

# NAG Fortran Library Routine Document

## F06FRF

**Note:** before using this routine, please read the Users' Note for your implementation to check the interpretation of ***bold italicised*** terms and other implementation-dependent details.

### 1 Purpose

F06FRF generates details of a real elementary reflection (Householder matrix),  $P$ , such that

$$P \begin{pmatrix} \alpha \\ x \end{pmatrix} = \begin{pmatrix} \beta \\ 0 \end{pmatrix}$$

where  $P$  is orthogonal,  $\alpha$  and  $\beta$  are real scalars, and  $x$  is an  $n$  element real vector.

$P$  is given in the form

$$P = I - \begin{pmatrix} \zeta \\ z \end{pmatrix} (\zeta \ z^T),$$

where  $z$  is an  $n$  element real vector and  $\zeta$  is a real scalar.

If  $x$  is such that

$$\max |x_i| \leq \max(\text{tol}, \epsilon |\alpha|)$$

where  $\epsilon$  is the ***machine precision*** and  $\text{tol}$  is a user-supplied tolerance, then  $\zeta$  is set to 0, and  $P$  can be taken to be the unit matrix. Otherwise  $1 \leq \zeta \leq \sqrt{2}$ .

### 2 Specification

```
SUBROUTINE F06FRF (N, ALPHA, X, INCX, TOL, ZETA)
  INTEGER          N, INCX
  double precision ALPHA, X(*), TOL, ZETA
```

### 3 Description

None.

### 4 References

None.

### 5 Parameters

- |    |  |                     |
|----|--|---------------------|
| 1: | N – INTEGER  | <i>Input</i>        |
|    | <i>On entry:</i> $n$ , the number of elements in $x$ and $z$ . |                     |
| 2: | ALPHA – <b><i>double precision</i></b>                         | <i>Input/Output</i> |
|    | <i>On entry:</i> the scalar $\alpha$ .                         |                     |
|    | <i>On exit:</i> the scalar $\beta$ .                           |                     |
| 3: | X(*) – <b><i>double precision</i></b> array                    | <i>Input/Output</i> |
|    | <i>On entry:</i> the vector $x$ .                              |                     |
|    | <i>On exit:</i> the vector $z$ .                               |                     |

- 4: INCX – INTEGER *Input*  
*On entry:* the increment in the subscripts of X between successive elements of  $x$ .  
*Constraint:* INCX > 0.
- 5: TOL – *double precision* *Input*  
*On entry:* the value  $tol$ .
- 6: ZETA – *double precision* *Output*  
*On exit:* the scalar  $\zeta$ .

## 6 Error Indicators and Warnings

None.

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