SMART PUMP MODULE

The Lee Company's Smart Pump Module (SPM) combines our piezoelectric disc pumps with drive electronics and pressure sensing in a tightly integrated package, providing a miniature pump and pressure regulator solution all-in-one. It eliminates the need for a pump and proportional valve combination, which reduces system complexity, size, and cost. The SPM can be controlled with either UART or I2C communication[1] as well as an analog input, providing maximum flexibility. The SPM benefits from the disc pump's near infinite turndown ratio, pulsation-free output, wide dynamic range, and millisecond response time. The pressure sensor supplies closed-loop feedback, allowing for exceptional pressure and vacuum regulation. This standalone pump module offers precision control that is not possible with conventional pumping technology, enabling innovation in a wide variety of markets such as:

- Microfluidics
- Point-of-care diagnostics
- Breathomics

- Standalone pressure and vacuum regulation
- Up to 600 mbar pressure, -400 mbar vacuum, or 2 L/min flow depending on pump choice
- Control precision less than 0.1%[5]
- Compact and lightweight (11 g)
- Simple 5-wire interface for UART or I2C communication
- Digital and analog control options
- No setup required, plug and play operation
- Low supply voltage: 3.5 to 5.5 V

The SPM can be fitted with any of our BL, XP, LT, or HP Series pumps[3,4]. See individual pump product data sheets for performance specifications and SPM part numbers.

CONTROL INTERFACES

UART, I2C, 0-3.3 V digital/analog input compatible with the Disc Pump Control App

CONTROL MODES

Power control, closed-loop pressure and vacuum control, and bang-bang pressure control

ELECTRICAL OPERATION

5-WIRE INTERFACE

1. VCC: 3.5 to 5.5 V supply
2. UART RX or I2C SDA (3.3 V)
3. UART TX or I2C SCL (3.3 V)
4. Ground
5. 0 to 3.3 V analog input

The integrated pump drive electronics provide the required AC drive waveform of 20 to 22 kHz. Pump drive voltage must not exceed 48 Vrms (where for a typical square-wave drive Vrms ≈ Vpk). Power is limited between 0 and 1 W into pump (continuous operation) and up to 1.4 W (intermittent operation). Drive electronics also perform drive frequency optimization. Drive efficiency depends on operating use case.

OPTIONAL ACCESSORIES

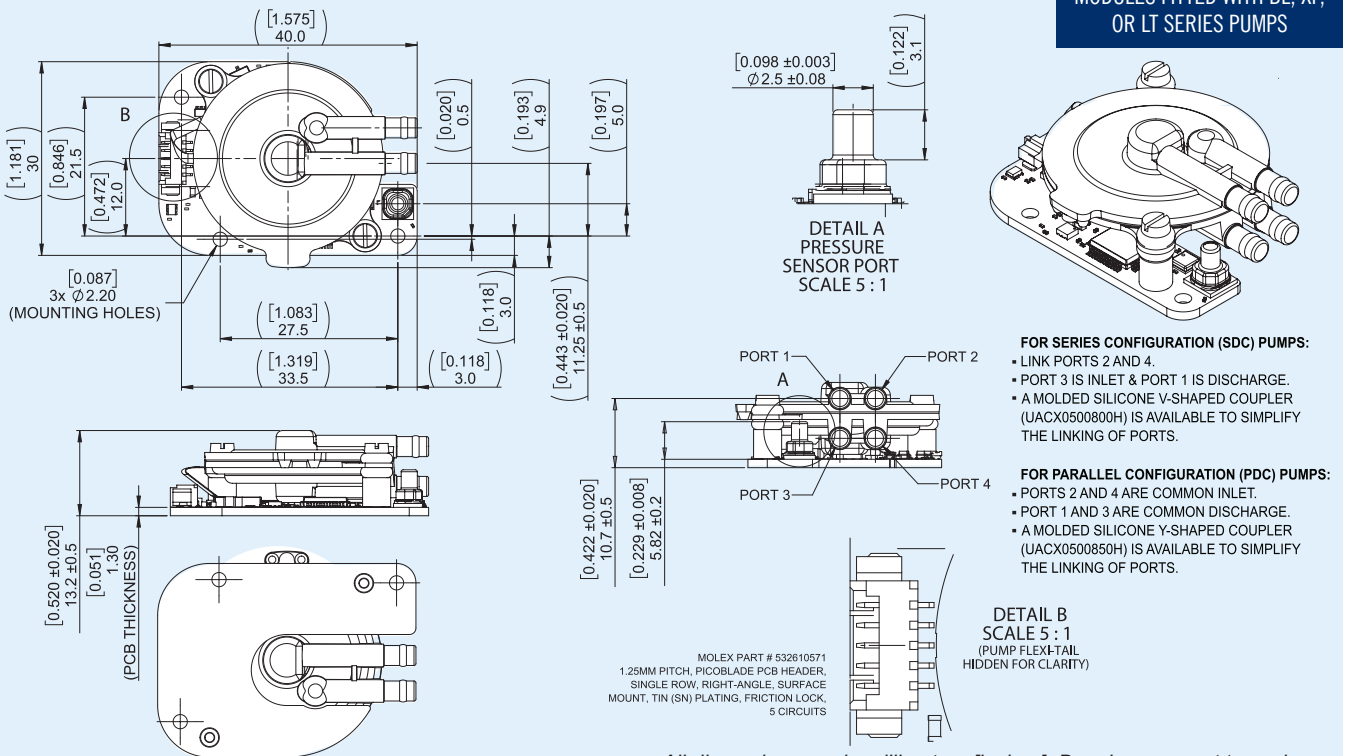
ITEM	PART NUMBER	DESCRIPTION
USB Power and Communications Cable	UACX0500400E	Enables connection between module and host PC, providing power and enabling configuration, control, and data-logging via the Disc Pump Control App.
Disc Filter	UACX0500750H	1.2 µm low pressure drop filter to protect disc pumps from the ingress of contamination and debris.
Development Kit	UEKA0500300A	This versatile plug and play starter kit enables control of solenoid valves and up to four SPMs. With a user-friendly GUI, easily accessible software, onboard pressure sensors, and integrated valve drivers, the kit offers advanced fluidic control and allows you to quickly create functional prototypes for a wide range of applications, from microfluidic and liquid handling systems to medical devices and industrial instruments.
SPM Prototype Pneumatic Adapter Kit	UACX0500600H	These adapters (C, Y, and L* shaped couplers) simplify the prototype process by streamlining all port connections to/from the pump, including connection to the onboard pressure sensor.

** Molded silicone L couplers enable simple connection to the pressure sensor. They are also available in packs of 10 under part number UACX0500900H.*

See dimensional drawings on reverse.

SMART PUMP MODULE

MODULES FITTED WITH BL, XP, OR LT SERIES PUMPS

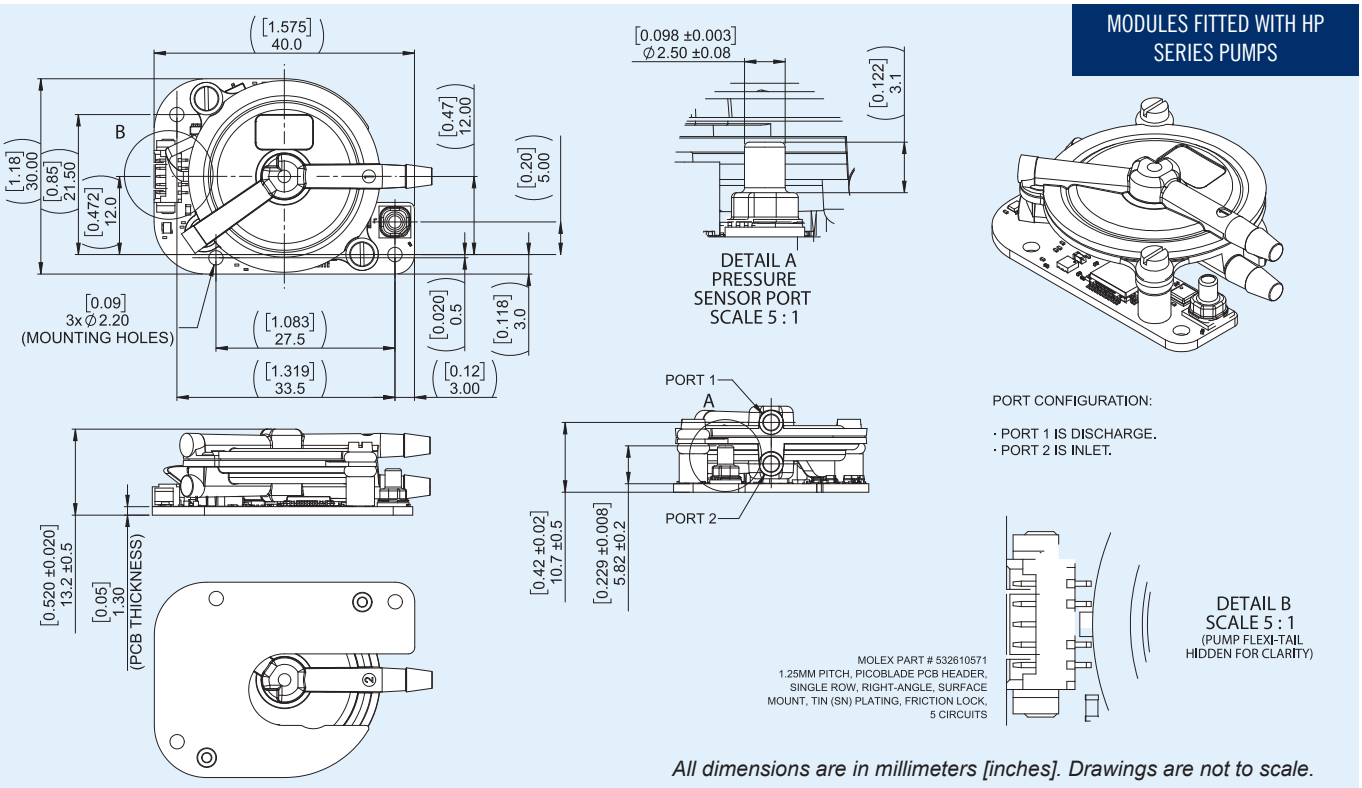


FOR SERIES CONFIGURATION (SDC) PUMPS:
- LINK PORTS 2 AND 4.
- PORT 3 IS INLET & PORT 1 IS DISCHARGE.
- A MOLDED SILICONE V-SHAPED COUPLER (UACX0500800H) IS AVAILABLE TO SIMPLIFY THE LINKING OF PORTS.

FOR PARALLEL CONFIGURATION (PDC) PUMPS:
- PORTS 2 AND 4 ARE COMMON INLET.
- PORT 1 AND 3 ARE COMMON DISCHARGE.
- A MOLDED SILICONE Y-SHAPED COUPLER (UACX0500850H) IS AVAILABLE TO SIMPLIFY THE LINKING OF PORTS.

All dimensions are in millimeters [inches]. Drawings are not to scale.

MODULES FITTED WITH HP SERIES PUMPS



PORT CONFIGURATION:

· PORT 1 IS DISCHARGE.
· PORT 2 IS INLET.

All dimensions are in millimeters [inches]. Drawings are not to scale.

Notes

1. Auto-detection function enables selection between I2C and UART as outlined in user manual. **2.** The disc pump's piezoelectric drive actuator has no stall speed. The pump can be controlled continuously between 0 and 100% maximum output. **3.** See individual pump product data sheets for performance specifications. **4.** The SPM is not available for use in certain applications. Please contact your local Lee Sales Engineer to discuss your application and pricing. **5.** Pressure and flow: requires pump under closed-loop control with suitable sensor and drive electronics.

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