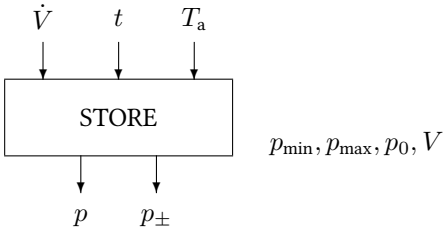
Block STORE

The STORE block simulates a pressure storage with a safety valve.





Name	STORE
Function	se0015
Inputs	3
Outputs	2
Parameters	4
Strings	0
Group	S

Inputs

1	Volume flow $\dot{V}$ / $m_n^3\ s^{-1}$
2	Time t / s
3	Ambient temperature T_a / °C

Outputs

1	Tank pressure p / bar
2	Difference pressure $p_{\pm}$ / bar

Parameters

1	Minimum tank pressure p_{min} / bar
2	Maximum tank pressure p_{max} / bar
3	Initial tank pressure p_0 / bar
4	Tank volume V / m^3

Strings

None

Description

It is assumed that the gas is an ideal gas and the tank volume V is a constant. Hence, the volume flow $\dot{V}$ for a time interval Δt, which is calculated from the time input, causes a change in the actual tank pressure

$$p_{\text{new}} = p + \frac{(T_{\text{a}} + T_{\text{n}})\, p_{\text{n}}}{T_{\text{n}}\, V}\, \dot{V} \Delta t \tag{1}$$

where

T_{n}	Standard temperature 273.15 K
p_{n}	Standard pressure 1.013 bar

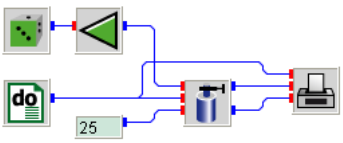
The outputs are set to

$$p = \begin{cases} p_{\text{min}} & \text{if } p_{\text{new}} < p_{\text{min}} \\ p_{\text{new}} & \text{if } p_{\text{min}} \le p_{\text{new}} \le p_{\text{max}} \\ p_{\text{max}} & \text{if } p_{\text{new}} > p_{\text{max}} \end{cases}$$

and

$$p_{\pm} = \begin{cases} p_{\text{new}} - p_{\text{min}} & \text{if } p_{\text{new}} < p_{\text{min}} \\ 0 & \text{if } p_{\text{min}} \le p_{\text{new}} \le p_{\text{max}} \\ p_{\text{new}} - p_{\text{max}} & \text{if } p_{\text{new}} > p_{\text{max}} \end{cases}$$

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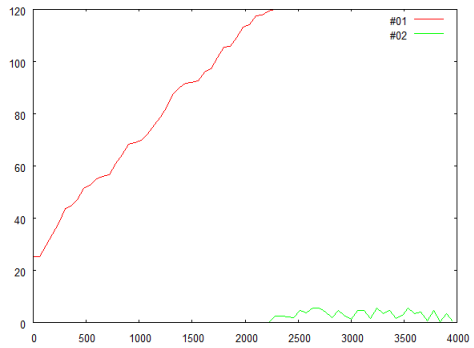


A RAN1 block generates uniform random numbers diluted by a factor of 10 by an ATT block, finally fed into a STORE block as volume flow in m^3/s. The storage tank is set to an initial pressure of 25 bar, with a tank volume of 1.2 m^3.

A DO block runs the simulation for 4000 seconds with a time step of 60 seconds. The time signal is connected to the STORE block.

The temperature of the high pressure storage is set to 25 °C by a CONST block.

The PLOT block displays tank pressure and the difference pressure which has to be dumped via the safety valve.



See also Block BALON.