

Manual for Package: physics

Revision 1:7M

Karl Kästner

March 28, 2020

Contents

1	@Constant	2
1.1	Constant	2
1.2	celsius_to_kelvin	2
1.3	depth_to_pressure	2
1.4	kelvin_to_celsius	2
1.5	optical_attenuation	2
1.6	pressure_to_depth	3
1.7	saturation_vapor_pressure	3
1.8	sound_absorption_air	3
1.9	sound_absorption_water	3
1.10	sound_velocity_water	4
1.11	viscosity_dynamic_water	4
1.12	viscosity_kinematic_water	4
2	physics	4
2.1	beam_bending_deflection	4
2.2	beam_bending_moment	4
2.3	beam_bending_strain	4
2.4	beam_bending_stress	4
2.5	bolt_stress	4
2.6	drag_force	4
3	hydrogen-spectrum	5
3.1	hydrogen_spectrum_1d	5
3.2	hydrogen_spectrum_2012_12_02	5
3.3	hydrogen_spectrum_2d	5
3.4	hydrogen_spectrum_3d	5
4	physics	5

4.1	minimum_cable_diameter	5
4.2	moment_of_inertia_rectangle	5
4.3	moment_of_inertia_ring	5
4.4	parabolic_reflector_gain	5
4.5	test_sound_absorption_air	5

1 @Constant

1.1 Constant

Constant and physical standard quantities

1.2 celsius_to_kelvin

convert temperature from degree Celsius to Kelvin
function t_K = celsius_to_kelvin(t_C)

1.3 depth_to_pressure

convert depth to pressure in fresh water at standard temperature

$$z = (p - p_0) / (\rho \cdot g)$$

$$\Rightarrow p = \rho \cdot g \cdot z + p_0$$

input :

p0 : nx1 or scalar, pressure at water surface in BAR
d : depth in metre

output :

p : nx1, pressure at measurement depth in BAR

1.4 kelvin_to_celsius

convert temperature degree Kelvin to Celsius

1.5 optical_attenuation

1.6 pressure_to_depth

convert pressure to depth in fresh water at standard temperature

$$z = (p - p_0)/(\rho \cdot g)$$

input:

p : nx1, pressure at measurement depth in BAR

p0 : nx1 or scalar, pressure at water surface in BAR

output:

d : depth in metre

1.7 saturation_vapor_pressure

1.8 sound_absorption_air

1.9 sound_absorption_water

sound absorption in water

following Francois and Garrison, 1982

function alpha = sound_absorption(f,S,D,T)

input:

f : frequency (Hz)

S : salinity

D : depth (m)

T : temperature (degree C)

output:

alpha = sound attenuation in dB/m (not dB/km)

function alpha = sound_absorption(f,S,D,T,model)

1.10 sound_velocity_water

sound velocity in water
following Lubbers and Graaff (1998)
this formula does not include depth and salinity effects

1.11 viscosity_dynamic_water

1.12 viscosity_kinematic_water

2 physics

2.1 beam_bending_deflection

2.2 beam_bending_moment

2.3 beam_bending_strain

2.4 beam_bending_stress

2.5 bolt_stress

2.6 drag_force

3 hydrogen-spectrum

3.1 hydrogen_spectrum_1d

3.2 hydrogen_spectrum_2012_12_02

3.3 hydrogen_spectrum_2d

3.4 hydrogen_spectrum_3d

4 physics

4.1 minimum_cable_diameter

4.2 moment_of_inertia_rectangle

4.3 moment_of_inertia_ring

4.4 parabolic_reflector_gain

4.5 test_sound_absorption_air