

Orifice Plate Discharge coefficient @ model

@wikipedia

A ratio between actual [volumetric flowrate](#) through the real [orifice](#) and [volumetric flowrate](#) estimate through the ideal [orifice](#):

(1)
$$C_d = \frac{q}{q_{ideal}}$$

where

(2)
$$q_{ideal} = \epsilon \cdot \frac{\pi d^2}{4} \cdot \sqrt{\frac{2 \cdot \Delta p}{\rho \cdot (1 - \beta^4)}}$$

and

Δp	pressure drop on the choke , $\Delta p = p_{in} - p_{out}$
$\beta = \frac{d}{D}$	orifice narrowing ratio
d	orifice diameter
D	pipe diameter
ϵ	expansion factor

The deviation from ideal estimation (2) arise from fluid friction with choke elements and possible flow turbulence.

The [discharge coefficient](#) C_d is a function of a [choke](#) narrowing ratio β and [Reynolds number](#) Re in the pipe:

(3)
$$C_d = C_d(\beta, Re)$$

where

(4)
$$Re = \frac{v \cdot D}{\nu} = \frac{4 q}{\pi D \nu}$$

where

ν	kinematic viscosity
v	cross-sectional average flow velocity in a pipe

It can be estimated for popular [choke](#) types or tabulated in laboratory.

The most popular engineering correlation covering various tapping arrangements is given by [ISO5167](#):

(5)
$$C_d = 0.5961 + 0.0261 \cdot \beta^2 - 0.216 \cdot \beta^8 + 0.000521 \cdot \left(\frac{10^6 \beta}{Re}\right)^{0.7}$$

See also

[Orifice Plate Expansion Factor @ model]

Pipeline Engineering / Pipeline / Choke

Reference

ISO5167 – Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full

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Stolz,J., "A Universal Equation for the Calculation of Discharge Coefficient of Orifice Plates";, Proc. Flomeko 1978-Flow Measurement of Fluids, H. H. Dijstelbergen and E. A. Spencer (Eds), North-Holland Publishing Co., Amsterdam (1978), pp 519-534