

# Small Overview of the Integration Methods in **OpenModelica**

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## 1 Methods

Name:	dassl
Order:	1-5
Step Size Control:	true
Order Control:	true
Background:	Default integration method
Stability Region:	Adams Moulton; with colored numerical Jacobian, with interval root finding variable; depend from order

Name:	dasslsteps
Order:	1-5
Step Size Control:	true
Order Control:	true
Background:	dassl as default, but without consideration of numberOfIntervals or stepSize. Output point are internal dassl
Stability Region:	variable; depend from order

Name:	dasslwort
Order:	1-5
Step Size Control:	true
Order Control:	true
Background:	dassl; without internal root finding
Stability Region:	variable; depend from order

Name: euler  
Order: 1  
Step Size Control: false  
Order Control: false  
Background: explicit euler  
Stability Region:  $|(1, 0) \text{ Padé}| \leq 1$

Name: rungekutta  
Order: 4  
Step Size Control: false  
Order Control: false  
Background: classical Runge-Kutta method  
Stability Region:  $|(4, 0) \text{ Padé}| \leq 1$

Name: radau1  
Order: 1  
Step Size Control: false  
Order Control: false  
Background: radau IIA with one point  
Stability Region:  $|(0, 1) \text{ Padé}| \leq 1$

Name: radau3  
Order: 3  
Step Size Control: false  
Order Control: false  
Background: radau IIA with two points  
Stability Region:  $|(1, 2) \text{ Padé}| \leq 1$

Name: radau5  
Order: 5  
Step Size Control: false  
Order Control: false  
Background: radau IIA with three points  
Stability Region:  $|(2, 3) \text{ Padé}| \leq 1$

Name: lobatto2  
Order: 2  
Step Size Control: false  
Order Control: false  
Background: lobatto IIIA with two point  
Stability Region:  $|(2, 2) \text{ Padé}| \leq 1$

Name: lobatto4  
Order: 4  
Step Size Control: false  
Order Control: false  
Background: lobatto IIIA with three points  
Stability Region:  $|(3, 3) \text{ Padé}| \leq 1$

Name: lobatto6  
Order: 6  
Step Size Control: false  
Order Control: false  
Background: lobatto IIIA with four points  
Stability Region:  $|(4, 4) \text{ Padé}| \leq 1$

## Notes

Simulation flags `-maxStepSize=<value>` and `-maxIntegrationOrder=<value>` specifies maximum absolute step size and maximum integration order, used by dassl solver.

General step size without control  $\approx \frac{\text{stopTime} - \text{startTime}}{\text{numberOfIntervals}}$ .

Events change the step size (see. <https://www.modelica.org/documents/ModelicaSpec33.pdf> p. 88).

For  $(a, b)$  Padé see [http://en.wikipedia.org/wiki/Pad%C3%A9\\_table](http://en.wikipedia.org/wiki/Pad%C3%A9_table)