

1" to 4" Guardsman™ LB, LJ, and LSJ Series

Bulletin SS02003 Issue/Rev. 2.2 (2/18)

Smith Meter® Turbine Meters

Smith Meter® Guardsman™ LB, LJ, and LSJ Series Turbine Meters are rimless-type rotor meters which utilize an up-stream stator to support the rotor. They are intended for use at loading racks to provide the highly accurate measurement required for custody transfer of petroleum liquids.



3" LSJ Turbine Meter with Integral Strate Plate

Features

- Stainless Steel measuring chamber and internals
- Locking stator prevents wear and improves performance
- Stainless steel ball bearings (LB versions) and Tungsten Carbide journal bearings (LJ and LSJ versions) provide long life on low lubricating fluids
- Integral strate plate flow conditioner (3" and 4" only)
- Horizontal or vertical installation
- PA-6 Pre-amplifier

Options

- Dual Pickup Coils – Used when pulse security is required.
- Turbine Meter Diagnostic when used with AccuLoad III (see application bulletin [AB06061](#)).

Operating Specifications

Linearity¹

Normal Flow Range		
1"	1.5" and 2"	3" and 4"
±0.25%	±0.25%	±0.15%

Repeatability

±0.02% over the normal flow range.

Flow Range

Meter Size	Model	Units ²	Normal Flow Range		K-Factor (Pulses/Units Volume) Nominal
			Min.	Max.	
1"	LB ³	USGPM	8	80	500
		L/min	30	300	132
1.5"	LB ³	USGPM	13	130	240
		L/min	50	500	63.4
2"	LJ-H or V	USGPM	25	250	125
		L/min	95	950	33
3"	LSJ-H	USGPM	70	700	52.7
		L/min	265	2,650	13.9
3"	LSJ-V	USGPM	70	700	60
		L/min	265	2,650	15.8
4"	LSJ-H or V	USGPM	120	1,200	25
		L/min	450	4,500	6.6

End Connections

Class 150 and 300 ASME B16.5, 125-250 AARH finish raised face (RF) flanges.

¹ Linearities and pressure drop based on 0.8 sp. gr., 1.5 mPa*s (1.5 cP) liquid.

² Metric units are nominal and may not convert precisely.

³ Model LB meters should not be used for LPG service or on products with a viscosity of less than 0.5 cP.

Maximum Working Pressure⁵ - PSI (kPa)

ASME	Carbon Steel
150	285 (1,965)
300 ⁴	740 (5,102)

Meter Operating Temperature Range

Meter with:	Carbon Steel Flanges
Pickup Coil	-20°F to 225°F -29°C to 107°C
Pickup Coil and Preamp or AccuLERT Smart Preamp	-20°F to 158°F -29°C to 70°C

Consult factory for temperatures outside noted ranges.

Approvals

Electrical Safety for Hazardous Locations

North American (United States and Canada) and countries following the US NEC Code

UL/CUL File E23545

Class I, Division I, Groups C & D

Class 1, Zone 1, Tamb = -50° to 70°C, IP66

UNL-UL ENCL 4, CNL ENCL 4

International

IECEX PTB 08.0040X (meter)

Exd IIC T3 – T6 Tamb = -40°C to +70°C, IP66

IECEX PTB 10.0052X (GP Junction Box)

Exd IIC T4 – T6 Gb Tamb = -40°C to +70°C, IP66

European Union: ATEX – Explosive Atmospheres Directive, ATEX 2014/34/EU

PTB 08 ATEX 1034X (meter)

Exd IIC T3 – T6 Tamb = -40°C to +70°C, IP66

PTB 10 ATEX 1039X (GP Junction Box)

Exd IIC T4 – T6 Gb Tamb = -40°C to +70°C, IP66

Weights and Measures

USA NTEP Certificate of Conformance: CC 93-053

Canadian NOA AV-2279

PTB Issued OIML R117-1 Test Report

European Union: MID – Measuring Instrument Directive, MID 2014/32/EU

Australia NMI 5/6B/87B

Consult Factory for others

Pressure Safety Requirements

European Union: PED – Pressure Equipment Directive, PED 2014/68/EU

CRN – Canadian Registration Number – Consult Factory

Electromagnetic Compatibility

European Union: EMC Compliance by Council Directive EMC Directive 2014/30/EU

EN 61326-1: Electrical equipment for measurement, control and laboratory use.

Materials of Construction

	Model LB	Model LJ & LSJ
Body	300 Series Stainless Steel	300 Series Stainless Steel
Flanges⁶	Carbon Steel	Carbon Steel
Bearings	440C SS Ball Type	Tungsten Carbide Journal and Thrust

Installation

Guardsman LB Series can be installed vertically (upward flow) or horizontally.

Guardsman LJ-H and LSJ-H Series must be installed horizontally.

Guardsman LSJ-V Series must be installed vertically (upward flow).

The meter should be mounted in a horizontal or vertical attitude ($\pm 5^\circ$) within a suitable flow conditioning assembly or immediately downstream of a strate plate. It is recommended that the meter be installed downstream of a strainer for protection and upstream of the system control valve. Refer to the installation manual [MN02002](#) for full instructions.

Applications

High Viscosity

The flow range of turbine meters is reduced considerably when metering viscous liquids. The minimum flow rate must be increased as the viscosity increases. The following relationships can be used to approximate the increase (reduction in range) that will maintain the stated linearity.

$$\text{Viscous Min. Rate} = \text{Normal Min. Rate} \times \frac{\text{Viscosity (cP)}}{\text{Meter Size (in)}}$$

Note: Caution should be used when dealing with liquids that result in a viscous minimum rate greater than two times the normal, since variations in operating temperature can result in substantial meter factor shifts.

Low Density

When metering light hydrocarbons such as LPG or other liquids with specific gravity less than 0.8, the minimum flow rate should be shifted upward. The amount of shift can be approximated by multiplying the normal minimum flow rate by the following factor:

$$\text{Rate Increasing Factor} = \frac{0.9}{\sqrt{S}}$$

Where: S = The specific gravity of the liquid being metered.

⁴ Not available with 1" Guardsman LB Series Meters.

⁵ Maximum working pressure are for temperatures of -20°F to 100°F (-28°C to 38°C). Consult factory for maximum working pressures at other temperatures.

⁶ Flanges are non-wetted on 1" through 2" and wetted on 3" and 4".

Minimum Back Pressure

In order to prevent cavitation, API M.P.M.S Chapter 5 recommends a minimum back pressure according to the following:

$$BP = (2 \times \Delta P) + 1.25 V_p$$

Where: BP = Minimum back pressure
 ΔP = Pressure drop at maximum flow rate
 V_p = Absolute vapor pressure at operating temperature

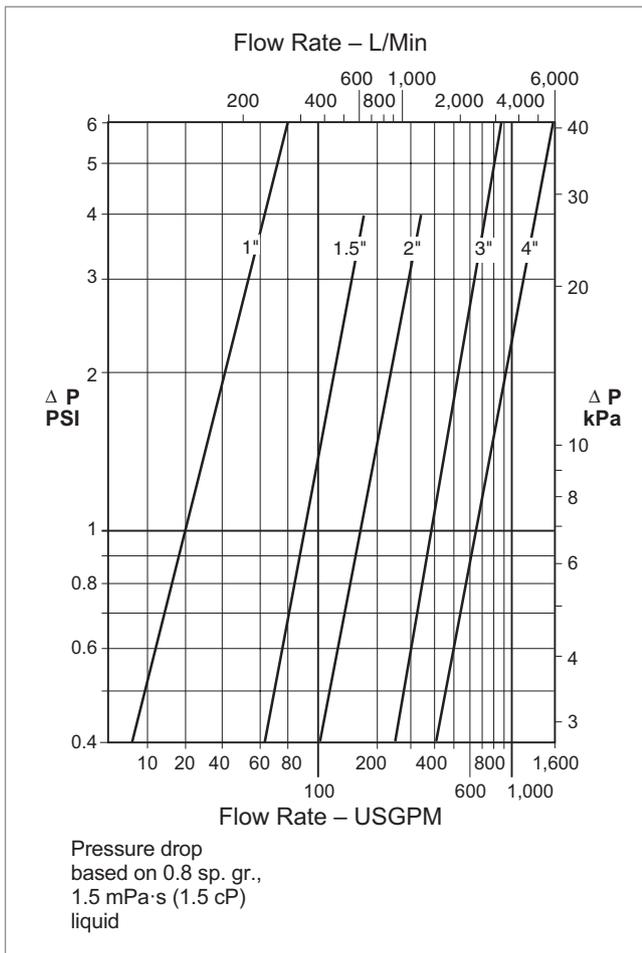
Example:

3" Guardsman LS at 600 GPM - $\Delta P = 2.5$ psi.

Absolute vapor pressure of gasoline at operating temperature - $V_p = 9.5$ psia.

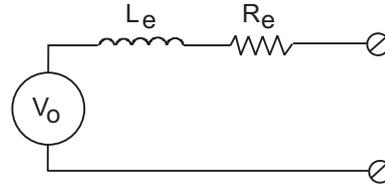
$$BP = (2 \times 2.5) + 1.25 (9.5) = 16.9 \text{ psi}$$

Pressure Drop



Pickup Coil Specifications

Type: Variable reluctance.



Electrical Characteristics

Effective Series Resistance (R_e): 1,200 Ω ($\pm 20\%$)

Effective Series Inductance (L_e): 450 mH @ 1,000 Hz

Minimum Open Circuit Voltage (V_o): 300 millivolts p/p at minimum flow rate

Maximum Transmission Distance: 2,000 ft (610 m) using #20 AWG two-conductor, shielded cable

Notes: A preamplifier is recommended for remote instrumentation that does not have Common Mode Noise Rejection. See Bulletin [SS02012](#) for PA-6 Preamplifier Specifications.

A preamplifier is included with all Guardsman LB, LJ, and LSJ Turbine Meters. See Bulletin [SS02012](#) for PA-6 Preamplifier Specifications.

An AccuLERT Smart Preamp is available in lieu of a standard preamplifier. See Bulletin [SS02015](#) for specifications.

Catalog Code

The following guide defines the correct turbine meter for a given application and the respective catalog code. This code is part of the ordering information and should be included on the purchase order.

1	2	3	4	5	6	7	8	9	10	11
K	2	C	A	A	0	0	1	1	0	0

Position 1: Code

K - Catalog Code

Position 2: Product Line

2 - Turbine Meter

Positions 3 and 4: Model and Size

Guardzman LB Horizontal and Vertical Ball Bearing Series - ASME End Connections

C1 - 1"

CA - 1.5"

Guardzman LJ-H Horizontal Journal Bearing Series - ASME End Connections

EA - 1.5"

EB - 2"

Guardzman LJ-V Vertical Journal Bearing Series - ASME End Connections

PB - 2"

Guardzman LSJ-H Horizontal Journal Bearing Series - ASME End Connections

GD - 3"

GE - 4"

Guardzman LSJ-V Vertical Journal Bearing Series - ASME End Connections

SD - 3"

SE - 4"

Position 5: Pressure Class

ANSI End Connections (ASME B16.5)

A - Class 150

B - Class 300

Position 6: End Connections⁷

0 - Carbon Steel RF Flanges

Position 7: Internal Configuration

0 - Unidirectional Flow

Position 8: Pickup Coils and Preamplifiers

Meter Mounted Junction Box(es) With

0 - 1 Pickup Coil

1 - 1 Pickup Coil and Preamplifier (standard)

2 - 2 Pickup Coils

3 - 2 Pickup Coils and 2 Preamplifiers

4 - 2 Pickup Coils and 1 Preamplifier

7 - 3 Pickup Coils and 2 Preamplifiers

P - 3 Pickup Coils and 3 Preamplifiers

Pickup Coil(s) with Explosion Proof Totalizer/Flow Rate Indicator

8 - MMRT¹⁰ with PA-11 and 1 Pickup Coil

9 - MMRT¹⁰ with PA-11 and 2 Pickup Coils

Pickup Coil(s) with Online Diagnostics

S - 1 Pickup Coil and AccuLERT⁸ XU

T - 2 Pickup Coils and AccuLERT⁸ XU

Position 9: Testing/Linearity

Size 1-Inch - 2-Inch

0 - $\pm 0.25\%$ Linearity

Sizes 3-Inch and 4-Inch

C - $\pm 0.15\%$ Linearity Tested with Strate Plate

Position 10: Compliance with Electrical and Other Standards

0 - UL/CUL Listed

3 - ATEX / IEC Ex Certified

4 - ATEX / IEC Ex / PED Certified⁹

5 - UL/CUL/CRN

Position 11: Specials

0 - None

X - Special - Specify

⁷ Low temperature (below -20°F) requires stainless steel end connections.

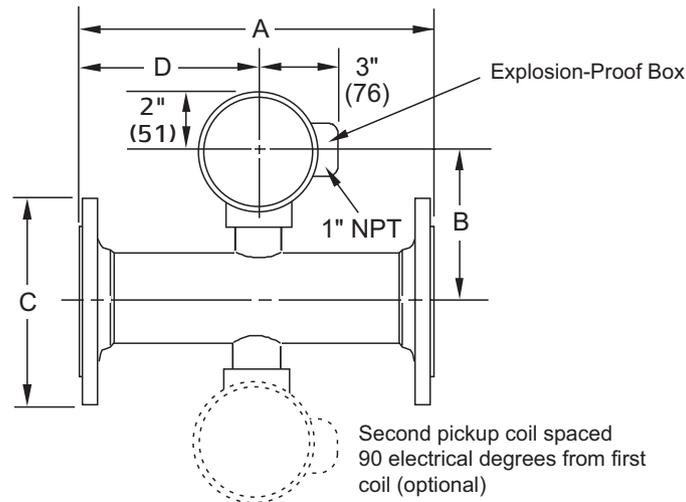
⁸ The AccuLERT also provides dual channel preamplification and online diagnostics - for details see [SS02015](#).

⁹ PED required for all European countries; equipment must be manufactured by Ellerbek, Germany facility.

¹⁰ Hazardous locations certificate not available, enclosure meets the requirements for CLI, Div 1, Groups C&D, for details see [SS09040](#).

Dimensions • Weight

Inches (mm) and Pounds (kg)



Consult factory for dimensions with AccuLERT.

Dimensions – inches to the nearest tenth (millimeters to the nearest whole mm), each independently dimensioned from respective engineering drawings

Size	A	B ¹¹	Class 150 ASME		Class 300 ASME		D
			C	Weight	C	Weight	
1"	5.5" (140)	5.1" (130)	4.25" (108)	12 lb (5 kg)	–	–	3.14" (80)
1.5"	6.0" (152)	5.5" (140)	5" (127)	14 lb (6 kg)	6.1" (155)	19 lb (9 kg)	3" (76)
2"	6.5" (165)	5.7" (145)	6" (152)	20 lb (9 kg)	6.5" (165)	24 lb (11 kg)	3.25" (83)
3"	10.0" (254)	6.5" (160)	7.5" (191)	60 lb (26 kg)	8.3" (211)	68 lb (31 kg)	5.28" (134)
4"	12.0" (305)	6.7" (170)	9" (229)	65 lb (29 kg)	10" (254)	80 lb (36 kg)	6.42" (163)

Note: Meter weights by flange class with one pickup coil and explosion-proof box. Add 5 lb (2.3 kg) for each additional pickup coil and explosion proof box.

¹¹ Add 24" for a standoff when using a preamplifier for temperatures 158°F to 225°F (70°C to 107°C).

Revisions included in SS02003 Issue/Rev. 2.2 (2/18):

Page 2: Catalog Code position 8 - options 8 and 9 have been added; Approvals section has been updated.
Footnotes 9 through 11 updated/added.

The specifications contained herein are subject to change without notice and any user of said specifications should verify from the manufacturer that the specifications are currently in effect. Otherwise, the manufacturer assumes no responsibility for the use of specifications which may have been changed and are no longer in effect.

Contact information is subject to change. For the most current contact information, visit our website at www.fmctechnologies.com/measurementsolutions and click on the "Contact Us" link in the left-hand column.