Compliance sheet — star-gasdynamics

Everything a supplier qualification, a legal review or an export check usually asks about star-gasdynamics 0.1.0, in one document.

1. Identity

Document	STAR-PKG-STAR-GASDYNAMICS-EN · v2.3 · 2026-11-14
Package	star-gasdynamics
Version	0.1.0
Capability	star.propulsion.gasdynamics
Maturity	Released & Verified (RELEASED)
Python	>=3.9
Source commit	dc09f61d
Source	https://github.com/Andrea07072000/S.T.A.R.-/tree/main/packages/star_gasdynamics

2. Licence and obligations

Apache License 2.0. You may use, copy, modify and distribute it, also commercially, and you receive a patent licence from the contributors. When you redistribute it: keep the LICENSE file and the copyright notices (and a NOTICE file, if a future version adds one), and state in modified files that you changed them. You may not use the S.T.A.R. name to endorse your product.

3. What it needs at run time

Nothing beyond the Python standard library: it works offline.

4. Integrity

SHA-256 fingerprints of the files published on this website. Check a downloaded file with:

```
python -c "import
hashlib,sys;print(hashlib.sha256(open(sys.argv[1],'rb').read()).hexdigest())"
star_gasdynamics-0.1.0-py3-none-any.whl
```

FILE	SHA-256
star_gasdynamics-0.1.0-py3-none-any.whl	963345570acc0a9acb5b0707b2da5603bd57f3fb4d986a27325f688995a16882
star_gasdynamics.py	6a7dab40d85811ce82ac4e3f45eef5f09477444c7e35eca8a43878abad1cd09c
star_gasdynamics-0.1.0-source.zip	e9c358cbebee484ec3afad43fa626d96f8e2716fc6dfe05b33c82c7c239e958f

5. What it does, and its limits

Isentropic flow ratios, Mach number from area ratio on either branch and normal-shock jump of a calorically perfect gas; within 1.2e-15 of scikit-aero and fluids on 600 cases for the relations they provide; reproduces the NACA Report 1135 tables; density, temperature and total-pressure ratios across the shock rest on the published table and the conservation laws only.

A calorically perfect gas only: no real-gas effects, no dissociation, no variable gamma, so the results are not valid for hot hypersonic flows whatever the Mach limit accepted. rho2/rho1, T2/T1 and p02/p01 have NO library lineage: no installed library computes them; they rest on the published table and on the conservation laws. scikit-aero's inverse of the area ratio did not converge, or converged to the other branch, in about a quarter of the 600 cases (451 and 460 usable roots per branch): those cases were not compared; recorded as a candidate observation about a third-party library, not investigated and not reported. No oblique shocks, no Prandtl–Meyer expansion, no Fanno or Rayleigh flow.

- `isentropic(mach, gamma)`: T/T0, p/p0, rho/rho0 and A/A* of a calorically perfect gas (NACA Report 1135). Reproduces the published table for gamma = 1.4 at Mach 0.5, 2, 3 and 5.
- `mach_from_area_ratio(area_ratio, gamma, supersonic)`: the inverse on the branch asked for, by bisection to the last bit. `normal_shock(mach1, gamma)`: M2 and the four ratios; reproduces the published table at Mach 2, 3 and 5 and satisfies the conservation of mass, momentum and energy across the shock.

- Measured on 600 cases (Mach 0.01 to 20, gamma 1.05 to 1.67): T/T0, p/p0, A/A*, M2 and p2/p1 within 1.2e-15 relative of scikit-aero; the pressure-temperature relation and the sonic ratios within 1.2e-15 of fluids; the Mach number from the area ratio within 2e-12 of scikit-aero where its root finder converged to the right branch.
- Every function returns finite floats (A/A* is infinite at Mach 0) or raises `ValueError`: non-numeric, boolean, NaN or infinite input, Mach outside [0, 50] (shock: [1, 50]), gamma outside [1.01, 3], an area ratio below 1 or beyond the branch, `supersonic` not a bool.

6. Export, use and certification

The package is published and freely available. That usually takes software out of export-control lists, but not every use of it: read the page on space activities and export control before using it in a controlled programme. It is not certified or qualified for flight; the evidence describes what was tested and how.

7. Citation and bill of materials

```
@software{cavazzini_star_gasdynamics_0_1_0,
  author  = {Cavazzini, Andrea},
  title   = {{star-gasdynamics}: Isentropic flow and normal shock of a perfect gas},
  version = {0.1.0},
  year    = {2026},
  url     = {https://andrea07072000.github.io/S.T.A.R.-/software/star_gasdynamics/},
  note    = {Apache-2.0. Source: https://github.com/Andrea07072000/S.T.A.R.-, commit dc09f61d}
}
```

CITATION.cff · BibTeX · SBOM CycloneDX 1.5 · SBOM SPDX 2.3

8. Warranty and liability

Provided "as is", without warranties or conditions of any kind (Apache License 2.0, sections 7 and 8), to the extent the law allows. This never excludes liability that the law does not allow to exclude.

Related: space activities and export control · acceptable use · evidence and limits · licence texts