Shear Stress, Pa

$$\tau = \frac{F\, r_c}{2\pi\, R_{ch}^2\, L}$$

where :

F	[N]	: force, = nominal load (Kg) * Gravity
r_c	[m]	: radius of die (capillary)
R_{ch}	[m]	: radius of cylinder
L	[m]	: length of die (capillary)

Shear Rate, s-1

$$\dot{\gamma} = \frac{4\, V}{\pi\, r_c^3\, t}$$

where :

V	[m^3]	: volume (total of steps) of extruded material $V = A_m * L_t$ L_t : total length of steps
r_c	[m]	: radius of die (capillary)
t	[s]	: time (total of steps) of extrusion

Viscosity, Pa * s

$$\eta = \frac{\tau}{\dot{\gamma}} = \frac{F\, r_c^4\, t}{8\, R_{ch}^2\, L\, V}$$

where :

F	[N]	: force, = test mass (kg) * gravity Gravity (free fall) = 9.806650 m/s^2
r_c	[m]	: radius of die (capillary)
t	[s]	: time (total of steps) of extrusion
R_{ch}	[m]	: radius of cylinder
L	[m]	: length of die (capillary)
V	[m^3]	: volume (total of steps) of extruded material $V = A_m * L_t$ L_t : total length of steps