

Supplementary material: Nomenclature

Roman symbols

C_d	drag coefficient (–)
C_n	mesh cell (–)
d_p	particle diameter (m)
e_c	particle-particle normal restitution coefficient (–)
f	force (N)
g	gravitational acceleration vector ($m \cdot s^{-2}$)
g_0	radial distribution function (–)
$I_{g \rightarrow p}$	Interphase momentum transfer ($kg \cdot m^{-2} \cdot s^{-2}$)
K	diffusivity ($m^2 \cdot s^{-1}$)
k_n	spring stiffness ($N \cdot m^{-1}$)
m_p	particle mass ($kg \cdot m^{-3}$)
n_p	particle density (m^{-3})
P	pressure ($N \cdot m^{-2}$)
q_p^2	kinetic energy of particle agitation ($m^2 \cdot s^{-2}$)
R	particle velocity covariance ($m^2 \cdot s^{-2}$)
R_c	cylinder radius (m)
Re_p	particle Reynolds number (–)
S	rate of deformation tensor (s^{-1})
T_c	collision time (s)
t	time (s)
u	velocity vector ($m \cdot s^{-1}$)
V_p	particle volume (m^3)
V_f	fluidisation velocity ($m \cdot s^{-1}$)
\check{r}_w	normalised distance to the wall (–)

Greek symbols

α	volume fraction (–)
α_p^{\max}	close-packing limit (–)
α_p^{\min}	frictional-pressure activation threshold (–)
γ_n	spring damping coefficient (s^{-2})
η	dynamic viscosity ($kg \cdot m^{-1} \cdot s^{-1}$)
μ	coefficient of friction (–)
ν	kinematic viscosity (m^2/s)
ρ	density ($kg \cdot m^{-3}$)
Σ	stress tensor ($kg \cdot m^{-1} \cdot s^{-2}$)
τ_p^c	collisional timescale (s)
τ_{gp}	mean gas-particle relaxation timescale (s)

Subscripts

g	gas
p	particle
w	wall

Superscripts

cnt	contact (collisional-frictional)
col	collisional
fr	frictional

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kin	kinetic
kin-col	kinetic-collisional
tot	total