

Dual-component Cozeny-Karman permeability @model

$$(1) \quad k = 1014.24 \cdot FZI^2 \cdot \frac{\phi^3}{(1 - \phi)^2}$$

where

| | |
|--------|---------------------|
| ϕ | effective porosity |
| FZI | Flow Zone Indicator |

with [Flow Zone Indicator](#) having a complex dependence on [porosity](#) and [shaliness](#):

$$(2) \quad FZI(V_{sh}, \phi_r) = w_1(V_{sh}) \phi_r^{m_1} + w_2(V_{sh}) \phi_r^{m_2}$$

for each [lithofacies](#) individually.

Usually, the first component $w_1(V_{sh}) \phi_r^{m_1}$ dictates [Flow Zone Indicator](#) values at low [porosities](#) while second component $w_2(V_{sh}) \phi_r^{m_2}$ takes over at high [porosities](#).

This allows to cover a wider range of [porosity](#) variations comparing to single-component [Cozeny-Karman permeability @model](#).

The dependance of weight coefficients on [shaliness](#) can be often approximated as:

$$(3) \quad w_1(V_{sh}) = w_{01} (1 - V_{sh}/V_{sh1})^{g_1}$$

$$(4) \quad w_2(V_{sh}) = w_{02} (1 - V_{sh}/V_{sh2})^{g_2}$$

where

| | |
|------------------------|---|
| $\{w_{01}, w_{02}\}$ | the highest values of weights for shale-free rock matrix |
| $\{V_{sh1}, V_{sh2}\}$ | critical values of shaliness at which the corresponding component of Flow Zone Indicator vanishes |
| $\{g_1, g_2\}$ | cementing factors, when low they diminish dependance on shaliness |

This model is very flexible and covers a wide range of practical cases.

When $\{m_1, m_2\}$ and $\{g_1, g_2\}$ are small (~ 0) the [Flow Zone Indicator](#) becomes independent on [porosity](#) and [shaliness](#) and the model degrades to conventional [Cozeny-Karman permeability @model](#) with $FZI = \text{const}$.

See also

