

# NAG Library Routine Document

## F06ZPF (ZHERK)

**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

F06ZPF (ZHERK) performs one of the Hermitian rank- $k$  update operations

$$C \leftarrow \alpha AA^H + \beta C \quad \text{or} \quad C \leftarrow \alpha A^H A + \beta C$$

where  $A$  is a complex matrix,  $C$  is an  $n$  by  $n$  complex Hermitian matrix, and  $\alpha$  and  $\beta$  are real scalars.

### 2 Specification

SUBROUTINE F06ZPF (UPLO, TRANS, N, K, ALPHA, A, LDA, BETA, C, LDC)

```

INTEGER          N, K, LDA, LDC
REAL (KIND=nag_wp) ALPHA, BETA
COMPLEX (KIND=nag_wp) A(LDA,*), C(LDC,*)
CHARACTER(1)     UPLO, TRANS

```

The routine may be called by its BLAS name *zherk*.

### 3 Description

None.

### 4 References

None.

### 5 Parameters

- 1: UPLO – CHARACTER(1) *Input*  
*On entry:* specifies whether the upper or lower triangular part of  $C$  is stored.  
UPLO = 'U'  
The upper triangular part of  $C$  is stored.  
UPLO = 'L'  
The lower triangular part of  $C$  is stored.  
*Constraint:* UPLO = 'U' or 'L'.
- 2: TRANS – CHARACTER(1) *Input*  
*On entry:* specifies the operation to be performed.  
TRANS = 'N'  
 $C \leftarrow \alpha AA^H + \beta C$ .  
TRANS = 'C'  
 $C \leftarrow \alpha A^H A + \beta C$ .  
*Constraint:* TRANS = 'N' or 'C'.

- 3: N – INTEGER *Input*  
*On entry:*  $n$ , the order of the matrix  $C$ ; the number of rows of  $A$  if TRANS = 'N', or the number of columns of  $A$  if TRANS = 'T' or 'C'.  
*Constraint:*  $N \geq 0$ .
- 4: K – INTEGER *Input*  
*On entry:*  $k$ , the number of columns of  $A$  if TRANS = 'N', or the number of rows of  $A$  if TRANS = 'T' or 'C'.  
*Constraint:*  $K \geq 0$ .
- 5: ALPHA – REAL (KIND=nag\_wp) *Input*  
*On entry:* the scalar  $\alpha$ .
- 6: A(LDA,\*) – COMPLEX (KIND=nag\_wp) array *Input*  
**Note:** the second dimension of the array  $A$  must be at least  $\max(1, K)$  if TRANS = 'N' and at least  $\max(1, N)$  if TRANS = 'T' or 'C'.  
*On entry:* the matrix  $A$ ;  $A$  is  $n$  by  $k$  if TRANS = 'N', or  $k$  by  $n$  if TRANS = 'T' or 'C'.
- 7: LDA – INTEGER *Input*  
*On entry:* the first dimension of the array  $A$  as declared in the (sub)program from which F06ZPF (ZHERK) is called.  
*Constraints:*  
     if TRANS = 'N',  $LDA \geq \max(1, N)$ ;  
     if TRANS = 'T' or 'C',  $LDA \geq \max(1, K)$ .
- 8: BETA – REAL (KIND=nag\_wp) *Input*  
*On entry:* the scalar  $\beta$ .
- 9: C(LDC,\*) – COMPLEX (KIND=nag\_wp) array *Input/Output*  
**Note:** the second dimension of the array  $C$  must be at least  $\max(1, N)$ .  
*On entry:* the  $n$  by  $n$  Hermitian matrix  $C$ .  
     If UPLO = 'U', the upper triangular part of  $C$  must be stored and the elements of the array below the diagonal are not referenced.  
     If UPLO = 'L', the lower triangular part of  $C$  must be stored and the elements of the array above the diagonal are not referenced.  
*On exit:* the updated matrix  $C$ . The imaginary parts of the diagonal elements are set to zero.
- 10: LDC – INTEGER *Input*  
*On entry:* the first dimension of the array  $C$  as declared in the (sub)program from which F06ZPF (ZHERK) is called.  
*Constraint:*  $LDC \geq \max(1, N)$ .

## 6 Error Indicators and Warnings

None.

## 7 Accuracy

Not applicable.

## **8 Further Comments**

None.

## **9 Example**

None.

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