

The **Smith Meter® Guardsman™ LB, LJ and LSJ Series Turbine Meters** are rimless-type rotor meters which utilize an upstream 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.

### 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 Preamplifier.**

### Options

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

### Operating Specifications

#### Linearity<sup>1</sup>

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

\*Optional Requires 2 Pickup Coils.

#### Repeatability

±0.02% over the normal flow range.

#### Flow Range

Meter Size	Model	Units <sup>2</sup>	Normal Flow Range		K-Factor (Pulses/Units Volume) Nominal
			Min.	Max.	
1"	LB <sup>3</sup>	USGPM	8	80	500
		L/min	30	300	132
1.5"	LJ & LB <sup>3</sup>	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

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

<sup>2</sup> Metric units are nominal and may not convert precisely.

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

<sup>4</sup> Not available with 1" Guardsman LB Series Meters.



3" LSJ Turbine Meter with Integral Strate Plate

#### End Connections

Class 150, 300 ANSI B16.5 125–250 AARH finish raised face (RF) flanges.

#### Maximum Working Pressure – PSI (kPa)

ANSI	Carbon Steel
150	285 (1,965)
300 <sup>4</sup>	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.

#### Electrical Approvals

##### Electrical

**UL/CUL, Listed 557 N** – Class I Groups C and D; Class I, Zone I, Group IIB; Class I, Zone I, AExd IIB T6 IP66; UNL-UL ENCL. 4, CNL-CSA ENCL. 4; Tamb -50°C to 70°C.

##### ATEX/IEC Ex

**PTB 08 ATEX 1034X, IEC Ex PTB 08.0040X**

EX d IIC T6 Tamb = -40°C to 70°C IP66.

### Essential Health and Safety Requirements

**EN/IEC 60079-0:** Electrical apparatus for potentially explosive atmospheres - General requirements.

**EN/IEC 60079-1:** Electrical apparatus for potentially explosive atmospheres - Flameproof enclosures 'd'.

**EN 60529:** Degrees of protection provided by enclosures (IP code).

**EMC Compliance:** (by Council Directive 2004/108/EC)

**Electromagnetic Emissions:** EN 61000-6-3.

**Electromagnetic Immunity:** EN 55022.

**IEC 61000-4-2:** Electrostatic Discharge (ESD), Level 3+ (8.0 kV by contact, 12 kV by air).

**IEC 61000-4-3:** Radiated Electromagnetic Field, Level 3 (10 V/m)

**IEC 61000-4-4:** Electrical Fast Transient (Burst), Level 2 (1kV).

**IEC 61000-4-5:** Electrical High Energy Pulses (Surge), Installation Class 3, Criterion B.

### Weights and Measures

Consult factory.

### Materials of Construction

	Model LB	Model LJ & LSJ
<b>Body</b>	300 Series Stainless Steel	300 Series Stainless Steel
<b>Flanges<sup>5</sup></b>	Carbon Steel	Carbon Steel
<b>Bearings</b>	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 LJ-V and 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 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 flow range should be shifted upward. The amount of shift can be approximated by multiplying the normal minimum and maximum flow rates by the following factor:

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

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

The increased flow rate should not exceed the meter's overspeed flow rate.

#### 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  
 $\Delta P$  = Pressure drop at maximum flow rate  
 $V_p$  = Absolute vapor pressure at operating temperature

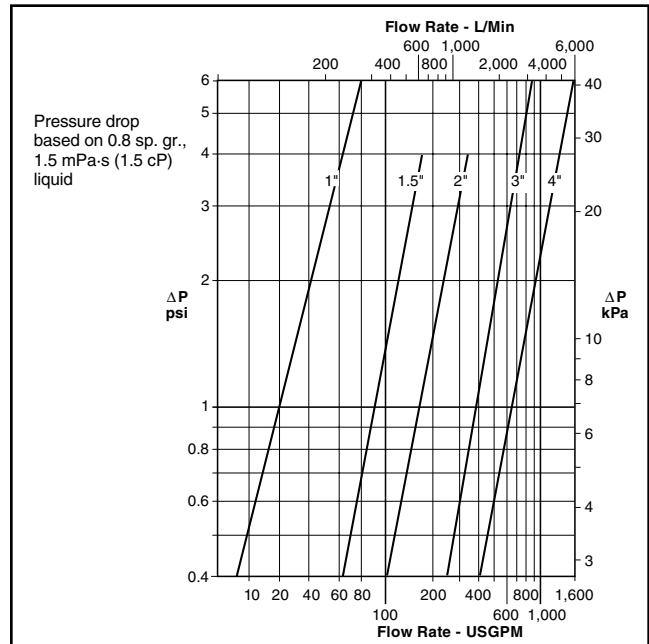
Example:

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

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

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

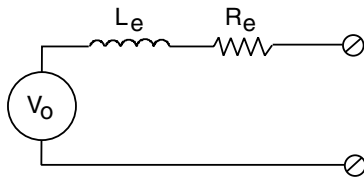
### Pressure Drop



<sup>5</sup> Flanges are non-wetted on 1" through 2" and wetted on 3" and 4".

## Pickup Coil Specifications

**Type:** Variable reluctance.



### Electrical Characteristics

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

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 PA6 Preamplifier Specifications.

A preamplifier is included with all Guardsman LB, LJ and LSJ Turbine Meters. See Bulletin SS02012 for PA6 Preamplifier Specifications.

An AccuLERT Smart Preamp is available in lieu of a standard pre-amplifier. See Bulletin SS02011 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

Guardsman LB Horizontal and Vertical Ball Bearing Series - ANSI End Connections

C1 - 1"

CA - 1.5"

Guardsman LJ-H Horizontal Journal Bearing Series - ANSI End Connections

EA - 1.5"

EB - 2"

Guardsman LJ-V Vertical Journal Bearing Series - ANSI End Connections

PA - 1.5"

PB - 2"

Guardsman LSJ-H Horizontal Journal Bearing Series - ANSI End Connections

GD - 3"

GE - 4"

Guardsman LSJ-V Vertical Journal Bearing Series - ANSI End Connections

SD - 3"

SE - 4"

### Positions 5: Pressure Class

ANSI End Connections (ASME B16.5)

A - Class 150

B - Class 300

D - Class 600

### Position 6: End Connections<sup>7</sup>

0 - Carbon Steel RF Flanges

### Position 7: Internal Configuration

Sizes 1.5-Inch – 2-Inch

0 - Unidirectional Flow

Sizes 3-Inch – 4-Inch

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

Pickup Coil(s) with Online Diagnostics

S - 1 Pickup Coil and AccuLERT<sup>8</sup> XU

T - 2 Pickup Coils and AccuLERT<sup>8</sup> XU

### Position 9: Testing/Linearity

Size 1-Inch

0 -  $\pm 0.25\%$  Linearity

Sizes 1.5-Inch – 2-Inch

0 -  $\pm 0.25\%$  Linearity

1 -  $\pm 0.15\%$  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 Certified<sup>9</sup>

5 - UL/CUL/CRN

### Position 11: Specials

0 - None

X - Special - Specify

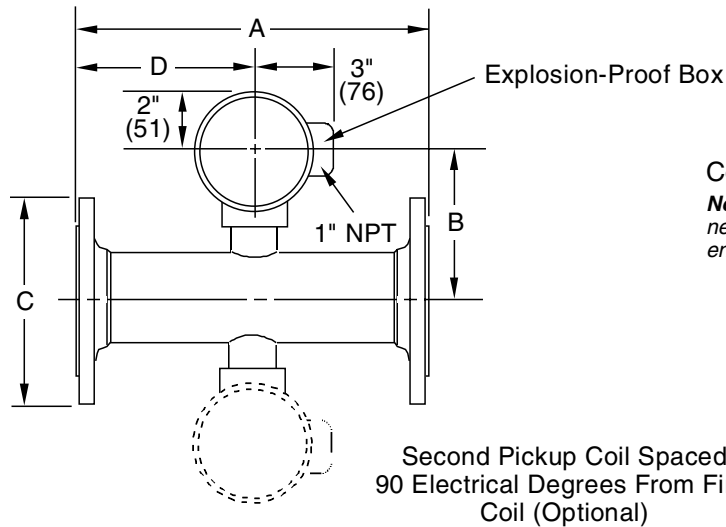
<sup>7</sup> Low temperature (below -20°F) requires stainless steel end connections.

<sup>8</sup> The AccuLERT also provides dual channel preamplification and online diagnostics.

<sup>9</sup> PED required for all European Countries; equipment must be manufactured by Ellerbek, Germany facility.

## Dimensions

Inches (mm) and Pounds (kg)



Consult factory for dimensions with AccuLERT.

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

Size	A	B	Class 150 ANSI		Class 300 ANSI		D
			C	Weight	C	Weight	
1"	5.5" (140)	5.1" (130)	4.25" (108)	12 lb (5 kg)	–	–	2.75" (70)
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.

### По вопросам продаж и поддержки обращайтесь:

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