MEDI's 120KVA three phase online UPS

MEDI is pleased to announce the launch of its Pure double conversion online UPS up to 120KVA.

Configuration -

Three phase three wire in, three phase 4 wire out

Single phase in, three phase 4 wire out

Three phase three wire in, single phase out

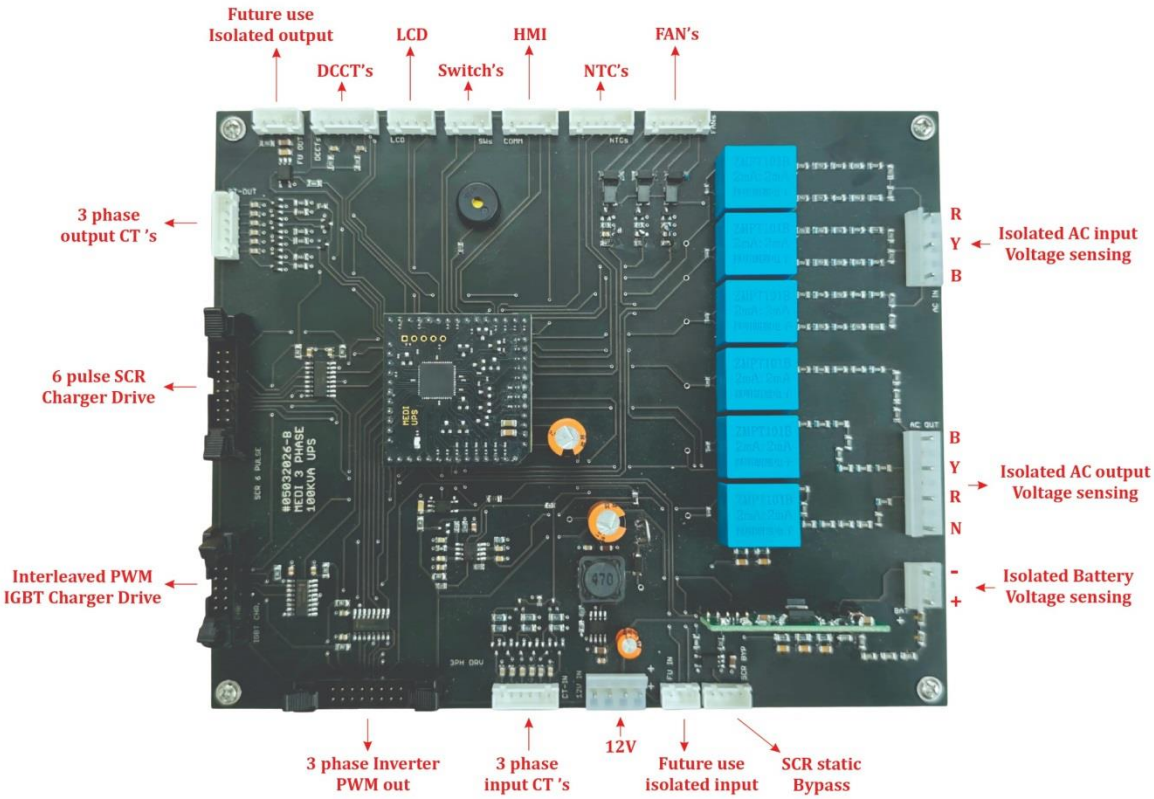
Two phase in, three phase 4 wire out

Two phase in, single phase out

Three phase three wire in, 4 wire out is the most commonly used model. Because we are not connecting the incoming grid neutral, all the problems associated with neutral open, neutral high impedance, neutral in contact with another phase are all eliminated. The output neutral is generated from the inverter and this is fully isolated from the incoming neutral, and the three phase output is also fully isolated from the incoming phases.

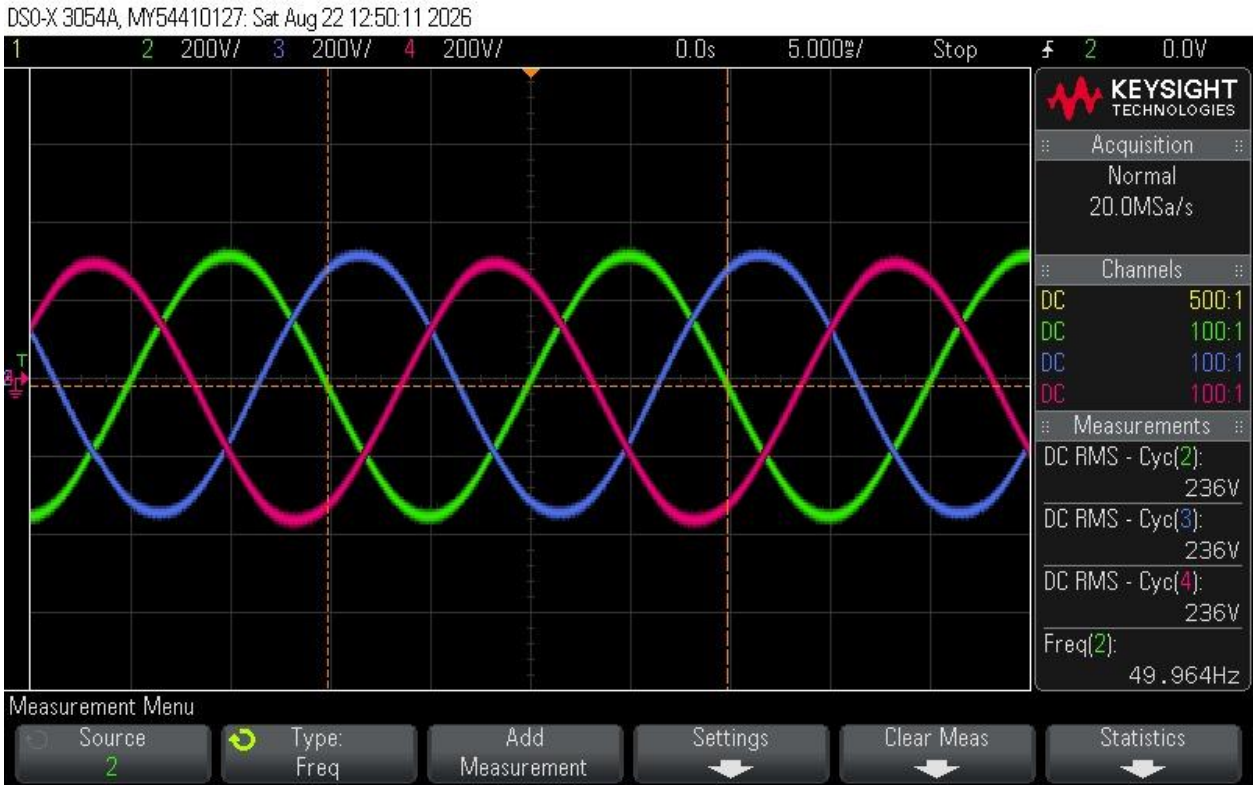
Our proprietary SMART three-phase PWM technology reduces IGBT and transformer primary current by >15% at the same KVA & same battery voltage compared to conventional PWM. With only three IGBT modules, it enables independent phase voltage correction. R, Y and B phase voltages are sensed individually with respect to neutral and corrected independently by the DSP. This ensures 100% unbalanced load capability - even with 100% load on R phase and no load on Y and B, all three phase voltages and line-to-line voltages (R-Y, Y-B, B-R) remain perfectly balanced.

In a single PCB we have incorporated both inverter and charger. The inverter section is with 3 half bridge IGBT modules and the charger section is with 2 buck chopper IGBT modules (you can also use 2 half bridge IGBT modules for this section but the bottom side IGBT will be in off mode) operating in interleaved PWM mode. Because the inverter and charger are on one card and controlled by a single DSP, synchronizing with the mains will be much easier.



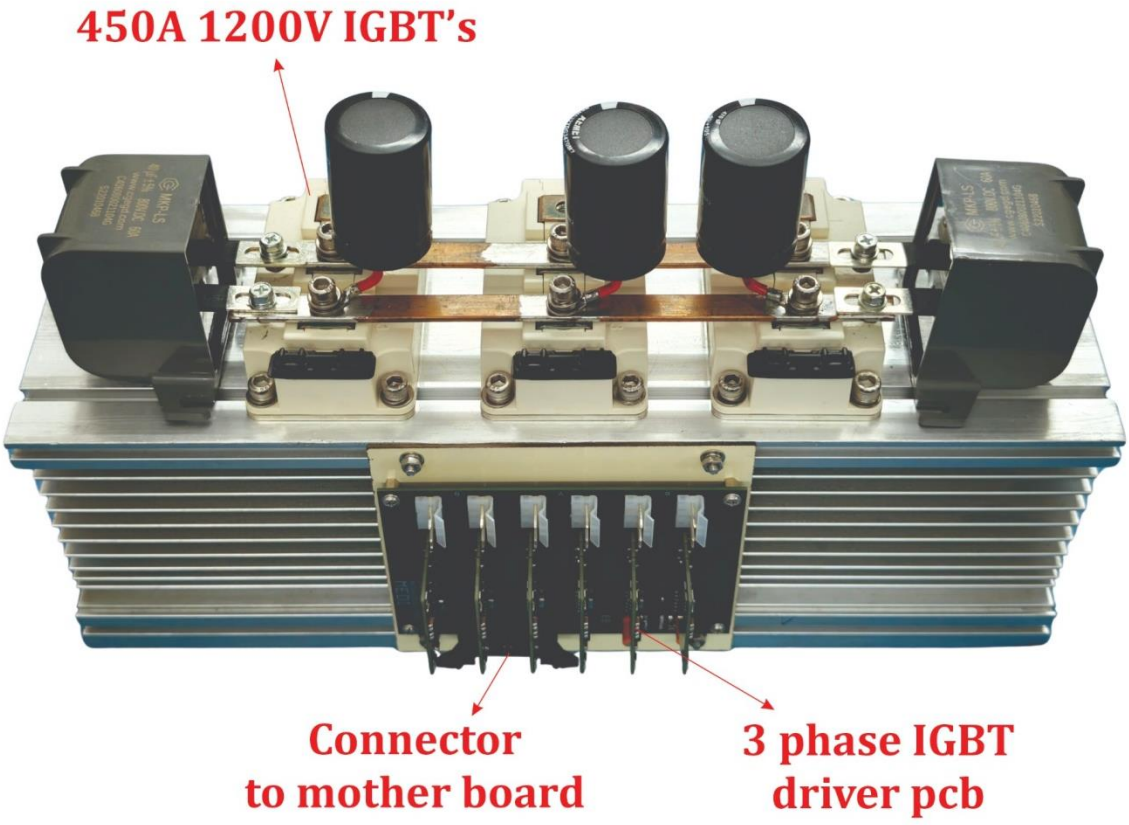
MEDI's 120KVA three phase online UPS mother board

In the inverter section, the three phase PWM from the DSP will individually correct the output voltage of each phase. The DSP will sense the voltages in R, Y, B with respect to neutral separately and will correct separately. In case of imbalanced load, for example if R is having 100% load and Y and B are 0% load, due to transformer drop only R-phase voltage will come down. The DSP will correct this individually and make R,Y, B even so R-Y, Y-B and B-R will all be even.

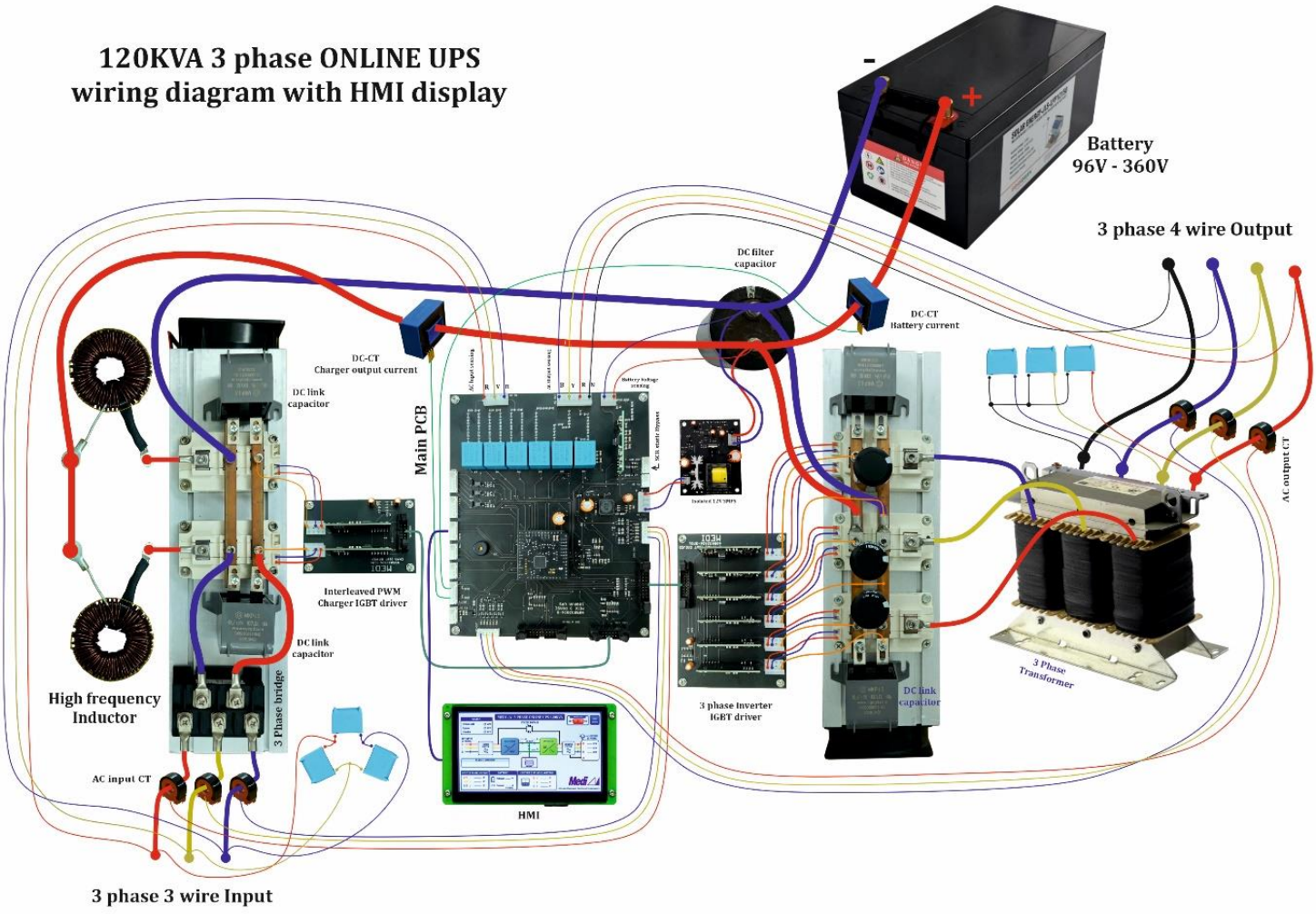


Red, Green, Blue UPS output voltage waveform at imbalance load

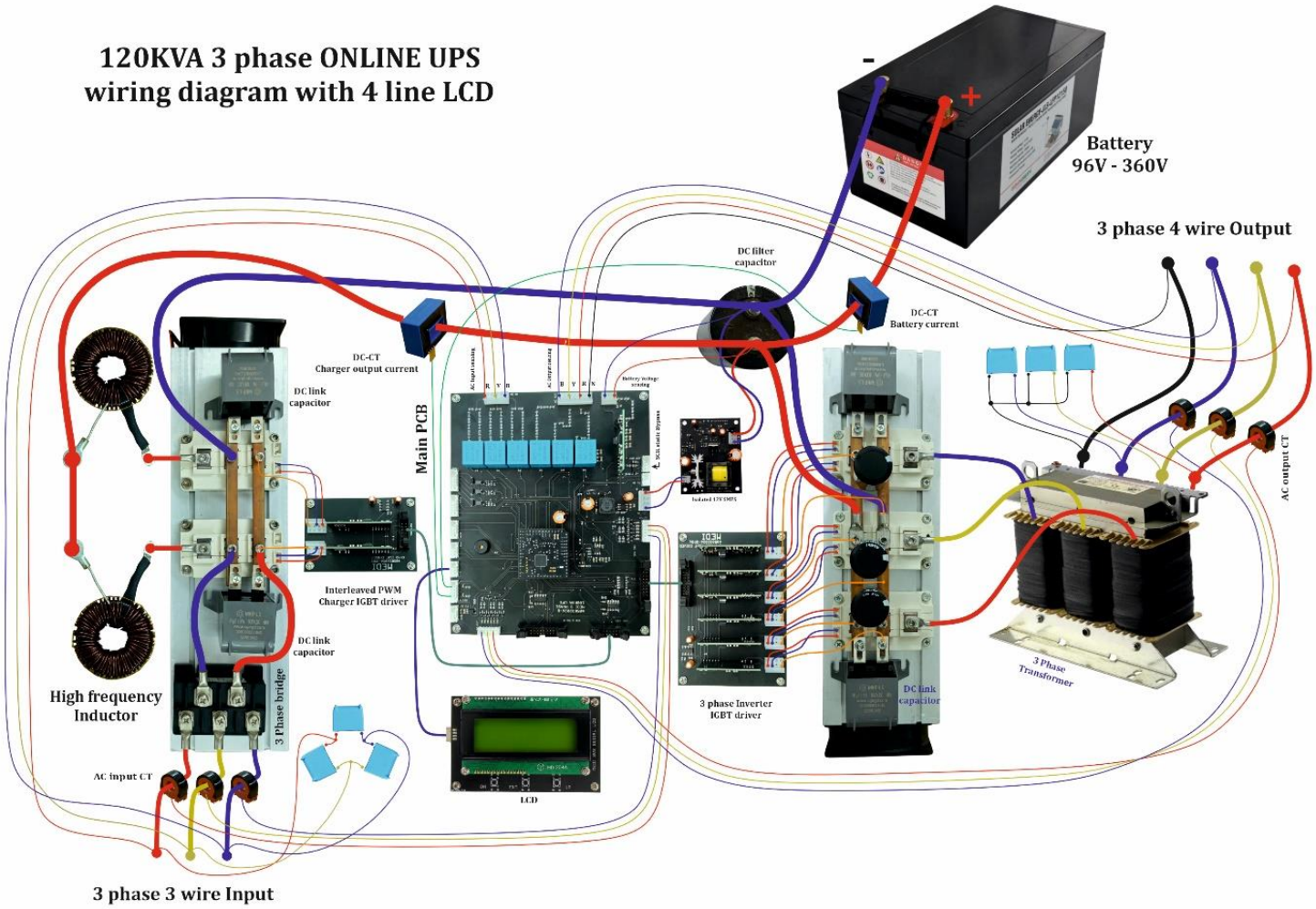
Only with 3 half bridge IGBT modules, we are achieving individual phase correction. This means very less component count and easy to manufacture.



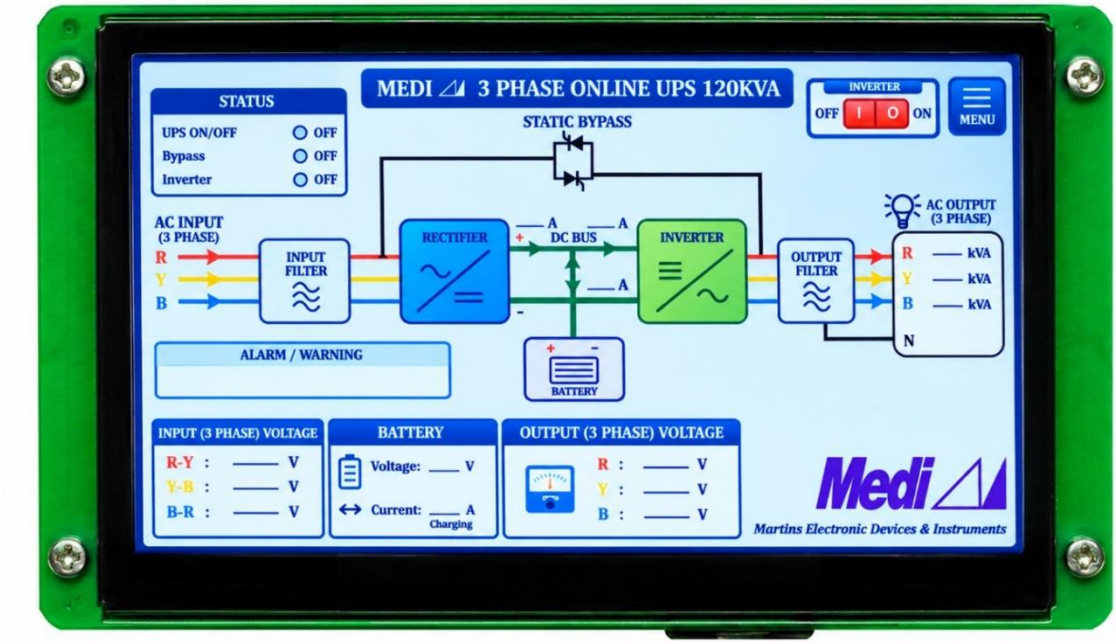
3 phase Inverter IGBT Power Stage



Full wiring of the product with IGBT charger & HMI



Full wiring of the product with IGBT charger & 4 line LCD



Complete HMI display provided for parameters and setup



4 line LCD display provided for parameters and setup

LCD will display the following :

Your company name

Line-Line AC input voltages

Line-Neutral AC output voltages

Load in each phase

Battery voltage

Charging current

AC input and output frequencies

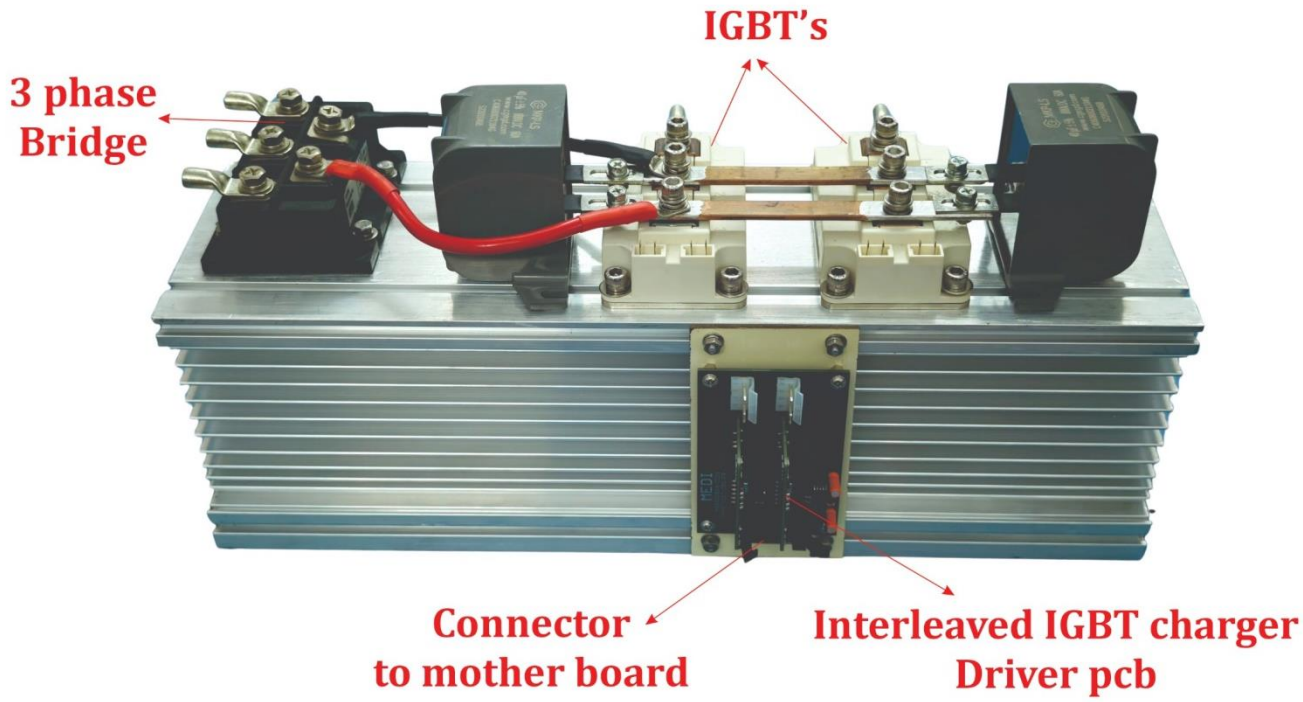
System status like over load, battery low, battery full, heavy load, short circuit, bypass mode etc

In the inverter section, each IGBT has desaturation protection and current is monitored separately in each phase, If the current in any phase exceeds the safe limit or any IGBT enters desaturation cut off mode, the inverter will cut-off and go into uninterruptible SCR static bypass. When the overload or surge is removed, the inverter will resume working by switching from static bypass back to the inverter from the mains. This static bypass will happen only if the mains voltage is within the safe range (settable).

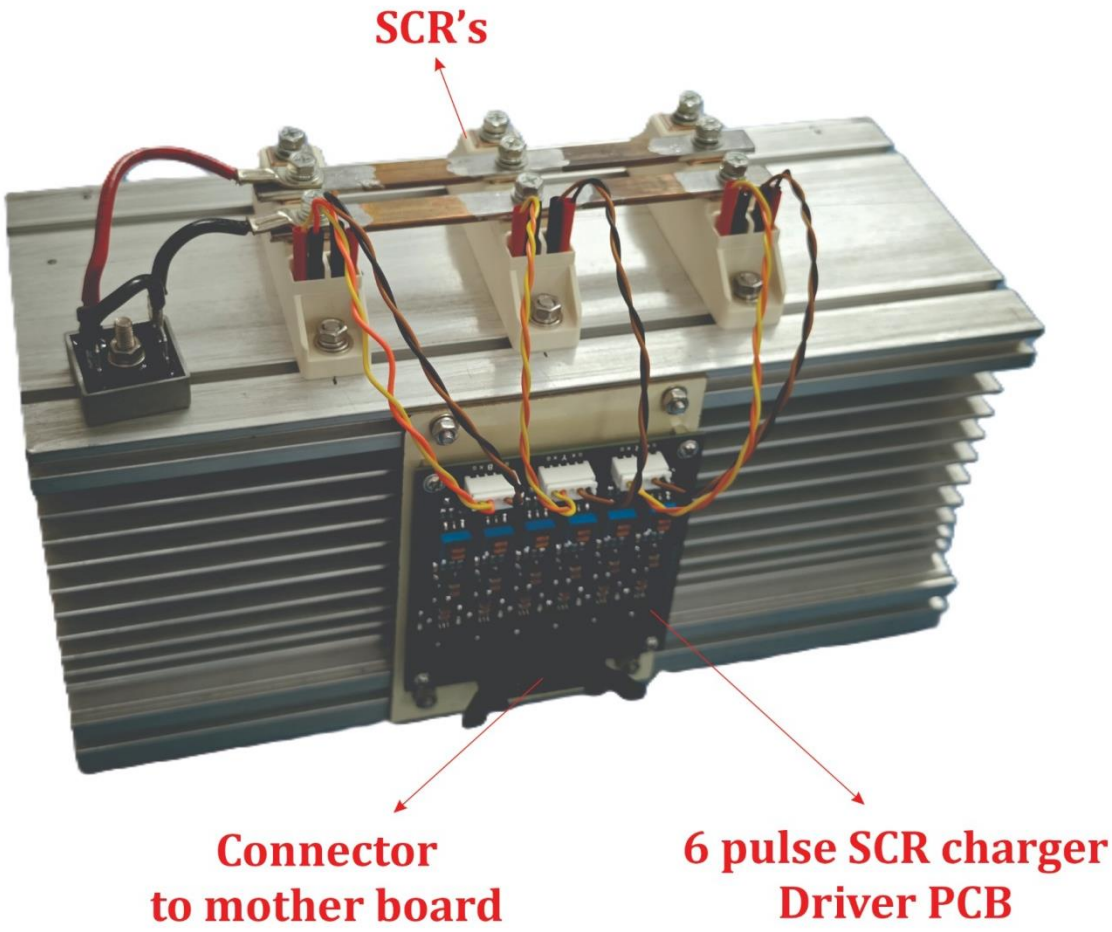
The IGBT charger section is also handled by the same DSP with interleaved PWM. Because of interleaved PWM, the ripple current and output ripple voltage will be very less and switching loss will also be reduced. This unit will work with any battery voltage from 96V to 360V. The power factor achieved in this design is > 0.85 even with a 96V battery with IGBT charger. In a 6-pulse SCR charger, even if you use 240V battery the power factor will be < 0.4. So, at 96V, it will be even lower. Because of this very low power factor, the current drawn from the grid will be 2 to 3 times that of our charger.

The design comes with both an IGBT interleaved PWM charger and a 6-pulse SCR charger. The hardware for both is available in the same PCB. You can select in the menu if you wish to use IGBT charger mode or SCR charger mode. Once selected, the unit will work only with the chosen charger.

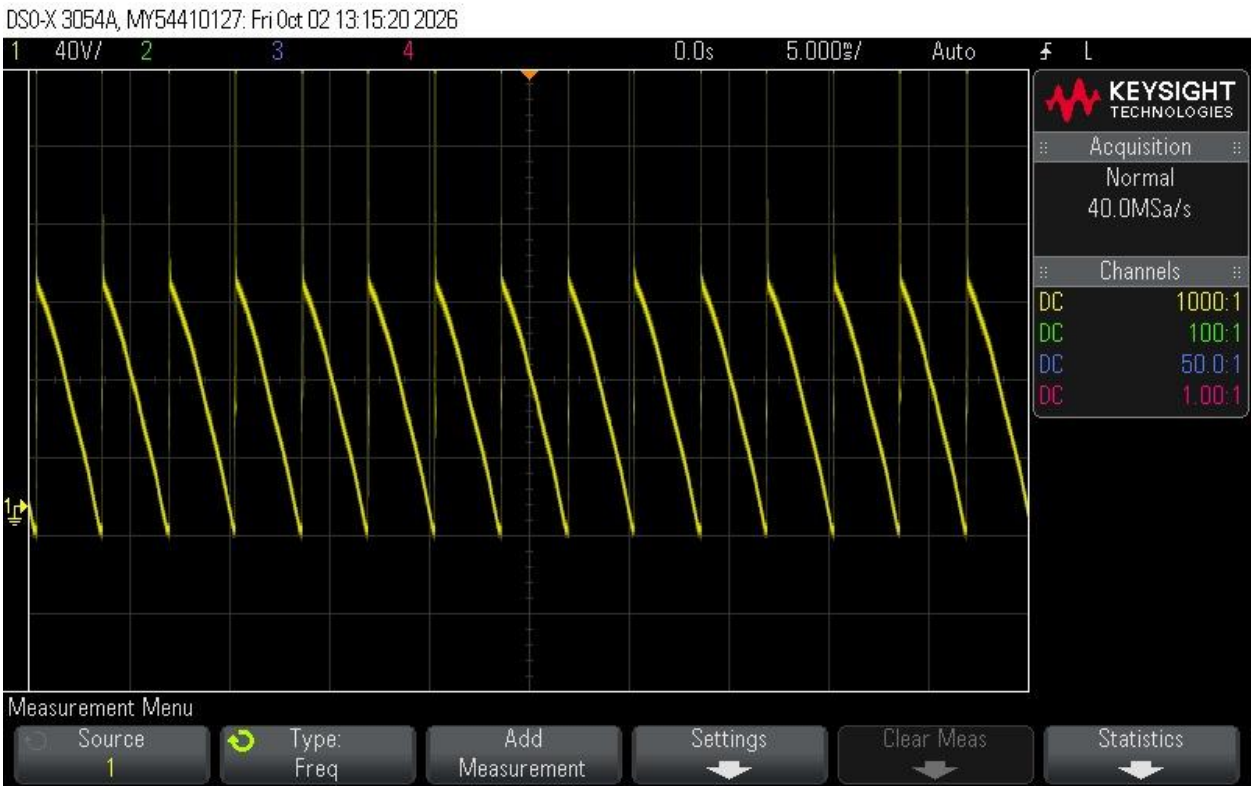
IGBT charger and SCR charger with connector



IGBT Charger power stage



6 pulse SCR Charger power stage



Phase controlled output voltage waveform of 6 pulse SCR charger

In the charging section, we sense the current in each phase individually (current in R, Y, B) and the voltage between each phase (voltage across R-Y, Y-B, B-R). This helps synchronize the inverter output and keep it in phase with the grid. This synchronization ensures the bypass is in phase and uninterrupted during static changeover. Moreover, this phase lock helps reduce the DC voltage ripple.

During this monitoring of individual current and voltage in each phase, if the current or voltage in any phase exceeds the safe limit at any moment during charging, the charging IGBT will trip. This provides additional protection for the charging IGBTs. Additionally, we have provided desaturation protection for each interleaved IGBT and high temperature protection for all IGBTs.

Separate DC-CTs measure the total DC current and only the battery charging current. This ensures current limiting happens separately for the battery current and the total load current in the DC bus.

The switching frequency is set to 18KHz because it is optimal. At 18KHz there is no audible noise and switching loss is comparatively lower than at 20KHz.

Static Bypass : Generally, in bypass mode the online UPS bypasses all three phases and the neutral from the grid directly to the load, carrying all associated grid neutral problems with it. In MEDI's online UPS, we use an uninterrupted SCR static bypass with neutral creation. We do not bypass the grid neutral; instead, we create an independent neutral from the inverter section during bypass. This neutral is completely independent and has no connection with the grid neutral. This eliminates all grid neutral-related problems.

For example, if the grid neutral has a potential of 100V or 200V with ground, at the same time our created neutral will have 0V with ground.

100% galvanic isolation: The UPS output R, Y, B, & Neutral are fully isolated. In addition to that the DSP and the mother board are fully isolated from the grid, AC output, battery and neutral, so there will be no shock even if touched while running. This will tremendously increase the reliability of the product. If any voltage reaches the PCB, it can go to LCD, switches, communication port, etc. If any of these is accidentally touched, or if leakage occurs through a human body, the cabinet, or wires, component damage will definitely occur.

Because the PCB in our unit is fully isolated, the voltage sensing, current sensing, LCD, switches, communication etc are also fully isolated. Therefore, there is no chance for failure because of human touch or leakage.

Specification:

Capacity	Upto 120KVA true double conversion Online UPS
Phase Configuration	Three phase three wire in, 3 phase 4 wire out Single phase in, three phase 4 wire out Three phase three wire in, single phase out Two phase in, three phase 4 wire out Two phase in, single phase out
Technology	True Online Double Conversion IGBT Based DSP Controlled
Charger Type	Interleaved IGBT PWM charger or 6 Pulse SCR charger
Charger Selection	Menu driven setup
Input Voltage	380V / 400V / 415V AC three phase (wide input window)
Output Voltage	380V / 400V / 415V AC three phase ±1%
Output Frequency	50 Hz ± 0.5%
Transfer Time	Zero
Output Waveform	Pure sine wave
Generator Compatible	Yes
Static bypass	Yes
HMI display	Yes
Isolation	100% Galvanic isolation
Switching frequency	18KHz
Input power factor	> 0.85
Battery Type	VRLA / SMF / Tubular / Lithium
Cooling	Forced Air Cooling
Protection Features	Over Voltage Protection Under Voltage Protection Overload Protection Short Circuit Protection Battery Deep Discharge Protection Battery over charge protection Surge and Spike Protection Over Temperature Protection Input Power Failure Protection Output Fault Protection
Communication	UART protocol

Technology cost - Rs.15 Lacs + tax

Discount - Rs. 3 Lacs for companies that have purchased MEDI's three phase inverter upto 30KVA.

Bill of Material of 120KVA with IGBT charger– Rs. 65000/-

Bill of Material of 120KVA with 6 pulse SCR charger– Rs. 60000/-

Transformer, Heatsink and Cabinet etc

Optional Frequency converter design

50Hz to 60Hz

60Hz to 50Hz

50Hz to 400Hz

60Hz to 400Hz

Additional cost - Rs.10 Lacs