DRD™ Liquid Handling — Dual Resolution Syringe DRS™

Short model to replace 3 cm syringes and pump modules

DRS Technical

The 20/300 Dual Resolution Syringe can replace a conventional 3 cm syringe and give the pump module ***much wider dynamic range with greater P & A -- all with lower maintenance.***

The DRS meters very finely down to nanoliters by our patented ***Differential Displacement*** technology, eliminating small seals and pistons. It is very robust, with huge flow power and free from the priming and bubble problems of small syringes. The technology is also called ***Dual Resolution Displacement***) because it does both Differential and traditional large volume Single displacement.

- one small device can do more than 2 or 3 conventional syringes
- dynamic range 250 nanoliters to 300 uL
- standard deviation in Differential mode typically 6 nanoliters (0.006 uL), a CV of 0.6% at 1 uL and 1.2% at 500 nanoliters.
- seals rugged and long lasting, don't leak, easy to replace.
- invention design proven over 10 years and > 10,000 installations
- easy priming without bubble traps
- accurately aspirates down to 250 nanoliters
- delivers contact-free high velocity dispensing without touch off.

with this resolution

with this flow

The cross-sectional area difference between the ID of the glass and the OD of the recessed spring-loaded bottom Piston is the same as a 100 uL syringe. When the glass tube moves relative to both the Plunger and the Piston simultaneously it gives the same ***fine resolution as a 100 uL syringe.***

Differential Displacement
up to 20 uL
(15 uL in XP3000)

Transition

When the glass tube moves relative only to the hollow top Plunger Wiper Seal it gives the same ***high flow power as a 2.5 mL syringe.***

Single Displacement
up to 300 uL

Bottom

DRS 20/300 INSTALLED IN HAMILTON PSD/4 PUMP MODULE

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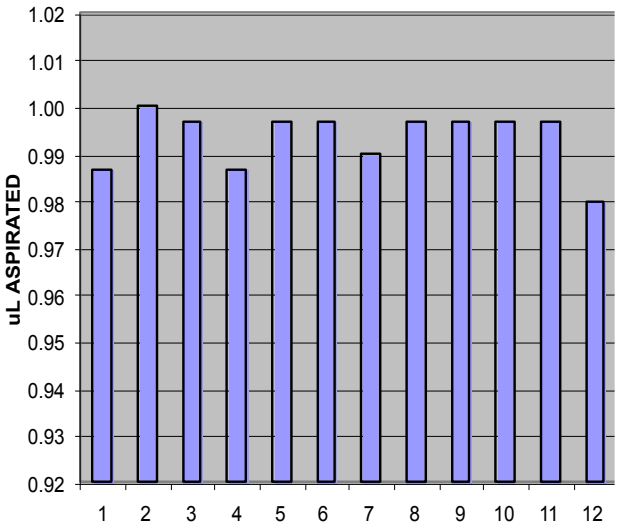
DRS 20/300 in Hamilton PSD/4 pump -- 1 uL aspiration & Blastoff example

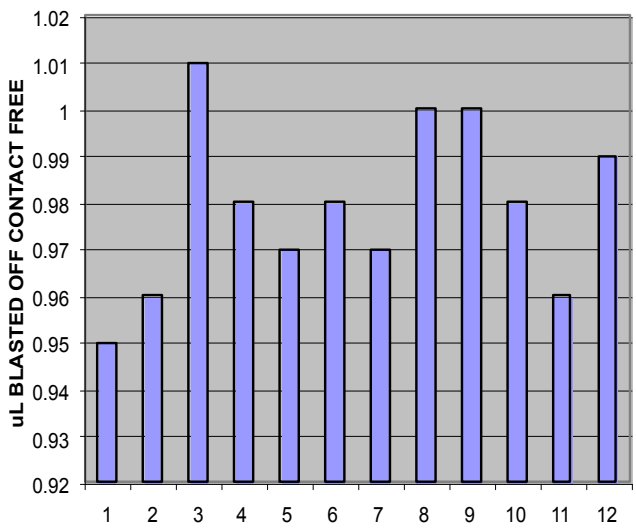
Differential Displacement will pick the sample up with a standard deviation of about 0.006 uL (6 nanoliters).

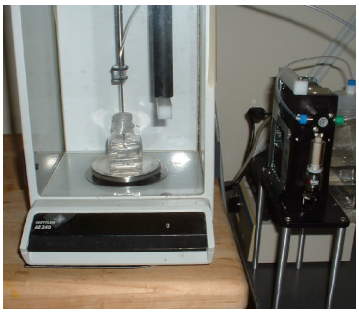
Aspiration
SD 0.006 uL, **CV 0.6%**, mean 0.99 uL



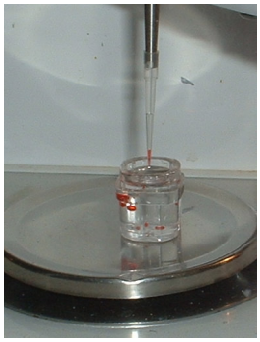
Single Displacement will blast the sample off contact-free with a standard deviation of about 0.018 uL (18 nanoliters).

Blastoff™ (contact-free delivery)
SD 0.018 uL, **CV 1.8%**, mean 0.98 uL,





Probe tip underwater on scale during a repetitive 1 uL Differential aspiration study(standard up/down cycles, weights polled automatically when stable). This setup produced the aspiration data above.



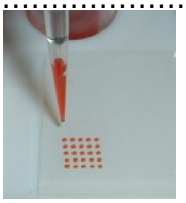
A precisely aspirated 1 uL sample in the disposable tip poised above the oil-filled cup on the scale. *One piston moving alone now blasts the sample* into the oil (several prior 1 uL blastoff globules can be seen). This setup produced the Blastoff data above.

Samples can also be gently plopped off onto slides, microplates or fluidic orifices.

The data shows that the aspiration precision is typically degraded about 3-fold by tip effects when the sample is blasted off from the disposable tips. A small amount of residual sample (1 - 3 %) may also remain inside the tip. However, because the sample was picked up so accurately and precisely to start with, and the high flow power tip escape velocity eliminates hanging drops, things are set up for optimal contact-free delivery.

Tiny samples can of course also be dispensed along with larger reagents, as in analytical or PCR applications, preserving the full P & A of the initial aspiration.

or as touchoff arrays down to 250 nL



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