TPI SV-PWM - Helper block

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Simon STROBL
Product Director
imperix

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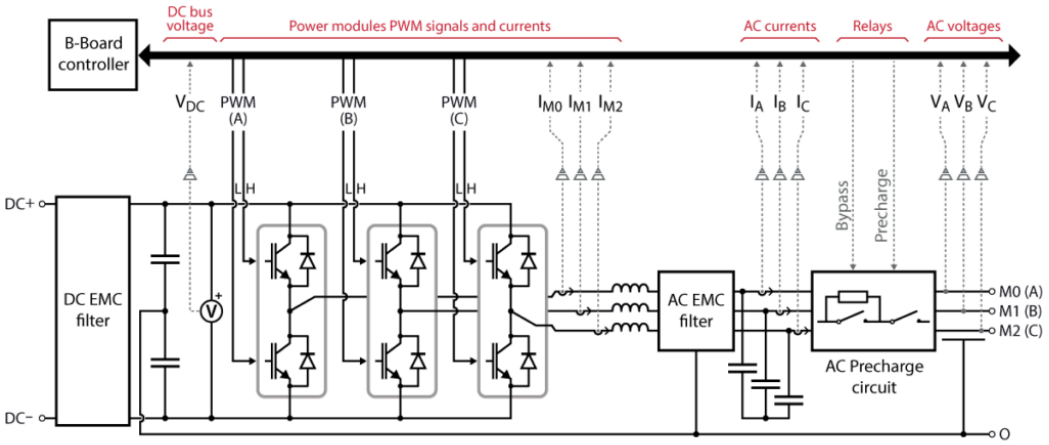
The TPI SV-PWM helper block is a wrapper that simplifies the use of the SV-PWM block with the all-in-one programmable inverter (TPI8032 22kW). Since the topology of the converter is fixed, the channel assignment and part of the modulators' configuration are known beforehand.

The topology of the converter and the connection of the PWM channels are shown below. To prevent short-circuiting the DC bus, the upper and lower leg switches always use pseudo-complementary signals with a fixed dead-time of 124 ns. This value was chosen as low as possible to minimize the distortion introduced by the dead-time.



Topology of the TPI8032

PWM channel	PWM lane	Description
0	0	PWM High – Phase A (M0)
	1	PWM Low – Phase A (M0)
1	2	PWM High – Phase B (M1)
	3	PWM Low – Phase B (M1)
2	4	PWM High – Phase C (M2)
	5	PWM Low – Phase C (M2)

PWM channels and lanes assignment

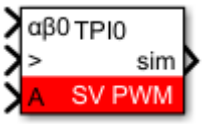
The TPI SV-PWM helper block is available starting from version 2024.2 of the SDK. The TPI8032 is **required** to use this driver.

Simulink SV PWM helper block

Signal specification

- The input `αβ0` is the normalized reference vector in the stationary reference frame (-1.15 to 1.15).
- The input signal `>` is the clock input and must be connected to the CONFIG block or to an independent CLK.
- The input `A` allows the activation (>0) or deactivation (<=0) of the PWM outputs.
- The `sim` output is a vector corresponding to the six generated PWM signals (phase A high and low, phase B high and low, and phase C high and low). They

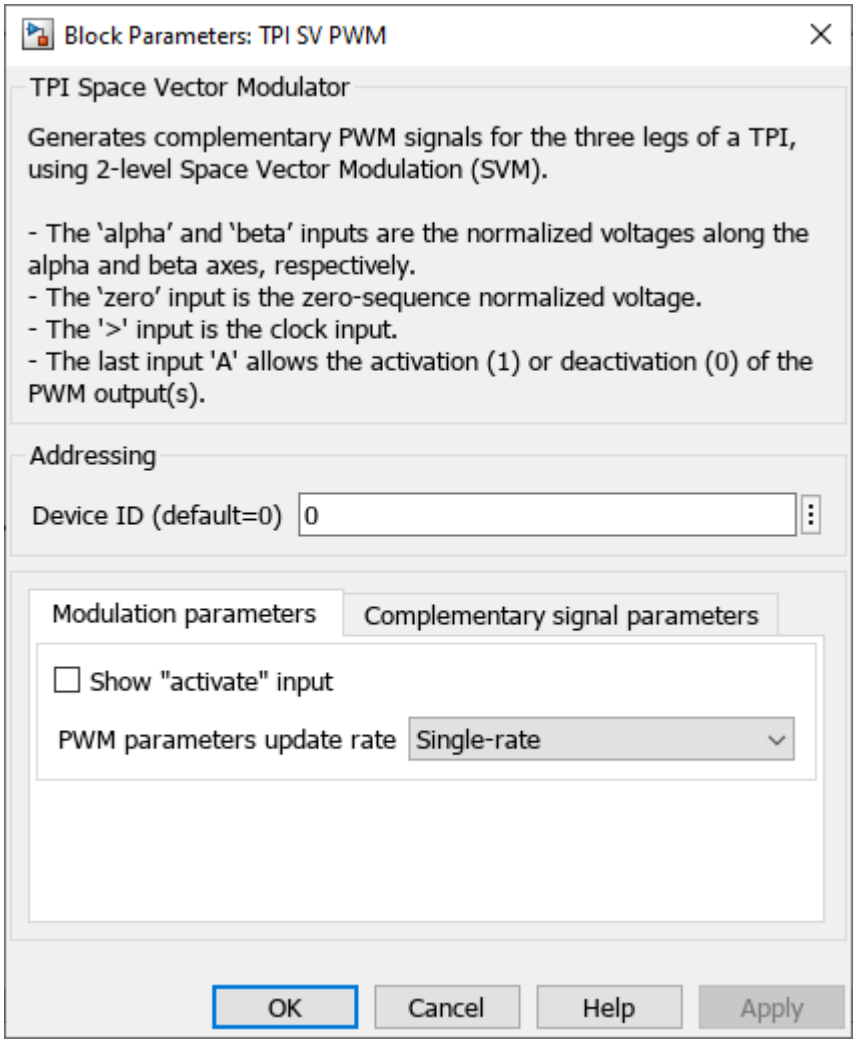
are only used in simulation.

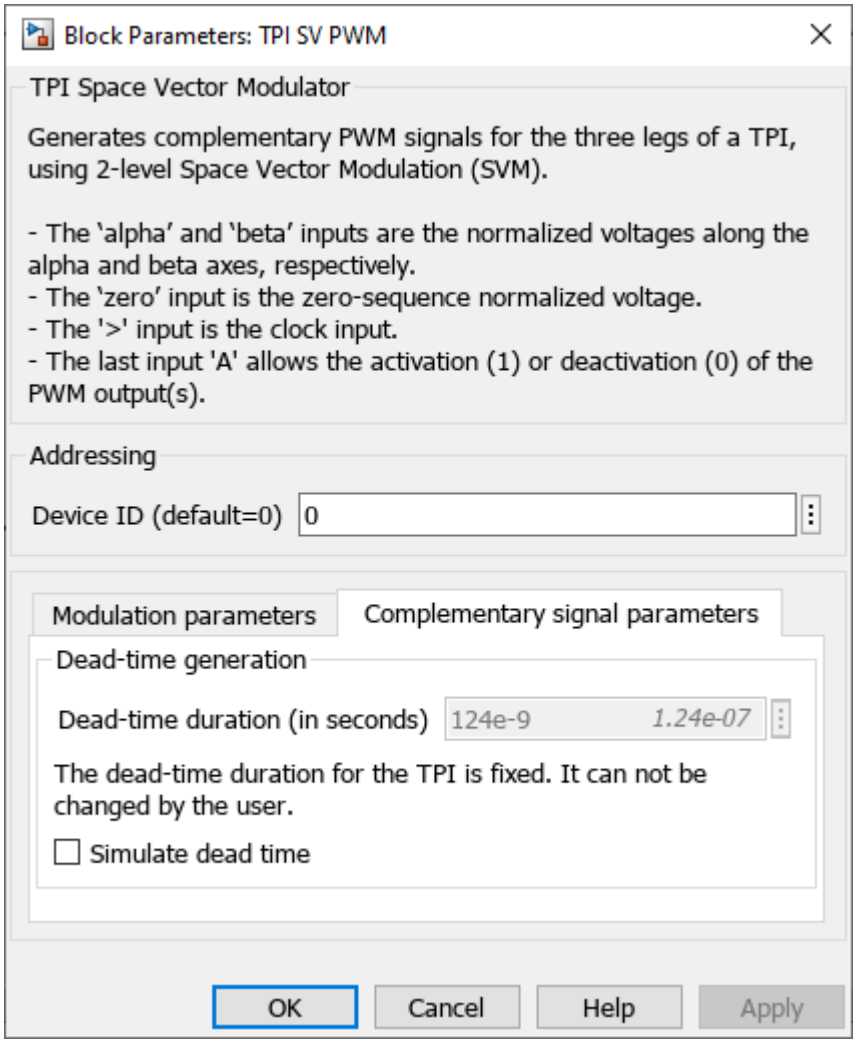


While each component of the normalized reference vector can be in the range [-1.15; 1.15], the norm of that vector must be in the range [0; 1.15]. The limitation of the norm is further explained in SVPWM vs SPWM modulation techniques (TN146). In addition, the page Space Vector Modulation (TN145) presents a way to take this limitation into account in a closed-loop control algorithm.

Parameters

- `Device ID` selects which TPI to address when used in a multi-device configuration.
- `Show "activate" input` makes the `A` input visible. If not checked, the TPI CB-PWM block is active by default.
- `PWM parameters update rate` selects when the duty-cycle parameter is applied.
  - *Single-rate*: it is applied at the end of the carrier period.
  - *Double-rate*: it is applied twice per carrier period: when the carrier reaches its lowest point and when it reaches its highest point. (for TRIANGLE and INVTRIANGLE carriers only)
- `Simulate dead-time` toggles the option to simulate the effect of the dead-time.

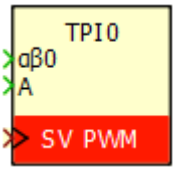

Block Parameters: TPI SV PWM
TPI Space Vector Modulator
Generates complementary PWM signals for the three legs of a TPI, using 2-level Space Vector Modulation (SVM).
- The 'alpha' and 'beta' inputs are the normalized voltages along the alpha and beta axes, respectively.
- The 'zero' input is the zero-sequence normalized voltage.
- The '>' input is the clock input.
- The last input 'A' allows the activation (1) or deactivation (0) of the PWM output(s).
Addressing
Device ID (default=0)
0
Modulation parameters
Complementary signal parameters
Show "activate" input
PWM parameters update rate
Single-rate
OK
Cancel
Help
Apply



PLECS SV PWM helper block

Signal specification

- The input αβ0 is the normalized reference vector in the stationary reference frame (-1.15 to 1.15).
- The input signal > is the clock input and must be connected to the CONFIG block or to an independent CLK.
- The input A allows the activation (>0) or deactivation (<=0) of the PWM outputs.
- The target output port (only visible at the atomic subsystem level) is a vector corresponding to the six generated PWM signals (phase A high and low, phase B high and low, and phase C high and low). They are only used in simulation.



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Parameters

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- `Show "activate" input` makes the `A` input visible. If not checked, the TPI CB-PWM block is active by default.
- `PWM parameters update rate` selects when the duty-cycle parameter is applied.
  - *Single-rate*: it is applied at the end of the carrier period.
  - *Double-rate*: it is applied twice per carrier period: when the carrier reaches its lowest point and when it reaches its highest point. (for TRIANGLE and INVTRIANGLE carriers only)
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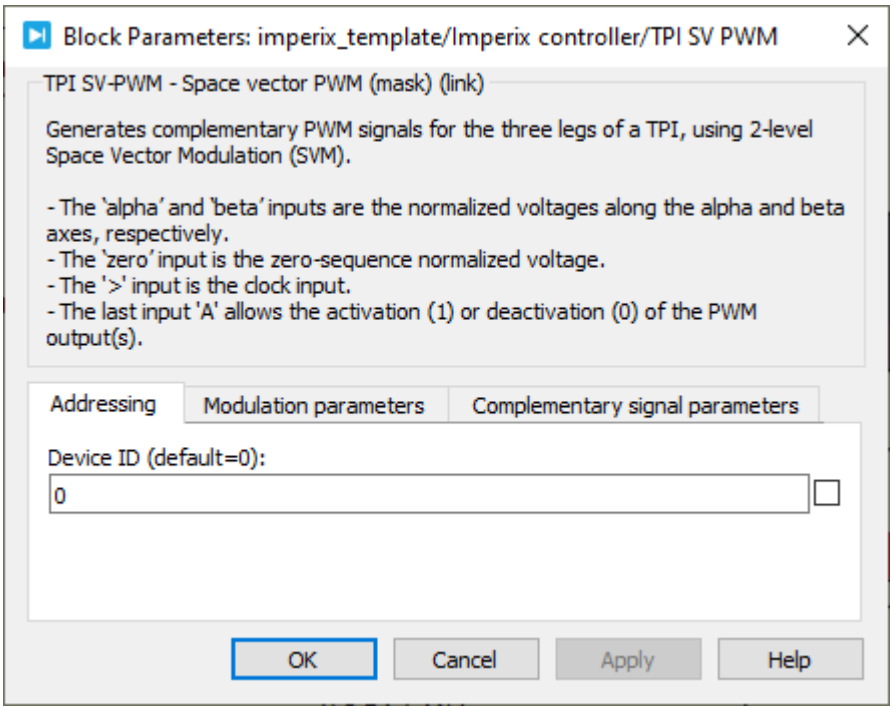

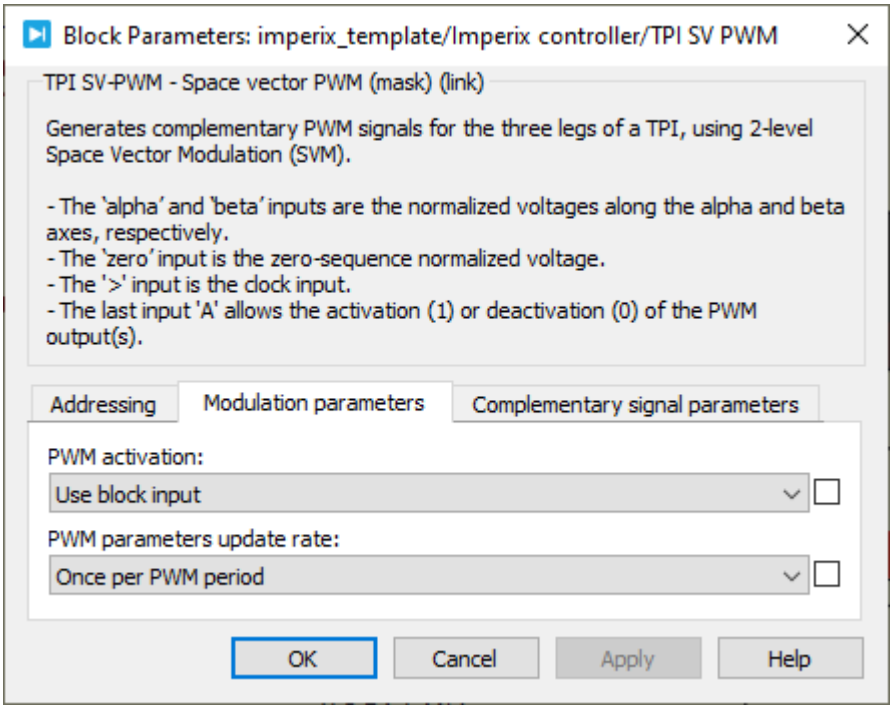

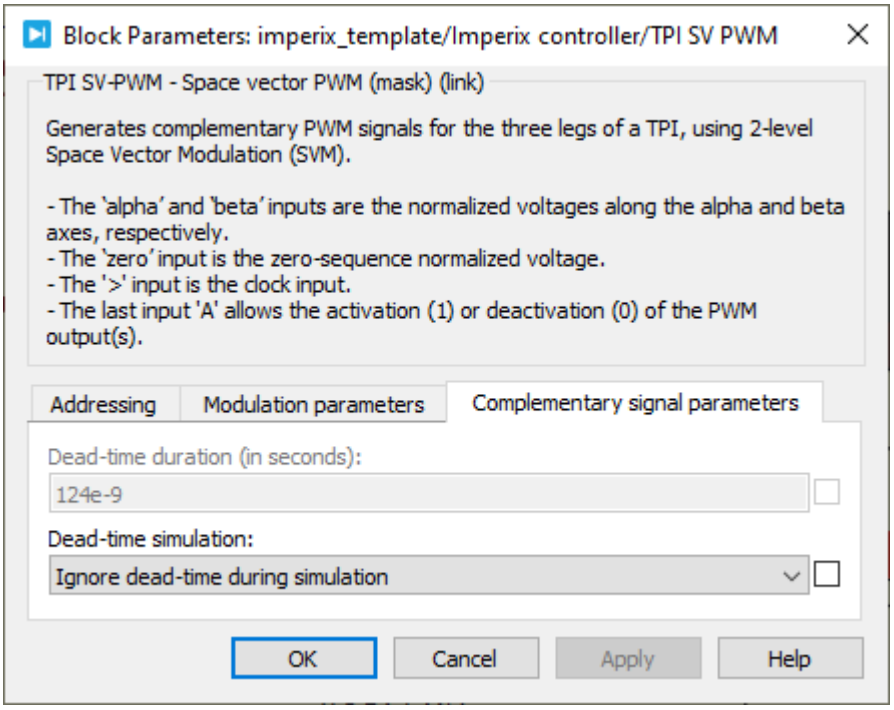

C++ functions

There are no C++ helper functions for the TPI. Please refer to the generic SV-PWM functions.