

# NAG Library Routine Document

## F06CAF

**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

F06CAF generates a complex Givens plane rotation having real cosine.

### 2 Specification

```
SUBROUTINE F06CAF (A, B, C, S)
REAL (KIND=nag_wp) C
COMPLEX (KIND=nag_wp) A, B, S
```

### 3 Description

F06CAF generates a complex Givens plane rotation with parameters  $c$  (real  $\geq 0$ ) and  $s$  (complex), such that, given complex  $a$  and  $b$ :

$$\begin{pmatrix} c & \bar{s} \\ -s & c \end{pmatrix} \begin{pmatrix} a \\ b \end{pmatrix} = \begin{pmatrix} d \\ 0 \end{pmatrix}.$$

If  $a$  is real, then  $d$  is also real. On exit,  $b$  is overwritten by  $t$ , the tangent of the rotation;  $c$  and  $s$  can be reconstructed from the single stored value  $t$ , by a subsequent call to F06CCF.

If  $|b| < \epsilon|a|$ , where  $\epsilon$  is the *machine precision*, the routine sets  $c = 1$  and  $s = t$ .

Note that  $t$  is always set to  $b/a$ , unless overflow would occur, in which case the routine returns the value of the expression

$$\text{CMPLX}(flmax \times \text{sign}(\text{Re}(b)/a), flmax \times \text{sign}(\text{Im}(b)/a));$$

$flmax$  is the real value given by 1/(X02AMF).

### 4 References

None.

### 5 Arguments

- |    |  |                     |
|----|--|---------------------|
| 1: | A – COMPLEX (KIND=nag_wp)  | <i>Input/Output</i> |
|    | <i>On entry:</i> the value $a$ , the first element of the vector which determines the rotation.  |                     |
|    | <i>On exit:</i> the value $d$ .  |                     |
| 2: | B – COMPLEX (KIND=nag_wp)  | <i>Input/Output</i> |
|    | <i>On entry:</i> the value $b$ , the second element of the vector which determines the rotation. |                     |
|    | <i>On exit:</i> the value $t$ , the tangent of the rotation.                                     |                     |
| 3: | C – REAL (KIND=nag_wp)   | <i>Output</i>       |
|    | <i>On exit:</i> the value $c$ , the cosine of the rotation.                                      |                     |

4: S – COMPLEX (KIND=nag\_wp)

*Output*

*On exit:* the value  $s$ , the sine of the rotation.

## 6 Error Indicators and Warnings

None.

## 7 Accuracy

Not applicable.

## 8 Parallelism and Performance

F06CAF is not threaded in any implementation.

## 9 Further Comments

None.

## 10 Example

None.

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