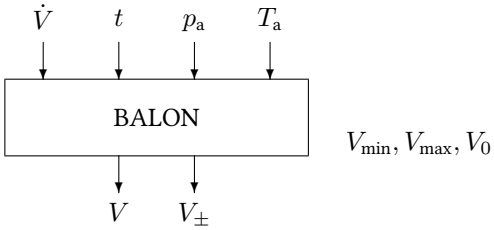
Block BALON

The BALON block simulates a gas balloon with a savety valve.





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Inputs

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

Outputs

1 Actual volume V / m^3
2 Actual overflow/deficit $V_\pm$ / m^3

Parameters

1 Minimum volume V_{min} / m^3
2 Maximum volume V_{max} / m^3
3 Initial volume V_0 / m^3

Strings

None

Description

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

$$V_{new} = V + \frac{(T_a + T_n)\, p_n}{T_n\, p_a}\, \dot{V} \Delta t$$

where

T_n	Standard temperature 273.15 K
p_n	Standard pressure 1.013 bar

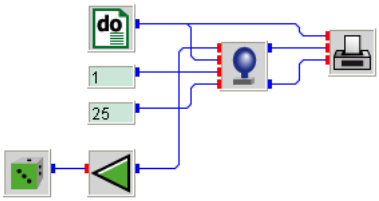
The outputs are set to

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

and

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

balon.vseit



A DO block varies a time signal from zero to 4000 in steps of 60 seconds. For each time step a uniform random number is calculated by a RAN1 block and divided by a factor of 1000 by a connected ATT block. This signal is interpreted as a random volume flow in Nm^3 per second and used as input of the BALON block. The othe inputs of the BALON block are a constant pressure of one bar and an ambient temperature of 25 degrees Celsius provides by two CONST blocks.

The two outputs of the BALON block, namely the actual volume and the overflow are displayed by the PLOT block. At the end of the simulation period the balon is completely full and the are inputs handled as overflow as can be seen from the green curve.

