Innovation in Miniature

ELECTRO-FLUIDIC SYSTEMS

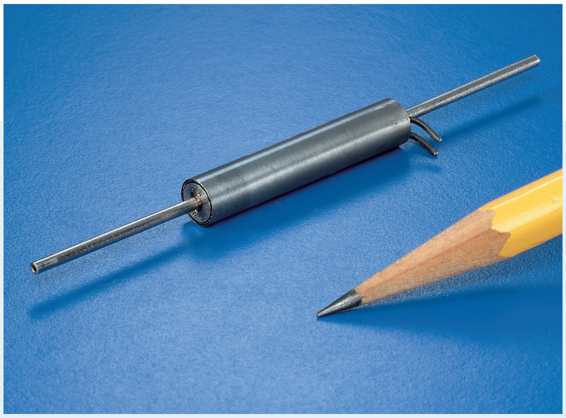
PRODUCT DATA SHEET

IEP EXTENDED PERFORMANCE SOLENOID VALVE

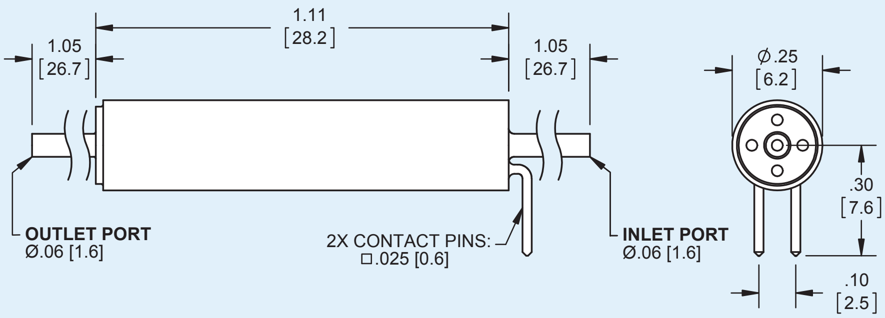
The Lee Company's IEP Series Extended Performance Solenoid Valve is designed to perform consistently under conditions that are far more demanding than typical high-speed dispensing applications. Available in a 2-way, normally closed, axial flow configuration, this compact solenoid valve expands on the operating pressure and temperature range capabilities of Lee's micro-dispense valves without compromising reliability.

Featuring welded stainless-steel construction and a wide selection of seal elastomers, this robust valve is suitable for flowing both gases and liquids in extreme environments. The valve design was optimized to achieve a perfect balance between switching and sealing performance making it ideal for a wide variety of applications such as CubeSat propulsion, precision combustion systems, gas chromatography, scanning electron microscopes, medical devices and other OEM applications.

Performance parameters can be optimized to meet specific application requirements. Contact your Lee Sales Engineer for additional technical assistance and application information.



- Compact size
- Light weight: 4.7 grams
- Low internal volume: 62 µL
- Operating pressures up to 800 psig
- Operating temperatures up to 275°F (135°C)
- Flow capacity: 4100 Lohms (54 SLPM @ 800 psid, air; 70°F, Ref. Cv = 0.005)
- Response time as fast as 0.5 ms
- Spike & hold drive required (reference Lee drawing number LFIX1002250A for schematic)
- Wetted materials: FeCr alloy, 316 SS and seal material
- Recommended filtration: 17 microns



PART NUMBER	SPIKE VOLTAGE (Vdc)	HOLD VOLTAGE (Vdc)	POWER AT HOLDING VOLTAGE (mW)	OPERATING PRESSURE RANGE (psig)	AMBIENT TEMPERATURE RANGE	SEAL MATERIAL
IEPA1211141H	12	1.6	250	0-800	0 to 120°F (-17 to 49°C)	FKM
IEPA2411141H	24	3.0	250	0-800	0 to 120°F (-17 to 49°C)	FKM
IEPA1221141H	12	1.6	250	0-800	0 to 275°F (-17 to 135°C)	FKM
IEPA2421141H	24	3.0	250	0-800	0 to 275°F (-17 to 135°C)	FKM
IEPA1211541H	12	1.6	250	0-300	40 to 120°F (4 to 49°C)	FFKM
IEPA2411541H	24	3.0	250	0-300	40 to 120°F (4 to 49°C)	FFKM
IEPA1221541H	12	1.6	250	0-300	40 to 275°F (4 to 135°C)	FFKM
IEPA2421541H	24	3.0	250	0-300	40 to 275°F (4 to 135°C)	FFKM
IEPA1211241H	12	1.6	250	0-800	-20 to 120°F (-29 to 49°C)	EPDM
IEPA2411241H	24	3.0	250	0-800	-20 to 120°F (-29 to 49°C)	EPDM

**The Lohm is a measure of flow resistance. Additional information can be found on the reverse side and at www.theleeco.com.*

LEE LOHM LAWS

The Lohm Laws are a simple system of defining the fluid resistance of Lee components. Just as the "Ohm" is used in the electrical industry, we can use the "Liquid Ohm" or "Lohm" to quantify the resistance to flow of any fluid control component. When using the Lohm system, you can forget about coefficients of discharge and dimensional tolerances on drilled holes. These factors are automatically compensated for in the Lohm calculations, and confirmed by testing each component to establish flow tolerances.

LOHM LAWS (liquids)

The Lohm has been selected so that a 1 Lohm restriction will permit a flow of 100 gallons per minute of water with a pressure drop of 25 psi at a temperature of 80°F.

The following formulas are presented to extend the use of the Lohm laws to many different liquids, operating over a wide range of pressure conditions.

These formulas introduce compensation factors for liquid density and viscosity. They are applicable to any liquid of known properties, with minimum restrictions on pressure levels or temperature.

The units constant (K) eliminates the need to convert pressure and flow parameters to special units.

Volumetric Flow Units $L = \frac{KV}{I}\sqrt{\frac{H}{S}}$

Gravimetric Flow Units $L = \frac{KV}{w}\sqrt{HS}$

LIQUID FLOW – UNITS CONSTANT K

VOLUMETRIC FLOW UNITS			
	Pressure Units		
Flow Units	psi	bar	kPa
GPM	20	76.2	7.62
L/min	75.7	288	28.8
ml/min	75 700	288 000	28 800
in³/min	4 620	17 600	1 760

GRAVIMETRIC FLOW UNITS			
	Pressure Units		
Flow Units	psi	bar	kPa
PPH	10 000	38 100	3 810
gm/min	75 700	288 000	28 800

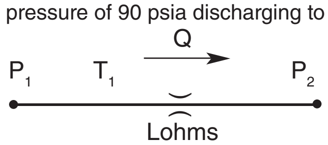
NOMENCLATURE, Liquids

L = Lohms
S = Specific gravity*
H = Differential pressure
V = Viscosity compensation factor**
I = Liquid flow rate: Volumetric
w = Liquid flow rate: Gravimetric
K = Units Constant – Liquid (see chart left)
*S = 1.0 for water at 80°F.
**V = 1.0 for water at 80°F.

(For other fluids and temperatures, contact your Lee Sales Engineer or visit us at www.theleeco.com)

LOHM LAWS (gases)

The Lohm has been selected so that a 100 Lohm restriction will permit a flow of 250 standard liters per minute of nitrogen at a temperature of 59°F, and an upsteam pressure of 90 psia discharging to atmosphere.



$$L = \frac{K f_T P_1}{Q}$$ (Sonic region) i.e. $P_1/P_2 \geq 1.9$

$$L = \frac{2 K f_T \sqrt{\Delta P \, P_2}}{Q}$$ (Subsonic region) i.e. $P_1/P_2 < 1.9$

GAS FLOW – UNITS CONSTANT K

To eliminate the need to convert pressure and flow parameters into specific units such as "psia" and "std L/min.", the table below lists values of the Units Constant "K", which is used in the Gas Flow Lohm Formulas:

VOLUMETRIC FLOW UNITS							
Abs. Pres	psia			bar		kPa	mm.Hg
Flow	SLPM	SCFM	in³/min	SLPM	SCFM	SLPM	mL/min
He	771	27.2	47 100	11 200	395	112	14 900
N_2	276	9.73	16 800	4 000	141	40.0	5 330
Air	271	9.56	16 500	3 930	139	39.3	5 230
O_2	257	9.08	15 700	3 730	132	37.3	4 970
CO_2	213	7.52	13 000	3 090	109	30.9	4 110

For more information on Lohms, visit us at www.theleeco.com or contact your Lee Sales Engineer.

NOMENCLATURE, Gases

L = Lohms
K = Units Constant – Gas (see chart left)
f_T = Temperature correction factor
P_1 = Upstream absolute pressure
P_2 = Downstream absolute pressure
Q = Gas flow rate
ΔP = $P_1 - P_2$

1. Compute the P_1/P_2 pressure ratio.
2. Select the correct formula for the flow region.
3. Look up the value of "K" for the gas.
4. Determine the temperature correction factor, "f_T".
   $f_T = 1.0$ @ room temperature (70°F)
   $$f_T = \sqrt{\frac{530}{T\,(°F) + 460}}$$
5. Use the formula to solve for the unknown.

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