1 Variables

2 root

	var	symbol	documentation	type	units	eqs
10	$F_{N,A}$	`F`	fundamental incidence matrix	network		
5	t	`t`	time	frame	s	
6	t^o	`to`	time zero	frame	s	4
7	t^e	`te`	time end	frame	s	5
8	Δt	`dt_pulse`	pulse length	frame	s	6
9	$pulse$	`pulse`	pulse function	frame		7
1	#	`value`	numerical value	constant		
2	1	`one`	numerical value one	constant		1
3	0	`zero`	numerical value zero	constant		2
4	0.5	`onehalf`	numerical value one half	constant		3

3 physical

	var	symbol	documentation	type	units	eqs
11	r_{xN}	`r_x`	x-coordinate	frame	m	
12	r_{yN}	`r_y`	y-coordinate	frame	m	
13	r_{zN}	`r_z`	z-coordinate	frame	m	
14	U_N	`U`	fundamental state - internal energy	state	$kg\,m^2\,s^{-2}$	
15	S_N	`S`	fundamental state - entropy	state	$kg\,m^2\,K^{-1}\,s^{-2}$	
16	$n_{N,S}$	`n`	fundamental state - molar mass	state	mol	
17	V_N	`V`	fundamental state - volume	state	m^3	8
21	H_N	`H`	Enthalpy	state	$kg\,m^2\,s^{-2}$	12
22	A_N	`A`	Helmholtz energy	state	$kg\,m^2\,s^{-2}$	13
23	G_N	`G`	Gibbs free energy	state	$kg\,m^2\,s^{-2}$	14
24	C_N	`C`	fundamental state – charge	state	$A\,s$	
25	B_N	`Boltzmann`	Boltzmann constant	constant	$kg\,m^2\,K^{-1}\,s^{-2}$	15
26	A^v	`Avogadro`	Avogadro number	constant	mol^{-1}	
27	R_N	`GasConstant`	gas constant	constant	$kg\,m^2\,mol^{-1}\,K^{-1}\,s^{-2}$	16
18	T_N	`T`	temperature	effort	K	9
19	p_N	`p`	pressure	effort	$kg\,m^{-1}\,s^{-2}$	10
20	$\mu_{N,S}$	`chemPot`	chemical potential	effort	$kg\,m^2\,mol^{-1}\,s^{-2}$	11
28	v_{xN}	`v_x`	velocity in x-direction	secondaryState	ms^{-1}	17
29	v_{yN}	`v_y`	velocity in y-direction	secondaryState	ms^{-1}	18
30	v_{zN}	`v_z`	velocity in z-direction	secondaryState	ms^{-1}	19

4 control

	var	symbol	documentation	type	units	eqs

5 reactions

	var	symbol	documentation	type	units	eqs

6 material

	var	symbol	documentation	type	units	eqs

7 macroscopic

	var	symbol	documentation	type	units	eqs

8 solid

	var	symbol	documentation	type	units	eqs

9 fluid

	var	symbol	documentation	type	units	eqs

10 energy

	var	symbol	documentation	type	units	eqs

11 liquid

	var	symbol	documentation	type	units	eqs

12 gas

	var	symbol	documentation	type	units	eqs

13 control–control

	var	symbol	documentation	type	units	eqs

14 energy–gas

	var	symbol	documentation	type	units	eqs

15 energy–energy

	var	symbol	documentation	type	units	eqs

16 gas–gas

	var	symbol	documentation	type	units	eqs

17 energy–liquid

	var	symbol	documentation	type	units	eqs

18 liquid–liquid

	var	symbol	documentation	type	units	eqs

19 energy–solid

	var	symbol	documentation	type	units	eqs

20 solid–solid

	var	symbol	documentation	type	units	eqs

21 gas–liquid

	var	symbol	documentation	type	units	eqs

22 gas–solid

	var	symbol	documentation	type	units	eqs

23 liquid–solid

	var	symbol	documentation	type	units	eqs

24 material–material

	var	symbol	documentation	type	units	eqs

25 reactions–reactions

	var	symbol	documentation	type	units	eqs

26 control–reactions

	var	symbol	documentation	type	units	eqs

27 reactions–control

	var	symbol	documentation	type	units	eqs

28 control–material

	var	symbol	documentation	type	units	eqs

29 material–control

	var	symbol	documentation	type	units	eqs

30 control–macroscopic

	var	symbol	documentation	type	units	eqs

31 macroscopic–control

	var	symbol	documentation	type	units	eqs

32 reactions–material

	var	symbol	documentation	type	units	eqs

33 material–reactions

	var	symbol	documentation	type	units	eqs

34 reactions–macroscopic

	var	symbol	documentation	type	units	eqs

35 macroscopic–reactions

	var	symbol	documentation	type	units	eqs

36 material–macroscopic

	var	symbol	documentation	type	units	eqs

37 macroscopic–material

	var	symbol	documentation	type	units	eqs

38 Equations

39 Generic

no	equation	documentation	layer
1	$1 := \text{Instantiate}(value, value)$	numerical value one	root
2	$0 := \text{Instantiate}(value, value)$	numerical value zero	root
3	$0.5 := \text{Instantiate}(value, value)$	numerical value one half	root
4	$t^o := \text{Instantiate}(t, value)$	time zero	root
5	$t^e := \text{Instantiate}(t, value)$	time end	root
6	$\Delta t := \text{Instantiate}(t, value)$	pulse length	root
7	$pulse := \text{sign}\,(t - to) - \text{sign}\,(t - (to - dt_pulse))$	pulse function	root
8	$V_N := r_{xN} \,.\, r_{yN} \,.\, r_{zN}$	fundamental state - volume	physical
9	$T_N := \frac{\partial U_N}{\partial S_N}$	temperature	physical
10	$p_N := \frac{\partial U_N}{\partial V_N}$	pressure	physical
11	$\mu_{N,S} := \frac{\partial U_N}{\partial n_{N,S}}$	chemical potential	physical
12	$H_N := U_N - p_N \,.\, V_N$	Enthalpy	physical
13	$A_N := U_N - T_N \,.\, S_N$	Helmholtz energy	physical
14	$G_N := U_N + p_N \,.\, V_N - T_N \,.\, S_N$	Gibbs free energy	physical
15	$B_N := \text{Instantiate}(S_N, \#)$	Boltzmann constant	physical
16	$R_N := Avogadro \,.\, B_N$	gas constant	physical

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no	equation	documentation	layer
17	$v_{xN} := \frac{\partial r_{xN}}{\partial t}$	velocity in x-direction	physical
18	$v_{yN} := \frac{\partial r_{yN}}{\partial t}$	velocity in y-direction	physical
19	$v_{zN} := \frac{\partial r_{zN}}{\partial t}$	velocity in z-direction	physical