



PLECS

*DEMO MODEL*

## Cycloconverter

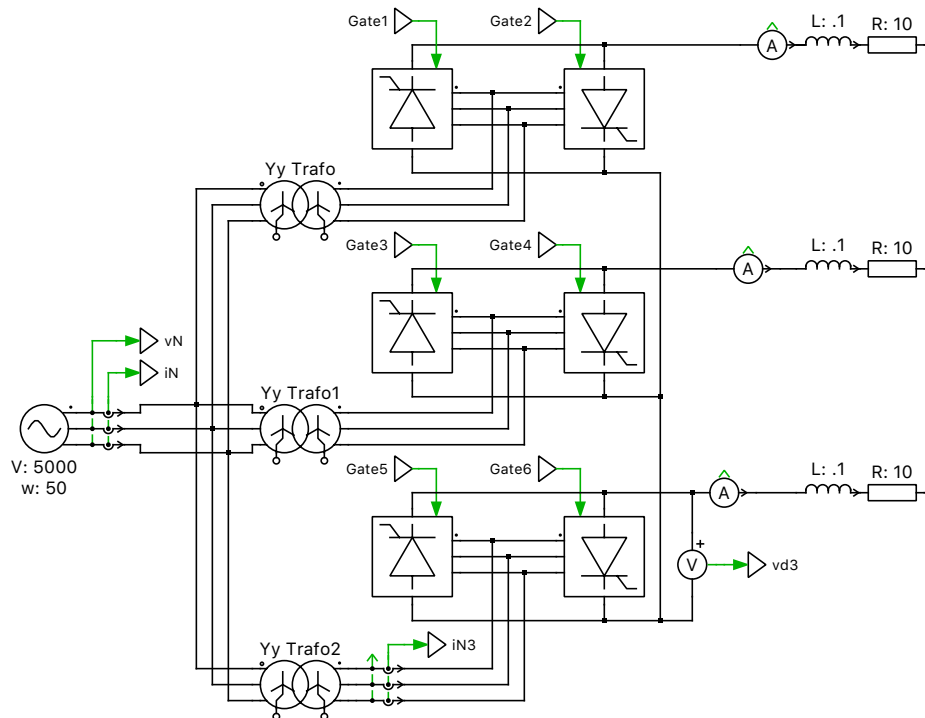
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# 1 Overview

This demonstration shows a cycloconverter with a three-phase RL load. A cycloconverter directly converts an AC input to another AC waveform of a lower frequency without an intermediary DC stage. Cycloconverters are used in high power applications to drive synchronous, and in some cases, induction motors. Most cycloconverters are phase-controlled and utilize thyristors. The commutation of a thyristor can be easily controlled based on a predetermined phase of the applied waveform. Three-phase to three-phase converters are most common, but one-phase to one-phase, three-phase to one-phase, and one-phase to three-phase also exist. In all cases, each input phase consists of two back-to-back connected line-frequency thyristor converters. The firing angles of the two converters in each phase are cyclically controlled to yield a lower frequency sinusoidal output. Galvanic isolation is required since the source and load operate at different frequencies. One inherent challenge with cycloconverters is that they generate harmonic rich output voltages. However, when driving an AC machine, for example, the leakage inductance of the machine often filters the higher frequency harmonics.



**Fig. 1: Cycloconverter**

# 2 Model

This model is of a three-phase to three-phase bridge cycloconverter. Each phase consists of two back-to-back connected line-frequency thyristor converters, for a total of 36 devices. The PLECS three-phase Thyristor Rectifier and Thyristor Inverter blocks are available for this purpose. Three three-phase star-star transformers are used, each with a 1:1 turns winding ratio. The three-phase load is represented by RL series-connected circuits. In this model, a 5 kV, 50 Hz AC input is converted to a 6.67 kV, 10 Hz AC output.

## Revision History:

PLECS 4.3.1      First release

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