

ELECTRIC VEHICLE CHARGING SYSTEMS

INTRODUCTION:

An Electric Vehicle charging system comprises of a charging cable from main power inlet to the charging socket mounted on the Vehicle, with an in-built RCD for protecting the Driver, Vehicle Charger & other electrical parts from different failure modes. The Vehicle Side Socket is internally connected to the Charger with a harness specific to the vehicle requirements.

This equipment is suitable for the recharging of electric vehicles, at home or work, when traveling and can recharge the vehicle by plugging into the nearest available 230 VAC supply outlet.



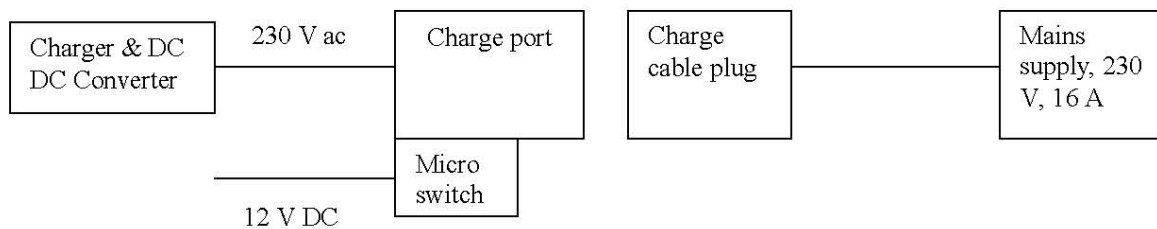
DESCRIPTION OF THE PRODUCT:

This specification describes the functional requirements of the charging cable used to charge an Electric Vehicle (EV). The Charging Cable consisting of a RCD unit, at one end, which has been designed to suit the charging of the (EV) from a domestic 230 VAC, 16 Amps main power inlet socket and at the other end, it will have a 3 pin Industrial type Female Plug, suitable for 230 VAC.

The design conforms to IEC 61851 and IEC 62195 standards. Our system is TYPE 1, MODE 2 charging system.

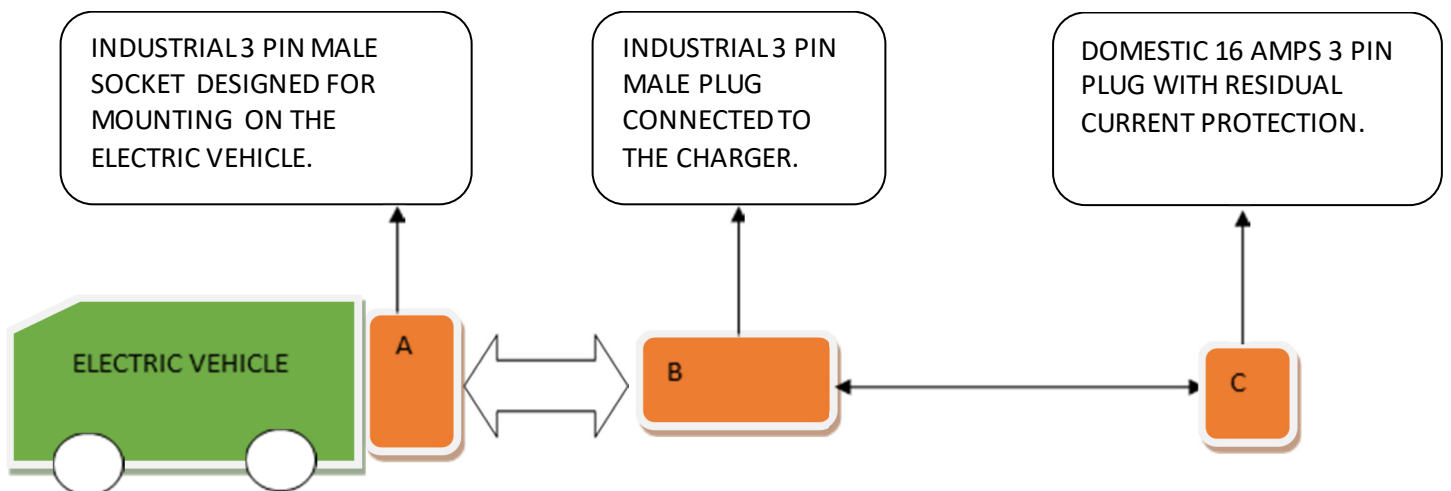
The 3 pin Industrial Male socket is fitted on the EV on the charge port area. The charging cable which has the 3 pin Female Plug will be attached to the Male Socket thus completing the EV charging mechanism. The RCD provides human safety as well as the safety of the EV.

The charging cable socket and Plug attachment will meet IP 67 Requirements, both during charging and in idle conditions. Hazardous live parts will not be accessible.



When the charge plug is inserted to charge port, the micro switch in the charge port disconnect the input to key switch. The micro switch also gives a signal to charger to start charging.

For ease of understanding we are dividing the Charging system into two parts --- Vehicle Side & Charging Side. As shown below the PART A will be Vehicle side assembly, PARTS B & C will form the Charging Side assembly.



VEHICLE SIDE ASSEMBLY:

The vehicle side assembly consists of the Charging Socket & the Harness connected to the Charger inside the car, & serves as the charging point for the vehicle.

Technical details are as follows ---

Current	16 A
Voltage	230 V ac
Type	3 pin single phase (Three wire system P,N,E)
Contact	Wire will be connected to terminal pins

The different types of Vehicle side charging sockets, shown below are customer specific products & are designed as per the manufacturer's design & space availability.



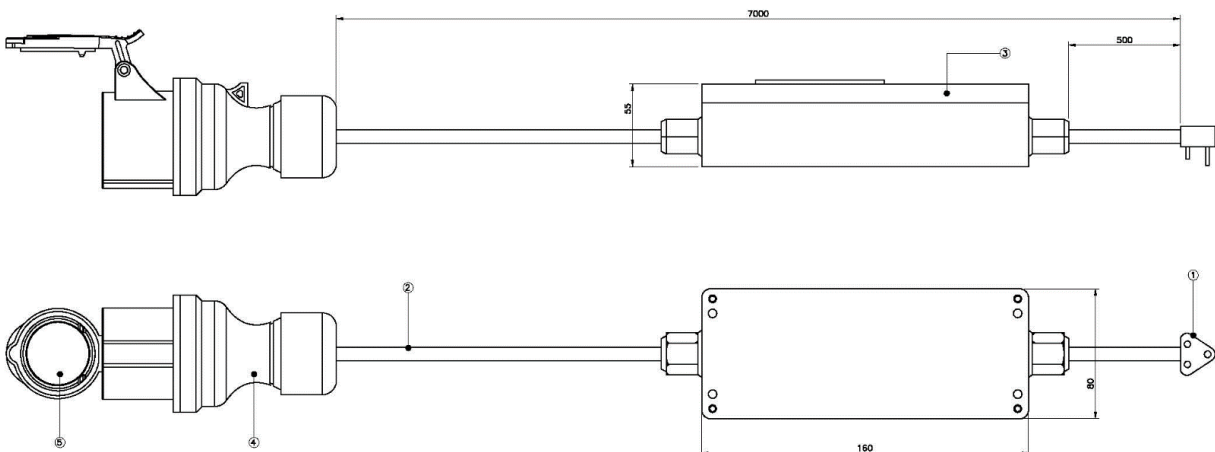
CHARGING SIDE ASSEMBLY:

The charging side assembly broadly consists of three parts ---

- A. Supply side plug and cable
- B. RCD
- C. Vehicle side connecting plug.

This assembly connects to the main inlet power supply 230 VAC on one side, and through the RCD unit supplies power to the vehicle by the vehicle side connecting plug.

Basic schematic of the charging side complete assembly:



VARIANTS OF CHARGE CABLE INPUT PLUG – MAINS SUPPLY SIDE (PLUGGED IN TO THE MAINS)

As per customer requirements we can provide different types of plugs --- 16 A domestic Plug, 16 A IP 44 Plugs & 16 A IP 67 Plugs conforming to IEC 60309 standards. These different types of plugs are MALE TYPE open ended plugs without covers which connect directly to the Mains supply.

Technical details are as follows ---

Current	16 A
Voltage	230 V ac
Type	3 pin single phase (Three wire system P,N,E)



VARIANTS OF CHARGE CABLE OUTPUT PLUG – VEHICLE SIDE (PLUGGED IN TO THE VEHICLE)

The standard Plugs are FEMALE TYPE closed end plugs, with minimum IP 54 & a maximum up to IP 67 degree of protection and conforms to IEC 60309 standards. Customer specific designs are available.

Technical details are as follows ---

Current	16 A
Voltage	230 V ac
Type	3 pin single phase (Three wire system P, N, E)



RCD PROTECTION DEVICE --- SUPPLY SIDE PROTECTION

The RCD --- Residual Current Device protects the vehicle, driver & the charger from various faults. This unit consists of an IP 67, FR PC enclosure with the RCD PCB housed in it. Fault Indications are provided on the TOP PCB and are visible from the front. Reset and Test button on unit for facilitating the testing and error reset in the unit. The unit is Fire Retardant as per UL94 V-0

The following fault conditions are sensed by the circuitry on the RCD & conveyed to the PIC Controller for switching ON or switching OFF the Relays, and controlling the LEDs on the cover side.

- **UNDERVOLTAGE**
- **OVERVOLTAGE**
- **LINE NEUTRAL INTERCHANGE**
- **RESIDUAL CURRENT 30Ma**
- **OVER CURRENT 17 AMPS**

PROTECTIONS/SAFETY	
Overvoltage	$\geq 270\text{Vac}$
Under Voltage	$\leq 170\text{Vac}$
Under Voltage Cut-off	$\leq 20\text{ms Max. (Detectable and trip the circuit in } t \leq 0.02 \text{ Sec)}$
Over Voltage Cut-off	$\leq 20\text{ms Max. (Detectable and trip the circuit in } t \leq 0.02 \text{ Sec)}$
Overcurrent	20 Amp
Short Circuit	Provided for both input & output sides
Over Load	Yes, 16Amp max.
Earth Leakage	Detectable and trip the circuit at $< 30\text{mA}$ in $t \leq 0.02 \text{ Sec}$
Earth Absence	Yes, Detectable and trip the circuit in $t \leq 0.02 \text{ sec}$
Line-Neutral Interchange	Detectable and trip the circuit



BLOCK CIRCUIT DIAGRAM FOR PROTECTION DEVICE- RCD

