Compliance sheet — star-wahba

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

1. Identity

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

2. Licence and obligations

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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_wahba-
0.1.0-py3-none-any.whl
```

FILE	SHA-256
star_wahba-0.1.0-py3-none-any.whl	1822bb8f136e7080bb1bd923bccaec1fc6c00eb5259250b2bbbd8e1e731745ad
star_wahba.py	57b35fe5a36575980d5786d657acbbf2c919dff6f7ed5034b7875fd530c2533b
star_wahba-0.1.0-source.zip	d30a7ca28b4a986a49d2b03c16b0ad184919f99cccc553a7aece2ab75b8a12c2

5. What it does, and its limits

Attitude from vector observations: TRIAD for two directions and Davenport's q-method (Wahba's problem) for 2 to 1000 weighted directions, with the eigenproblem solved by Jacobi rotations in the standard library; conversion to the attitude matrix and the Wahba loss; within 7e-15 of SciPy's SVD solution and 5e-16 of ahrs TRIAD on 401 attitudes.

A single-frame estimate: no filtering over time, no gyro, no covariance of the estimate, no bias estimation, no QUEST or ESOQ variants (they solve the same problem faster; this one favours robustness over speed). TRIAD and the q-method give different answers on noisy data by design: TRIAD trusts the first observation entirely. Nearly parallel observations are accepted down to 1e-12 and give an attitude that is very sensitive to noise about their common direction: the functions do not warn about it. No published numerical example is reproduced: the references (Wahba 1965, Black 1964, Davenport 1968, Markley and Crassidis) are cited for the method.

- `triad(r1, r2, b1, b2)` returns the attitude matrix A (reference to body, b = A r) that matches the first pair exactly; `q_method(refs, bodies, weights)` returns the unit quaternion (w, x, y, z), w >= 0, that minimises Wahba's loss; `rotation_matrix(q)` converts it to A; `wahba_loss` evaluates 0.5 Σ w |b - A r|² with the weights normalised to sum 1.
- TRIAD by two orthonormal triads; the q-method by the eigenvector of the largest eigenvalue of Davenport's K matrix, found with Jacobi rotations. Vectors need not be unit: only their directions are used.
- Measured on 401 attitudes with 2 to 8 weighted directions, half of them with 0.01 rad of noise: the q-method agrees with the singular-value solution of SciPy within 7e-15 in every element of the matrix, TRIAD with the TRIAD of ahrs within 5e-16.

- Every function returns floats or raises `ValueError`: vectors that are not three finite numbers or are zero, fewer than 2 or more than 1000 pairs, weights that are not positive, directions that do not fix an attitude (parallel), a zero quaternion.

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_wahba_0_1_0,
  author  = {Cavazzini, Andrea},
  title   = {{star-wahba}: Attitude from vector observations},
  version = {0.1.0},
  year    = {2026},
  url     = {https://andrea07072000.github.io/S.T.A.R.-/software/star_wahba/},
  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

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