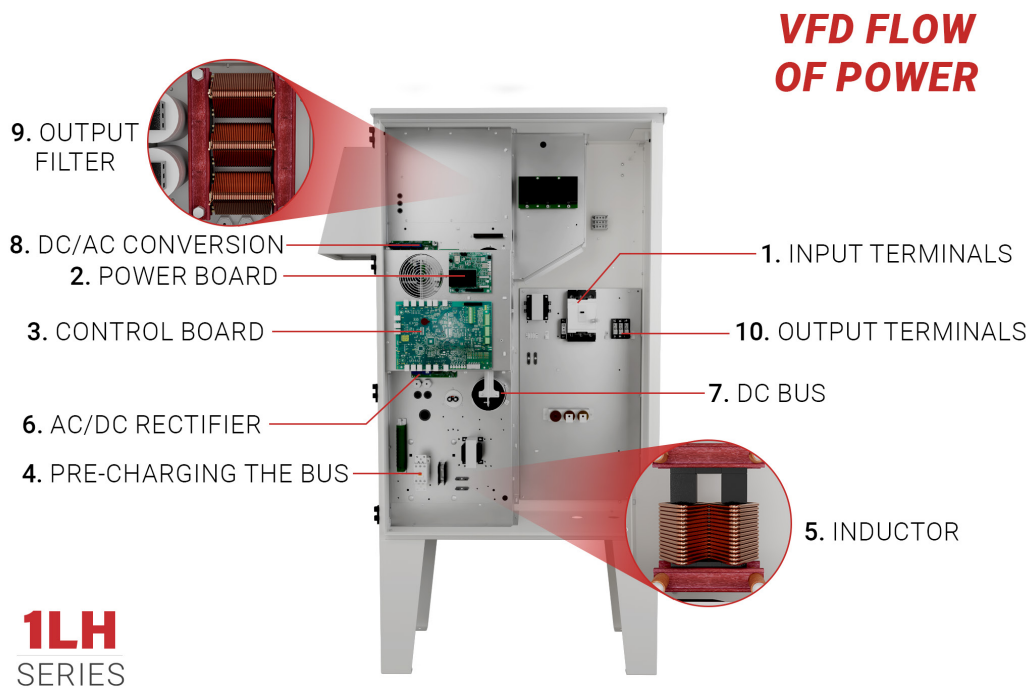# VFD Anatomy of a Drive

Flow of Power

1. **Input Terminals/Circuit Breaker** — the first stop for any input power, the line side terminals provide a connection for incoming power and the circuit breaker acts as a guard against high incoming current, tripping in the event of a surge.

2. **Power Board** — distributes the incoming voltage throughout the drive for use by other components.

3. **Control Board** — operates as the brain of the VFD by collecting all current and voltage measurements, storing and facilitating user parameters, and controlling the entire system.

4. **Pre-charging the Bus** — the circuit reduces inrush current through the input stage of the VFD and prevents damage to the DC bus caps. This is done by routing current through a resistor until the bus is charged which increases time to charge from several cycles to several seconds. Once the bus is charged, a contactor closes, removing the pre-charge resistor from the circuit.

5. **Inductor** — input current is routed through the inductor to smooth out any harmonics that may potentially damage the VFD or equipment on the line side.

VFD FLOW OF POWER

9. OUTPUT FILTER

8. DC/AC CONVERSION
2. POWER BOARD
3. CONTROL BOARD
6. AC/DC RECTIFIER
4. PRE-CHARGING THE BUS

1. INPUT TERMINALS
10. OUTPUT TERMINALS
7. DC BUS
5. INDUCTOR

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6. **AC/DC Rectifier** — the input goes through IGBT rectifiers or diodes to convert AC voltage to DC voltage that can be used by the DC bus.

7. **DC Bus** — is a bank of capacitors that stores energy that will be sent to the motor after the DC to AC conversion.

8. **DC/AC Inverter** — responsible for taking the DC power provided by the bus and inverting it to AC power usable by a motor. This is done with Insulated Gate Bipolar Transistors (IGBTs) which open and close according to a Digital Signal Processer (DSP). This process creates a Pulsed Width Modulated (PWM) waveform that simulates an AC sine wave.

9. **Output Filter** — the PWM waveform is put through an output reactor/filter to limit dangerous voltage spikes. NOTE: depending on lead length and motor specifications, an output filter may not be required. Consult your motor specifications manual.

10. **Output Terminals** — this PWM waveform is transferred to the output terminals to be sent through the motor leads to the motor.