



# Twin Builder Components: Transfer



ANSYS, Inc.  
Southpointe  
2600 Ansys Drive  
Canonsburg, PA 15317  
[ansysinfo@ansys.com](mailto:ansysinfo@ansys.com)  
<https://www.ansys.com>  
(T) 724-746-3304  
(F) 724-514-9494

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# 1 - Transfer Library

The Blocks in the Transfer model library are defined by an internal identifier, the name and a set of parameters; Blocks have no conservative nodes. A block is a linear or nonlinear transfer element with a defined static or dynamic response characteristic. The block output signal does not influence the block input quantity (non-reacting).

The blocks are subdivided into [Linear](#) and [Nonlinear](#) transfer blocks. The components are contained in the Tools Section.

The model library provides linear transmission components, partially also with nonlinear supplementary actions, which are quite frequently required in control engineering. The models are implemented as macro models and based on the block diagram components of the Basic section.

The block output signal and the specific block dependent parameters can be used as outputs. The block output signal is represented by the **VAL** entry; the other parameters by their corresponding name.

The response characteristic (i.e. the connection between the output signal  $y$  and the input signal  $x$ ) is  $y = G(s)*x$  (Laplace-domain, Laplace-operator specified as  $s$ ).

## Linear Transfer Blocks

- Allpass with First Order Time Delay (ALLP1)
- Derivative with First Order Time Delay (DT1)
- Derivative with Second Order Time Delay (DT2)
- Integrator with First Order Time Delay (IT1)
- Integrator with Second Order Time Delay (IT2)
- PD Controller (PD)
- PD Element with First Order Time Delay (PDT1)
- PD Element with Second Order Time Delay (PDT2)
- PI Controller (PI\_)
- PID Controller (PID)
- PID Element with First Order Time Delay (PIDT1)
- PID Element with Second Order Time Delay (PIDT2)
- First Order Time Delay Element (PT1)
- Second Order Delay Element T1, T2 (PT2\_AP)
- Second Order Delay Element D, T1 (PT2\_OSC)
- Variable Order Delay Element (PTN)

## Allpass with First Order Time Delay

|                   |                        |                                     |
|-------------------|------------------------|-------------------------------------|
| Library: Transfer | Modeling Language: SML | Version Number: Twin Builder 2024.2 |
|-------------------|------------------------|-------------------------------------|



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### Description

The Block represents a linear continuous transmission element with all-pass behavior. A typical characteristic is the undershoot in the unit step response, caused by a “negative” metered time constant. The macro consist of a cascade connection of a symmetrical pole-zero point pair and a PT1 element.

You can define the gain, the time constant 1, and time constant 2, as well as the sample time and input signal.

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### Assumptions and Limitations

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## Mathematical Description

$$G(s) = \frac{K_s(1 - T_1 \cdot s)}{1 + T_1 \cdot s} * \frac{1}{1 + T_2 \cdot s}$$

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## Netlist Syntax

```
MODEL ALLP1 ?InstanceName(@InstanceName):(@Refbase@ID) ( INPUT:= @INPUT,
KS:= @KS, T1:= @T1, T2:= @T2, TS:= @TS) SRC: DB(Lib:=@ModelLibraryName);
```

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## Parameters

Table 1

| Name  | Description     | Data Type | Default Value [Unit] |
|-------|-----------------|-----------|----------------------|
| Ks    | Gain            | real      | 1                    |
| T1    | Time Constant 1 | real      | 1 [s]                |
| T2    | Time Constant 2 | real      | 1 [s]                |
| TS    | Sample Time     | real      | 0 [s]                |
| INPUT | Input Signal    | real      | 0                    |

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## Input/Output Quantities

Table 2

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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## Example

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## References

## Derivative with First Order Time Delay

|                   |                        |                                     |
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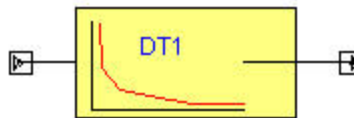


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### Description

The Block represents a linear continuous transmission element with differential behavior and time delay of the 1st order.

You can define the derivative gain and the time constant, as well as the sample time and input signal.

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### Assumptions and Limitations

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## Mathematical Description

$$G(s) = \frac{K_D \cdot s}{1 + T_1 \cdot s}$$

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## Netlist Syntax

```
MODEL DT1 ?InstanceName(@InstanceName):(@Refbase)@(ID)) ( INPUT:= @INPUT, KD:=
@KD, T1:= @T1, TS:= @TS) SRC: DB(Lib:=@ModelLibraryName) ;
```

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## Parameters

**Table 1**

| Name  | Description     | Data Type | Default Value [Unit] |
|-------|-----------------|-----------|----------------------|
| KD    | Derivative Gain | real      | 1                    |
| T1    | Time Constant   | real      | 1 [s]                |
| TS    | Sample Time     | real      | 0 [s]                |
| INPUT | Input Signal    | real      | 0                    |

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## Input/Output Quantities

**Table 2**

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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## References

## Derivative with Second Order Time Delay

|                   |                        |                                     |
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### Description

The Block represents a linear continuous transmission element with differential behavior and time delay of the 2nd order.

You can define the derivative gain, the damping, and the time constant, as well as the sample time and input signal.

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### Assumptions and Limitations

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## Mathematical Description

$$G(s) = \frac{K_D \cdot s}{1 + 2D_s T_1 s + T_1^2 s^2}$$

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## Netlist Syntax

MODEL DT2 ?InstanceName(@InstanceName):(@ (Refbase)@ (ID)) ( INPUT:= @INPUT, KD:= @KD, DS:= @DS, T1:= @T1, TS:= @TS) SRC: DB(Lib:=@ModelLibraryName);

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## Parameters

**Table 1**

| Name  | Description     | Data Type | Default Value [Unit] |
|-------|-----------------|-----------|----------------------|
| KD    | Derivative Gain | real      | 1                    |
| DS    | Damping         | real      | 1                    |
| T1    | Time Constant 1 | real      | 1 [s]                |
| TS    | Sample Time     | real      | 0 [s]                |
| INPUT | Input Signal    | real      | 0                    |

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## Input/Output Quantities

**Table 2**

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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## References

## Integrator with First Order Time Delay

|                   |                        |                                     |
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### Description

The Block represents a linear continuous transmission element with integrating behavior and time delay of the 1st order.

You can define the integral gain and the time constant, as well as the sample time and input signal.

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### Assumptions and Limitations

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## Mathematical Description

$$G(s) = \frac{1}{s} \cdot \frac{K_I}{1 + T_1 \cdot s}$$

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## Netlist Syntax

MODEL IT1 ?InstanceName(@InstanceName):(@Refbase)(@ID) ( INPUT:= @INPUT, KI:= @KI, T1:= @T1, TS:= @TS) SRC: DB(Lib:=@ModelLibraryName);

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## Parameters

**Table 1**

| Name  | Description   | Data Type | Default Value [Unit] |
|-------|---------------|-----------|----------------------|
| KI    | Integral Gain | real      | 1                    |
| T1    | Time Constant | real      | 1 [s]                |
| TS    | Sample Time   | real      | 0 [s]                |
| INPUT | Input Signal  | real      | 0                    |

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## Input/Output Quantities

**Table 2**

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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## Integrator with Second Order Time Delay

|                   |                        |                                     |
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### Description

The Block represents a linear continuous transmission element with integrating behavior and time delay of the 2nd order.

You can define the integral gain, the damping, and the time constant, as well as the sample time and input signal.

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### Assumptions and Limitations

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## Mathematical Description

$$G(s) = \frac{1}{s} \cdot \frac{K_I}{1 + 2D_s T_1 s + T_1^2 s^2}$$

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## Netlist Syntax

```
MODEL IT2 ?InstanceName(@InstanceName):(@Refbase)@(ID)) ( INPUT:= @INPUT, KI:=
@KI, DS:= @DS, T1:= @T1, TS:= @TS) SRC: DB(Lib:=@ModelLibraryName) ;
```

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## Parameters

**Table 1**

| Name  | Description   | Data Type | Default Value [Unit] |
|-------|---------------|-----------|----------------------|
| KI    | Integral Gain | real      | 1                    |
| DS    | Damping       | real      | 1                    |
| T1    | Time Constant | real      | 1 [s]                |
| TS    | Sample Time   | real      | 0 [s]                |
| INPUT | Input Signal  | real      | 0                    |

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## Input/Output Quantities

**Table 2**

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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## PD Controller

|                   |                        |                                     |
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### Description

The Block represents a continuous PD controller with parameters for the P and D component.

You can define the set point, the initial derivative value, the limitations of the internal D component, and the total controllers output signals, as well as the sample time and input signal.

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### Assumptions and Limitations

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### Mathematical Description

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## Netlist Syntax

```
MODEL PD ?InstanceName(@InstanceName):(@Refbase)@(ID)) ( IN:= @IN, SET:= @SET,
KP:= @KP, KD:= @KD, UL:= @UL, LL:= @LL, TS:= @TS, D0:= @D0, UL_D:= @UL_D, LL_D:=
@LL_D) SRC: DB(Lib:=@ModelLibraryName);
```

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## Parameters

**Table 1**

| Name | Description              | Data Type | Default Value [Unit] |
|------|--------------------------|-----------|----------------------|
| KP   | Gain                     | real      | 0.5                  |
| KD   | Derivative Gain          | real      | 0.1                  |
| UL   | Upper Limit              | real      | 1e12                 |
| LL   | Lower Limit              | real      | -1e12                |
| UL_D | Upper Derivative Value   | real      | 0                    |
| LL_D | Lower Derivative Value   | real      | 0                    |
| TS   | Sample Time              | real      | 0 [s]                |
| D0   | Initial Derivative Value | real      | 0                    |
| IN   | Input Signal             | real      | 0                    |
| SET  | Reference Input Signal   | real      | 0                    |

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## Input/Output Quantities

**Table 2**

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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## PD Element with First Order Time Delay

|                   |                        |                                     |
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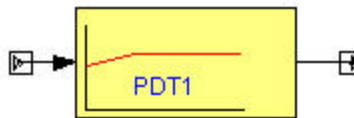


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### Description

The Block represents a linear continuous transmission element with both a pole as well as a zero point.

You can define the gain, the derivative action time, and the time constant, as well as the sample time and input signal.

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### Assumptions and Limitations

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## Mathematical Description

$$G(s) = \frac{K_s \cdot (1 + T_D \cdot s)}{1 + T_1 \cdot s}$$

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## Netlist Syntax

MODEL PDT1 ?InstanceName(@InstanceName):(@Refbase@ID) ( INPUT:= @INPUT, KS:= @KS, TD:= @TD, T1:= @T1, TS:= @TS) SRC: DB(Lib:=@ModelLibraryName) ;

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## Parameters

Table 1

| Name  | Description            | Data Type | Default Value [Unit] |
|-------|------------------------|-----------|----------------------|
| Ks    | Gain                   | real      | 1                    |
| T1    | Time Constant          | real      | 1 [s]                |
| TD    | Derivative Action Time | real      | 1 [s]                |
| TS    | Sample Time            | real      | 0 [s]                |
| INPUT | Input Signal           | real      | 0                    |

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## Input/Output Quantities

Table 2

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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## References

## PD Element with Second Order Time Delay

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### Description

The Block represents a linear continuous and oscillating transmission element with 2 poles and one zero point.

You can define the gain, the derivative action time, the damping and the time constant, as well as the sample time and input signal.

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### Assumptions and Limitations

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## Mathematical Description

$$G(s) = \frac{K_s \cdot (1 + T_D \cdot s)}{(1 + 2D_s T_1 s) \cdot (T_1^2 s^2)}$$

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## Netlist Syntax

```
MODEL PDT2 ?InstanceName(@InstanceName):(@Refbase@ID) ( INPUT:= @INPUT,
KS:= @KS, DS:= @DS, TD:= @TD, T1:= @T1, TS:= @TS) SRC: DB(Lib:-
:=@ModelLibraryName);
```

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## Parameters

Table 1

| Name  | Description            | Data Type | Default Value [Unit] |
|-------|------------------------|-----------|----------------------|
| Ks    | Gain                   | real      | 1                    |
| DS    | Damping                | real      | 1                    |
| TD    | Derivative Action Time | real      | 1 [s]                |
| T1    | Time Constant          | real      | 1 [s]                |
| TS    | Sample Time            | real      | 0 [s]                |
| INPUT | Input Signal           | real      | 0                    |

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## Input/Output Quantities

Table 2

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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## References

## PI Controller

|                   |                        |                                     |
|-------------------|------------------------|-------------------------------------|
| Library: Transfer | Modeling Language: SML | Version Number: Twin Builder 2024.2 |
|-------------------|------------------------|-------------------------------------|

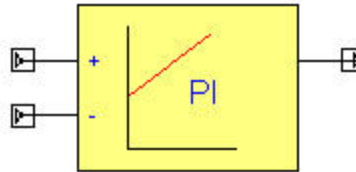


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### Description

The Block represents a continuous PI controller with parameters for the P and I component.

You can define the set point, the initial integral value, the limitations of the internal I component, and the total controllers output signals, as well as the sample time and input signal.

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### Assumptions and Limitations

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### Mathematical Description

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## Netlist Syntax

```
MODEL PI_?InstanceName(@InstanceName):(@Refbase)@(ID)) ( IN:= @IN, SET:= @SET,
KP:= @KP, KI:= @KI, UL:= @UL, LL:= @LL, TS:= @TS, IO:= @IO, UL_I:= @UL_I, LL_I:= @LL_
I) SRC: DB(Lib:=@ModelLibraryName);
```

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## Parameters

**Table 1**

| Name | Description            | Data Type | Default Value [Unit] |
|------|------------------------|-----------|----------------------|
| KP   | Gain                   | real      | 0.5                  |
| KI   | Integral Gain          | real      | 0.1                  |
| UL   | Upper Limit            | real      | 1e12                 |
| LL   | Lower Limit            | real      | -1e12                |
| TS   | Sample Time            | real      | 0 [s]                |
| IO   | Initial Integral Value | real      | 0                    |
| UL_I | Upper Integral Limit   | real      | 0                    |
| LL_I | Lower Integral Limit   | real      | 0                    |
| IN   | Input Signal           | real      | 0                    |
| SET  | Reference Input Signal | real      | 0                    |

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## Input/Output Quantities

**Table 2**

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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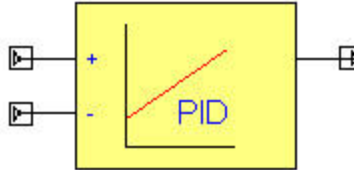
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## PID Controller

|                   |                        |                                     |
|-------------------|------------------------|-------------------------------------|
| Library: Transfer | Modeling Language: SML | Version Number: Twin Builder 2024.2 |
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### Description

The Block represents a continuous PID controller with parameters for the P, D, and I component.

You can define the set point, the initial integral value, the initial derivative value, the limitations of the internal I component, the limitations of the internal D component and the total controllers output signals, as well as the sample time and input signal.

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### Assumptions and Limitations

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### Mathematical Description

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## Netlist Syntax

```
MODEL PID ?InstanceName(@InstanceName):(@ (Refbase)@(ID)) ( IN:= @IN, SET:= @SET,
KP:= @KP, KI:= @KI, KD:= @KD, UL:= @UL, LL:= @LL, TS:= @TS, IO:= @IO, UL_I:= @UL_I,
LL_I:= @LL_I, D0:= @D0, UL_D:= @UL_D, LL_D:= @LL_D) SRC: DB(Lib:-
:=@ModelLibraryName);
```

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## Parameters

**Table 1**

| Name | Description              | Data Type | Default Value [Unit] |
|------|--------------------------|-----------|----------------------|
| KP   | Gain                     | real      | 0.5                  |
| KI   | Integral Gain            | real      | 0.1                  |
| KD   | Derivative Gain          | real      | 0.1                  |
| UL   | Upper Limit              | real      | 1e12                 |
| LL   | Lower Limit              | real      | -1e12                |
| TS   | Sample Time              | real      | 0 [s]                |
| IO   | Initial Integral Value   | real      | 0                    |
| UL_I | Upper Integral Limit     | real      | 0                    |
| LL_I | Lower Integral Limit     | real      | 0                    |
| DO   | Initial Derivative Value | real      | 0                    |
| UL_D | Upper Derivative Limit   | real      | 0                    |
| LL_D | Lower Derivative Limit   | real      | 0                    |
| IN   | Input Signal             | real      | 0                    |
| SET  | Reference Input Signal   | real      | 0                    |

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## Input/Output Quantities

**Table 2**

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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## References

## PID Element with First Order Time Delay

|                   |                        |                                     |
|-------------------|------------------------|-------------------------------------|
| Library: Transfer | Modeling Language: SML | Version Number: Twin Builder 2024.2 |
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### Description

The Block represents a linear continuous transmission element.

You can define the gain, the integral action time, the derivative action time, and the time constant, as well as the sample time and input signal.

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### Assumptions and Limitations

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## Mathematical Description

$$G(s) = K_s \cdot \left( \frac{1 + \frac{1}{T_N \cdot s} + T_V \cdot s}{1 + T_1 \cdot s} \right) = K_s \cdot \frac{1 + T_N \cdot s + T_N \cdot T_V \cdot s^2}{T_N \cdot s + T_N \cdot T_1 \cdot s^2}$$

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## Netlist Syntax

```
MODEL PID1 ?InstanceName(@InstanceName):(@Refbase)@(ID)) ( INPUT:= @INPUT,
KS:= @KS, TN:= @TN, TV:= @TV, T1:= @T1, TS:= @TS) SRC: DB(Lib:-
:=@ModelLibraryName);
```

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## Parameters

Table 1

| Name  | Description            | Data Type | Default Value [Unit] |
|-------|------------------------|-----------|----------------------|
| Ks    | Gain                   | real      | 1                    |
| TN    | Integral Action Time   | real      | 10 [s]               |
| TV    | Derivative Action Time | real      | 10 [s]               |
| T1    | Time Constant          | real      | 1 [s]                |
| TS    | Sample Time            | real      | 0 [s]                |
| INPUT | Input Signal           | real      | 0                    |

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## Input/Output Quantities

Table 2

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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## Example

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## References

## PID Element with Second Order Time Delay

|                   |                        |                                     |
|-------------------|------------------------|-------------------------------------|
| Library: Transfer | Modeling Language: SML | Version Number: Twin Builder 2024.2 |
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### Description

The Block represents a linear, continuous, and oscillating transmission element.

You can define the gain, the integral action time, the derivative action time, the damping and the time constant, as well as the sample time and input signal.

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### Assumptions and Limitations

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## Mathematical Description

$$G(s) = K_s \cdot \left( \frac{1 + \frac{1}{T_N \cdot s} + T_V \cdot s}{1 + 2T_1 D_s s + T_1^2 s^2} \right) = K_s \cdot \frac{1 + T_N \cdot s + T_N \cdot T_V \cdot s^2}{T_N \cdot s + 2 \cdot D_s \cdot T_N \cdot T_1 \cdot s^2 + T_N \cdot T_1^2 \cdot s^3}$$

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## Netlist Syntax

```
MODEL PIDT2 ?InstanceName(@InstanceName):(@Refbase)@(ID)) ( INPUT:= @INPUT,
KS:= @KS, TN:= @TN, TV:= @TV, DS:= @DS, T1:= @T1, TS:= @TS) SRC: DB(Lib:-
:=@ModelLibraryName);
```

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## Parameters

Table 1

| Name  | Description            | Data Type | Default Value [Unit] |
|-------|------------------------|-----------|----------------------|
| Ks    | Gain                   | real      | 1                    |
| TN    | Integral Action Time   | real      | 10 [s]               |
| TV    | Derivative Action Time | real      | 10 [s]               |
| DS    | Damping                | real      | 1                    |
| T1    | Time Constant          | real      | 1 [s]                |
| TS    | Sample Time            | real      | 0 [s]                |
| INPUT | Input Signal           | real      | 0                    |

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## Input/Output Quantities

Table 2

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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## References

## First Order Time Delay Element

|                   |                        |                                     |
|-------------------|------------------------|-------------------------------------|
| Library: Transfer | Modeling Language: SML | Version Number: Twin Builder 2024.2 |
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### Description

The Block represents a linear continuous transmission element with time delay of the 1st order. You can define the gain and the time constant, as well as the sample time and input signal.

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### Assumptions and Limitations

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### Mathematical Description

$$G(s) = \frac{K_s}{1 + T_1 \cdot s}$$

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## Netlist Syntax

```
MODEL PT1 ?InstanceName(@InstanceName):(@Refbase)@(ID)) ( INPUT:= @INPUT, KS:=  
@KS, T1:= @T1, TS:= @TS) SRC: DB(Lib:=@ModelLibraryName);
```

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## Parameters

**Table 1**

| Name  | Description   | Data Type | Default Value [Unit] |
|-------|---------------|-----------|----------------------|
| Ks    | Gain          | real      | 1                    |
| T1    | Time Constant | real      | 1 [s]                |
| TS    | Sample Time   | real      | 0 [s]                |
| INPUT | Input Signal  | real      | 0                    |

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## Input/Output Quantities

**Table 2**

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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## Example

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## References

## Second Order Delay Element (T1,T2)

|                   |                        |                                     |
|-------------------|------------------------|-------------------------------------|
| Library: Transfer | Modeling Language: SML | Version Number: Twin Builder 2024.2 |
|-------------------|------------------------|-------------------------------------|

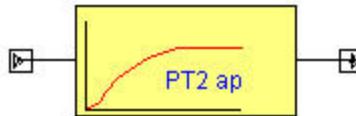


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### Description

The Block represents a linear continuous transmission element with time delay of the 2nd order (two time constants, aperiodic).

You can define the gain, the time constant 1, and the time constant 2, as well as the sample time and input signal.

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### Assumptions and Limitations

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## Mathematical Description

$$G(s) = \frac{K_s}{(1 + T_1 \cdot s) \cdot (1 + T_2 \cdot s)}$$

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## Netlist Syntax

```
MODEL PT2_AP ?InstanceName(@InstanceName):(@Refbase)@(ID)) ( INPUT:= @INPUT,
KS:= @KS, T1:= @T1, T2:= @T2, TS:= @TS) SRC: DB(Lib:=@ModelLibraryName) ;
```

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## Parameters

**Table 1**

| Name  | Description     | Data Type | Default Value [Unit] |
|-------|-----------------|-----------|----------------------|
| Ks    | Gain            | real      | 1                    |
| T1    | Time Constant 1 | real      | 1 [s]                |
| T2    | Time Constant 2 | real      | 1 [s]                |
| TS    | Sample Time     | real      | 0 [s]                |
| INPUT | Input Signal    | real      | 0                    |

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## Input/Output Quantities

**Table 2**

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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## Example

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## References

## Second Order Delay Element (D,T1)

|                   |                        |                                     |
|-------------------|------------------------|-------------------------------------|
| Library: Transfer | Modeling Language: SML | Version Number: Twin Builder 2024.2 |
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### Description

The Block represents a linear, continuous, and oscillating transmission element with time delay of the 2nd order.

You can define the gain, the damping, and the time constant, as well as the sample time and input signal.

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### Assumptions and Limitations

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## Mathematical Description

$$G(s) = \frac{K_s}{(1 + 2D_s T_1 \cdot s - T_1^2 s^2)}$$

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## Netlist Syntax

```
MODEL PT2_OSC ?InstanceName(@InstanceName):(@@ (Refbase)@(ID)) ( INPUT:= @INPUT,
KS:= @KS, DS:= @DS, T1:= @T1, TS:= @TS) SRC: DB(Lib:=@ModelLibraryName);
```

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## Parameters

Table 1

| Name  | Description   | Data Type | Default Value [Unit] |
|-------|---------------|-----------|----------------------|
| Ks    | Gain          | real      | 1                    |
| DS    | Damping       | real      | 1                    |
| T1    | Time Constant | real      | 1 [s]                |
| TS    | Sample Time   | real      | 0 [s]                |
| INPUT | Input Signal  | real      | 0                    |

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## Input/Output Quantities

Table 2

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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## Example

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## References

## Variable Order Time Delay Element

|                   |                        |                                     |
|-------------------|------------------------|-------------------------------------|
| Library: Transfer | Modeling Language: SML | Version Number: Twin Builder 2024.2 |
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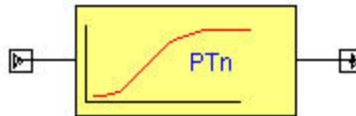


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### Description

The Block represents a linear continuous transmission element with time delay of n-th order.

You can define the gain, the order, and the time constant, as well as the sample time and input signal.

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### Assumptions and Limitations

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### Mathematical Description

$$G(s) = \frac{K_s}{(1 + T_1 \cdot s)^N} \quad 0 < N < 10$$

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## Netlist Syntax

```
MODEL PTN ?InstanceName(@InstanceName):(@ (Refbase)@(ID)) ( INPUT:= @INPUT, N:=  
@N, KS:= @KS, T1:= @T1, TS:= @TS) SRC: DB(Lib:=@ModelLibraryName);
```

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## Parameters

**Table 1**

| Name  | Description   | Data Type | Default Value [Unit] |
|-------|---------------|-----------|----------------------|
| Ks    | Gain          | real      | 1                    |
| N     | Order         | real      | 1                    |
| T1    | Time Constant | real      | 1 [s]                |
| TS    | Sample Time   | real      | 0 [s]                |
| INPUT | Input Signal  | real      | 0                    |

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## Input/Output Quantities

**Table 2**

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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## Example

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## References

## Non-Linear Transfer Blocks

- Dead Zone (DEADBAND)
- Divider (DIV)
- Insensitivity Zone (INSTTY)
- Inverse Dead Zone (INVDEAD)
- Variable Gain (KPVAR)
- Keyboard Controlled Ramp Generator (KRMP)
- Pulse Frequency Modulation (PFM)
- Pulse Width Modulation (PWM)
- Pulse Width Modulation with Phase Triggering (PWM\_phase)
- Rise Rate Limiting (RISEMAX)
- Rise Rate Limiting with Initial Value(RISEMAX\_INIT)
- Square Function (SQR)
- Square Root Function (SQRT)
- Switch 11 (SW10)
- Switch 12 (SW12)
- Switch 21 (SW21)

## Dead Zone

|                   |                        |                                     |
|-------------------|------------------------|-------------------------------------|
| Library: Transfer | Modeling Language: SML | Version Number: Twin Builder 2024.2 |
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### Description

The Block represents a dead zone element. All input signals within the interval  $[a,b]$  will be ignored. The signals left of the dead zone are multiplied by  $K1$ , the signals right of the dead zone by  $K3$ .

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### Assumptions and Limitations

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## Mathematical Description

$$y = f(x)$$

$$x \leq a \quad y = K1 \cdot x$$

$$a < x \leq b \quad y = 0$$

$$x > b \quad y = K3 \cdot x$$

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## Netlist Syntax

```
MODEL DEADBAND ?InstanceName(@InstanceName):(@Refbase)@(ID)) ( INPUT:=
@INPUT, K1:= @K1, K3:= @K3, A:= @A, B:= @B, TS:= @TS) SRC: DB(Lib:-
:=@ModelLibraryName);
```

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## Parameters

**Table 1**

| Name  | Description  | Data Type | Default Value [Unit] |
|-------|--------------|-----------|----------------------|
| K1    | Left Gain    | real      | 1                    |
| K3    | Right Gain   | real      | 1                    |
| A     | Left Limit   | real      | -1                   |
| B     | Right Limit  | real      | 1                    |
| TS    | Sample Time  | real      | 0 [s]                |
| INPUT | Input Signal | real      | 0                    |

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## Input/Output Quantities

**Table 2**

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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## Example

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## References

## Divider

|                   |                        |                                     |
|-------------------|------------------------|-------------------------------------|
| Library: Transfer | Modeling Language: SML | Version Number: Twin Builder 2024.2 |
|-------------------|------------------------|-------------------------------------|

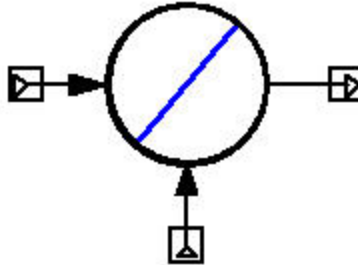


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### Description

The Block represents the division of two signals.

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### Assumptions and Limitations

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### Mathematical Description

$$y = \frac{x_1}{x_2} = \frac{I_N}{I_D} \quad x_2 \neq 0$$

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## Netlist Syntax

MODEL DIV ?InstanceName(@InstanceName):(@(Refbase)@(ID)) ( I\_N:= @I\_N, I\_D:= @I\_D, TS:= @TS) SRC: DB(Lib:=@ModelLibraryName) ;

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## Parameters

**Table 1**

| Name | Description | Data Type | Default Value [Unit] |
|------|-------------|-----------|----------------------|
| I_N  | Dividend    | real      | 0                    |
| I_D  | Divisor     | real      | 1                    |
| TS   | Sample Time | real      | 0 [s]                |

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## Input/Output Quantities

**Table 2**

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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## Example

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## References

## Insensitivity Zone

|                   |                        |                                     |
|-------------------|------------------------|-------------------------------------|
| Library: Transfer | Modeling Language: SML | Version Number: Twin Builder 2024.2 |
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### Description

The Block represents a insensitivity zone element. All input signals within the interval  $[a,b]$  are multiplied by  $K2$ . The signals left of the insensitivity zone are multiplied by  $K1$ , the signals right of the insensitivity zone by  $K3$ . If  $K2 > K1, K3$ , an oversensitive zone is defined.

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### Assumptions and Limitations

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## Mathematical Description

$$y = f(x)$$

$$x \leq a \quad y = K1 \cdot x$$

$$a < x \leq b \quad y = K2 \cdot x$$

$$x > b \quad y = K3 \cdot x$$

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## Netlist Syntax

```
MODEL INSTTY ?InstanceName(@InstanceName):(@Refbase@ID) ( INPUT:= @INPUT,
K1:= @K1, K2:= @K2, K3:= @K3, A:= @A, B:= @B, TS:= @TS) SRC: DB(Lib:-
:=@ModelLibraryName);
```

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## Parameters

**Table 1**

| Name  | Description  | Data Type | Default Value [Unit] |
|-------|--------------|-----------|----------------------|
| K1    | Left Gain    | real      | 1                    |
| K2    | Central Gain | real      | 0.1                  |
| K3    | Right Gain   | real      | 1                    |
| A     | Left Limit   | real      | -1                   |
| B     | Right Limit  | real      | 1                    |
| TS    | Sample Time  | real      | 0 [s]                |
| INPUT | Input Signal | real      | 0                    |

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## Input/Output Quantities

**Table 2**

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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**References**

## Inverse Dead Zone

|                   |                        |                                     |
|-------------------|------------------------|-------------------------------------|
| Library: Transfer | Modeling Language: SML | Version Number: Twin Builder 2024.2 |
|-------------------|------------------------|-------------------------------------|

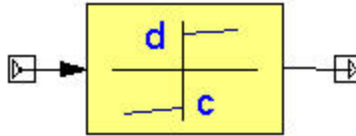


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### Description

The Block represents a inverse dead zone element. All input signals less than a trigger point are multiplied by K1 and added to an offset CC. All input signals greater than a trigger point are multiplied by K2 and added to an offset DD. So a preload characteristic can be modeled (e.g. compensation the dead zone of a real actuator).

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### Assumptions and Limitations

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## Mathematical Description

$$y = f(x)$$

$$x < TRIGG \quad y = K1 \cdot x + CC$$

$$x \geq TRIGG \quad y = K2 \cdot x + DD$$

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## Netlist Syntax

```
MODEL INVDEAD ?InstanceName(@InstanceName):(@Refbase)@(ID)) ( INPUT:= @INPUT,
K1:= @K1, K2:= @K2, TRIGG:= @TRIGG, CC:= @CC, DD:= @DD, TS:= @TS) SRC: DB(Lib:-
:=@ModelLibraryName);
```

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## Parameters

Table 1

| Name  | Description     | Data Type | Default Value [Unit] |
|-------|-----------------|-----------|----------------------|
| K1    | Left Gain       | real      | 1                    |
| K2    | Right Gain      | real      | 1                    |
| TRIGG | Threshold Value | real      | 0                    |
| CC    | Lower Offset    | real      | -1                   |
| DD    | Upper Offset    | real      | 1                    |
| TS    | Sample Time     | real      | 0 [s]                |
| INPUT | Input Signal    | real      | 0                    |

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## Input/Output Quantities

Table 2

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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## Example

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## References

## Variable Gain

|                   |                        |                                     |
|-------------------|------------------------|-------------------------------------|
| Library: Transfer | Modeling Language: SML | Version Number: Twin Builder 2024.2 |
|-------------------|------------------------|-------------------------------------|

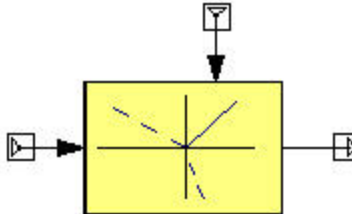


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### Description

The Block represents a variable, over a control signal switched factor. With the block a direction coupled transfer characteristic, or an amplification in only one direction (diode function) can be modeled.

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### Assumptions and Limitations

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## Mathematical Description

$$y = f(x, CTRL)$$

$$y = K2 \cdot x, \quad \text{if } CTRL \geq TRIGG$$

$$y = K1 \cdot x, \quad \text{otherwise}$$

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## Netlist Syntax

```
MODEL KPVAR ?InstanceName(@InstanceName):(@ (Rebase)@(ID)) ( INPUT:= @INPUT,
CTRL:= @CTRL, K1:= @K1, K2:= @K2, TRIGG:= @TRIGG, TS:= @TS) SRC: DB(Lib:-
:=@ModelLibraryName);
```

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## Parameters

**Table 1**

| Name  | Description     | Data Type | Default Value [Unit] |
|-------|-----------------|-----------|----------------------|
| K1    | Left Gain       | real      | -1                   |
| K2    | Right Gain      | real      | 1                    |
| TRIGG | Threshold Value | real      | 0                    |
| TS    | Sample Time     | real      | 0 [s]                |
| INPUT | Input Signal    | real      | 0                    |
| CTRL  | Control Signal  | real      | 0                    |

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## Input/Output Quantities

**Table 2**

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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## References

# Keyboard Controlled Ramp Generator

|                   |                        |                                     |
|-------------------|------------------------|-------------------------------------|
| Library: Transfer | Modeling Language: SML | Version Number: Twin Builder 2024.2 |
|-------------------|------------------------|-------------------------------------|

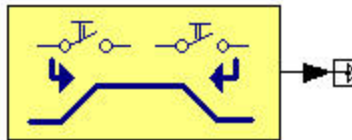


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## Description

The Block represents a ramp generator, which is controlled with user-defined key actions.

You can define the rate of rise, the initial value, the limitations of the output signal, and the keys controlling the ramp curve, as well as the sample time.

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## Assumptions and Limitations

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## Mathematical Description

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## Netlist Syntax

```
MODEL KRMP ?InstanceName(@InstanceName):(@(Rebase)@(ID)) ( SR:= @SR, SR0:=  
@SR0, UL:= @UL, LL:= @LL, TEP:= @TEP, TAP:= @TAP, TEM:= @TEM, TAM:= @TAM,  
TS:= @TS) SRC: DB(Lib:=@ModelLibraryName);
```

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## Parameters

Table 1

| Name | Description        | Data Type | Default Value [Unit] |
|------|--------------------|-----------|----------------------|
| SR   | Slope Rate         | real      | 0                    |
| SR0  | Initial Slope Rate | real      | 0                    |
| UL   | Upper Limit        | real      | 0                    |
| LL   | Lower Limit        | real      | 0                    |
| TS   | Sample Time        | real      | 0 [s]                |

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## Input/Output Quantities

Table 2

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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## Example

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## References

## Pulse Frequency Modulation

|                   |                        |                                     |
|-------------------|------------------------|-------------------------------------|
| Library: Transfer | Modeling Language: SML | Version Number: Twin Builder 2024.2 |
|-------------------|------------------------|-------------------------------------|

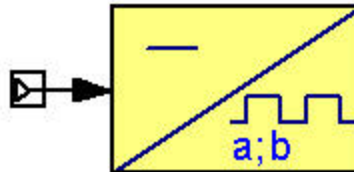


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### Description

The Block represents a pulse rate modulation for symmetrical input signals (signal amplitudes between maximum values). The output A provides a pulse with a constant ON period and a variable OFF period. The output B provides a pulse with a variable ON period and a constant OFF period. Positive input signal amplitudes result in high pulse rate, negative input signal amplitudes result in lower pulse rate.

You can define the ON period, the maximum period, and the maximum input amplitude, as well as the sample time and the input signal.

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### Mathematical Description

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## Netlist Syntax

```
MODEL PFM ?InstanceName(@InstanceName):(@Refbase)@(ID)) ( INPUT:= @INPUT,  
TON:= @TON, TMAX:= @TMAX, INMAX:= @INMAX, TS:= @TS, A:= @A, B:= @B) SRC: DB  
(Lib:=@ModelLibraryName);
```

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## Parameters

Table 1

| Name             | Description             | Data Type | Default Value [Unit] |
|------------------|-------------------------|-----------|----------------------|
| T <sub>ON</sub>  | ON Period               | real      | 0.0005 [s]           |
| T <sub>MAX</sub> | OFF Period              | real      | 0.001 [s]            |
| INMAX            | Maximum Input Amplitude | real      | 1                    |
| TS               | Sample Time             | real      | 0 [s]                |
| INPUT            | Input Signal            | real      | 0                    |

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## Input/Output Quantities

Table 2

| Name | Description [Unit]    | Direction    | Data Type |
|------|-----------------------|--------------|-----------|
| A    | Output Signal         | Input/Output | real      |
| B    | Negated Output Signal | Input/Output | real      |

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## Example

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## References

## Pulse Width Modulation

|                   |                        |                                     |
|-------------------|------------------------|-------------------------------------|
| Library: Transfer | Modeling Language: SML | Version Number: Twin Builder 2024.2 |
|-------------------|------------------------|-------------------------------------|

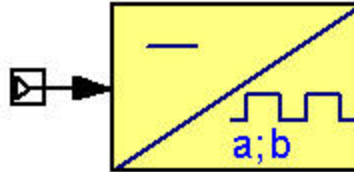


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- [Mathematical Description](#)
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### Description

The Block represents a pulse-width modulation. The intern trigger signal (saw-tooth rising) should be adjusted in frequency, amplitude, offset to the input signal. Example: At an input signal between 0V and +10V a trigger signal with an amplitude of 5V and an offset of 5V should be used. A maximum input signal result to maximum pulse width, a minimum input signal result to minimum pulse width (pulse width close to 0)..

You can define amplitude, offset, and frequency of the trigger signal, as well as the sample time ant the input signal.

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### Assumptions and Limitations

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### Mathematical Description

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## Netlist Syntax

MODEL PWM ?InstanceName(@InstanceName):(@Refbase)@(ID)) ( INPUT:= @INPUT, ATR:= @ATR, FTR:= @FTR, OTR:= @OTR, TS:= @TS, A:= @A, B:= @B) SRC: DB(Lib:- :=@ModelLibraryName);

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## Parameters

Table 1

| Name  | Description              | Data Type | Default Value [Unit] |
|-------|--------------------------|-----------|----------------------|
| ATR   | Trigger Signal Amplitude | real      | 1                    |
| FTR   | Trigger Signal Frequency | real      | 1                    |
| OTR   | Trigger Signal Offset    | real      | 0                    |
| TS    | Sample Time              | real      | 0 [s]                |
| INPUT | Input Signal             | real      | 0                    |

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## Input/Output Quantities

Table 2

| Name | Description [Unit]    | Direction    | Data Type |
|------|-----------------------|--------------|-----------|
| A    | Output Signal         | Input/Output | real      |
| B    | Negated Output Signal | Input/Output | real      |

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## Example

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## References

## Pulse Width Modulation with Phase Triggering

|                   |                        |                                     |
|-------------------|------------------------|-------------------------------------|
| Library: Transfer | Modeling Language: SML | Version Number: Twin Builder 2024.2 |
|-------------------|------------------------|-------------------------------------|

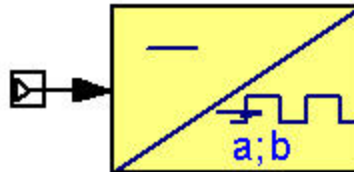


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### Description

The Block represents a pulse-width modulation with threshold value. If the input signal  $\geq$  threshold value, the output A is '1'. If the input signal  $<$  threshold value, the output A is '0'.

You can define the threshold value, as well as the sample time and the input signal.

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### Assumptions and Limitations

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### Mathematical Description

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## Netlist Syntax

```
MODEL PWM_phase ?InstanceName(@InstanceName):(@Refbase)@(ID)) ( INPUT:=
@INPUT, ATR:= @ATR, FTR:= @FTR, OTR:= @OTR, PHTR:= @PHTR, TS:= @TS, A:= @A,
B:= @B) SRC: DB(Lib:=@ModelLibraryName) ;
```

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## Parameters

**Table 1**

| Name  | Description              | Data Type | Default Value [Unit] |
|-------|--------------------------|-----------|----------------------|
| ATR   | Trigger Signal Amplitude | real      | 1                    |
| FTR   | Trigger Signal Frequency | real      | 1 [Hz]               |
| OTR   | Trigger Signal Offset    | real      | 0                    |
| PHTR  | Trigger Signal Phase     | real      | 0 [deg]              |
| TS    | Sample Time              | real      | 0 [s]                |
| INPUT | Input Signal             | real      | 0                    |

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## Input/Output Quantities

**Table 2**

| Name    | Description [Unit]    | Direction    | Data Type |
|---------|-----------------------|--------------|-----------|
| TRIGGER | Trigger Signal        | Output       | real      |
| A       | Output Signal         | Input/Output | real      |
| B       | Negated Output Signal | Input/Output | real      |

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## Example

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## References

## Rise Rate Limiting

|                   |                        |                                     |
|-------------------|------------------------|-------------------------------------|
| Library: Transfer | Modeling Language: SML | Version Number: Twin Builder 2024.2 |
|-------------------|------------------------|-------------------------------------|

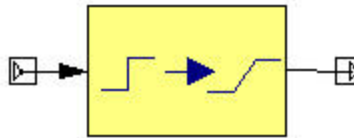


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### Description

The Block represents a limited, maximum possible rate of signal rise. A real actuator can only react to input signal changes with a limited rate, i.e., if an input signal changes more quickly than the given limit, the rate of change is bound to this limit..

You can define the maximum rise for the positive and negative direction separately, as well as the sample time and the input signal.

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### Assumptions and Limitations

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### Mathematical Description

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## Netlist Syntax

MODEL RISEMAX ?InstanceName(@InstanceName):(@ (Refbase)@(ID)) ( INPUT:= @INPUT, APOS:= @APOS, ANEG:= @ANEG, TS:= @TS) SRC: DB(Lib:=@ModelLibraryName);

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## Parameters

Table 1

| Name  | Description        | Data Type | Default Value [Unit] |
|-------|--------------------|-----------|----------------------|
| APOS  | Positive Rise Rate | real      | 1                    |
| ANEG  | Negative Rise Rate | real      | -1                   |
| TS    | Sample Time        | real      | 0 [s]                |
| INPUT | Input Signal       | real      | 0                    |

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## Input/Output Quantities

Table 2

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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## References

## Rise Rate Limiting With Initial Value

|                   |                        |                                     |
|-------------------|------------------------|-------------------------------------|
| Library: Transfer | Modeling Language: SML | Version Number: Twin Builder 2024.2 |
|-------------------|------------------------|-------------------------------------|

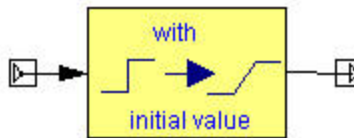


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### Description

The Block represents a limited, maximum possible rate of signal rise with a defined initial value. A real actuator can only react to input signal changes with a limited rate, i.e., if an input signal changes more quickly than the given limit, the rate of change is bound to this limit.

You can define the maximum rise for the positive and negative direction separately and the initial value, as well as the sample time and the input signal.

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### Assumptions and Limitations

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### Mathematical Description

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## Netlist Syntax

```
MODEL RISEMAX_INIT ?InstanceName(@InstanceName):(@ (Refbase)@ (ID)) ( INPUT:=  
@INPUT, APOS:= @APOS, ANEG:= @ANEG, RR0:= @RR0) SRC: DB(Lib:-  
:=@ModelLibraryName);
```

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## Parameters

**Table 1**

| Name  | Description        | Data Type | Default Value [Unit] |
|-------|--------------------|-----------|----------------------|
| APOS  | Positive Rise Rate | real      | 1                    |
| ANEG  | Negative Rise Rate | real      | -1                   |
| RRO   | Initial Rise Rate  | real      | 0                    |
| INPUT | Input Signal       | real      | 0                    |

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## Input/Output Quantities

**Table 2**

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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## Example

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## References

# Square Function

|                   |                        |                                     |
|-------------------|------------------------|-------------------------------------|
| Library: Transfer | Modeling Language: SML | Version Number: Twin Builder 2024.2 |
|-------------------|------------------------|-------------------------------------|

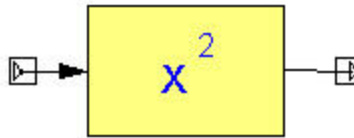


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## Description

The Block represents a square function.

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## Assumptions and Limitations

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## Mathematical Description

$$y = x^2$$

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## Netlist Syntax

```
MODEL SQR ?InstanceName(@InstanceName):(@Refbase@ID) ( INPUT:= @INPUT, TS:=  
@TS) SRC: DB(Lib:=@ModelLibraryName);
```

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## Parameters

Table 1

| Name  | Description  | Data Type | Default Value [Unit] |
|-------|--------------|-----------|----------------------|
| TS    | Sample Time  | real      | 0 [s]                |
| INPUT | Input Signal | real      | 0                    |

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## Input/Output Quantities

Table 2

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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## Example

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## References

# Square Root Function

Library: Transfer

Modeling Language: SML

Version Number: Twin Builder 2024.2

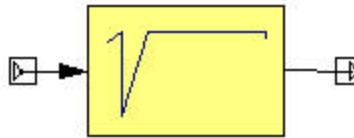


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## Description

The Block represents a square root function. For negative input signals, the output signal is zero.

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## Assumptions and Limitations

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## Mathematical Description

$$y = \sqrt{x} \quad x \geq 0$$

$$y = 0 \quad \text{in all other cases}$$

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## Netlist Syntax

```
MODEL SQRT ?InstanceName(@InstanceName):(@(Refbase)@(ID)) ( INPUT:= @INPUT,  
TS:= @TS) SRC: DB(Lib:=@ModelLibraryName) ;
```

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## Parameters

**Table 1**

| Name  | Description  | Data Type | Default Value [Unit] |
|-------|--------------|-----------|----------------------|
| TS    | Sample Time  | real      | 0 [s]                |
| INPUT | Input Signal | real      | 0                    |

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## Input/Output Quantities

**Table 2**

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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## Example

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## References

## Switch 11

|                   |                        |                                     |
|-------------------|------------------------|-------------------------------------|
| Library: Transfer | Modeling Language: SML | Version Number: Twin Builder 2024.2 |
|-------------------|------------------------|-------------------------------------|

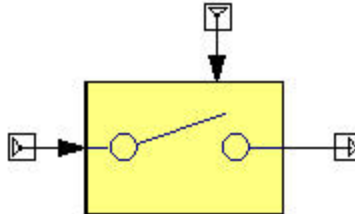


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### Description

The Block represents a controlled switch. Dependent on the control signal, the input signal is connected to the output, or zero is set at the output.

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### Assumptions and Limitations

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## Mathematical Description

$$y = f(x, CTRL)$$

$$y = x \quad \text{if } CTRL \geq TRIGG$$

$$y = 0 \quad \text{otherwise}$$

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## Netlist Syntax

```
MODEL SW10 ?InstanceName(@InstanceName):(@Refbase@ID) ( INPUT:= @INPUT,
CTRL:= @CTRL, TRIGG:= @TRIGG, TS:= @TS) SRC: DB(Lib:=@ModelLibraryName) ;
```

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## Parameters

Table 1

| Name  | Description    | Data Type | Default Value [Unit] |
|-------|----------------|-----------|----------------------|
| CTRL  | Control Signal | real      | 0                    |
| TRIGG | Trigger Signal | real      | 0                    |
| TS    | Sample Time    | real      | 0 [s]                |
| INPUT | Input Signal   | real      | 0                    |

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## Input/Output Quantities

Table 2

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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## Example

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## References

## Switch 12

|                   |                        |                                     |
|-------------------|------------------------|-------------------------------------|
| Library: Transfer | Modeling Language: SML | Version Number: Twin Builder 2024.2 |
|-------------------|------------------------|-------------------------------------|

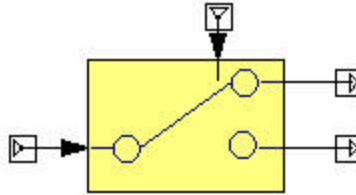


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### Description

The Block represents a controlled switch. Dependent on the control signal, the input signal is connected to the output 1 or the output 2.

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### Assumptions and Limitations

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## Mathematical Description

$$y1, y2 = f(x, CTRL)$$

$$y1 = x \quad \text{if } CTRL \geq TRIGG$$

$$y2 = x \quad \text{otherwise}$$

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## Netlist Syntax

```
MODEL SW12 ?InstanceName(@InstanceName):(@ (Refbase)@(ID)) ( INPUT:= @INPUT,
CTRL:= @CTRL, TRIGG:= @TRIGG, TS:= @TS) SRC: DB(Lib:=@ModelLibraryName);
```

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## Parameters

Table 1

| Name  | Description    | Data Type | Default Value [Unit] |
|-------|----------------|-----------|----------------------|
| CTRL  | Control Signal | real      | 0                    |
| TRIGG | Trigger Signal | real      | 0                    |
| TS    | Sample Time    | real      | 0 [s]                |
| INPUT | Input Signal   | real      | 0                    |

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## Input/Output Quantities

Table 2

| Name  | Description [Unit] | Direction | Data Type |
|-------|--------------------|-----------|-----------|
| VAL_1 | Output Signal 1    | Output    | real      |
| VAL_2 | Output Signal 2    | Output    | real      |

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## Example

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## References

## Switch 21

|                   |                        |                                     |
|-------------------|------------------------|-------------------------------------|
| Library: Transfer | Modeling Language: SML | Version Number: Twin Builder 2024.2 |
|-------------------|------------------------|-------------------------------------|

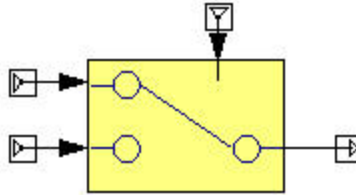


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### Description

The Block represents a controlled switch. Dependent on the control signal, input signal 1 or input signal 2 is connected to the output.

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### Assumptions and Limitations

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## Mathematical Description

$$y = f(x1, x2, CTRL)$$

$$y = x1 \quad \text{if } CTRL \geq TRIGG$$

$$y = x2 \quad \text{otherwise}$$

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## Netlist Syntax

```
MODEL SW21 ?InstanceName(@InstanceName):(@Refbase@ID) ( INPUT_1:= @INPUT_1, INPUT_2:= @INPUT_2, CTRL:= @CTRL, TRIGG:= @TRIGG, TS:= @TS) SRC: DB(Lib:- :=@ModelLibraryName);
```

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## Parameters

Table 1

| Name    | Description    | Data Type | Default Value [Unit] |
|---------|----------------|-----------|----------------------|
| CTRL    | Control Signal | real      | 0                    |
| TRIGG   | Trigger Signal | real      | 0                    |
| TS      | Sample Time    | real      | 0 [s]                |
| INPUT_1 | Input Signal 1 | real      | 0                    |
| INPUT_2 | Input Signal 2 | real      | 0                    |

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## Input/Output Quantities

Table 2

| Name | Description [Unit] | Direction | Data Type |
|------|--------------------|-----------|-----------|
| VAL  | Output Signal      | Output    | real      |

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