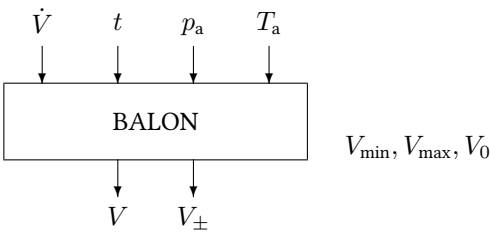


Block BALON

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



Name	BALON
Function	se0013
Inputs	4
Outputs	2
Parameters	3
Strings	0
Group	S

- Inputs
- 1 Volume flow $\dot{V} / \text{m}^3 \text{s}^{-1}$
 - 2 Time t / s
 - 3 Ambient pressure p_a / bar
 - 4 Ambient temperature $T_a / ^\circ\text{C}$

- Outputs
- 1 Actual volume V / m^3
 - 2 Actual overflow/deficit $V_{\pm} / \text{m}^3$

- Parameters
- 1 Minimum volume $V_{\min} / \text{m}^3$
 - 2 Maximum volume $V_{\max} / \text{m}^3$
 - 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 temperature 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

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

where

T_n Standard temperature 273.15 K

p_n Standard pressure 1.013 bar

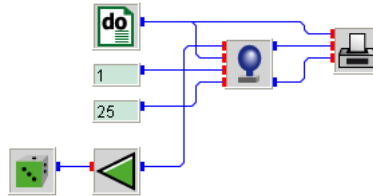
The outputs are set to

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

and

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

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 other inputs of the **BALON** block are a constant pressure of one bar and an ambient temperature of 25 degrees Celsius provided 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.

