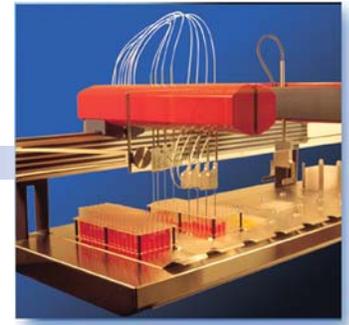


Liquid Handling Equipment

In the rapidly growing Analytical Laboratory Instrument market a definite trend can be found for more and more automation. A major need in the industry is for more precise and higher liquid handling throughput. This trend drives the need for development engineers to evaluate new or different pumping technologies. Currently, syringe and peristaltic pumps are probably the most widely used pump technologies in these liquid handling applications. With good precision the syringe pump is used to aspirate and dispense samples for analysis. There are three major drawbacks with a syringe pump. First, there is the issue of maintenance and contamination due to the wear of the plunger seal and valves. Second, dispense volume limitations are a reality, which require the need for either back-up syringe pumps or multiple aspirate/dispense cycles for increased dispense capacity. Third, syringe pumps require a substantial amount of space in an instrument. Since micro annular gear pumps are as small as a lipstick container, they allow a quantum leap in integration. Because of the dynamic capabilities, the new pump is able to dispense small volumes with high flow rates, eliminating the need for peristaltic pumps and valves for flushing.

One company that has been successful at integrating the Micro Annular Gear pump technology in their liquid handling instruments is SIAS AG, Switzerland. SIAS is a spin off from Tecan and Rosys (Quiagen). Their instrument creates a paradigm shift in laboratory automation by replacing syringe pumps in the instruments robotic arm with Micropump's Low Pressure Series Micro Annular Gear Pump.

As promoted by SIAS, their "Xantus is a unique family of state of the art robotic manipulation. The modular design allows the hardware to be configured and upgraded to suit a very wide range of applications. Xantus can have several arm modules, and each arm can carry up to 8 pipetting tips or a robotic handler. Multi-level application software facilitates programming and optimization of even the most demanding applications." Eight Micro Annular Gear Pumps are mounted inside the robotic arm performing the same functions, and more, that was required of the syringe pumps. The Micro Annular Gear Pumps have the capability of running forward and reverse for aspirating and dispensing liquids, plus they are used for flushing the pipette tips. Typical dispense volumes are as low as a few microliters with a precision of +/- 1%.



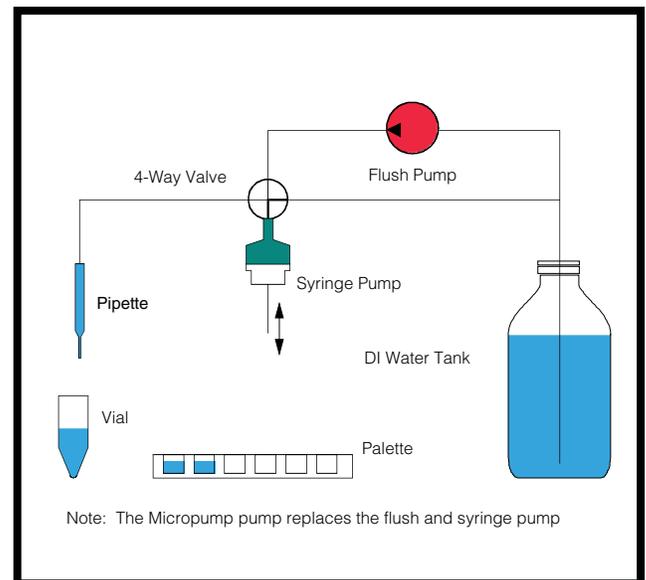
Common Pumping Requirements

Typical dispense volumes less than 1µl to 10 ml

Differential pressure < 15psi

Advantages of a Micropump Positive Displacement Pump

- Increased fluid handling flexibility is achieved by utilizing the full dynamic flow range of the pump, eliminating the need for multiple syringe pumps or multiple aspirate/dispense cycles for increased dispense capacity.
- Reduced maintenance required and no contaminants due to the wearing of the syringe plunger seal or valves.
- Size of pumps allow high degree of integration.
- Pump guarantees highest precision even for smallest dispense volumes.
- Easy to control because of highly precise DC-motors (e.g. CAN-bus)



Liquid Handling Equipment

System Configuration Variations

Other laboratory instruments, like dissolution, that require automated liquid handling, offer additional opportunities to replace syringe pumping technology with a Micro Annular Gear Pump product.

Pumping Technology

A low pressure Micro Annular Gear Pump is ideal for this application. Micropump's models include:

1. mZR-2521
2. mZR-2921
3. mZR-4622
4. mZR-7223

Pump Series		2521	2921	4622	7223	
Pump Size						
1. Construction						
Displacement Volume (µl)		1.5	3	12	48	
Measurements [mm]	L x W x H or Ø x L	Ø 13 x 75	Ø 13 x 75	Ø 16 x 87	Ø 25 x 147	
	[inch]	0.51 x 2.95	0.51 x 2.95	0.63 x 3.50	0.98 x 5.12	
Weight [g]		56	56	75	200	
	[lbs]	0.025	0.025	0.034	0.091	
Gear material	Tungsten carbide (WC-Ni)	●	●	●	●	
Case material	Stainless Steel	○	○	○	○	
	Nickel silver	●	●	●	●	
	Epoxy resin	●	●	●	●	
Bearing material	Tungsten carbide (WC-Ni)	●	●	●	●	
	Ceramics Al ₂ O ₃	○	○	○	○	
Dynamic seal material	PFE graphite reinforced	●	●	●	●	
Static seal material	VITON®	●	●	●	●	
	EPDM	○	○	○	○	
2. Characteristics						
Fluidic connection	Slip fittings	2 mm	2 mm	2 mm	5 mm	
	Manifold assembly	○	○	○	○	
Q [ml/min]	1/4"-28 UNF	■	■	■	●	
	min.	0.15	0.3	1.2	4.8	
	max.	9	18	72	288	
	[l/h]	max.	0.54	1.08	4.32	17.28
min. dosage volume	[µl]	0.25	0.5	2	5	
p _{max.} [bar]	(16 mPas)	1.5	3	5	8	
	[psi]	22	44	73	116	
Viscosity η [mPas]	min.	0.5	0.5	0.5	0.5	
	max.	50	50	50	50	
Temperature [°C]	min.	-20	-20	-20	-20	
	max.	60	60	60	60	
	optional	■	■	■	■	
Precision (coefficient of variation) [%]		1	1	1	1	
Values are correct for standard version. Customized solutions on request.						
Legend: ● = Applicable / available ○ = option / customized solution ■ = not applicable / not available						

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