DPAS

"Hysterisis"
A Rockwell Logix v21 Add On Instruction (AOI)

This AOI was developed to simulate the response of a valve with hysterisis. The ISA DIctionary of Measurement and Control gives the following definition of hysterisis:

1. That property of an element evidenced by the dependence of the value of the output, for a given excursion of the input, upon the history of prior excursions and the direction of the current traverse. NOTE: 1: It is usually determined by subtracting the value of dead band from the maximum measured separation between upscale going and downscale going indications of the measured variable (during a full range traverse, unless otherwise specified) after transients have decayed. This measurement is sometimes called "hysteresis error" or "hysteretic error." NOTE 2: Some reversal of output may be expected for any small reversal of input; this distinguishes hysteresis from dead band [S51.01].
2. The maximum difference in output value for any single input value during a calibration cycle, excluding errors due to deadband [S75.05].
3. The maximum difference in output, at any measurand value within the specified range, when the value is approached first with increasing and then with decreasing measurand. NOTE: (S) Hysteresis is expressed in percent of full scale output, during any one calibration cycle. Friction error is included with hysteresis unless dithering is specified [S37.1].
4. A phenomenon demonstrated by materials which make their behavior a function of the history of the environment to which they have been subjected.
5. The tendency of an instrument to give a different output for a given input, depending on whether the input resulted from an increase or decrease from the previous value.

In summary, when the input is going up the output will also go up but at a deviation behind the input. Reversing the input will not reverse the output until the deviation is exceeded. Once exceeded, as the input goes down the output will go down at a deviation behind the input.
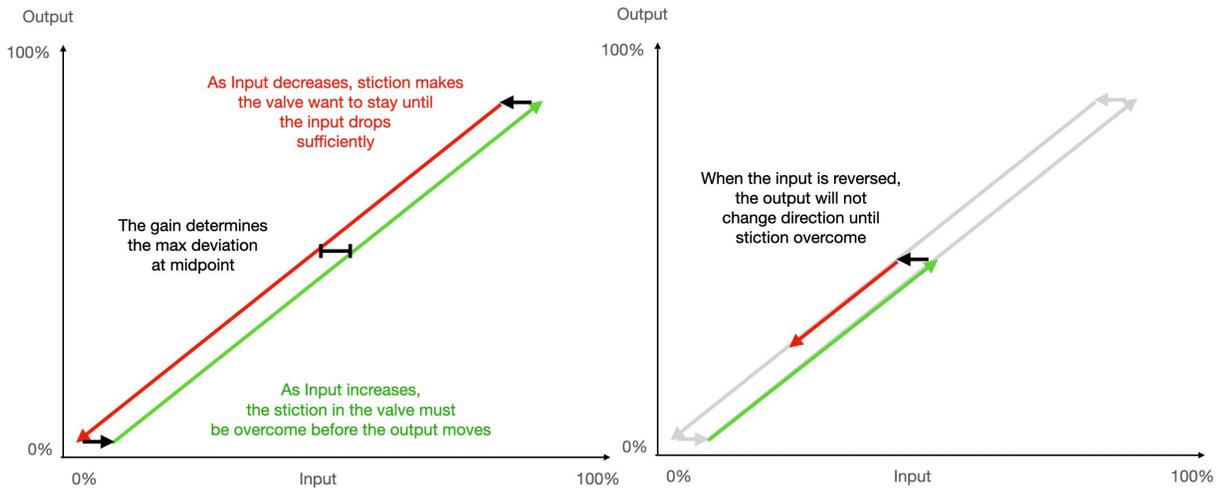
There are 2 types of responses available in this AOI:
1. The default response is NON-LINEAR, which is the most commonly illustrated response shown in literature. This response features complete opening and closure at the full range of the input, and the deviation of output from input is largest at the midpoint of the range.
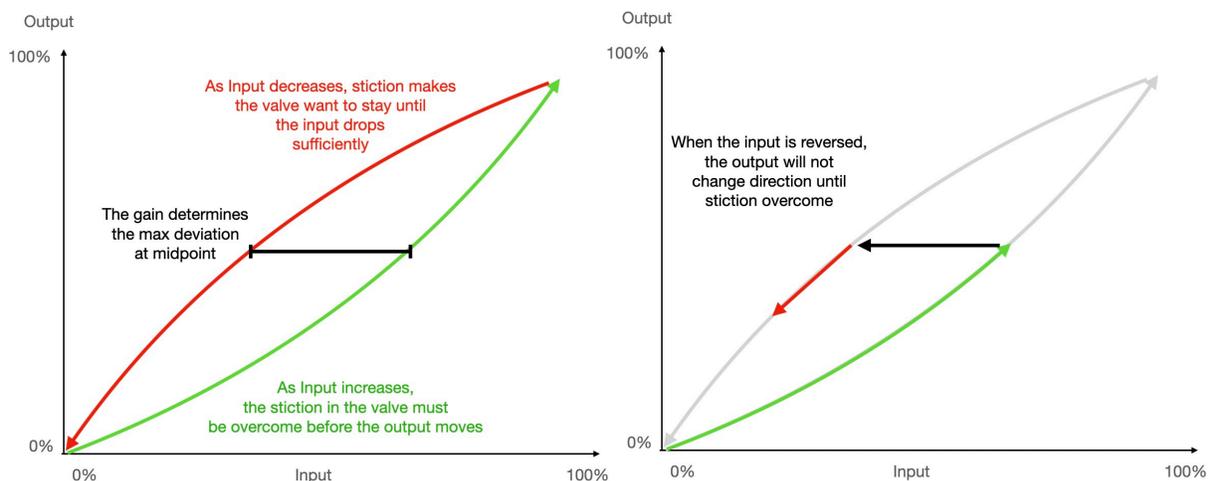
2. There is also a LINEAR option, in which the stiction is constant throughout the range. In this option, the output will never reach fully open or closed because the stiction prevents it from getting there.

Output

100%

As Input decreases, stiction makes the valve want to stay until the input drops sufficiently

The gain determines the max deviation at midpoint

As Input increases, the stiction in the valve must be overcome before the output moves

0%

0%   Input   100%

Output

100%

When the input is reversed, the output will not change direction until stiction overcome

0%

0%   Input   100%

The parameters on the AOI are as follows:

Name	Usage	Data Type	Alias For	Default	Style	Re	Vis	Description	External Acces	Constant
EnableIn	Input	BOOL		1	Decim...	☐	☐	Enable Input - System Defined Parameter	Read Only	☐
EnableOut	Output	BOOL		0	Decim...	☐	☐	Enable Output - System Defined Parameter	Read Only	☐
Input	Input	REAL		0.0	Float	☐	☑	Connect input value	Read/Write	☐
Gain	Input	REAL		0.0	Float	☐	☑	Gain for max hysterisis gap	Read/Write	☐
Output	Output	REAL		0.0	Float	☐	☑	Output	Read Only	☐
Hi_Range	Input	REAL		100.0	Float	☐	☐	Maximum input range	Read/Write	☐
Lo_Range	Input	REAL		0.0	Float	☐	☐	Minimum input range	None	☐
Type	Input	BOOL		0	Decim...	☐	☐	False=NON-LINEAR, True=LINEAR	Read/Write	☐

In runtime, it appears as:
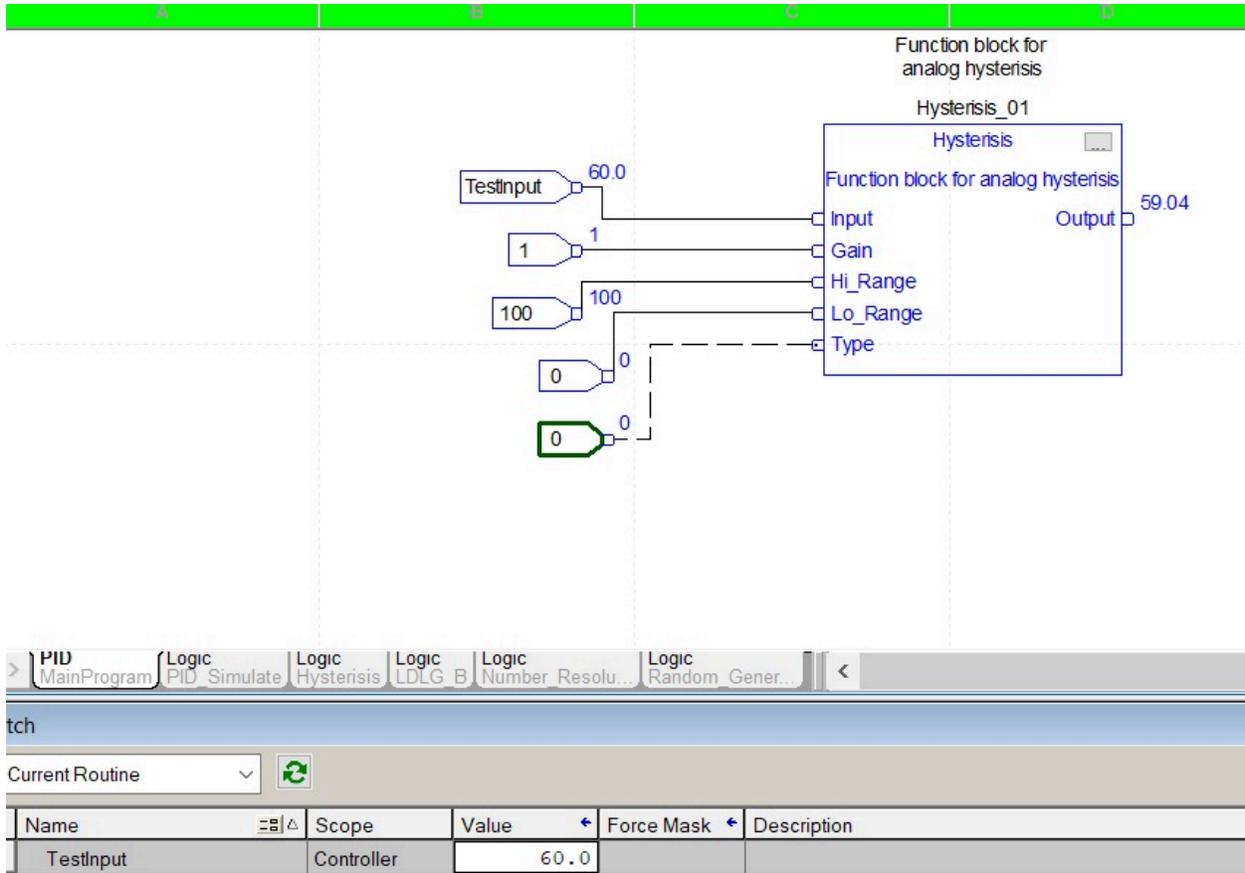
This AOI (Hysterisis.L5X) was developed in Logix v21. It can be imported into any later version of Logix.

Provided without warranty; all use and behavior is responsibility of user, no obligation to DPAS.

This software is provided as shareware. If you find this valuable and would like to make a voluntary contribution, you can mail a check to DPAS Inc, PO Box 4187, Lago Vista TX 78645 or contribute at https://www.dpas-inc.com/resources.