

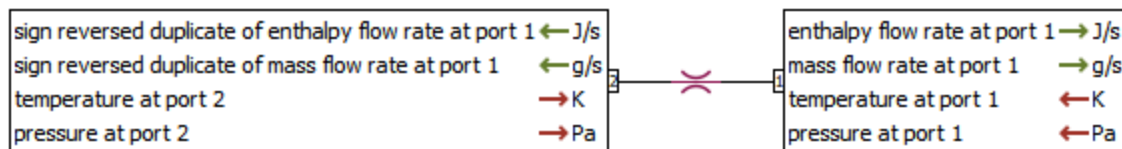
PNOR001 - pneumatic orifice (constant flow coefficient)

Description

PNOR001 is a submodel of a pneumatic orifice with a constant area. A pressure in Pa and a temperature in K are input at each ports and a mass flow rate in g/s and an enthalpy flow rate in J/s are computed to be an output at both ports.

The orifice can be characterized either by a discharge coefficient $\backslash(C_q\backslash)$ and an area, or by a flow coefficient $\backslash(C_v\backslash)$ or $\backslash(K_v\backslash)$ [1].

Icon with external variables



Usage

Use PNOR001 for an orifice of fixed area where you want to adjust the discharge coefficient.

Use the submodel [PNOR002](#) for a discharge coefficient given by the Perry's polynomial.

Use the submodel [PNOR003](#) for a pneumatic orifice defined by ISO 6358 parameters

Parameter settings

The *gas type index* refers to the gas defined by the [PNGD00](#) icon put on the sketch.

The enumeration **flow coefficient setting** is used to select the characterization of the orifice between a flow coefficient $\backslash(C_q\backslash)$, $\backslash(C_v\backslash)$ or $\backslash(K_v\backslash)$.

If the flow coefficient $\backslash(C_q\backslash)$ (or discharge coefficient) is chosen, the *orifice area* should be greater or equal than zero. Usually, $\backslash(C_q\backslash)$ is set to a value between 0.3 and 0.9.

Physics and equations

The equivalent area of the orifice is computed from the flow coefficient with utility [orif_areafromcv](#) from $\backslash(C_v\backslash)$ or with utility [orif_areafromkv](#) from $\backslash(K_v\backslash)$.

The flow rates through the orifice are computed using the utility [pn2rcqfix](#).

The pressures used in the calculation are absolute pressures in PaA. The atmospheric pressure is set using the pneumatic utility [pn2getatp](#) to 101300 [PaA] by default, but it can be set to another value using submodel [PNATP00](#).

Reference

[1] ISA-75.01.01-2007, Flow Equations for Sizing Control Valves, 2007.

Detailed submodel view

External variables

	Title	Variable name	Unit	Type	In/Out	Default value
Port 1						
1	enthalpy flow rate at port 1	dh1	J/s	basic variable	output	-
2	mass flow rate at port 1	dm1	g/s	basic variable	output	-
3	temperature at port 1	temp1	K	basic variable	input	-
4	pressure at port 1	press1	Pa	basic variable	input	-
Port 2						
1	duplicate of dh1	dh2	J/s	sign reversed duplicate [hidden]	output	-
2	duplicate of dm1	dm2	g/s	sign reversed duplicate [hidden]	output	-
3	temperature at port 2	temp2	K	basic variable	input	-
4	pressure at port 2	press2	Pa	basic variable	input	-

Internal variables

	Title	Variable name	Unit	Type	Default value
1	mass flow parameter (cm)	cm	(kg*K/J)**(1/2)	basic variable	-
2	vena contracta gas velocity	gasvel	m/s	basic variable	-

Real parameters

	Title	Variable name	Unit	Default value
1	flow coefficient (Cq)	cq	null	0.72
2	orifice area	area	mm**2	5
3	flow coefficient (Cv)	Cv	null	0.5

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4	flow coefficient (Kv)	Kv	null	0.4
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Integer parameters

	Title	Variable name	Default value
1	gas type index	gi	1
2	flow coefficient setting	flowset	1: Cq

[Contents of the Pneumatic library](#)