Blocked Area Calculation Report (Step-wise)

File: 0.4b 1hz 30um.csv
Pressure: 0.4 bar
Device: 30um
Date: 2026-01-02 16:49:57

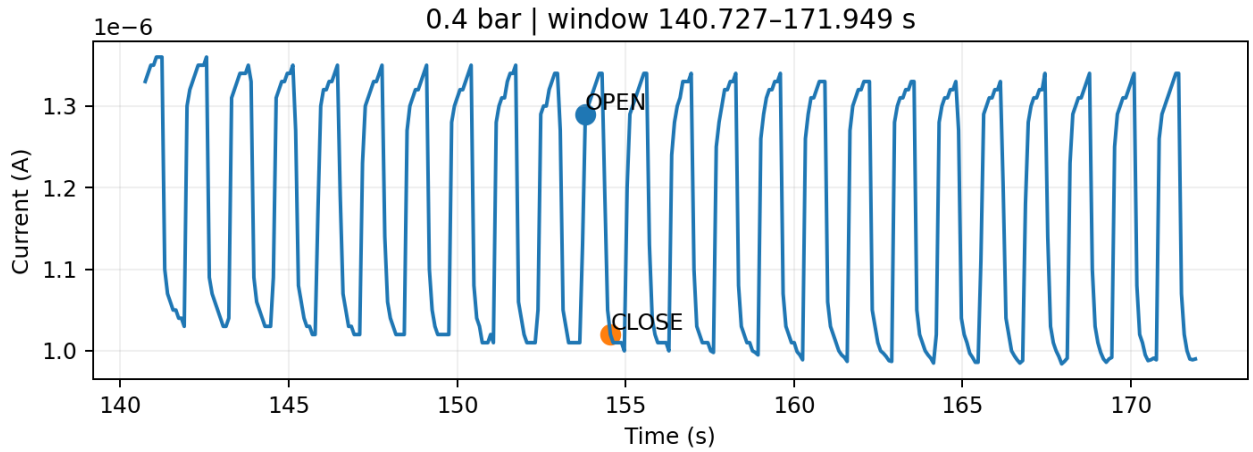
1) Selected window

Window start = 140.726978 s, Window end = 171.948580 s

2) Picked points (NO averaging; single raw datapoint)

Point	Snapped time (s)	Snapped current (A)
OPEN	153.805543	1.290000000000e-06
CLOSE	154.549913	1.020000000000e-06

3) Window plot with selected points



4) Experimental blocked area (exact order)

```
V = 1.0 V
ρ = 0.0896 Ω·m, l = 0.000145 m, w = 0.0001 m, d = 3e-05 m
A = w×d = 3e-09 m², ρl = ρ×l = 1.2992e-05 Ω·m²
G_open = |I_open/V| = |1.290000000000e-06/1.0| = 1.290000000000e-06 S
G_closed = |I_close/V| = |1.020000000000e-06/1.0| = 1.020000000000e-06 S
R_open = 1/G_open = 775194 Ω
R_closed = 1/G_closed = 980392 Ω
ΔR = R_closed − R_open = 205198 Ω
k = (A×ΔR)/(ρl) = 47.3826
A′/A = 1/(1+k) = 0.0206686
Blocked% = 100×(1 − A′/A) = 97.9331 %
```

5) Theoretical blocked area (PDF-style: sector − triangle)

[1] Input Parameters

```
Pressure (P) = 0.4 bar = 40000 Pa
Membrane radius (a) = 50.00 μm = 0.00500 cm
Membrane thickness (t) = 1.50 μm = 0.00015 cm
Young's modulus (E) = 7.00e+06 Pa
Poisson's ratio (ν) = 0.3
Constant (C_f) = 2.67
Effective modulus (E') = E/(1-ν) = 1.00e+07 Pa
Channel cross-section A = 3.00000e-05 cm²
```

[2] Intermediate Calculations

Factor = (a × P × C_f) / (E' × t)
= (0.00500 × 40000 × 2.67) / (1.00e+07 × 0.00015)
= 0.35600
w = a × factor^(1/3)
= 0.00500 × (0.35600)^(1/3)
= 0.00354 cm = 35.44 µm
r = (a² + w²) / (2w)
= (5.00000e-03 + 1.25576e-05) / (2 × 0.00354)
= 0.00530 cm
θ = 2 × arcsin(a / r)
= 2 × arcsin(0.00500 / 0.00530)
= 2.46626 rad
Triangle Area = a × (r − w)
= 0.00500 × (0.00530 − 0.00354)
= 8.77790e-06 cm²
Sector Area = 0.5 × r² × θ
= 0.5 × 0.00530² × 2.46626
= 3.46288e-05 cm²
Arc (Blocked) Area = Sector − Triangle
= 3.46288e-05 − 8.77790e-06
= 2.58509e-05 cm²

[3] Final Result

Blocked Area (%) = (Arc Area / Channel Area) × 100
= (2.58509e-05 / 3.00000e-05) × 100
= 86.17 %