Clean Power – CPW11

WEG 18 Pulse Harmonic Reduction Drive

Guide Form Specification

WEG Electric Corp
6655 Sugarloaf Parkway, Duluth, GA 30097
www.weg.net/us - 1-800-ASK-4WEG

Contents:

1.0 General

1.1 Purpose

This specification shall establish the minimum requirements for a drive panel for variable torque or constant torque applications requiring mitigating harmonics as defined by IEEE 519-2014, the equipment shall meet all requirements as described in the latest edition of IEEE 519 with respects to current and voltage harmonic levels as outlined in table 1. The point of common coupling for all harmonic calculations and field measurements for both voltage and current distortion shall be defined at the PCC. The PCC is defined as the point of common coupling between the utility and the user. The adjustable frequency drive equipment shall be the CFW11 model (2-600HP) drives as furnished by WEG.

2.0 Enclosure

2.1 Construction

A. The enclosure shall be NEMA Type 12 as standard and be in compliance with UL 508A and NEMA 250. Enclosure is rated for a maximum temperature range of 0 to 45° C without derating.

B. The system enclosure shall have a panel mounted disconnect handle means of removing all AC input power from the integral drive. Input disconnect handle shall be mounted through-the-door and be lockable in the OFF position.

C. The enclosure shall have indicators for VFD Running and VFD fault as a minimum. Also, to include operational functions such as run (green)/stop (red) push buttons, These indicators and push buttons shall be mounted on the panel door and clearly visible to an operator.

D. The system enclosure shall have door interlock for safety.

E. The Main Power and Motor Power shall be top entry/bottom exit.

3.0 AC Drive Equipment

3.1 Driven Equipment

3.1.1 The Drive shall be an IGBT based sinusoidal PWM type AC Drive capable of operating a squirrel cage induction motor with a full load current equal to or less than the continuous output of the Drive. The drive panel shall incorporate 18 pulse phase shifting (nine outputs) autotransformer with 5-7% input reactor.

The drive must be located within 300 feet from the motor location without the need of special cabling or protective devices such as DV/DT filters. Drive shall be capable to operate altitude up 3,300 feet in standard condition without derating.

3.1.2 Drive Panel Construction

3.1.2.1 The drive panel shall be of modular construction for ease of access to control and power wiring, and maintenance. It shall consist of the following general components:

- Main incoming disconnect/circuit breaker with operating handle.
- Drive charging circuit.
- Drive Isolation contactor before Autotransformer.
- One 18 pulse, 40° phase shifting (nine outputs) Autotransformer with 5-7% input reactor.
- Full wave diode bridge rectifier assembly supplied by a phase shifted, three phases AC to provide a fixed DC voltage.
- High speed semiconductor fuses for the DC circuit.
- Suitable VFD with DC link capacitors and Insulated Gate Bipolar Transistor (IGBT) power section rated for variable torque or constant torque applications.

3.1.3 The Drive shall be microprocessor based with an LED and LCD display to monitor operating conditions. The Drive display section shall allow for local operation and setting of Drive function codes and display fault indication and reasons associated with the fault.

3.1.4 The Drive shall have Communication port plug and play as to recognized industry standard device level networks such as DeviceNet, Profibus, Modbus, Ethernet/IP, and CANopen.

3.1.5 The keypad shall be common for the entire HP and drive input voltage range. Drive's keypad shall be capable of copying, uploading and downloading drive function codes regardless of horsepower.

4.0 Operating Conditions

4.1 The Drive's operating ambient temperature range shall be -10°C to 50°C. Storage temperatures shall be between -25°C to 60°C.

4.2 The relative humidity range shall be 5-90% non-condensing.

4.3 The Drive shall be suitable for operation at altitudes up to 3300 feet without de-rating.

4.4 The Drive shall meet IEC 6100-3-12 to lower current harmonic level in the network and compliance IEC 60947-4-2/UL 508 C for motor overload protection.

5.0 Standards

5.1 The Drive shall be UL, cUL, CE, and GOST listed. The Drive shall be designed in accordance with applicable portions of NEMA standards.

5.2 The Drive shall optionally be able to install Safety stop in accordance with EN-954-1.

5.3 The Drive shall be compatible with the installation requirements of interpretive codes such as National Electric Code (NEC) and Occupational Safety & Health Act (OSHA).

5.4 Drive Manufacturer shall be capable of providing harmonic calculations and onsite post installation harmonic testing with certified reports on request.

6.0 Input Power

6.1 The Drive design shall be such that it will be available for use with 380-480V AC, 50/60 H, 3-phase power input.

6.2 The Drive shall be able to withstand voltage variations of -15% to +10% and phase imbalance of </= 3% of the rated phase-to-phase input voltage without tripping or affecting Drive performance.

6.3 System frequency shall be 50 or 60 Hertz with a maximum frequency variation of +/-2HZ.

6.4 Drive efficiency at rated load shall be 98% or higher depending on Drive's operating carrier frequency and rating.

6.5 Line notching, transients and harmonics on the incoming line shall not affect Drive performance. Drive shall have built in Dual DC Chokes.

7.0 Output Power

7.1 The Drive shall be capable of horsepower ratings from 75 through 1000 and output frequencies up to 300 Hertz. It shall also have an energy saver feature with the capability of selecting a V/Hz automatic control function that will modify the V/Hz curve based on light load characteristics that will minimize power consumption.

7.2 The Drive output voltage shall vary with frequency to maintain a constant volts/hertz ratio up to base speed (60 hertz).

7.3 The Drive overload current rating shall be 110% of rated current, for one minute (variable torque) and 150% of rated current, for one minute (constant torque), every ten minutes.

8.0 Drive Features

8.1 The drive display presents a navigation manner with options to access the parameters sequentially or by means of groups (menu).

8.2 The Drive shall have a graphic, back-lit liquid crystal display (LCD) which can be configured to display frequency, current, function code set points, or Drive status and fault codes. It shall display 5 lines with 13 characters of text, providing display of:

Programming Mode: Function Code Numbers, Set points, and Status.
Diagnostic Mode: Fault Indication Codes.
I/O Check Mode: Analog and digital input/output signal status.
Copy Function Mode: Function Data Copy.

8.3 The Graphic display (drive Keypad) should be battery powered to keep the VFD real time clock operating in the event of the power interruption. The minimum life of the battery must not be less than 10 years.

8.4 The VFD Keypad can be installed or removed from the VFD with or without AC power applied to the VFD.

8.5 The Drive shall display operating data, fault information, and programming prompts in English with graphic representations of functions where applicable. The Drive shall have three (3) main different languages LCD readout capabilities of (English, Spanish, and Portuguese).

8.6 The graphic display terminal will provide 7 segment LED display in addition to a 3 line by 16 character LCD display in plain English to control, adjust and configure the AC Drive. All electrical values, bar charts, configuration parameters, I/O assignments, application and activity function access, faults, local control, adjustment storage, self-test and diagnostics.

8.7 The Drive keypad shall be extendible, by optional cable, to a remote location up to 33 feet from the Drive. The keypad shall include the following buttons, allowing following modes of operations: Forward/Reverse/Stop/Start/Local/Remote/Jog keys, Reference increment/ decrement keys, and Menu selection keys.

8.8 When power is applied to the inverter, the display must automatically enter the monitoring mode.

8.9 The Drive keypad shall be able to easily display the following data at time of last fault.

8.5.1 Current at last fault
8.5.2 DC link at last fault
8.5.3 Speed at last fault
8.5.4 Reference Demand at last fault
8.5.5 Frequency at last fault
8.5.6 Motor Voltage at last fault
8.5.7 All Digital Inputs status at last fault
8.5.8 All Digital Outputs status at last fault

9.0 Speed Control & Torque Control

9.1 The Drive shall have both low frequency limit and high frequency limit functions. Drive shall have switching frequency ranging depending on HP.

9.2 Drive rated frequency shall be programmable from 0Hz to 300Hz in the scalar mode and from 30Hz to 120Hz in the vector mode.

9.3 The Drive shall be capable of starting into a rotating load (forward or reverse) and shall smoothly accelerate or decelerate to the set point without experiencing component damage.

9.4 The Drive shall be capable of stopping by selectable DC injection braking. It shall be

adjustable from 0 to 100% braking level and have a programmable starting frequency for DC braking and programmable braking time.

9.5 The Drive shall be constructed to support external signals, whether variable reference or discrete inputs is used.

9.6 Drive Speed Control performance:

V/f Scale:
Regulation (with slip compensation): 1% of the rated speed
Speed variation range: 1:20.

VVW:
Regulation: 1% of the rated speed
Speed variation range: 1:30.

Sensorless:
Regulation: 0.5% of the rated speed
Speed variation range: 1:100.

Vector with Encoder:
Regulation: +/-0.01% of the rated speed with a 14-bits analog input;
+/-0.01% of the rated speed with a digital reference.

9.7 Drive Torque Control:

Sensorless:
Range: 20 to 180%,
Regulation: +/- 10% of the rated torque (above 3 Hz)

Vector with Encoder:
Range: 10 to 180%,
Regulation: +/- 5% of the rated torque.

10.0 Drive Control

10.1 The Drive shall accept inputs from either external dry contacts for the following functions:

- Run forward command
- Run reverse command
- Multi-step frequency selection
- Acceleration/Deceleration time selection
- Stop command
- Coast to stop command
- Alarm reset
- Trip command (external fault)
- Jogging operation
- DC brake command
- Speed Increase command
- Speed Decrease command
- Write enable for keypad
- PID control cancel

- Forced stop command
- Forced stop command with Deceleration time

10.2 The Drive shall be capable of selectable external start/stop control, either 2-wire or 3-wire type.

10.3 The frequency reference shall be from, selectively, an external speed potentiometer, external analog signals (0±10 VDC, 4 to 20mA with signal inversion), from the built in keypad, or from bus communication. The drive shall have a loss of signal detection for the 4 to 20mA ref. Input.

11.0 Protective and Diagnostic Features

11.1 When a fault occurs, the Drive shall have a controlled shut down sequence. The reason for the fault condition shall be enunciated on the LED display, and the LCD graphic screen shall display the current, temperature, frequency, and voltage at the time of the fault as well as potential reasons for the condition. The Drive shall monitor, sense, and display the following fault conditions:

- Over-current
- Ground fault
- Input phase loss
- Over-voltage DC bus
- Under-voltage at input
- Overheating of heatsink
- External thermal relay
- Over-temperature of internal air
- Overheating at Dynamic Braking circuit
- Keypad panel communication error
- CPU error
- Output wiring error / Impedance imbalance
- Modbus-RTU error

11.2 The Drive shall have a selectable electronic inverse time thermal overload function as required by NEC and UL Standard for an AC Induction Motor (Refer to applicable codes for specific installation requirements). Drive overload type shall be software configurable to protect general-purpose ac motors by reducing overload level at reduced motor shaft speeds. External motor overload relays for single motor applications shall not be required. Drive overload software shall be configurable to protect “inverter duty” AC motors without the use of external motor overload relays.

11.3 The Drive shall have an over-voltage protection function that operates if supply voltage rises above rated value or by motor’s regeneration.

11.4 The Drive shall treat short circuits in either the output load or the output module as an over-current.

11.5 If the Drive heat sink temperature exceeds approximately 45°, the Drive will shut down on over temperature fault when provided no ventilation.

11.6 The Drive shall provide output ground fault protection.

11.7 The drive shall provide diagnostic capability to monitor all major maintenance categories real-time from the keypad. Data shall include but not be limited to :

- Drive terminal strip I/O status for digital and analog
- Signals Output frequency
- Output current Output voltage
- Cumulative operating time
- Maximum internal drive temperature
- Maximum Heat sink temperature
- Bus capacitor hours and indicate the electrostatic capacitance
- Heat sink fan hours
- Network communications errors
- Time based peak holding load rate measurement for maximum and average output current data

12.0 Quality Assurance

12.1 All Drives shall be factory tested to ensure proper performance upon delivery.

12.2 The Drive vendor shall provide a warranty for material and workmanship, for a period of 12 months after start up or 18 months after shipment, whichever occurs first.

13.0 Start-Up Service and Training:

The Drive vendor shall offer drive operational and maintenance training and/or startup service separately. The Drive vendor shall have factory trained personnel at field locations convenient to the installation site, available for trouble shooting and/or startup assistance.

14.0 Documentation

An instruction manual, complete with wiring diagrams, schematics, operating, and maintenance instructions, shall be provided with the Drive at the time of shipment.

15.0 Spare Parts

Spare parts shall be available locally through local stocking distributors.

16.0 Factory Installed Options

16.1 Input circuit breaker
16.2 Input Fused Disconnect
16.3 3 contactor By-Pass
16.4 3 contactor Soft Start By-Pass
16.5 User configurable 4 – 20 mA DC output
16.6 Serial communication options

END OF SECTION

Please contact your local WEG distributor or sales representative for specification assistance regarding a particular application. The Variable Frequency Drives specification is recommended for inclusion in Division 16 or 26 (Electrical) for proper coordination with the electrical distribution system.