

NAG Toolbox for MATLAB

e04dk

1 Purpose

To supply individual optional parameters to e04dg.

2 Syntax

```
[lwsav, iwsav, rwsav, inform] = e04dk(str, lwsav, iwsav, rwsav)
```

3 Description

e04dk may be used to supply values for optional parameters to e04dg. It is only necessary to call e04dk for those parameters whose values are to be different from their default values. One call to e04dk sets one parameter value.

Each optional parameter is defined by a single character string, of up to 72 characters, consisting of one or more items. The items associated with a given option must be separated by spaces, or equals signs [=]. Alphabetic characters may be upper or lower case. The string

```
Print Level = 1
```

is an example of a string used to set an optional parameter. For each option the string contains one or more of the following items:

- a mandatory keyword;
- a phrase that qualifies the keyword;
- a number that specifies an integer or double value. Such numbers may be up to 16 contiguous characters in Fortran's I, F, E or D formats, terminated by a space if this is not the last item on the line.

Blank strings and comments are ignored. A comment begins with an asterisk (*) and all subsequent characters in the string are regarded as part of the comment.

For e04dk, each user-specified option is normally printed as it is defined, on the current advisory message unit (see x04ab), but this printing may be suppressed using the keyword **Nolist**. Thus the statement

```
[lwsav, iwsav, rwsav, inform] = e04dk('Nolist', lwsav, iwsav, rwsav);
```

suppresses printing of this and subsequent options. Printing will automatically be turned on again after a call to e04dg and may be turned on again at any time using the keyword **List**.

For e04dk printing is turned off by default, but may be turned on at any time using the keyword **List**.

Optional parameter settings are preserved following a call to e04dg and so the keyword **Defaults** is provided to allow you to reset all the optional parameters to their default values before a subsequent call to e04dg.

A complete list of optional parameters, their abbreviations, synonyms and default values is given in Section 11 of the document for e04dg.

4 References

None.

5 Parameters

5.1 Compulsory Input Parameters

1: **str** – string

A single valid option string (as described in Section 3 and in Section 11 of the document for e04dg).

2: **lwsav(120)** – logical array

3: **iwsav(610)** – int32 array

4: **rwsav(475)** – double array

The arrays **lwsav**, **iwsav** and **rwsav** **must not** be altered between calls to any of the functions e04wb, e04dg or e04dk.

5.2 Optional Input Parameters

None.

5.3 Input Parameters Omitted from the MATLAB Interface

None.

5.4 Output Parameters

1: **lwsav(120)** – logical array

2: **iwsav(610)** – int32 array

3: **rwsav(475)** – double array

The arrays **lwsav**, **iwsav** and **rwsav** **must not** be altered between calls to any of the functions e04wb, e04dg or e04dk.

4: **inform** – int32 scalar

Contains zero if a valid option string has been supplied and a value > 0 otherwise (see Section 6).

6 Error Indicators and Warnings

Errors or warnings detected by the function:

inform = 5

The supplied option is invalid. Check that the keywords are neither ambiguous nor misspelt.

7 Accuracy

Not applicable.

8 Further Comments

None.

9 Example

```
e04dg_objfun.m

function [mode, objf, objgrd, user] = e04dg_objfun(mode, n, x, nstate,
user)

    expx1 = exp(x(1));
```

```

objf = expx1*(4.0*x(1)^2+2.0*x(2)^2+4.0*x(1)*x(2)+2.0*x(2)+1.0);
if (mode == 2)
    objgrd(1) = 4.0*expx1*(2.0*x(1)+x(2)) + objf;
    objgrd(2) = 2.0*expx1*(2.0*x(2)+2.0*x(1)+1.0);
else
    objgrd = zeros(2,1);
end

```

```

x = [-1;
     1];
[cwsav,lwsav,iwsav,rwsav,ifail] = e04wb('e04dg');
[lwsav, iwsav, rwsav, inform] = e04dk('Iteration Limit = 25', lwsav,
iwsav, rwsav);
[lwsav, iwsav, rwsav, inform] = e04dk('Print Level = 1', lwsav, iwsav,
rwsav);
[lwsav, iwsav, rwsav, inform] = e04dk('Verify Level = 1', lwsav, iwsav,
rwsav);
[lwsav, iwsav, rwsav, inform] = e04dk('Maximum Step length = 100', lwsav,
iwsav, rwsav);
[iter, objf, objgrd, xOut, user, lwsav, iwsav, rwsav, ifail] = ...
    e04dg('e04dg_objfun', x, lwsav, iwsav, rwsav)

```

*** E04DGF

Parameters

```

Variables.....                2

Maximum step length.... 1.00E+02      EPS (machine precision) 1.11E-
16
Optimality tolerance... 3.26E-12      Linesearch tolerance... 9.00E-
01

Est. opt. function val.      None      Function precision..... 4.38E-
15
Verify level.....          1

Start obj chk at varble      1          Stop obj chk at varble.
2

Iteration limit.....        25          Print level.....
1

```

Verification of the objective gradients.

The objective gradients seem to be ok.

```

Directional derivative of the objective  -1.47151776E-01
Difference approximation                 -1.47151796E-01

```

J	X(J)	DX(J)	G(J)	Difference approxn	Itns
1	-1.00E+00	1.64E-07	3.67879441E-01	3.67879441E-01	OK 1
2	1.00E+00	1.84E-07	7.35758882E-01	7.35758882E-01	OK 1

```

2 Objective gradients out of the 2
set in cols 1 through 2 seem to be ok.

```

The largest relative error was 5.98E-11 in element 1

Exit from E04DGF after 10 iterations.

```
Variable      Value      Gradient value
Varbl   1      0.500000      9.1E-07
Varbl   2     -1.00000      8.3E-07

Exit E04DGF - Optimal solution found.

Final objective value =  0.5308300E-13
iter =
      10
objf =
      5.3083e-14
objgrd =
      1.0e-06 *
      0.9125
      0.8316
xOut =
      0.5000
     -1.0000
user =
      0
lwsav =
      array elided
iwsav =
      array elided
rwsav =
      array elided
ifail =
      0
```