

Stress

@wikipedia

A [tensor](#) measure of internal [forces](#) that neighbouring [particles](#) of a [continuum body](#) exert on each other per unit area across which the [force](#) is applied.

Symbol	Dimension	SI units	Oil metric units	Oil field units	Additional
σ	$M L^{-1} T^{-2}$	Pa	$kPa = 10^3 Pa = 0.145038 psi$ $MPa = 10^3 Pa = 145.038 psi$ $GPa = 10^6 Pa = 145,038 psi$	$psi = 6894.76 Pa = 6.89476 kPa$	$bar = 10^5 Pa = 100 kPa = 14.5038 psi$ $atm = 101,325 Pa = 101.325 kPa = 14.6959 psi$

For a given surface element $dS_{\mathbf{n}}$ with nor [normal vector](#) $\mathbf{n} = (n_x, n_y, n_z)$, $|\mathbf{n}| = \sqrt{n_x^2 + n_y^2 + n_z^2} = 1$ the [stress](#) is represented by a vector $\mathbf{T} = (T_x, T_y, T_z)$, showing direction and the value of [forces](#) exerted across a given surface element $dS_{\mathbf{n}}$:

(1)
$$\begin{bmatrix} T_x \\ T_y \\ T_z \end{bmatrix} = \begin{bmatrix} \sigma_x & \tau_{xy} & \tau_{xz} \\ \tau_{xy} & \sigma_y & \tau_{yz} \\ \tau_{xz} & \tau_{yz} & \sigma_z \end{bmatrix} \begin{bmatrix} n_x \\ n_y \\ n_z \end{bmatrix}$$

where

Normal stress	Shear stress
$\{ \sigma_x, \sigma_y, \sigma_z \}$	$\{ \tau_{xy} \tau_{xz}, \tau_{yz} \}$

See also

[Physics](#) / [Mechanics](#) / [Continuum mechanics](#)

[[Strain](#)]