

# 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. The SPM can be controlled with either UART or I2C communication<sup>1</sup> as well as an analog input, providing maximum flexibility. The module's closed-loop feedback from the pressure sensor allows for exceptional pressure and vacuum regulation, benefiting from the near-infinite turndown ratio<sup>2</sup>, pulsation-free output, wide dynamic range, and millisecond response time of the disc pump. 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:

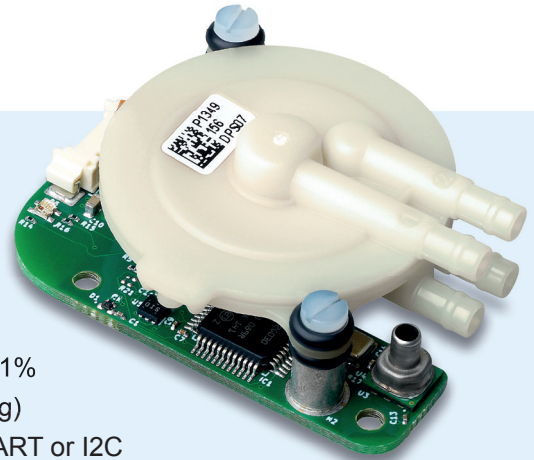
- Microfluidics
- Point-of-care diagnostics
- Breathomics

The SPM can be fitted with any of our BL, XP, LT or HP Series pumps<sup>3,4</sup>. For more information on our disc pump product range, please visit [theleeco.com/discpumps](http://theleeco.com/discpumps).

## 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 in
- The integrated pump drive electronics provide an AC drive waveform of 20-22 kHz at 0 to 60 V peak. Power is limited between 0 and 1 W into pump (continuous operation) and up to 1.4 W (intermittent operation). Drive electronics also perform

For mating cable assemblies, visit [theleeco.com/discpumps](http://theleeco.com/discpumps)



- Standalone pressure/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%
- 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

See individual pump Product Data Sheets for performance specifications.

### CONTROL INTERFACES

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

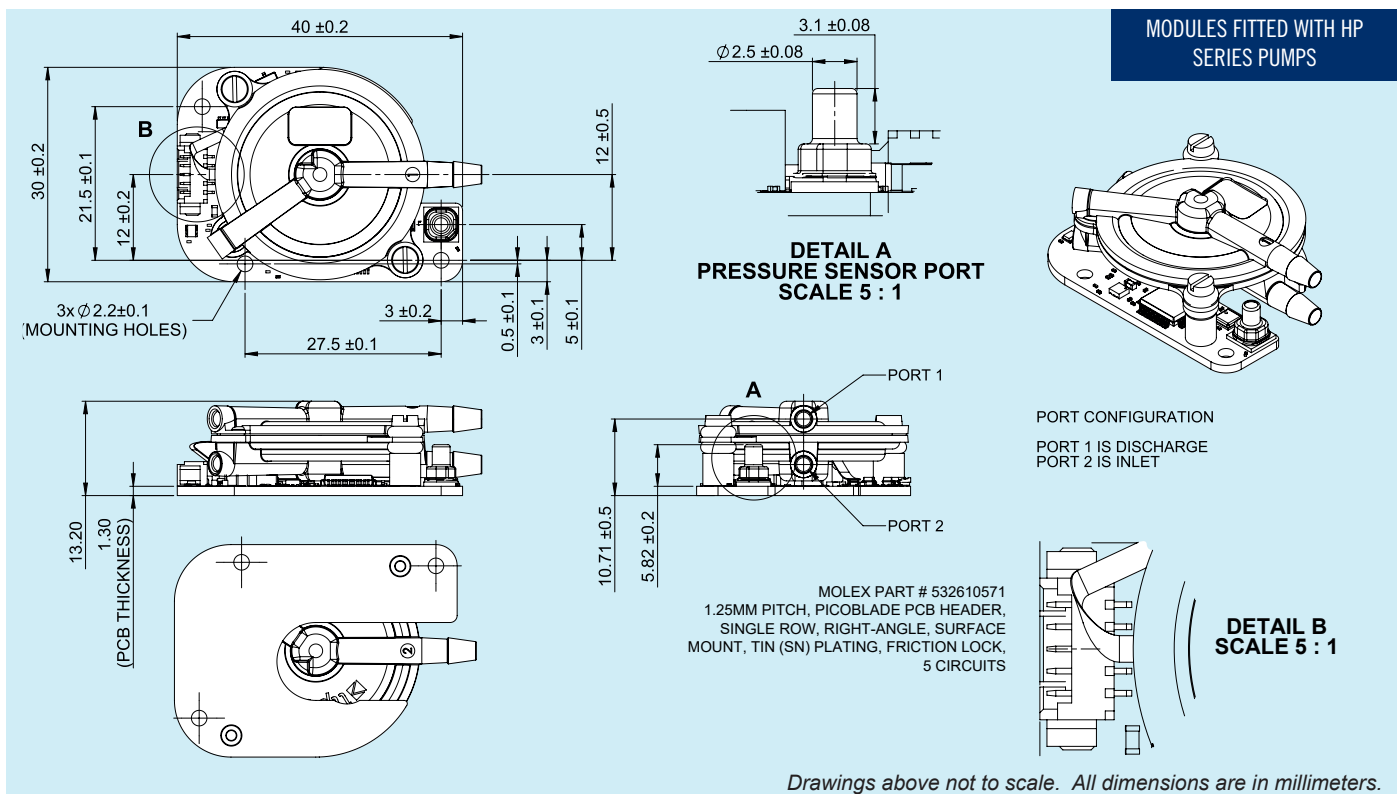
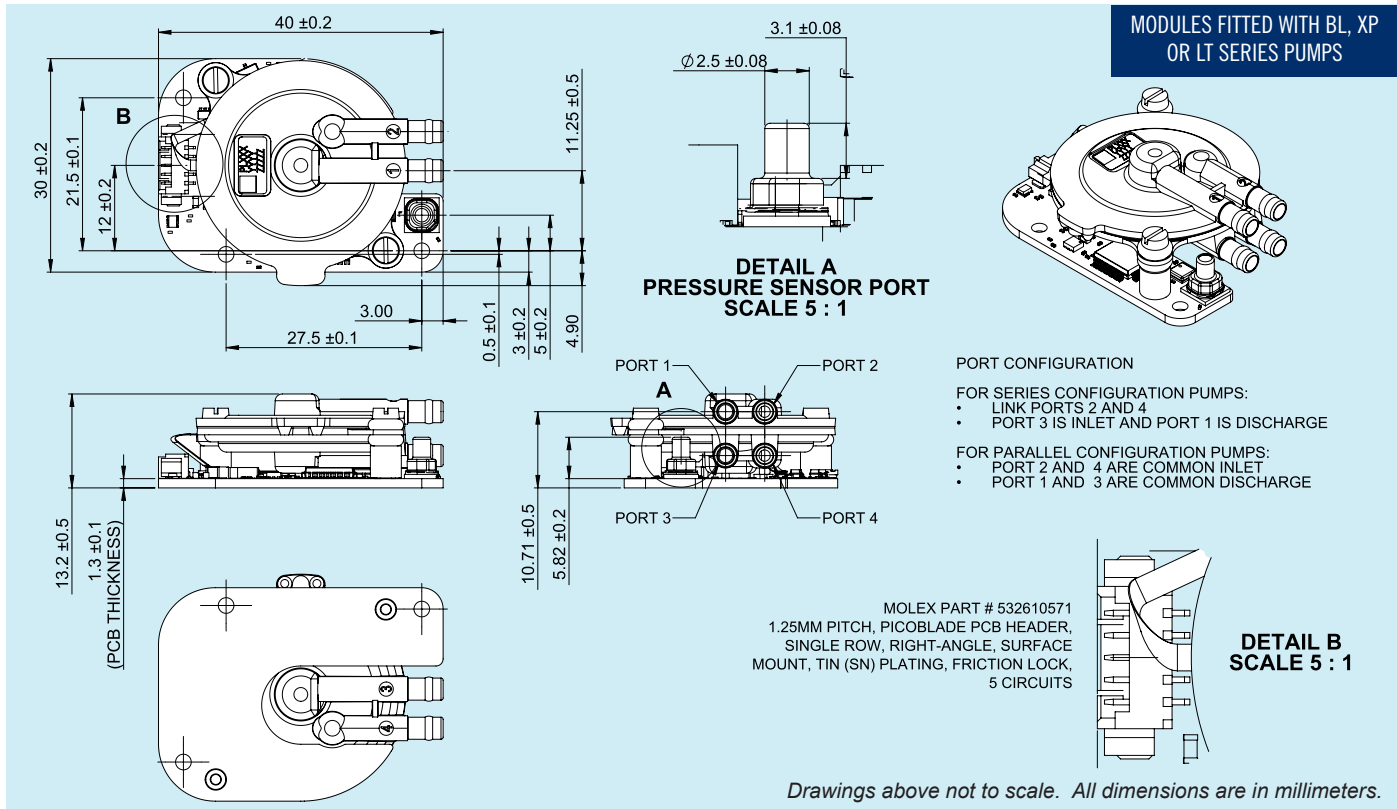
### CONTROL MODES

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

## 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                                                                                  |
| USB Flash Drive                     | UACX0500200E | Contains Disc Pump Control App, SPM Manual, technical notes, and mechanical files. Contents can also be downloaded on company website.                                                                                              |
| SPM Prototype Pneumatic Adapter Kit | UACX0500600H | Enables convenient connection between the pump and onboard pressure sensor. Adapters are made via SLA / rapid prototyping and are intended for prototyping and development purposes; they are not suitable for use in end products. |

# SMART PUMP MODULE



## 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 during the quotation stage.

*The information presented herein is based on engineering data and test results of nominal module prototype units. It is believed to be accurate and reliable and is offered as an aid to guide in the selection of Lee pump products and module prototypes. It is the responsibility of the customer to determine the suitability of the pump products and module prototypes for the intended use and the customer assumes all risk and liability whatsoever in connection therewith. The Lee Company does not warrant, guarantee or assume any obligation or liability in connection with this information. Specifications may change without notice.*