	2213,3	3541,2	5754,5	8853	14164,8
9	900	9,18	131	246,4	394,3	640,7	985,7	1577,1	2464,3	3942,9	6407,1	9857,1	15771,4
10	1000	10,20	145	270,5	432,8	703,4	1082,1	1731,4	2705,3	4328,4	7033,7	10821	17313,6
11	1100	11,21	160	295,7	473,2	768,9	1183,0	1892,8	2957,5	4732,0	7689,5	11829,9	18927,9
12	1200	12,30	175	321,5	514,4	836	1286	2057,6	3215,0	5144	8359	12860	20576
13,8	1380	14,06	200	363,75	582								

ROOTS® HIGH PRESSURE METERS										
MODEL				G16-300	G16-740	G16-1480	G65-300	G65-740	G65-1480	G65-600
BASE RATING (m³/h)				25	25	25	100	100	100	100
METER OPERATING PRESSURE				Corrected Capacity at Meter Pressure -in Nm³/H						
Bar	kPa	kg/cm2	PSIG							
8,6	862	8,8	125	237	237	237	946	946	946	946
10,3	1034	10,5	150	279	279	279	1116	1116	1116	1116
12,1	1207	12,3	175	322	322	322	1286	1286	1286	1286
13,8	1379	14,1	200	364	364	364	1455	1455	1455	1455
17,2	1724	17,6	250	449	449	449	1795	1795	1795	1795
20,7	2068	21,1	300	534	534	534	2134	2134	2134	2134
24,1	2413	24,6	350		619	619		2474	2474	2474
27,6	2758	28,1	400		703	703		2813	2813	2813
34,5	3447	35,2	500		873	873		3492	3492	3492
41,4	4137	42,2	600		1043	1043		4171	4171	4171
48,3	4826	49,2	700		1213	1213		4850	4850	
51,0	5102	52,0	740		1281	1281		5122	5122	
55,2	5516	56,2	800			1382			5529	
62,1	6205	63,3	900			1552			6208	
69,0	6895	70,3	1000			1722			6887	
82,8	8274	84,4	1200			2061			8244	
99,3	9929	101,2	1440			2469			9874	
102,1	10204	104,1	1480			2537			10146	

TECHNICAL DATA	UNITS	8C175*	11C175*	15C175*	2M175	3M175	5M175	7M175	8.8M175	11M175	16M175	23M175
Base Rating (Q Max.)	acfh	800	1100	1500	2000	3000	5000	7000	N/A	11000	16000	23000
	m^3/h	22,6	31,0	42,5	56,6	85,0	141,5	200,0	250,0	310,0	450,0	650,0
Max. Operating Pressure (MAOP)*	psig	175	175	175	175	175	175	175	N/A	175	175	175
	kPa	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
Rangeability +/- 1%	ratio	26:1	31:1	40:1	68:1	76:1	120:1	67:1	70:1	124:1	116:1	40:1
Start Rate	cfh	2.8	2.3	1.9	1.9	2.1	1.2	5.3	N/A	3.9	3.2	23.0
	m^3/h	0,0790	0,0651	0,0549	0,0538	0,0595	0,0340	0,1509	0,1510	0,1099	0,0917	0,6513
Stop Rate	cfh	2.0	1.7	1.6	1.1	1.8	0.8	3.4	N/A	3.2	1.9	18.0
	m^3/h	0,0575	0,0493	0,0445	0,0311	0,051	0,0227	0,096	0,0960	0,0915	0,0535	0,5097
Avg. Differential, 100% Flow	in. w.c.	0.5	0.6	0.8	0.7	1.1	1.1	1.6	N/A	1.6	2.1	1.3
	mbar	1,1	1,5	1,9	1,6	2,6	2,6	4,0	2,8	4,0	5,2	3,1
Drive Rate CTR, CD	cf/rev	10	10	10	10	10	10	10	N/A	10	100	100
	m^3/rev	0,1	0,1	0,1	0,1	0,1	1	1	1	1	1	1
Drive Rate TC, TD	cf/rev	100	100	100	100	100	100	100	N/A	100	1000	N/A
	m^3/rev	1	1	1	1	1	10	10	10	10	10	N/A
Nominal Pipe Size	in.	2	2	2	2	2	3	3	N/A	4	4	6
	mm	50,8	50,8	50,8	50,8	50,8	80	80	80 or 100	100	100	150
Flange-to-Flange	in.	6-3/4	6-3/4	6-3/4	6-3/4	6-3/4	6-3/4	9-1/2	N/A	9-1/2	9-1/2	16
	mm	172	172	172	172	172	172	241,3	241,3	241,3	241,3	406,4
Flange Connection	ANSI	125#FF	125#FF	125#FF	125#FF	125#FF	125#FF	125#FF	125#FF	125#FF	125#FF	125#FF
Net Weight - CTR Version	lbs.	18	22	24	26	29	35	52	N/A	60	85	202
	kg	8,2	10,0	10,9	11,8	13,2	15,9	23,6	29,0 or 31,0	27,2	38,6	91,6

TECHNICAL DATA	UNITS	38M175	56M175	102M125	1M300	1M740	1M1480	3M300	3M740	3M1480	5M1480	7M1480
Base Rating (Q Max.)	acfh	38000	56000	102000	1000	1000	1000	3000	3000	3000	5000	7000
	m^3/h	1,050.0	1,575.0	2,875.0	28,3	28,3	28,3	85,0	85,0	85,0	141,6	198,2
Max. Operating Pressure (MAOP)*	psig	175	175	125	300	740	1480	300	740	1480	1480	1480
	kPa	1,200	1,200	860	2,065	5,100	10,200	2,065	5,100	10,200	10,200	10,200
Rangeability +/- 1%	ratio	90:1	53:1	38:1	30:1	18:1	18:1	50:1	77:1	77:1	28:1	60:1
Start Rate	cfh	27.0	40.0	120.0	1.9	2.5	2.5	2.1	3.0	3.0	7.6	5.8
	m^3/h	0,7646	1,1327	3,3980	0,0538	0,0708	0,0708	0,0595	0,0850	0,0850	0,133	0,1642
Stop Rate	cfh	20.0	1.0	110.0	1.1	2.0	2.0	1.8	2.5	2.5	4.6	4.6
	m^3/h	0,5663	0,0283	3,1149	0,0311	0,0566	0,0566	0,0510	0,0708	0,0708	0,057	0,1303
Avg. Differential, 100% Flow	in. w.c.	1.9	2.2	2.0	0.2	0.4	0.3	1.0	1.3	1.35	2	2
	mbar	4,7	5,5	5,0	0,5	1,0	0,7	2,5	3,2	3,4	2,24	4,26
Drive Rate CTR, CD	cf/rev	100	100	100	10	10	10	10	10	10	10	10
	m^3/rev	1	10	10	0,1	0,1	0,1	0,1	0,1	0,1	1	1
Drive Rate TC, TD	cf/rev	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	m^3/rev	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nominal Pipe Size	in.	6	8	10	1-1/2	2	2	2	2	2	3	3
	mm	150	200	254	50.8	50.8	50.8	50.8	50.8	50.8	79.2	3
Flange-to-Flange	in.	18	21	28	6-3/4	10-3/4	10-3/4	6-3/4	10-3/4	10-3/4	14-3/4	14-3/4
	mm	457,2	533,4	711,2	172	273	273	172	273	273	374,65	374,65
Flange Connection	ANSI	125#FF	125#FF	125#FF	300#FF	300#RF	600#RF	300#FF	300#RF	600#RF	600#RF	600#RF
Net Weight - CTR Version	lbs.	244	284	2390	26.5	107	107	29	107	107	215	220
	kg	110,7	128,8	1084,1	12,0	48,5	48,5	13,2	48,5	48,5	97,52	99,79

* Available with 200 PSIG Rating

G-Rating Technical Data

Technical Data	UNITS	G16	G25	G40	G65	G100	G160-3"	G160-4"	G250	G400	G650	G1000
Base Rating (qMax.)	m^3/h	25,0	40,0	65,0	100,0	160,0	250,0	250,0	400,0	650,0	1,000.0	1,600.0
Max Operating Pressure (MAOP)	bar	12	12	12	12	12	12	12	1200	1200	1200	1200
Rangeability +/- 1%	ratio	28:1	37:1	78:1	89:1	135:1	70:1	70:1	103:1	40:1	85:1	53:1
Start Rate	m^3/h	0,0790	0,0549	0,0538	0,0595	0,0340	0,1510	0,1510	0,0917	0,6513	0,7646	1,1327
Stop Rate	m^3/h	0,0575	0,0445	0,0311	0,0510	0,0227	0,0960	0,0960	0,0535	0,5097	0,5663	0,8212
Avg. Differential, 100% Flow	mbar	1,6	1,9	2,2	3,2	3,7	2,8	2,8	3,9	3,1	4,7	5,5
Drive Rate CTR, CD	m^3/rev	0,1	0,1	0,1	0,1	1,0	1,0	1,0	1,0	1,0	1,0	10,0
Drive Rate TC, TD	m^3/rev											
Nominal Pipe Size	mm	50	50	50	50	80	80	100	100	150	150	200
Flange-to-Flange	mm	172	172	172	172	172	241,3	241,3	241,3	406,4	457,2	533,4
Flange Connection	ANSI	125# FF	125# FF	125# FF	125# FF	125# FF	125# FF	125# FF	125# FF	125# FF	125# FF	125# FF
Bolt Size**	Inches	5/8-11	5/8-11	5/8-11	5/8-11	5/8-11	5/8-11	5/8-11	3/4-10	3/4-10	3/4-10	3/4-10
Net Weight - CTR Version	kg	8	11	12	13	16	29	31	39	92	111	129

** Bolt Length varies by application.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