

# NAG Fortran Library Routine Document

## F06ZCF (ZHEMM)

**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

F06ZCF (ZHEMM) performs one of the matrix-matrix operations

$$C \leftarrow \alpha AB + \beta C \quad \text{or} \quad C \leftarrow \alpha BA + \beta C$$

where  $A$  is a complex Hermitian matrix,  $B$  and  $C$  are  $m$  by  $n$  complex matrices, and  $\alpha$  and  $\beta$  are complex scalars.

### 2 Specification

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SUBROUTINE F06ZCF (SIDE, UPLO, M, N, ALPHA, A, LDA, B, LDB, BETA, C,
1                LDC)
    INTEGER          M, N, LDA, LDB, LDC
    complex*16      ALPHA, A(LDA,*), B(LDB,*), BETA, C(LDC,*)
    CHARACTER*1      SIDE, UPLO

```

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

### 3 Description

None.

### 4 References

None.

### 5 Parameters

- 1: SIDE – CHARACTER\*1 *Input*  
*On entry:* specifies whether  $B$  is operated on from the left or the right, as follows:  
 if SIDE = 'L',  $B$  is pre-multiplied from the left;  
 if SIDE = 'R',  $B$  is post-multiplied from the right.  
*Constraint:* SIDE = 'L' or 'R'.
- 2: UPLO – CHARACTER\*1 *Input*  
*On entry:* specifies whether the upper or lower triangular part of  $A$  is stored as follows:  
 if UPLO = 'U', the upper triangular part of  $A$  is stored;  
 if UPLO = 'L', the lower triangular part of  $A$  is stored.  
*Constraint:* UPLO = 'U' or 'L'.
- 3: M – INTEGER *Input*  
*On entry:*  $m$ , the number of rows of the matrices  $B$  and  $C$ ; the order of  $A$  if SIDE = 'L'.  
*Constraint:*  $M \geq 0$ .

- 4: N – INTEGER *Input*  
*On entry:*  $n$ , the number of columns of the matrices  $B$  and  $C$ ; the order of  $A$  if SIDE = 'R'.  
*Constraint:*  $N \geq 0$ .
- 5: ALPHA – *complex\*16* *Input*  
*On entry:* the scalar  $\alpha$ .
- 6: A(LDA,\*) – *complex\*16* array *Input*  
**Note:** the second dimension of the array A must be at least  $\max(1, M)$  if SIDE = 'L' and at least  $\max(1, N)$  if SIDE = 'R'.  
*On entry:* the Hermitian matrix  $A$ ;  $A$  is  $m$  by  $m$  if SIDE = 'L', or  $n$  by  $n$  if SIDE = 'R'. If UPLO = 'U', the upper triangle of  $A$  must be stored and the elements of the array below the diagonal are not referenced; if UPLO = 'L', the lower triangle of  $A$  must be stored and the elements of the array above the diagonal are not referenced.
- 7: LDA – INTEGER *Input*  
*On entry:* the first dimension of the array A as declared in the (sub)program from which F06ZCF (ZHEMM) is called.  
*Constraint:*  $LDA \geq \max(1, M)$  if SIDE = 'L';  $LDA \geq \max(1, N)$  if SIDE = 'R'.
- 8: B(LDB,\*) – *complex\*16* array *Input*  
**Note:** the second dimension of the array B must be at least  $\max(1, N)$ .  
*On entry:* the  $m$  by  $n$  matrix  $B$ .
- 9: LDB – INTEGER *Input*  
*On entry:* the first dimension of the array B as declared in the (sub)program from which F06ZCF (ZHEMM) is called.  
*Constraint:*  $LDB \geq \max(1, M)$ .
- 10: BETA – *complex\*16* *Input*  
*On entry:* the scalar  $\beta$ .
- 11: C(LDC,\*) – *complex\*16* array *Input/Output*  
**Note:** the second dimension of the array C must be at least  $\max(1, N)$ .  
*On entry:* the  $m$  by  $n$  matrix  $C$ . If BETA = 0, C need not be set.  
*On exit:* the updated matrix  $C$ .
- 12: LDC – INTEGER *Input*  
*On entry:* the first dimension of the array C as declared in the (sub)program from which F06ZCF (ZHEMM) is called.  
*Constraint:*  $LDC \geq \max(1, M)$ .

## 6 Error Indicators and Warnings

None.

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