35kW PFC Plus, VAR Plus, and PFC Master Controller Specification

The 35kW PFC module converts 3-phase AC voltage at 480VAC or 400VAC nominal into a high DC voltage of 950V with high efficiency, high power factor, and low distortion, to form a non-isolated Front-End System for a subsequent DCDC stage as part of an overall Ultrafast EV charger.

Inside each 35kW PFC module are two 17.5kW sub-modules which are wired in parallel from their power circuits but separately controlled. Each 17.5kW sub-module is a "Slave" and requires a PFC Master Controller to regulate its output.

A PFC Master Controller regulates the output voltage for all the modules in a master-slave control arrangement.

The '**Plus**' version permits more output to be delivered provided that the user limits the output power and consequently the input current. At 400VAC 37.5kW is available. At 480VAC 45kW is available. The user must carefully monitor the input voltage and proportionally reduce the output power demand if the AC reduces below these two setpoints.

The '**VAR Plus**' version has an adjustment to the power factor that reduces the VARs consumed at high loads. VAR consumption becomes lagging above 28kW at 400VAC, 50Hz.

Efficiency exceeds 98% over half power and 480VAC. The 35kW PFC is designed to be mounted in a 19-inch standard rack supported front and rear.

35kW PFC module

Detailed specifications at 400V_{AC} 50Hz in, 950V_{DC} out, 25°C, unless otherwise stated

Input 400VAC to 480VAC nominal

Voltage requirement	Three phase, 4-wire (no neutral) Nominal: 400 to 480 V_{AC} Voltage tolerance: 340 – 528 V_{AC} Full output power available above 400VAC Frequency: 45 – 66 Hz
Current draw at full load	55A RMS max at 480 V_{AC} 55A RMS max at 400 V_{AC} Companion power converter is required to limit its demand to regulate input current to less than 60A
Power Factor	Greater than 0.99 at full load; 0.98 at half load
Displacement power factor at 400VAC 50Hz, VAR Plus version	Leading below 28kW Unity at 28kW Lagging above 28kW, 0.9997lg at 37.5kW
Harmonic distortion of input current (sinusoidal voltage)	Less than 5% at full load; 10% at half load
Voltage withstand test	3000VDC input to chassis for 1 minute
Protection	Overvoltage: operates to 535 V_{AC} typically Undervoltage: operates to 320 V_{AC} typically Surge protection to 6 kV/3 kA differential

	Customer to supply SPDs from AC earth at 750V 40kA minimum. Fuses 30A 600V provided at the input of each sub-module
Startup	Inrush less than 100% input current

Output 950VDC

Voltage	950V nominal, +/- 30V adjustment range in PFC Master Controller
Startup	Overshoot to less than 1000V Companion power converter must be off until all 35kW PFC modules start
Sharing between parallel modules	Better than ± 5%
Protection	Fuses in the 2 DC lines, 30A 100VDC in each sub-module Overtemperature and overvoltage protection in each module
Ripple	Less than 40V peak to peak under all conditions

General

Isolation	The controls are isolated from AC input and DC output.
Typical Efficiency at 480 V_{AC}	>98.2% peak efficiency >98% from 50-100% output

Standards

Safety	Intertek compliance with UL1012 and CSA C22.2#107.1; tested to IEC62477.1
EMC Emissions and Immunity	Designed to IEC61000-6-4:2006; IEC61000-6-2:2005

Mechanical

Module	Width: 482.6 mm (19-inch panel) Height: 86.9 mm (2U) Depth: 502 mm Mass: < 16kg
Acoustic Noise	≤ 60dB (A Weighted)

Environment

Operating temperature range	-35°C to +55°C, ≤90% RH
Storage and transport	-40°C to +70°C, ≤95% RH
Vibration	10-55Hz, 0.35mm sine
Altitude	3000m max, de-rating 5C per 1000m

Connections

Input, Output, Interface, and Paralleling:
Internally mounted terminal blocks provide termination points for 10mm2 cabling for the AC input and DC output.
A 10-way box header is provided for the interface to the customer's monitoring equipment for each sub-module. An enable control, status monitor, and temperature signal is provided.
A 4-pin connector joins the slave 35kW PFC modules to the PFC master controller.