User Manual

We as the JAS TtC (T-Type Team) are glad to work on the T-type converter as it will eliminate the challenges being faced with the neutral-point clamped converter. Here is powerful system that has three-level output waveform, balanced DC capacitors voltage during all operating conditions, lower size of output harmonic filter and increased equivalent switching frequency. Some of its special features are;

- Three-level output waveform.
- Balanced DC capacitor voltage.
- Small harmonic filter.
- Fast switching.
- Low electromagnetic interference

The purpose of this user manual is to help you, the client, successfully use and maintain the T-Type Converter in your actual business context going forward. Our aim is to make sure that you are able to benefit from our product for many years to come!

T type converters come as an alternative on low voltages because of its low conducting losses and its simplicity on isolated gates controls. In addition, they are the best alternatives in industries due to its performance since it combines the advantages of 2 level and 3 level converters. The T type inverter topology series connection of lower and upper switches allows it to operate on high frequencies and high-speed variable systems. Besides, it is better than the other three-level inverters when using in low voltage system. Instead of 3 level NPC topology, a bidirectional switch is connected to DC link midpoint making an alternative reliable 3 level topology. The bidirectional switches of T type inverter block half of DC ink voltage only hence

its acceptable conduction losses. Thus, a successful design, simulations, and implementation of the three-phase grid-connected T-type converter will provide a new dimension in the grid connection and energy industry as a whole.

Installation of Widget

At the input side we have the two terminals denoted as '+' and '-' positive and negative terminals where you are going to input your DC supply. This feeds the T-type grid converter connected to a step-up transformer made from copper coils. In this step-up transformer you will notice that the number of turns in the secondary coil is large as compared to the number of turns in the primary coil, therefore, it will boost the voltage, and it will reduce the current. Ensure that the inverter circuit supplies the required DC voltage to the various part interfaced to it. If there are product malfunction check the DC triggering signals of the gate drives if it is present using an oscilloscope. What we have now is now a prototype of the converter built on Dspace so we are still yet to test the circuit with a grid connected model. The PCB schematic should be replicated also when connecting the Fuji-electric module. Since different modules of the converter are used it is important to ensure that the circuits stay intact in one place, and if it is necessary the whole circuit should be isolated from grid and from the input side by a technically trained personnel. The output can be tapped from the respective three phases provided on the output side of the converter.

Together with the attached sketches, configuration pictures and videos you will get an idea of how the device is operated.

Configuration and Use

The prototypes entails a transformer, inverters, current and voltage boards, the interface board, and the DSpace. The components were chosen because they have a major role in our project. The entire layout of the project was that the team built the circuit of boards, gate drivers, Dspace. The board was connected to the gate drivers and then D space was connected to the interfaced board and then to the t type converter. The circuit had to be mechanically and electrically sound to enable us to achieve our objective of analyzing the output current, voltage signals, and their ideals. The step-up transformer was used to increase the voltage and decrease the current at the output and for our project, the step-up transformer was used to modulate the input signal which is quite small. This step-up transformer will be interconnected to the Type grid converter. The inverter circuits ensured that the voltage supply to the various modules used in the circuit was up to the needed DC voltage so that it does not affect the integrity of the interfaced parts.

The other important from the prototypes is actually the simulation parts that are ideally an outcome from the interaction between the interface board, gate drivers, voltage supply, Simulink models and the software controls i.e. Matlab codes. Firstly, we run the initialization files for Modulated Predictive Control (MPC) for the T-type converter, which were already saved in the Matlab directory files, and it shows fundamental waves that were smooth as compared to that of predictive control. Additionally, they had very low noise. Even though we will still do analyzes at later stages, the initial results show that the team is on the right track and on the verge of fulfilling the client's requirements. In addition, based on what was achieved on the Simulink simulation and oscilloscope output results, the project can be a reliable prototype for the future development of advanced T type inverters. The MPCC and PCC signals displayed on results gave a clear distinction between the models. The prototype will form a basis of research for

advanced T-inverters that have advanced power conversion of high quality and reduced harmonics.

Maintenance

The circuit has a lot of circuitry wires soldered on the board, and these are to prone to disconnection on the solder joints. It is therefore important that regular check on the solder joints is performed, and continuity test can also be done to check that the circuits and wires are okay. Diodes and capacitors are likely to get blown due to overvoltage and overcurrents but this we do not anticipate because we have sized them to handle such scenarios. There is likelihood of a failure in the gate drive trigger/source current signal and this needs to be checked on the oscilloscope.

Trouble-Shooting Operation

To check that the circuit is working well, a few tips such as checking for the continuity of wires (using continuity test), using the schematic diagram to check the circuit if it is working well and check if the gate drivers are receiving the current signal.

Conclusion

We wish you happy years of proper usage of the product with less interruptions and years full of productivity. With best wishes from your product developers JAS TtC Team: Jafar Ahmad, Saad alqahtani and Abdullah Alotaibi. While we are all moving on to professional careers, we would be happy to answer short questions in the coming months to help you get the product deployed and operating optimally in your organization.