

# NAG Library Routine Document

## G01ETF

**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

G01ETF returns the value of the Landau distribution function  $\Phi(\lambda)$ , via the routine name.

### 2 Specification

```
FUNCTION G01ETF (X)
  REAL (KIND=nag_wp) G01ETF
  REAL (KIND=nag_wp) X
```

### 3 Description

G01ETF evaluates an approximation to the Landau distribution function  $\Phi(\lambda)$  given by

$$\Phi(\lambda) = \int_{-\infty}^{\lambda} \phi(\lambda) d\lambda,$$

where  $\phi(\lambda)$  is described in G01MTF, using piecewise approximation by rational functions. Further details can be found in K lb g and Schorr (1984).

### 4 References

K lb g K S and Schorr B (1984) A program package for the Landau distribution *Comp. Phys. Comm.* **31** 97–111

### 5 Arguments

1: X – REAL (KIND=nag\_wp) *Input*  
*On entry:* the argument  $\lambda$  of the function.

### 6 Error Indicators and Warnings

None.

### 7 Accuracy

At least 7 significant digits are usually correct, but occasionally only 6. Such accuracy is normally considered to be adequate for applications in experimental physics.

Because of the asymptotic behaviour of  $\Phi(\lambda)$ , which is of the order of  $\exp[-\exp(-\lambda)]$ , underflow may occur on some machines when  $\lambda$  is moderately large and negative.

### 8 Parallelism and Performance

G01ETF is not threaded in any implementation.

### 9 Further Comments

None.

## 10 Example

This example evaluates  $\Phi(\lambda)$  at  $\lambda = 0.5$ , and prints the results.

### 10.1 Program Text

```

Program g01etfe

!      G01ETF Example Program Text

!      Mark 26 Release. NAG Copyright 2016.

!      .. Use Statements ..
      Use nag_library, Only: a00acf, g01etf, nag_wp
!      .. Implicit None Statement ..
      Implicit None
!      .. Parameters ..
      Integer, Parameter          :: nin = 5, nout = 6
!      .. Local Scalars ..
      Real (Kind=nag_wp)          :: x, y
      Integer                      :: ifail
!      .. Executable Statements ..
      Write (nout,*) 'G01ETF Example Program Results'
      Write (nout,*)

!      Check for valid licence prior to calling G01ETF
      If (.Not. a00acf()) Then
         Write (nout,*) ' ** A valid licence key was not found'

      Else
!      Skip heading in data file
         Read (nin,*)

!      Display titles
         Write (nout,*) '  X              Y'
         Write (nout,*)

d_lp:   Do
         Read (nin,*,Iostat=ifail) x
         If (ifail/=0) Then
            Exit d_lp
         End If

!      Compute the value of the Landau distribution function
         y = g01etf(x)

!      Display the results
         Write (nout,99999) x, y
      End Do d_lp
      End If

99999 Format (1X,F4.1,3X,1P,E12.4)
End Program g01etfe

```

### 10.2 Program Data

G01ETF Example Program Data  
 0.5 : Value of X

### 10.3 Program Results

G01ETF Example Program Results

X	Y
0.5	3.7328E-01

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