Data Sheet

Off-Line Front Ends

Single or Three Phase

Strappable

Features

- 250 W, 500 W, 750 W, 115/230 Vac strappable single-phase
- 1.5, 3, 5 kW, 208 Vac three-phase
- 20 – 50 mS holdup
- UL, CSA, TÜV, VDE, BABT
- FCC/VDE Class B (single-phase)
- FCC/VDE Class A (three-phase)
- BUS OK, AC OK, DC OK status signal
- 96 – 98% efficiency
- PC and chassis mount
- VI-26X, VI-J6X series compatible
- CE Marked

Product Highlights

From AC line in, to highly regulated DC out, Vicor offers the total design solution through a complete family of off-line front end and DC-DC modular power components.

Vicor's family of off-line front ends interface VI-260 and VI-J60 series DC-DC converters, and MegaMods, to 100, 115, 230 or 240 Vac single-phase and 208 Vac three-phase mains. In addition, front ends provide conducted EMI/RFI filtering to FCC/VDE (Class B single-phase, Class A three-phase), transient surge protection, active inrush limiting, a BUS OK status output (suitable for controlling Vicor DC-DC converter modules via their Gate In pin) and an AC OK status output for system use in the event of loss of the AC line.

Operating Temperature

(Free Convection)

C: 0°C to +50°C (750 W: +45°C)

I: -20°C to +50°C (750 W: +45°C)

Storage Temperature

-40°C to +80°C

Front End Specifications

(typical at T = 25°C, nominal line, 75% load, unless otherwise specified)

	Single Phase (250, 500, 750W)	Three Phase (1.5, 3, 5 kW)
AC Line Input	Strappable 115/230 Vac	208 Vac +20%/–10% (Wye or Delta, ø to ø)
With Range Strap	90 Vac to 135 Vac	N/A
Without Range Strap	180 Vac to 270 Vac	N/A
Line Frequency	47 to 63 Hz (C-Grade) 47 to 440 Hz (I-Grade)	47 to 63 Hz (C-Grade) 47 to 440 Hz (I-Grade)
Line Inrush Current		
115 Vac Operation	35 A at peak line	
230 Vac Operation	67 A at peak line	
240 Vac Operation		52 A at peak line
AC Leakage Current	1.9 mA max. at 250 Vac, 63 Hz (C- Grade)	3.2 mA max. at 208 Vac, 63 Hz
Power Factor (at full load)	0.52 to 0.65 (at low line input)	0.9 (typical at nom. line)
Holdup Time (at full load)		
Low Line	250 W (60 Hz): 4 ms min. 500, 750 W (60 Hz): 7 ms min.	
Nominal Line	250 W (60 Hz): 27 ms min. 500, 750 W (60 Hz): 29 ms. min.	20 ms min. (47 Hz)
AC Fail Warning Time (at full load)	250W: None 500, 750W: 6 ms min.	5 ms min.
Module Gate Control Output (open drain FET, non-isolated, referenced to –DC output)	Called BUS OK	Called Module Enable
ENABLE Active High (FET cutoff)	Active High (FET cutoff) Vds max. 18 V transorb clamp Power up threshold DC bus: 250 W: 216 V, ±12% 500, 750 W: 244, ±3.5%	Power-up threshold >227 V Vds max: 15 V zener clamp
$\overline{\text{ENABLE}}$	Inactive state (DC BUS <190 V ±5%) Current sinking 100 mA @ .3 Vds max., threshold DC bus 250 W: 172 V, ±16% 500, 750 W: 175 V, ±3.5%	Inactive state (DC BUS <187 Vdc) Current sinking 100 mA @ .3Vds max.
AC OK and BUS OK Status Outputs (optically isolated, transistor output; 500 W, 750 W only)	500, 750 W only	AC OK and BUS OK
Off State Breakdown Voltage	70 Vce max.	70 Vce max.
On State Voltage	.4 Vce (sat.) max. at 1 mA	.4 Vce (sat.) max. at 1 mA
On State Current	15 mA max.	15 mA max.
On State Threshold (no load)	80 – 89 Vac	>210 Vdc/187 Vac
Off State Threshold (load dependent)	85 – 76Vac	<205 Vdc/<182 Vac
Conducted EMI/RFI	VDE 0871/FCC part 15, Class B	VDE 0871/FCC part 15, Class A
Dielectric Withstand	AC line (both phases) to GND or case 1.5 kVAC; 2121 Vdc	AC line (all phases) to GND or case 1.5 kVAC; 2121 Vdc
Transient Surge Withstand Capability (with no disruption of function)	IEC 61000-4-5, Level 3	IEC 61000-4-5, Level 3
Common Mode	1.2/50 µs, 2 kV, either polarity 0 to 360 degree phase angle with respect to AC line	1.2/50 µs, 2 kV, either polarity 0 to 360 degree phase angle with respect to AC line
Normal Mode	1.2/50 µs, 1 kV pulse, either polarity 0 to 360 degree phase angle with respect to AC line	1.2/50 µs, 1 kV pulse, either polarity 0 to 360 degree phase angle with respect to AC line

THERMAL CONSIDERATIONS

Free Convection Derating

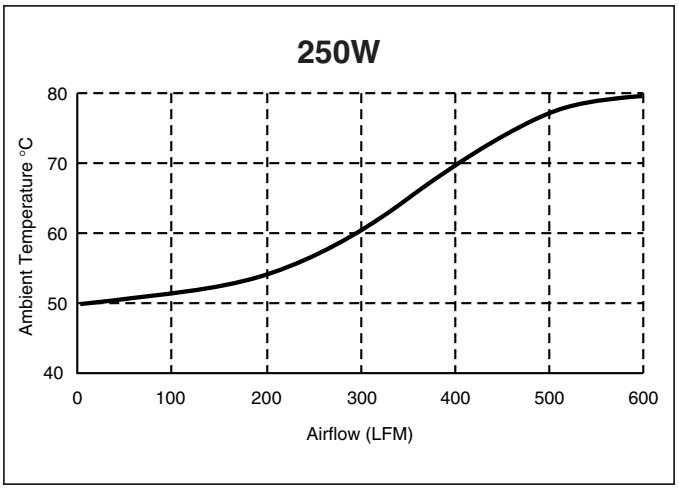
- 250 W: Derate output power linearly at 7.2 W/˚C over 50˚C.
- 500 W: Derate output power linearly at 14.3 W/˚C over 50˚C.
- 750 W: Derate output power linearly at 18.8 W/˚C over 45˚C.

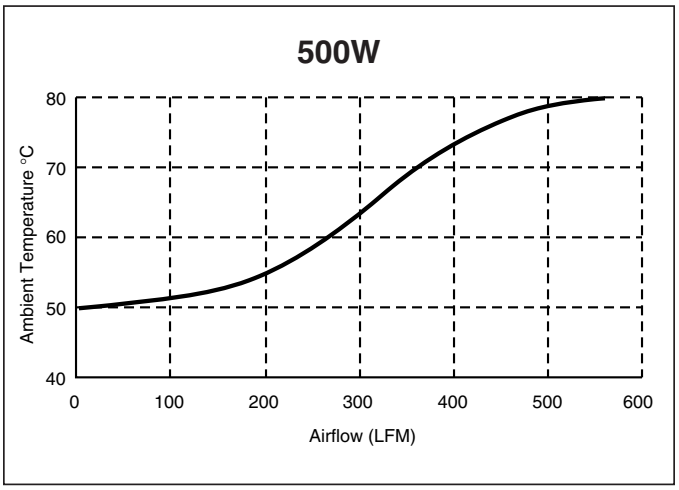
Forced Convection

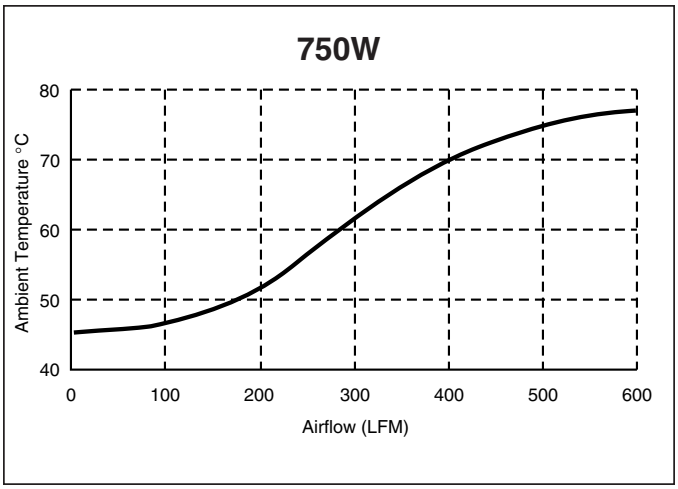
The curves below represent worst case data for chassis mounted (enclosed) front ends, i.e., low line, full load. System conditions such as higher line voltage, lighter load or PC mount versions of the front ends will increase reliability if the data here is used as the nominal design criteria.

The sigmoid shape of the curves at low air flows is due to the chassis mount cover restricting the airflow to the inboard components until an airflow of approximately 200 LFM is achieved. Thereafter, the velocity of air rushing over the cover causes air to be pulled in through the side perforations, causing a rapid improvement of cooling of internal components.

Max. Amb. Temp. vs. Airflow (LFM) Over Cover
(Full Load, 90 Vac In, Chassis Mount)



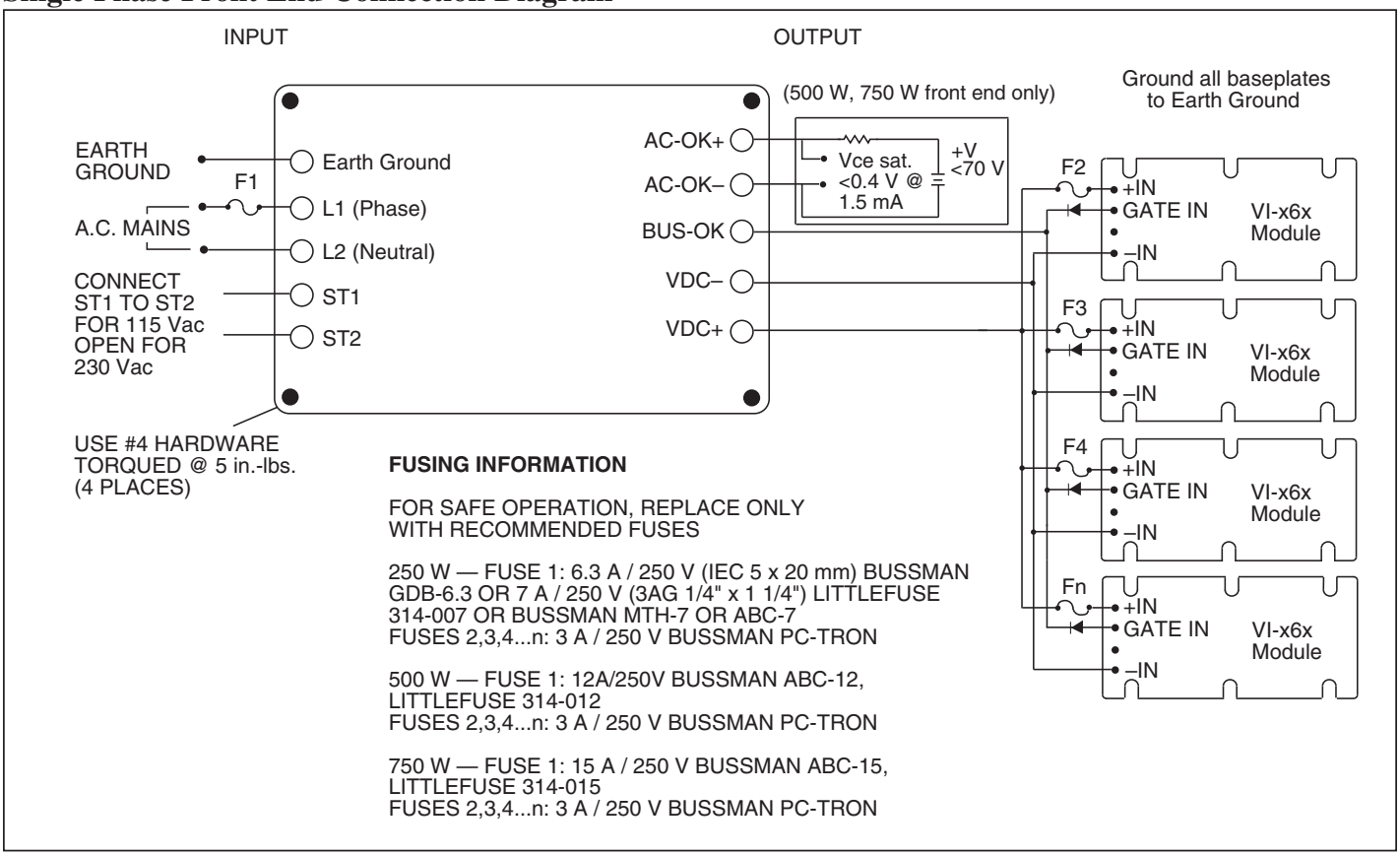




Front End Selection Chart

Model	PC	Mounting	Output Power (Watts)		
Single Phase		**Chassis**	**250**	**500**	**750**
VI-FPE6-CUX	■		■		
VI-FKE6-CUX		■	■		
VI-FPE6-CQX	■			■	
VI-FKE6-CQX		■		■	
VI-FPE6-CMX	■				■
VI-FKE6-CMX		■			■
Three Phase			**1,500**	**3,000**	**5,000**
VI-TKY6-CHX		■	■		
VI-TKY6-CEX		■		■	
VI-TRY6-CCX		■			■

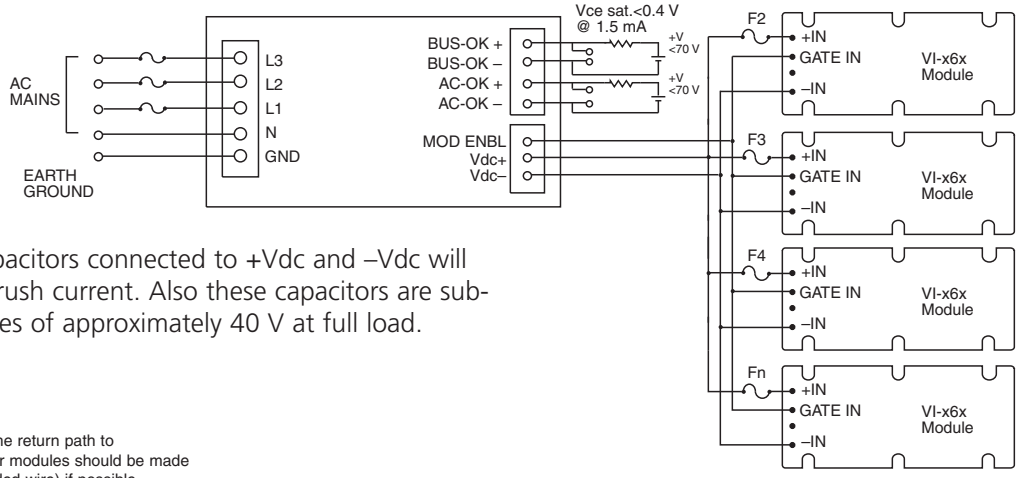
Single Phase Front End Connection Diagram



Notes:

1. If input power is applied with the DC output BUS shorted, the active inrush circuitry will usually prevent Fuse 1 from blowing. Remove power, clear shorts, wait a few minutes and reapply input power.
2. If unit is strapped for 115V operation and 230V is applied, the internal overvoltage crowbar will clear Fuse 1. Replace fuse, strap correctly and reapply power.
3. To control EMI/RFI most effectively, the return path to earth ground from either the front end or modules should be made via a good RF ground. User must assure proper grounding for safe operation.

Three Phase Front End Connection Diagram (1.5 kW, 3.0 kW only)



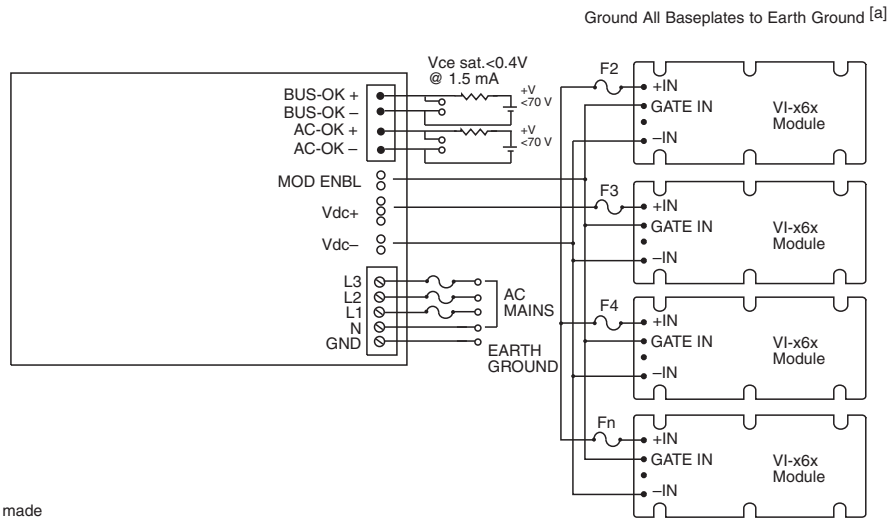
CAUTION: External capacitors connected to +Vdc and –Vdc will significantly increase inrush current. Also these capacitors are subject to AC ripple voltages of approximately 40 V at full load.

[a] To control EMC most effectively, the return path to ground from either the front-end or modules should be made via a good RF ground (i.e., a braided wire) if possible.

NOTE: x,y capacitors not shown for clarity

Three Phase Front End Connection Diagram (5.0 kW only)

CAUTION: External capacitors connected to +Vdc and –Vdc will significantly increase inrush current. Also these capacitors are subject to AC ripple voltages of approximately 40 V at full load.



[a] To control EMC most effectively, the return path to ground from either the front-end or modules should be made via a good RF ground (i.e., a braided wire) if possible.

NOTE: x,y capacitors not shown for clarity

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