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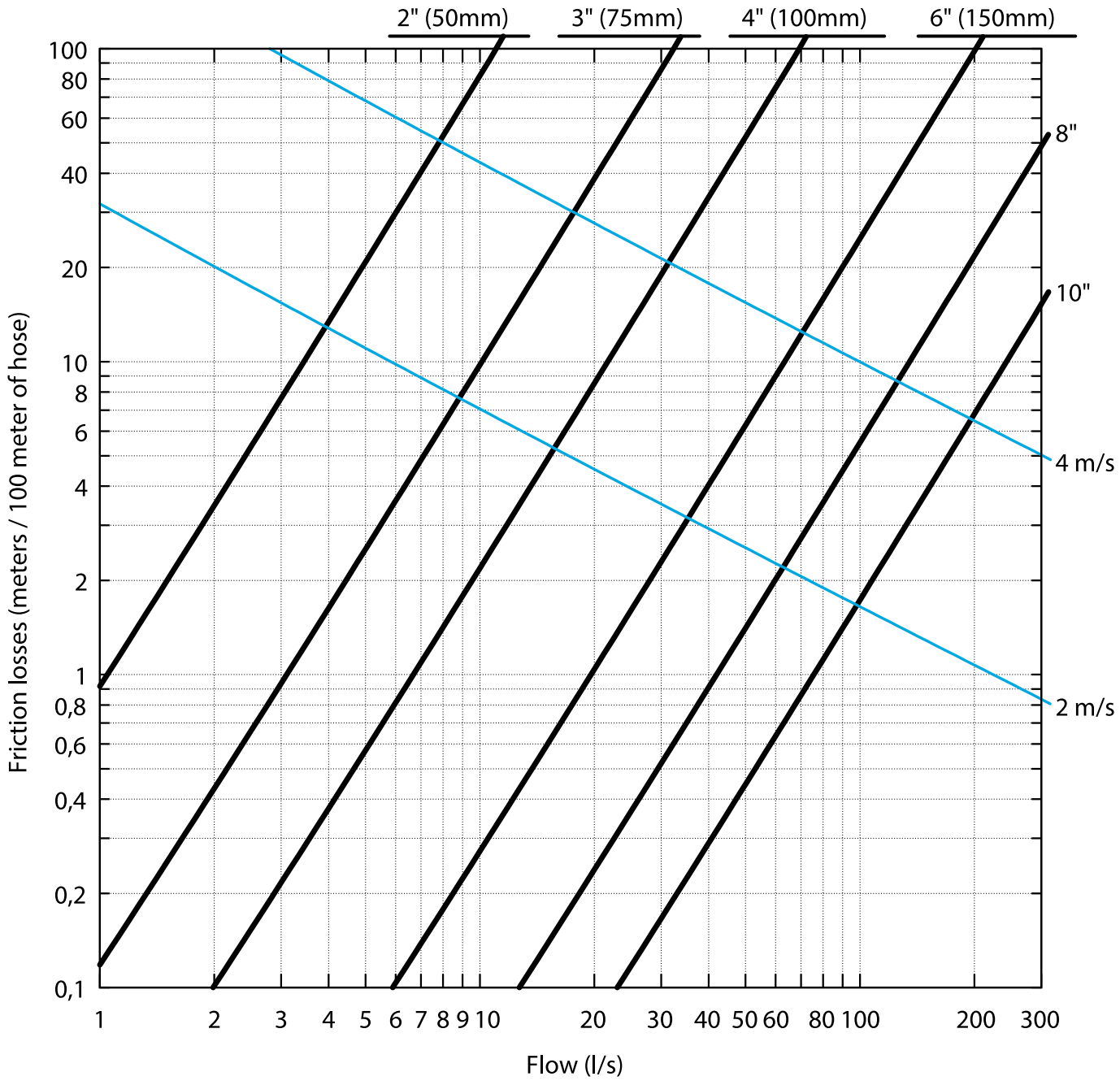
Chart for calculating friction losses in hoses

All pump capacities are measured for clean water, directly at the discharge outlet. When connecting a hose you need to consider the friction losses that come from the size and length of the hose. The chart below shows this.



Formulas for calculating friction losses in hoses and tubes

The chart on page 69 was created using the following formulas:

Friction loss (meters)	Velocity (m/s)	Reynolds number	Friction factor (Swamee & Jain formula)
$H_{friction} = \frac{1000 \times f \times L \times v^2}{2 \times g \times D}$	$V = \frac{1274 \times Q}{D^2}$	$Re = \frac{v \times D}{1000 \times \mu}$	$f = \frac{0.25}{\left[{}^{10}log\left(\frac{\varepsilon}{3.7 \times D} + \frac{5.74}{Re^{0,9}} \right) \right]^2}$
f = friction factor **L** = length (m) **v** = avg. velocity **g** = 9.81 m/s^2 **D** = pipe ∅ (mm)	**Q** = flow (l/s) **D** = pipe ∅ (mm)	**v** = velocity **D** = pipe ∅ (mm) **μ** = viscosity = 1.161 x 10^{-6} m^2/s = 1 cSt	ε = roughness factor (mm) **D** = pipe ∅ (mm) **Re** = Reynolds number

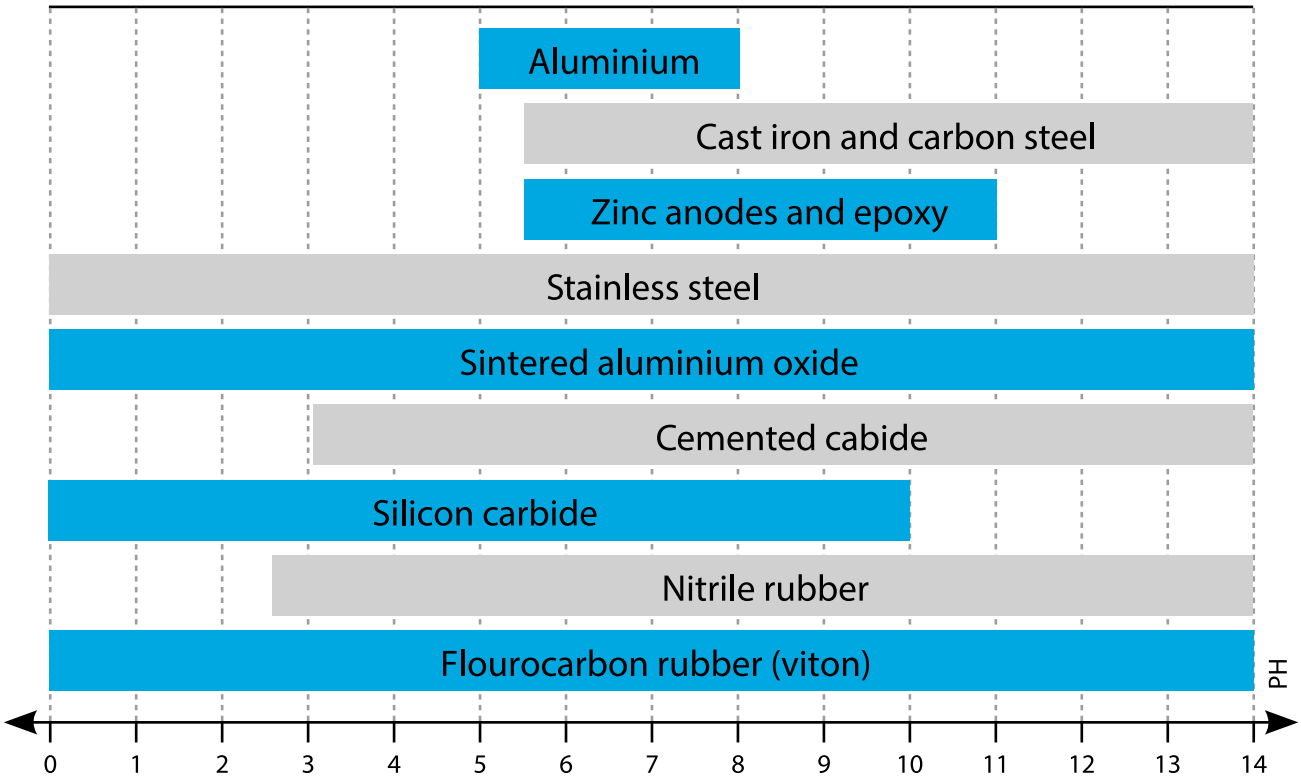
Friction factor

Material	Cast iron	Stainless	PVC	HDPE	Concrete	Hose
ε new (mm)	0.25	0.10	0.05	0.05	0.50	0.25
ε used (mm)	1.00	0.25	0.25	0.25	3.00	1.00

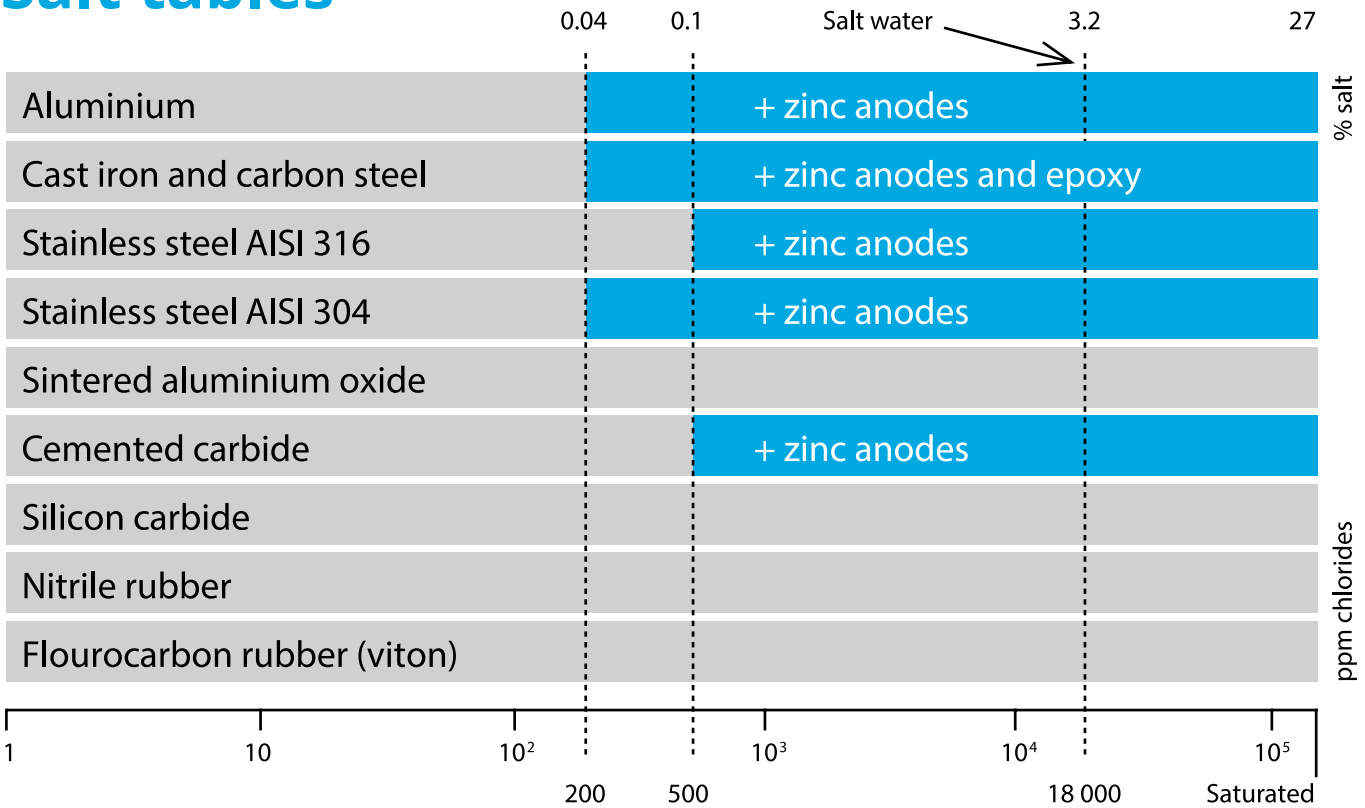
Sludge/slurry solids concentration

By volume (C_v)	By mass/weight (C_v)	Mixture
$C_v = \frac{V_{solids}}{V_{solids + water}}$	$C_m = \frac{m_{solids}}{m_{solids + water}}$	$\frac{SV_{mixture}}{SV_{solids}} = \frac{C_v}{C_m}$
$\mathbf{V}_{\mathbf{solids}}$ = volume of solids $\mathbf{V}_{\mathbf{solids+water}}$ = total sludge volume	$\mathbf{m}_{\mathbf{solids}}$ = mass of solids $\mathbf{m}_{\mathbf{solids+water}}$ = total sludge mass	**SV** = Specific weight

pH tables



Salt tables



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Translation charts