

FCL H SERIES - THREE PHASE - 6 to 400 kVA



Electronic Virtually Maintenance Free

STATIC VARIABLE AC VOLTAGE & FREQUENCY CONVERTERS

AC THREE PHASE 6 TO 400 kVA

IGBT SOLID STATE PWM DESIGN

H SERIES MODELS

INPUT: 380/220V - 400/230V - 415/240V - 50 or 60Hz

OUTPUT: 0/0V to 520/300V - 40 to 70Hz

H X468 MODELS: INPUT: 440/256V - 460/265V - 480/277V

OUTPUT: 0/0V - 600/346V (OPTION on H SERIES)

FCL

4 WIRE - WITH NEUTRAL
THREE PHASE

THE UNIVERSAL AC POWER SOURCE

IDEAL FOR USE IN TESTING CENTRES, RESEARCH LABS AND TESTING ON PRODUCTION LINES

FCL Series Three Phase Static Variable Voltage and Frequency Converters utilise the latest in solid state Pulse Width Modulated (PWM) Inverter and Rectifier technology, combined with Galvanic Isolation, to deliver a clean and regulated variable AC power supply - ideal for use in civil testing centres, research laboratories and for testing on production lines.

FCL Series Variable AC Voltage & Frequency Converters offer -

- Ability to replicate all the numerous nominal utility mains three phase voltages (eg 190/100V to 600/346V) and civil Frequencies 40 to 70 Hz (40 to 499 Hz Special Build Option for Military, Avionic and Marine applications) deployed throughout the world
- Suitable for use with Resistive, Capacitive, Inductive and Non-Linear Loads
- Galvanically Isolated with Pure & Stable Sine Wave Output delivering minimal harmonic distortion (EMI/EMC)
- Selectable High or Low Current Output Voltage Ranges
- High Overload Capability
- PWM / IGBT design ensures High Efficiency and Low Noise whilst delivering Maximum Reliability
- Uncomplicated and simple to use set-up and operation
- Easy to read LED Digital Metering displaying Output Frequency, Voltage, Current and Loading - eliminating the need for external monitoring



TYPICAL APPLICATIONS

- Test Laboratory & Research Centre
- Electrical & Electronic Equipment Testing
- Production & Process Control Systems
- Airport Grounding Equipment
- Military Diagnostic Systems
- Communication, Avionics & Marine Equipment

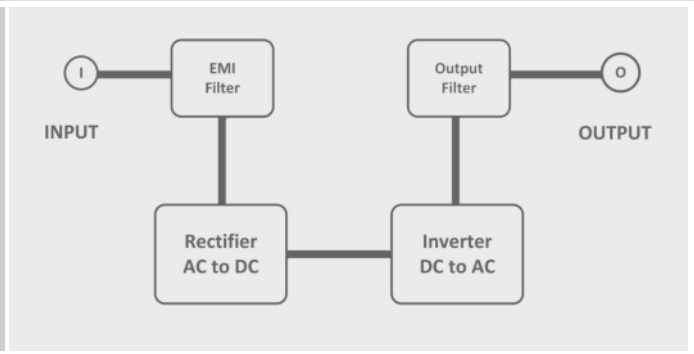


STATIC IGBT PWM DESIGN TOPOLOGY

A FCL Series Variable AC Voltage & Frequency Converter takes the electrical input power at one frequency and voltage and provides an adjustable output voltage and frequency - ideal for testing loads over their full voltage and frequency range.

By design the incoming AC Mains Utility supply is converted by a rectifier into DC. The DC is then feed into an Inverter which produces the required AC output power. The resulting stable and pure sinewave is then passed through a low distortion linear amplifier to achieve the required high power output rating. By utilising crystal oscillation the availability of enhanced frequency stability is ensured.

Solid State in basic design, the only moving parts are the fans used to force cool the system.



INPUT VOLTAGE CHOICES AVAILABLE

Also available as 3 Wire Solutions (No Neutral)
- FCL-HD-3P & FCL-LD-3P SERIES

4 WIRE SOLUTIONS

THREE PHASE WITH NEUTRAL (+ GROUND / EARTH)

H SERIES

6 to 400 kVA

High Voltage Models:

380/220V, 400/230V or 415/240V

X468 Models - 440/254V, 460/265V or 480/277V

Other voltages available on individual request / quotation.



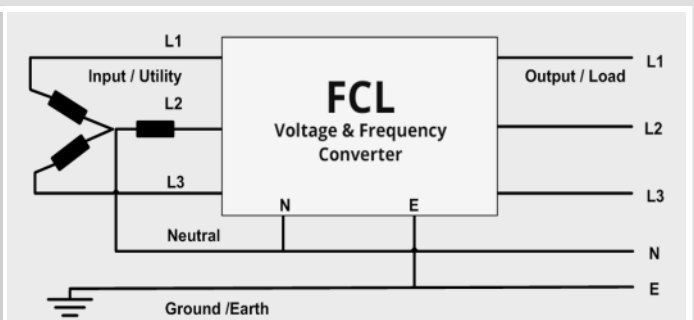
LY SERIES

6 to 200 kVA

Low Voltage Models:

190/110V, 200/115V, 208/120V or 220/127V

Other voltages available on individual request / quotation.



INPUT & OUTPUT VOLTAGE & FREQUENCY SETTINGS

H SERIES

* = 600/346V available as an option

Nominal Three Phase Input Voltage & Frequency	INPUT	
	Input Voltage Window - S10	
	L-L	L-N
380V L-N: 220V 50 or 60Hz	342 to 418V	198 to 242V (± 10%)
400V L-N: 230V 50 or 60Hz	360 to 440V	207 to 253V (± 10%)
415V L-N: 240V 50 or 60Hz	374 to 456V	216 to 264V (± 10%)

Available Output Voltages	SELECTABLE HIGH OR LOW CURRENT OUTPUT VOLTAGE RANGES		Output Voltage Accuracy ± % of Output	Programmable Output Frequency	Output Frequency Accuracy ± % of Output
	L-L / L-N	L-N			
0/0V to 520/300V *	High Level	0 to 300V	± 1%	40 to 70 Hz (40 to 499 Hz Special Option)	± 0.01%
	Low Level	0 to 150V			
0/0V to 520/300V *	High Level	0 to 300V	± 1%	40 to 70 Hz (40 to 499 Hz Special Option)	± 0.01%
	Low Level	0 to 150V			
0V to 520/300V *	High Level	0 to 300V	± 1%	40 to 70 Hz (40 to 499 Hz Special Option)	± 0.01%
	Low Level	0 to 150V			

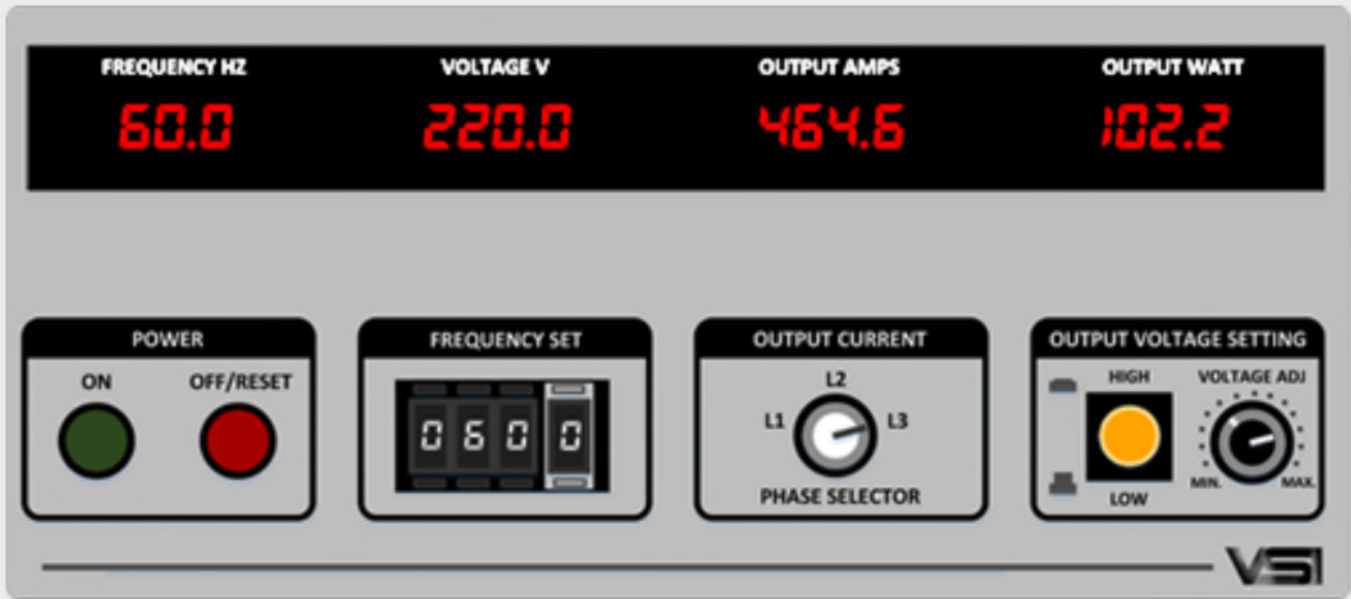
H-X486 SERIES



Nominal Three Phase Input Voltage & Frequency	INPUT	
	Input Voltage Window - S10	
	L-L	L-N
440V L-N: 256V 50 or 60Hz	396 to 484V	230 to 281V (± 10%)
460V L-N: 265V 50 or 60Hz	414 to 506V	239 to 291V (± 10%)
480V L-N: 277V 50 or 60Hz	432 to 528V	249 to 304V (± 10%)

Available Output Voltages	SELECTABLE HIGH OR LOW CURRENT OUTPUT VOLTAGE RANGES		Output Voltage Accuracy ± % of Output	Programmable Output Frequency	Output Frequency Accuracy ± % of Output
	L-L / L-N	L-N			
0/0V to 600/346V	High Level	0 to 346V	± 1%	40 to 70 Hz (40 to 499 Hz Special Option)	± 0.01%
	Low Level	0 to 173V			
0/0V to 600/346V	High Level	0 to 346V	± 1%	40 to 70 Hz (40 to 499 Hz Special Option)	± 0.01%
	Low Level	0 to 173V			
0V to 600/346V	High Level	0 to 346V	± 1%	40 to 70 Hz (40 to 499 Hz Special Option)	± 0.01%
	Low Level	0 to 173V			

DIGITAL DISPLAY PANEL



PRODUCT SELECTION TABLE

H SERIES & H-X468 SERIES

VSi Model No. Add Suffix – -X440 for 440V Input, -X460 for 460V & -X480 for 480V	Power Rating kVA (kW)	Max. Current for Selectable High or Low Current Output Voltage Ranges				Physical Size & Weights	
		H Series (Input 380-415V)		H-X468 Series (Input 440-480V)		W x H x D mm	Kg
		High Amps per Phase	Low Amps per Phase	High Amps per Phase	Low Amps per Phase		
FCL-6H-3P-S10	6 kVA (4.8 kW)	8.3	16.6	7.2	14.8	460 x 920 x 640	130
FCL-10H-3P-S10	10 kVA (8 kW)	13.9	27.8	12.0	24.0	460 x 920 x 640	170
FCL-15H-3P-S10	15 kVA (12 kW)	20.9	41.8	18.0	36.0	500 x 1100 x 770	220
FCL-20H-3P-S10	20 kVA (16 kW)	27.8	55.6	24.0	48.0	500 x 1100 x 770	270
FCL-30H-3P-S10	30 kVA (24 kW)	41.7	83.4	36.1	72.2	750 x 1200 x 850	320
FCL-45H-3P-S10	45 kVA (36 kW)	62.6	125.2	54.1	108.2	750 x 1200 x 850	380
FCL-60H-3P-S10	60 kVA (48 kW)	83.4	166.8	72.1	144.2	750 x 1200 x 850	450
FCL-75H-3P-S10	75 kVA (60 kW)	104.3	208.6	90.2	180.4	860 x 1300 x 1050	470
FCL-100H-3P-S10	100 kVA (80 kW)	139.1	278.2	120.2	240.2	860 x 1300 x 1050	530
FCL-120H-3P-S10	120 kVA (96 kW)	166.9	333.8	144.3	288.6	860 x 1435 x 1500	600
FCL-150H-3P-S10	150 kVA (120 kW)	208.6	416.2	180.4	360.8	860 x 1435 x 1500	680
FCL-200H-3P-S10	200 kVA (160 kW)	278.2	556.4	240.5	481.0	860 x 1435 x 1500	750
FCL-240H-3P-S10	240 kVA (192 kW)	333.8	667.6	288.6	577.2	960 x 1600 x 1700	TBA
FCL-300H-3P-S10	300 kVA (240 kW)	417.2	834.4	360.7	721.4	960 x 1600 x 1700	TBA
FCL-330H-3P-S10	330 kVA (264 kW)	459.0	918.0	396.8	793.6	960 x 1600 x 1700	TBA
FCL-400H-3P-S10	400 kVA (320 kW)	556.3	1112.6	481.0	962.0	1060 x 1750 x 1900	TBA

Note: 1. Larger kVA and alternative voltage options available to order / individual request.
2. X486 Model Sizing & Weights may vary- subject to confirmation at time of ordering



TECHNICAL SPECIFICATION

General:

Phase	Three Phase, 4 Wire (3P+Neutral+G/E)
Ashley-Edison Models	FCL-6H-3P-S10 to FCL-400H-3P-S10
Power Ratings	<p>16 Model Ratings-</p> <p>6kVA (4kW), 10kVA (8kW), 15kVA (12kW), 20kVA (16kW), 30kVA (24kW), 45kVA (36kW), 60kVA (48kW), 75kVA (60kW), 100kVA (80kW), 120kVA (96kW), 150kVA (120kW), 200kVA (160kW), 240kVA (192kW), 300kVA (240kW), 330kVA (264kW) & 400kVA (320kW)</p> <p>- Larger ratings to special order</p>
Design Topology	Static—IGBT/ Pulse Width Modulated (PWM)

Input:

Voltage	H Series	380/220V - 400/230V - 415/240V $\pm 10\%$
	H-X468 Models	440/256V - 460/265V - 480/277V $\pm 10\%$
Frequency		47 to 63Hz $\pm 5\%$ (400Hz Option)

Output:

Selectable High or Low Current Output Voltage Ranges Line to Neutral Voltages * = to specific order	H Series	High Voltage - 0 to 300V (Option 0 to 346V*) Low Voltage - 0 to 150V (Option 0 to 173V*)
	H-X468 Models	High Voltage - 0 to 346V Low Voltage - 0 to 173V
Voltage Regulation		$\pm 1\%$
Frequency		40 to 70 Hz (Programmable Key Lock Setting) (Extendable to 499 Hz as a special build option)
Frequency Stability		$\pm 0.01\%$
Power Factor		0.8 Power Factor
Digital Metering:	Frequency (Hz)	4 Digit LED Digital Display - Resolution 0.1Hz/Step
	Voltage (Volts)	4 Digit LED Digital Display - Resolution 0.1 Volt
	Current (Amps)	4 Digit LED Digital Display - Resolution 0.1 Amp
	Loading (Watts)	4 Digit LED Digital Display - Resolution 0.1 Watt

Protection Features:

As Standard	Electronic Circuit/Circuit Breaker, Overload Warning, Over Temperature, Short Circuit and Auto-Power Off
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Environmental:

Operating Temperature Range	Temperature range -15 to 45 °C. Derate by 2% for each additional °C Up to max 60 °C .
Maximum Altitude	Maximum altitude 4000m. Derate by 2.5% for each additional 500m.
Relative Humidity	Suitable for indoor tropical use 90% RH (non-condensing).
Efficiency	$\geq 94\%$
THD - Harmonic Distortion	Pure Sinewave $\leq 2\%$
Audible Noise	< 60 dB (at 1 metre)

Physical:

Construction:	Enclosures to IP20 (NEMA 1 Style) - BS EN 60529
Colour:	RAL 7032 (Pebble Grey - Epoxy Powder Coating)
Dimensions & Weights	See Product Selection Table

Certification & Conformance:

EMC Conformance	Complies with BS EN 55022 and the relevant parts of the BS EN 61000 series of standards
CE Certification	CE Marked - being fully compliant with European Union Directives 2014/30/EU (The EMC Directive) and 2014/35/EU (The Low Voltage Directive).

Warranty:

Standard Warranty	1 Year / 12 Months from date of supply
Extended Warranty	Option - Extendable Warranty up to 60 Months / 5 Years



TYPICAL APPLICATIONS

Our **FCL Series** Variable Voltage and Frequency Converters are typically utilised in -

<p>- Research & Design</p>	<ul style="list-style-type: none"> ● New product design brings certain challenges for manufacturers today as the world marketplace presents a wide variety of AC power forms. In addition to the many variations of power, the stability of that power may not always be consistent from one locality to another. ● Whether you want consistent precision power from day to day or need to simulate a wide variety of power line disturbances, VSi can work with you to define your AC power solution.
<p>- Manufacturing Testing</p>	<ul style="list-style-type: none"> ● Often products are used at a different voltage and frequency from the country in which they are produced. This creates a need to convert both voltage and frequency on a production line. ● VSi products are used worldwide to supply the voltage and frequency needed by any given product requiring AC Power. Stable voltage and frequency are also required to minimize the rejection of a product due to poor power conditions in a factory. Our products provide a stable output while the input voltage or frequency may vary. This provides the assurance that a product did not fail due to a low-voltage line in your facility.
<p>- Military</p>	<ul style="list-style-type: none"> ● From field use, to shipboard applications, to laboratory environments, VSi's military customers benefit from the high quality, rugged designs of its standard Variable AC Voltage and Frequency Converters. ● Our products can be found powering sensitive electronic equipment in a wide variety of military applications and environments.
<p>- Avionics</p>	<ul style="list-style-type: none"> ● As aircraft electronics continue to evolve, so do their power requirements. ● At VSi we are able to replicate the environments required to test for compliance with aerospace test requirements. Varying frequency and voltage, we can provide a great amount of control and simulation of the AC power on an aircraft.

ENSURING THE CORRECT SIZING

FCL Frequency Converters have both maximum kVA (Apparent Power) ratings and kW (Real Power) ratings – difference between the two being commonly referred to as the Power Factor.

In general, when sizing the Frequency Converter neither the kW nor kVA rating of a Frequency Converter should be exceeded.

Equipment nameplate ratings are often stated in kVA, which makes it difficult to know the kilowatt ratings. If using equipment nameplate ratings for sizing, a user might configure a system, which appears to be correctly sized based on kVA ratings, but actually exceeds the Frequency Converters kW rating. By sizing the kVA rating of a load to be no greater than 60% of the kVA rating of the Converter, it minimises the risk of exceeding the watt rating of the Converter.

Therefore, unless you have high certainty of the watt ratings of the loads, the safest approach, and widely considered to be the 'best practice', is to keep the sum of the load nameplate ratings below 60% of the converters kVA rating.

Where the load type is **inductive** in nature such as motors (fans, pumps, etc), solenoids, and relays it is essential that high inrush current and short-time overload factors are fully considered. With motors (*without a soft start facility*) typically drawing on start-up current 5 to 7 times the stated rating of the motor it is recommended that a Frequency Converter is selected that is 3 times the stated rated capacity of the load.

Outdoor - IP54 Ingress Protection (-IP54 Option)



FCL Frequency Converters presented in durable IP54 (BS/EN 60529) / NEMA 3 free standing steel cubicles suitable for external use, or more challenging internal environments.

CUSTOM BUILT SOLUTIONS

VSi, with a strong and wide manufacturing base, is able to meet the requirements of customers from our own in-house professional resources.

Where bespoke / custom built solutions are required we are able to call upon our extensive portfolio of proven standard designs and tailor offerings to accommodate, without breaking the bank, most individual specific requirements.

