PRODUCTION QUALITY CONTROL · AUTOMATED TEST RECORD

EVO TEST CERTIFICATE

Certificate ref: EVO-TESTER-001-9f5198d9-85224593 · attempt 1

PASSED

UNIT & TEST IDENTIFICATION

Unit serial (QR)	**EVOTEST01**	Station firmware	—
Product size	**22 mm**	Tested by	**George · Tech (EVOP000001)**
Box barcode	**799192291265**	Date & time tested	**2026/08/04, 12:32:36**
Test attempt	**#1**	Cycle duration	**30.2 s**
Test station	**EVO-TESTER-001**		

TEST RESULTS

#	Result	Measurement	Outcome
1	**PRESSURE LEAK**	End kPa: 583.64 · Hold ms: 5000 · Drop kPa: 3.06 · Start kPa: 586.70 · Target kPa: 600 · Drop limit kPa: 10 · Leak rate kPa s: 0.61	**PASS**
2	**PLUNGER OPENING**	VACUUM BREAK / OPENING POINT: **-2.749 kPa**	**PASS**

RESULT DETAIL

RESULT 1 · PRESSURE LEAK
PASS

Criteria: Hold ms: 5000 · Target kPa: 600 · Maximum drop kPa: 10
Measured: End kPa: 583.64 · Hold ms: 5000 · Drop kPa: 3.06 · Start kPa: 586.70 · Target kPa: 600 · Drop limit kPa: 10 · Leak rate kPa s: 0.61

RESULT 2 · PLUNGER OPENING
PASS

VACUUM BREAK / OPENING POINT

-2.749 kPa

Recorded 375 ms into the vacuum step.

This certificate reports the automated production test performed on the EVO unit identified above. Two results are certified: the pressure leak test, and the plunger opening test — the vacuum break and plunger opening are the same physical event, reported as the exact sensor sample captured immediately before the vacuum trace rebounds toward atmosphere. All measurements were captured by the calibrated test station listed and are stored against this serial number for traceability.

Tested by: George · Tech (EVOP000001)

Authorised by (Quality)

Date: **2026/08/04, 12:32:36**

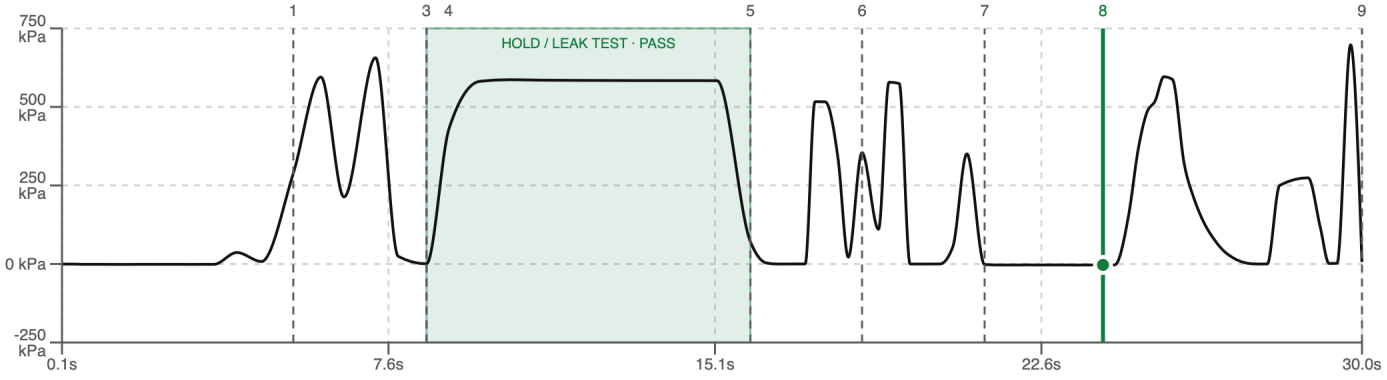
APPENDIX A — PRESSURE TRACE GRAPHS

Certificate ref EVO-TESTER-001-9f5198d9-85224593 · unit EVOTEST01 · attempt 1. Charts plot pressure (kPa) against elapsed time. Grey dashed line = size-matched reference profile, black line = measured signal. Items with no device evidence are shown as MISSING / UNRESOLVED.

COMPLETE TEST CYCLE

LEAK TEST PASS

Full device pressure trace from 0.13 s to 30.00 s. Shaded band = hold / leak-measurement window. Numbered markers = cycle stage boundaries listed below. Green marker = vacuum plunger opening event (-2.749 kPa at 24.05 s).



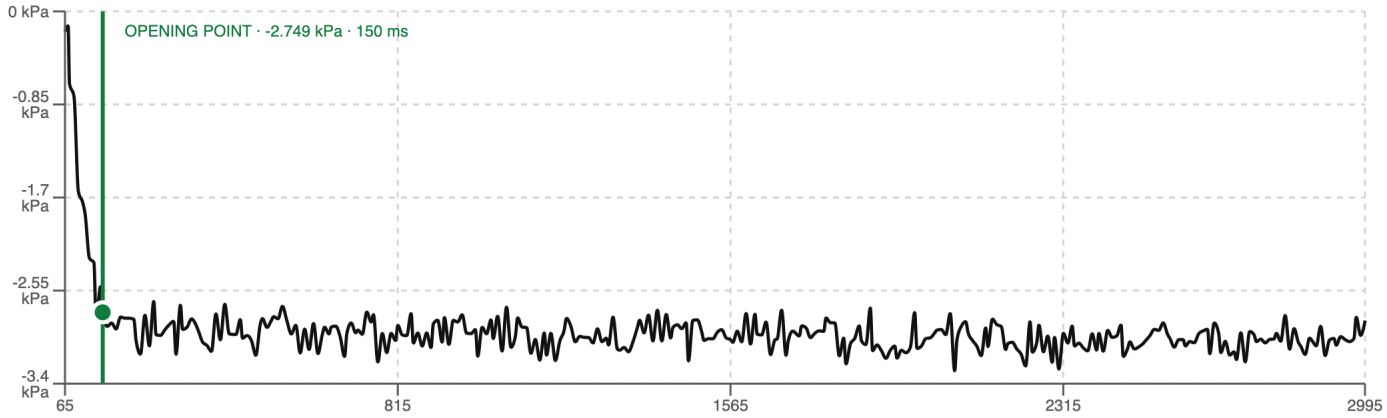
#	CYCLE STAGE / EVENT	TIME	PRESSURE
1	Product locked / loaded	5.45 s	288.14 kPa
2	Plunger down	MISSING	MISSING
3	Air push / purge	8.51 s	0.58 kPa
4	Pressure hold — leak measurement	8.51 s	0.58 kPa
5	Exhaust / vent	15.95 s	71.69 kPa
6	Plunger up / release	18.51 s	354.58 kPa
7	Vacuum pull	21.33 s	−1.65 kPa
8	Plunger opening (vacuum break)	24.05 s	−2.75 kPa
9	Recovery / end of cycle	30.00 s	7.53 kPa

Hold start pressure	**586.698 kPa**
Hold end pressure	**583.643 kPa**
Hold duration	**5000 ms**
Pressure loss	**3.055 kPa**
Leak rate	**0.611 kPa/s**
Allowed loss	**10.000 kPa**
Target pressure	**600.000 kPa**
Window	**8.51 s → 15.95 s**

22 mm BUMBLEBEE PLUNGER OPENING CURVE

PASS

Pull-down, opening point and atmospheric rebound at 111.6 Hz. Green marker = VACUUM BREAK / OPENING POINT (-2.749 kPa at 150 ms pump). Shaded band = reference tolerance envelope.



Reference: **bumblebee-22mm-flow-knee-20260804-v1**	Match: **85.0 %**	RMSE: **—**	Max profile error: **—**
Opening pressure error: **-0.037 kPa**	Opening time error: **5 ms**	Sample rate: **111.6 Hz**	