NAG Toolbox for Matlab

s18cd

1 Purpose
s18cd returns a value of the scaled modified Bessel function \( e^{x} K_1(x) \) via the function name.

2 Syntax

\[ \text{[result, ifail]} = 	ext{s18cd}(x) \]

3 Description
s18cd evaluates an approximation to \( e^{x} K_1(x) \), where \( K_1 \) is a modified Bessel function of the second kind. The scaling factor \( e^{x} \) removes most of the variation in \( K_1(x) \).

The function uses the same Chebyshev expansions as s18ad, which returns the unscaled value of \( K_1(x) \).

4 References

5 Parameters
5.1 Compulsory Input Parameters
1: \( x \) – double scalar
   The argument \( x \) of the function.
   Constraint: \( x > 0.0 \).

5.2 Optional Input Parameters
None.

5.3 Input Parameters Omitted from the MATLAB Interface
None.

5.4 Output Parameters
1: \( \text{result} \) – double scalar
   The result of the function.

2: \( \text{ifail} \) – int32 scalar
   \( \text{ifail} = 0 \) unless the function detects an error (see Section 6).

6 Error Indicators and Warnings
Errors or warnings detected by the function:

\( \text{ifail} = 1 \)

On entry, \( x \leq 0.0 \): \( K_1 \) is undefined. On soft failure s18cd returns zero.
ifail = 2

On entry, x is too close to zero, as determined by the value of the safe-range parameter x02am: there is a danger of causing overflow. On soft failure, s18cd returns the reciprocal of the safe-range parameter.

7 Accuracy

Relative errors in the argument are attenuated when propagated into the function value. When the accuracy of the argument is essentially limited by the *machine precision*, the accuracy of the function value will be similarly limited by at most a small multiple of the *machine precision*.

8 Further Comments

None.

9 Example

```matlab
x = 0.4;
[result, ifail] = s18cd(x)
```

```
result =  
3.2587
ifail = 0
```