

# NAG Library Routine Document

## F06REF

**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

F06REF returns, via the function name, the value of the 1-norm, the  $\infty$ -norm, the Frobenius norm, or the maximum absolute value of the elements of a real  $n$  by  $n$  symmetric band matrix.

### 2 Specification

```
FUNCTION F06REF (NORM, UPLO, N, K, AB, LDAB, WORK)
REAL (KIND=nag_wp) F06REF
INTEGER           N, K, LDAB
REAL (KIND=nag_wp) AB(LDAB,*), WORK(*)
CHARACTER(1)     NORM, UPLO
```

### 3 Description

None.

### 4 References

None.

### 5 Arguments

- 1: NORM – CHARACTER(1) *Input*  
*On entry:* specifies the value to be returned.  
 NORM = '1' or 'O'  
     The 1-norm.  
 NORM = 'I'  
     The  $\infty$ -norm (= the 1-norm for a symmetric matrix).  
 NORM = 'F' or 'E'  
     The Frobenius (or Euclidean) norm.  
 NORM = 'M'  
     The value  $\max_{i,j} |a_{ij}|$  (not a norm).  
*Constraint:* NORM = '1', 'O', 'I', 'F', 'E' or 'M'.
- 2: UPLO – CHARACTER(1) *Input*  
*On entry:* specifies whether the upper or lower triangular part of  $A$  is stored.  
 UPLO = 'U'  
     The upper triangular part of  $A$  is stored.  
 UPLO = 'L'  
     The lower triangular part of  $A$  is stored.  
*Constraint:* UPLO = 'U' or 'L'.

- 3: N – INTEGER *Input*  
*On entry:*  $n$ , the order of the matrix  $A$ .  
 When  $N = 0$ , F06REF returns zero.  
*Constraint:*  $N \geq 0$ .
- 4: K – INTEGER *Input*  
*On entry:*  $k$ , the number of subdiagonals or superdiagonals of the matrix  $A$ .  
*Constraint:*  $K \geq 0$ .
- 5: AB(LDAB,\*) – REAL (KIND=nag\_wp) array *Input*  
**Note:** the second dimension of the array AB must be at least  $N$ .  
*On entry:* the  $n$  by  $n$  symmetric band matrix  $A$ .  
 The matrix is stored in rows 1 to  $k + 1$ , more precisely,  
     if UPLO = 'U', the elements of the upper triangle of  $A$  within the band must be stored with  
     element  $A_{ij}$  in  $AB(k + 1 + i - j, j)$  for  $\max(1, j - k) \leq i \leq j$ ;  
     if UPLO = 'L', the elements of the lower triangle of  $A$  within the band must be stored with  
     element  $A_{ij}$  in  $AB(1 + i - j, j)$  for  $j \leq i \leq \min(n, j + k)$ .
- 6: LDAB – INTEGER *Input*  
*On entry:* the first dimension of the array AB as declared in the (sub)program from which  
 F06REF is called.  
*Constraint:*  $LDAB \geq K + 1$ .
- 7: WORK(\*) – REAL (KIND=nag\_wp) array *Workspace*  
**Note:** the dimension of the array WORK must be at least  $\max(1, N)$  if NORM = '1', 'O' or 'I', and  
 at least 1 otherwise.

## 6 Error Indicators and Warnings

None.

## 7 Accuracy

Not applicable.

## 8 Parallelism and Performance

F06REF is not threaded in any implementation.

## 9 Further Comments

None.

## 10 Example

None.

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