

Annexure-1

POWER STACK FOR 60 KW EV CHARGER

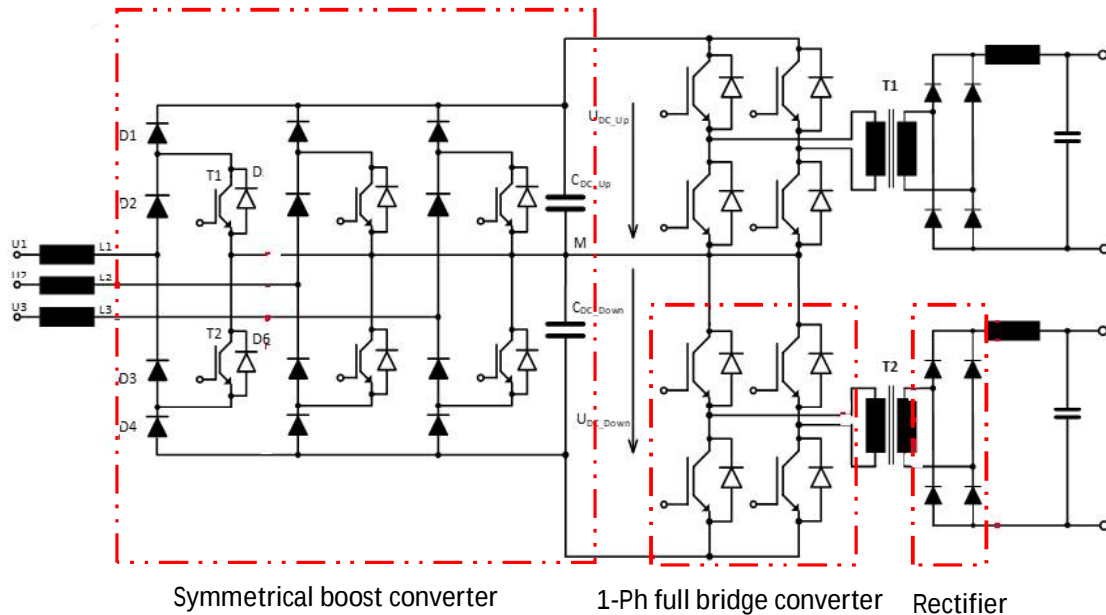


Fig.- 60 kW unit

Scope of supply: The specifications call for supply of 2 no. of 60 kW power stacks. Each 60 kW power stack consists of a symmetrical boost PFC converter, 2 no. of 1-Ph full bridge converter and 2 no. of full bridge rectifier as shown in the above figure. Symmetrical boost converter and 2 no. of 1-Ph full bridge converter should be connected back to back as a single unit by the vendor. Rectifiers can be supplied separately. The supplied stack shall consist of heat sink for mounting of IGBTs, IGBT gate driver cards, DC-link capacitors, laminated bus-bars for DC link, cooling fans, IGBT snubber capacitors, copper bus-bars & Thermal switch. The output terminals of 1-Ph full bridge converters should be brought out for making connections to high frequency transformer. The specifications of these converters are given below.

Specifications of AC-DC converter (Symmetrical Boost Converter)

S.No	Parameter	Rating	To be filled by the Supplier	Remarks
1	AC Power	60 kVA		
2	AC input	3-Ph, 415V+/-10%, 50Hz		
3	Rated DC output voltage	1000 V		
4	Efficiency	>97%		
5	Switching frequency	10 kHz		
6	DC voltage ripple	<+/-1%		
7	DC link Capacitance & type	Cdc_up>1.25 mF, Cdc_down>1.25 mF & Polypropylene type		
8	DC Link Capacitor current rating	The capacitor bank of the offered stack should be able to supply harmonic		

		current when operating at a switching frequency of 10 kHz.		
9	Quantity	2 no.s		

Specifications of 1-Ph Full Bridge converter (High Frequency Inverter)

S.No	Parameter	Rating	To be filled by the Supplier	Remarks
1	DC input voltage	500 V		
2	Rated Current	100 A (rms)		
3	Efficiency	>97%		
4	Switching frequency (Hard switching)	20 kHz		
5	Quantity	4 no.s		

Specifications of Diode Bridge Rectifier

S.No	Parameter	Rating	To be filled by the Supplier	Remarks
1	AC input voltage	a) Square wave with 500 V peak b) Frequency : 20 kHz		
2	Rated DC Current	100 A		
3	Efficiency	>97%		
4	Quantity	4 no.s		

General Specifications

S.No	Description	Requirement of BHEL	To be filled by the Supplier	Remarks
1	Type of Cooling	Forced air cooling		
2	Ambient temperature	50°C		
3	Thermal Protection	Thermal trip switches with potential free contacts should be mounted on heat sink for the purpose of thermal protection.		
4	Specification of gate driver	It should have in-built protections against shoot through fault, short circuit and di/dt protection. The gate drivers should have interface for electrical inputs via WAGO connector and should give IGBT healthy status through an electrical output via WAGO connector.		

		It should generate isolated power supply from control supply.		
5	Connection between capacitor and IGBTs	The DC link capacitors should be connected to IGBTs through laminated bus bars to achieve very low stray inductance		
6	Thermal Calculation	Detailed temperature-rise calculations for the assembled power stacks for rated condition should be submitted along with the offer by clearly indicating the junction temperatures of IGBT, built-in diode, heat sink, outlet air temperature etc. for an ambient temperature of 50°C.		
7	Mechanical design of the stack	The mechanical design of the stack should be maintenance free and replacement friendly. Output termination details to be provided.		
8	Testing requirements	Visual, dimensional checks, capacitor charging & discharging check. Insulation resistance & HV test.		
9	Size and weight of the stack	The size and weight of the power stack shall be as minimum as possible. Vendor should provide the details of the same.		
10	Documents to be submitted with technical offer	Data sheets of IGBT, Gate driver cards, Heat sink, cooling fan & DC capacitor, OGA (drawings).		
11	Enclosure	Suitable enclosure/measure should be provided/taken for reducing the radiated electromagnetic disturbance.		

Note: Input filter, output filter and high frequency transformer are not in the scope of supply of the vendor.