The FCL-3P-S10-FX range of Three Phase Static Frequency Converters / Changers allows the connection of 60 Hz powered equipment to a 50 Hz supply and 50 Hz powered equipment to a 60 Hz supply. Where required, they can convert the supply voltage to a different voltage to match the requirement of the load. Models are also available offering a fixed 400 Hz output - as frequently required in Aviation and Military applications.

In addition FCL-3P-S10-FX Frequency Converters keep the load equipment running through utility voltage fluctuations and frequency variations, delivering a stable and clean voltage and frequency supply to the load equipment.

Suitable for all load types – Resistive, Inductive & Capacitive (see Ensuring the Correct Sizing – Page 4)

Built upon a dynamic platform, and incorporating the latest Pulse Width Modulated (PWM) inverter and rectifier controls, their solid-state design means that the static converter’s only moving parts are the fans used for forced cooling the system.
---

**STATIC IGBT PWM DESIGN TOPOLOGY**

A FCL-FX Series Fixed Output AC Voltage & Frequency Converter takes the electrical input power at one frequency and voltage and provides another output voltage and frequency.

By design the incoming AC Mains Utility supply is converted by a rectifier into DC. The DC is then fed 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.

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**50Hz INPUT & 60Hz OUTPUT MODELS - VOLTAGE OPTIONS**

<table>
<thead>
<tr>
<th>FCL-3P-S10 Model</th>
<th>Input Voltage * &amp; Frequency</th>
<th>Output Voltage * &amp; Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>HL-FX</td>
<td>380/220V or 400/230V or 415/240V</td>
<td>190/100V or 200/110V or 208/120V or 220/127V</td>
</tr>
<tr>
<td>HDL-FX</td>
<td>380V or 400V or 415V</td>
<td>380V or 400V or 415V</td>
</tr>
<tr>
<td>H-FX</td>
<td>380/220V or 400/230V or 415/240V</td>
<td>380/220V or 400/230V or 415/240V</td>
</tr>
<tr>
<td>HD-FX</td>
<td>380V or 400V or 415V</td>
<td>380/220V or 400/230V or 415/240V</td>
</tr>
<tr>
<td>HDY-FX</td>
<td>380V or 400V or 415V</td>
<td>380V or 400V or 415V</td>
</tr>
<tr>
<td>HHX-FX</td>
<td>380/220V or 400/230V or 415/240V</td>
<td>440V or 460V or 480V or 600V</td>
</tr>
<tr>
<td>HDHXD-FX</td>
<td>380V or 400V or 415V</td>
<td>440/254V or 460/265V or 480/277V or 600/346V</td>
</tr>
<tr>
<td>HDHXX-FX</td>
<td>380V or 400V or 415V</td>
<td>440V or 460V or 480V or 600V</td>
</tr>
</tbody>
</table>

* Customer to specify required Input & Output Voltage at time of ordering

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**60Hz INPUT & 50Hz OUTPUT MODELS - VOLTAGE OPTIONS**

<table>
<thead>
<tr>
<th>FCL-3P-S10 Model</th>
<th>Input Voltage * &amp; Frequency</th>
<th>Output Voltage * &amp; Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>LH-FX</td>
<td>190/100V or 200/110V or 208/120V or 220/127V</td>
<td>380/220V or 400/230V or 415/240V</td>
</tr>
<tr>
<td>LDY-FX</td>
<td>190/100V or 200/110V or 208/120V or 220/127V</td>
<td>380/220V or 400/230V or 415/240V</td>
</tr>
<tr>
<td>HXY-FX</td>
<td>440/254V or 460/265V or 480/277V or 600/346V</td>
<td>380/220V or 400/230V or 415/240V</td>
</tr>
<tr>
<td>HXDY-FX</td>
<td>440V or 460V or 480V or 600V</td>
<td>380/220V or 400/230V or 415/240V</td>
</tr>
</tbody>
</table>

Models are also available offering a 400Hz Output (or alternative fixed output - 5 to 1000Hz) - please contact our Sales Team for further information.

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**ENCLOSURES - IP20 INDOOR & IP54 OUTDOOR**

**Indoor - IP20 Ingress Protection (Standard)**

FCL-3P-S10-FX Frequency Converters presented in endurable in robust air-cooled IP20 (BS/EN 60529) / NEMA 1 floor standing steel cubicles, primarily intended for indoor use.

These enclosures offer removeable panels for ease of installation and servicing and, in addition, lockable front door access is provided.

**Outdoor - IP54 Ingress Protection (-IP54 Option)**

FCL-3P-S10-FX Frequency Converters presented in endurable IP54 (BS/EN 60529) / NEMA 3 free standing steel cubicles suitable for external use, or more challenging internal environments.

IP 54 = Dust Protected. Limited ingress of dust permitted, but will not interfere with operation of the equipment. Protection against water splashing from all directions. Limited ingress permitted.

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## General: **HL, H, LH, HXY Models Three Phase, 4 Wire (3P+Neutral+G/E) or HDL, HD, HDY, LDY, HXDY Models - Three Phase, 3 Wire (3P+G/E - No Neutral)**

**FCL-6-3P-S10-FX to FCL-400-3P-S10-FX**

### Power Ratings

16 Power Ratings:
- 6kVA (4.8kW)
- 10kVA (8kW)
- 15kVA (12kW)
- 20kVA (16kW)
- 30kVA (24kW)
- 45 kVA (36kW)
- 60 kVA (48kW)
- 75 kVA (60kW)
- 100kVA (80kW)
- 120kVA (96kW)
- 150kVA (120kW)
- 200kVA (160kW)
- 240 kVA (192kW)
- 300 kVA (240kW)
- 330 kVA (264kW)
- 400 kVA (320kW)

### Design Topology

Static Solid State - Sine Wave Pulse Width Modulated (SPWM)

### Input:

**Voltage**

- HL (4 Wire), HDL (3 Wire), H (4 Wire), HD (4 Wire), HDY (3 Wire) HHX (4 Wire), HDHDX (3 Wire) & HDHXD (3 Wire) Models - 380V / 400V / 415V ±10%
- HXY (4 Wire) & HXDY (3 Wire) Models - 440V / 460V / 480V / 600V ±10% (Customer to Specify)

**Frequency**

- 47 to 63Hz ±5%
- 6 Pulse
- 0.8 PF

### Output:

**Voltage**

- HHX (3/4 Wire), HDHDX (3 Wire) & HDHXD (4 Wire) Models - 440V / 460V / 480V / 600V ±1% (Customer to Specify)

**Frequency**

- All H Models - 60Hz ±0.05%
- All L & HX Models - 50Hz ±0.05%
- 400Hz Output & Other Frequencies (15 to 1000Hz) available to individual quotation / request

**Wave Form**

- Pure Sine Wave

**Efficiency**

- ≥ 85%

### Metering, Alerts & Communication:

**Front Display Panel**

Digital Display & Control Panel with Phase Selector Parameter Metering and On / Off Push Buttons

**LCD Digital Metering:**

- Frequency (Hz)
- Voltage (Volts)
- Current (Amps)
- Load (Watts)

**Protection Features:**

**Surge Protection**

BS EN 61000-4-5 Level 3

**EPO**

Front Panel Power Off Button

**Overload Protection**

3x max current rating for 2 seconds - with Output Cut Off after 2 seconds

**Short Circuit Protection**

Output Cut Off Immediately (Input & Output Circuit Breaker Protection)

### Environmental:

**Operating Temp Range**

- -10% to +45°C

**Storage Temp Range**

- -40 to 50°C

**Maximum Altitude**

- 1000 meters (de-rate by 1% per 100 meters up to 2000 meters)

**Relative Humidity**

- 0 to 95% (non-condensing)

**THD - Harmonic Distortion**

- <3% for Linear Loads
- <5% for Non-Linear Loads

**Audible Noise**

- @ 1 meter 50 to 65 dBA (dependent on model rating)

### Physical:

**Power Connections**

Hardwire - Input & Output

**Construction**

IP20 / NEMA 1 Style - BS EN 60529 (Option IP54 / NEMA 3 Style)

**Dimensions & Weights**

Dependent on model rating and configuration

Sizes and weights available on individual request

### Certification & Conformance:

**EMC Conformance**

BS EN 55022 and relevant parts of BS EN 61000

**CE Certification**

2014/30/EU (The EMC Directive) and 2014/35/EU (The Low Voltage Directive)

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UNDERSTANDING FCL MODEL NUMBERS

FCL-100HXDY-3P-S10-FX600/60-400/50-IP54

1. Ashley-Edison Range: FCL
2. Power Rating: 100 kVA (80kW)
3. Configuration: Input 3 Wire / Output 4 Wire - see Voltage Options
4. No of Phases: Three Phase
5. Input Voltage Swing: ±10%
6. Fixed Output
7. Input Voltage / Frequency: 600 Volts / 60Hz
8. Output Voltage / Frequency: 400 Volts / 50Hz
9. Option Fitted: IP54 Enclosure

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 kilo-watt 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.