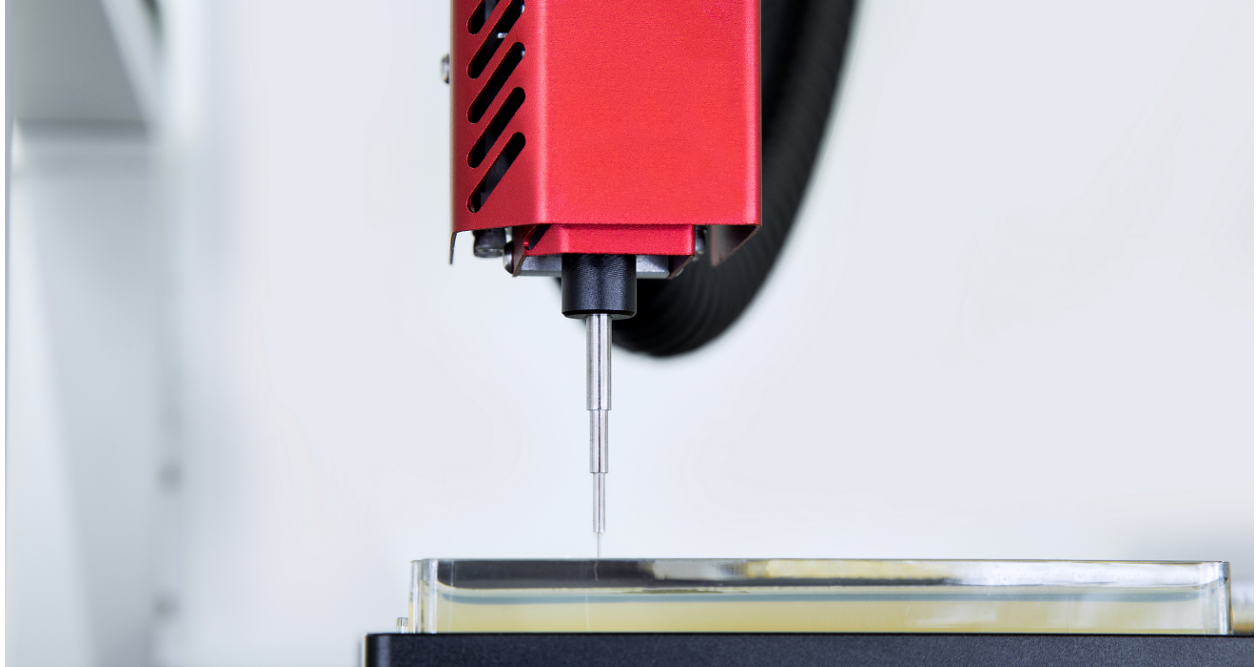


## PIXL Pinning Pressure



### Summary:

This report covers the measurement and evaluation of the pinning pressure achieved by the PIXL Precision Colony Picker, produced by Singer Instruments.

The pinning pressure was measured using a bespoke test procedure, which replicated the standard pinning functionality of the PIXL. Over the span of 80 separate pinning events the PIXL achieved an **average pressure of  $6.97 \pm 0.74 \text{ g/mm}^2$** , with a maximum recorded pressure of  $8.531 \text{ g/mm}^2$ .



## Introduction:

When Singer Instruments were asked by their customers to develop a colony picker, one of the main requirements was to outperform the achievable precision and contamination rates of pneumatic firing pins. There are serious concerns that accelerated pin firing damages and/or misses important samples and can contribute to contamination. When designing PIXL, one of the primary considerations was the maximum speed of approach to ensure no chance of microbial material becoming airborne and causing contamination; cell splashing. Meticulous analysis identified the maximum speed of approach to be 19mm/s to ensure no cell splashing, and therefore this is the default approach speed for PIXL.

PIXL uses a novel polymer (PickupLine™) to pick microbial colonies and deposit them on a variety of target plates. The pressure applied to agar plates (and colonies) is vital to ensure agar is not pierced, this guarantees that picking is repeatable and that colonies are not damaged. PIXL was designed to have a gentle picking force and therefore pressure, to never pierce agar. We have minimised the chance of contamination through our regulated speed of approach and pressure. A high speed of approach could induce contamination if cells are forcibly hit by a firing pin causing cell splashing. Regulating contact pressure on every pick is vital to ensure that agar depth can vary across plates and that contamination is minimised whilst protecting microbial samples.

## Method:

To measure the pinning pressure delivered by PIXL, a laboratory scale was used. This was positioned at the source bay location replicating the location of a source plate. The height was representative of an agar filled PlusPlate.

For the testing, a routine was produced that would hold the applied weight to allow a reading to be taken from the scale. Every applied parameter in this routine was set to default to represent a typical picking run. The applied weights were recorded for eighty consecutive pinning events to give a representative sample.

The recorded weights were then converted to pressure, accounting for the diameter of PickupLine as 1 mm.

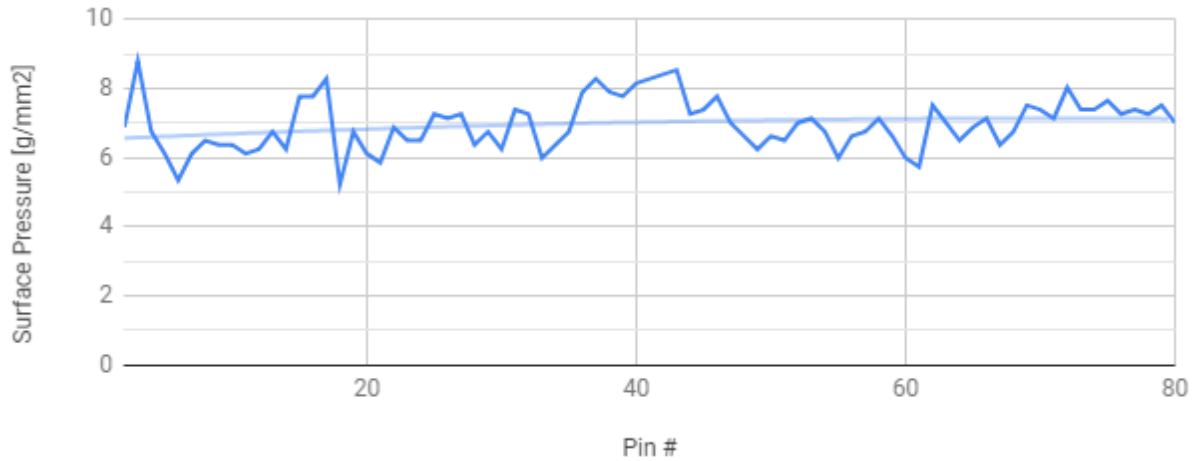
## Results:

The data from eighty consecutive pinning events is presented in Figure 1, with the raw data and calculated pressure shown in Table 1 (below).

**Figure 1 - Calculated pressure values for all pinning events.** All eighty calculated pressure values are shown with their corresponding pin number. An average is shown and suggests there is no



increase over time.



Each data point recorded is detailed below in Table 1. To account for the diameter of the PickupLine, a surface area of 0.785 mm<sup>2</sup> was used to calculate surface pressure.

A mean pressure of 6.97 g/mm<sup>2</sup> was calculated, with a standard deviation of ±0.74 g/mm<sup>2</sup>. The maximum pressure observed was 8.79 g/mm<sup>2</sup> and the minimum pressure observed was 5.22 g/mm<sup>2</sup>.

ID	Weight [g]	Pressure [g/mm2]	ID	Weight [g]	Pressure [g/mm2]	ID	Weight [g]	Pressure [g/mm2]	ID	Weight [g]	Pressure [g/mm2]
1	5.4	6.875	21	5.4	6.875	41	6.6	8.403	61	5.9	7.512
2	6.9	8.785	22	5.1	6.494	42	6.7	8.531	62	5.5	7.003
3	5.3	6.748	23	5.1	6.494	43	5.7	7.257	63	5.1	6.494
4	4.8	6.112	24	5.7	7.257	44	5.8	7.385	64	5.4	6.875
5	4.2	5.348	25	5.6	7.130	45	6.1	7.767	65	5.6	7.130
6	4.8	6.112	26	5.7	7.257	46	5.5	7.003	66	5.0	6.366
7	5.1	6.494	27	5.0	6.366	47	5.2	6.621	67	5.3	6.748
8	5.0	6.366	28	5.3	6.748	48	4.9	6.239	68	5.9	7.512
9	5.0	6.366	29	4.9	6.239	49	5.2	6.621	69	5.8	7.385
10	4.8	6.112	30	5.8	7.385	50	5.1	6.494	70	5.6	7.130
11	4.9	6.239	31	5.7	7.257	51	5.5	7.003	71	6.3	8.021
12	5.3	6.748	32	4.7	5.984	52	5.6	7.130	72	5.8	7.385
13	4.9	6.239	33	5.0	6.366	53	5.3	6.748	73	5.8	7.385
14	6.1	7.767	34	5.3	6.748	54	4.7	5.984	74	6.0	7.639
15	6.1	7.767	35	6.2	7.894	55	5.2	6.621	75	5.7	7.257
16	6.5	8.276	36	6.5	8.276	56	5.3	6.748	76	5.8	7.385
17	4.1	5.220	37	6.2	7.894	57	5.6	7.130	77	5.7	7.257
18	5.3	6.748	38	6.1	7.767	58	5.2	6.621	78	5.9	7.512
19	4.8	6.112	39	6.4	8.149	59	4.7	5.984	79	5.5	7.003



20	4.6	5.857	40	6.5	8.276	60	4.5	5.730	80	5.9	7.512
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## Conclusion:

PIXL has demonstrated a consistent picking pressure of under  $9\text{g/mm}^2$ , with an average pressure of approximately  $7\text{g/mm}^2$ . This has been attained through regulated contact pressure on every pick, ensuring protection of both the agar surface and microbial sample, whilst minimising the risk of contamination.

