

## hesian

briefly

[called by: [xspech](#).][calls: [packxi](#) and [dforce](#).]

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#### 1.0.1 construction of Hessian matrix

1. The routine [dforce](#) is used to compute the derivatives, with respect to interface geometry, of the force imbalance harmonics,  $[[p + B^2/2]]_j$ , which may be considered to be the “physical” constraints, and if [Igeometry.eq.3](#) then also the derivatives of the “artificial” spectral constraints,  $I_j \equiv (R_\theta X + Z_\theta Y)_j$ .
2. The input variable [Lconstraint](#) determines how the enclosed fluxes,  $\Delta\psi_t$  and  $\Delta\psi_p$ , and the helicity multiplier,  $\mu$ , vary as the geometry is varied; see [global](#) and [mp00ac](#) for more details.

#### 1.0.2 construction of eigenvalues and eigenvectors

1. If [LHevalues.eq.T](#) then the eigenvalues of the Hessian are computed using the NAG routine [NAG: F02EBF](#).
2. If [LHevectors.eq.T](#) then the eigenvalues and the eigenvectors of the Hessian are computed.
3. Note that if [Igeometry.eq.3](#), then the derivative-matrix also contains information regarding how the “artificial” spectral constraints vary with geometry; so, the eigenvalues and eigenvectors are not purely “physical”.
4. The eigenvalues and eigenvectors (if required) are written to the file `+.ext.GF.ev` as follows:

```
open(hunit,file="."//trim(ext)//".GF.ev",status="unknown",form="unformatted")
write(hunit)NGdof,Ldvr,Ldvi      ! integers; if only the eigenvalues were computed then Ldvr=Ldvi=1;
write(hunit)evalr(1:NGdof)      ! reals    ; real      part of eigenvalues;
write(hunit)evali(1:NGdof)      ! reals    ; imaginary part of eigenvalues;
write(hunit)evecr(1:NGdof,1:NGdof) ! reals    ; real      part of eigenvalues; only if Ldvr=NGdof;
write(hunit)eveci(1:NGdof,1:NGdof) ! reals    ; imaginary part of eigenvalues; only if Ldvi=NGdof;
close(hunit)
```

5. The eigenvectors are saved in columns of `evecr`, `eveci`, as described by the NAG documentation for [NAG: F02EBF](#).