New Information

Harmonic Correction Unit NEMA 1 Enclosure

Contents

Harmonic Correction Units — NEMA 1 Enclosure

Harmonic Correction Unit — NEMA 1 Enclosure Specifications

The harmonic correction unit is an integrated power electronic product which senses and injects current to cancel harmonics and provide reactive power. Harmonic cancellation is installed directly on the AC line in parallel to harmonic producing loads such as AC drives.

Table 1. Harmonic Correction Unit — NEMA 1 Enclosure Specifications

Safety Agency	UL: CSA:	Pending Approved
Electrical	Voltage: Frequency:	208 – 480V +/- 10% 50/60 Hz, +/- 3 Hz
Environment	Ambient Temperature: Storage Temperature: Relative Humidity: Altitude: Vibration:	0° to 40°C Enclosed -40° to 65°C to 95% Non-condensing to 2000 Meters Seismic Zone 4
Packaging	Standard Enclosure:	NEMA 1 Wall Mount (50/100A) Floor Standing (300A)
Protection	Input Fuses Surge Withstand Capacity: Logic Ride-Through: Output Capacity:	600V, 200,000 AIC, Class T IEEE C62.41-1991 30 Seconds Upon Full Loss of Input Voltage Self-limited to 100% Rated
Performance	Corrective Capability:	<5% TDD and Near Unity Displacement Power Factor ①
Information/Control	Display: Operators: Indicator LED: Information Diagnostics: Output Contacts: Communications:	2 Line, 20 Character/line Alphanumeric Run, Stop, Setup, Enter Up and Down Scroll Run (green) English Power On, Run, Fault, at Maximum Capacity RS-485 Port

① Requires series input line reactor or DC bus choke in each AC drive for optimum performance.

Sizing and Selection

Table 2. Harmonic Control Units Ratings — NEMA 1 Enclosed

Model	Voltage	Frequency	Total Current Amperes (rms)	Watt Losses (kW)	Exterior Dimensions in Inches (H x W x D)	Unit Weight Lbs.	Enclosure Type	Disconnect
HCU050D5N1	208 – 480	50/60	50	1.8	51.8 x 20.7 x 18.5	250	Wall-Mount/NEMA 1	
HCU100D5N1	208 – 480	50/60	100	3.0	68.7 x 20.7 x 18.5	350	Wall-Mount/NEMA 1	
HCU300D5N1	208 – 480	50/60	300	8.0	74.9 x 32.2 x 19.5	775	Free-Standing/NEMA 1	X

Table 3. Current transformer Ratings — Dimensions in Inches (mm)

Model Type	AC Line Current Rating	Type	Internal Diameter
CT500SC	500	Split	2.25
CT1000SC	1000	Split	4.65
CT3000SC	3000	Split	6.50
CT5000SC	5000	Split	7.50

Note: Current transformers are rated for 400 Hz. Two current transformers are required for 3-phase loads. Three current transformers are required when single-phase loads are present.

Table 4. Digital Interface Specifications

Model	Cable Length Feet
DIMCBL03	7.6
DIMCBL05	12.7
DIMCBL10	25.4

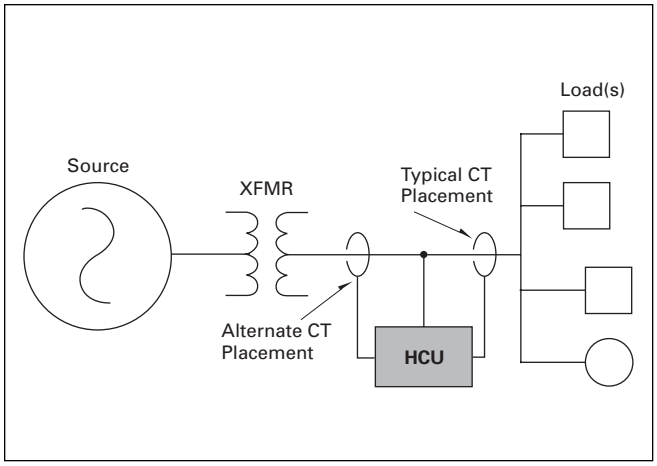

Figure 1. Installation Diagram

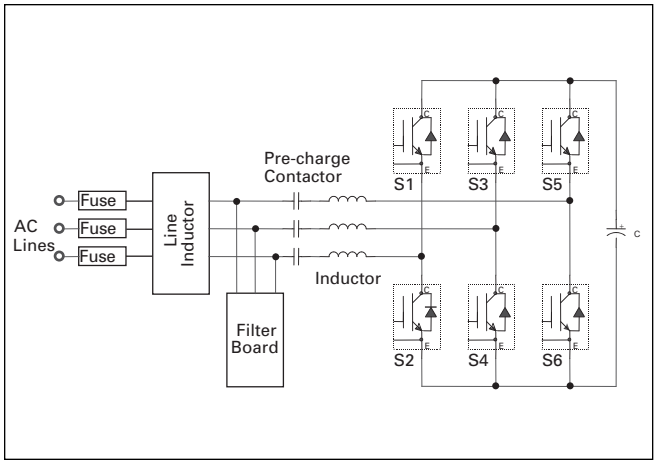

Figure 2. Power Circuit Diagram

Drawings — NEMA 1 Enclosure

HCU050 Layout Dimensions

The HCU050 series offers 50 amperes of corrective current in a convenient package. The enclosed model comes standard with a digital interface panel for control diagnostics and programming. Input fuses are included. The enclosed unit includes a removable panel for bottom conduit entry.

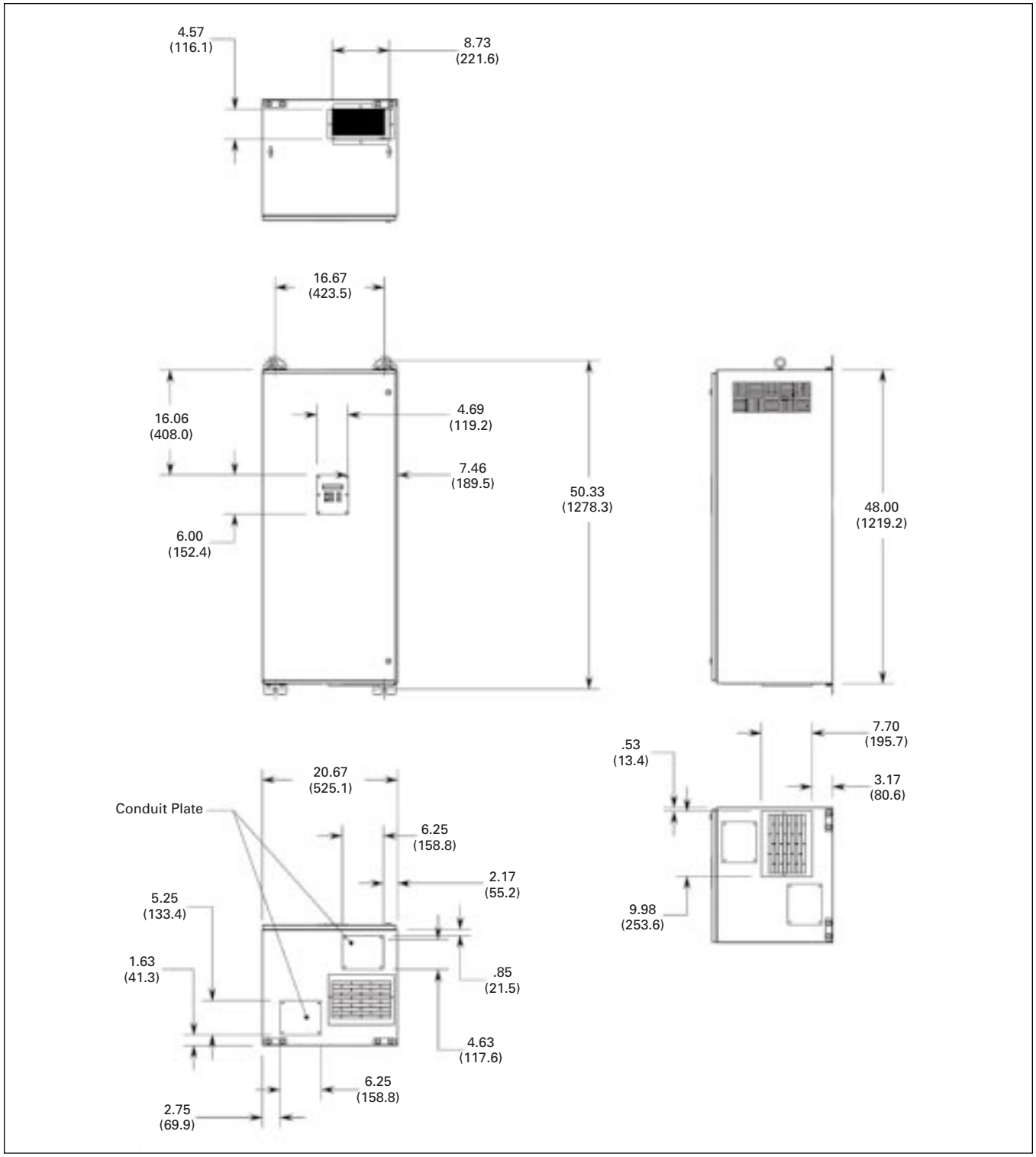

Figure 3. HCU050 — 50 Amperes — Dimensions in Inches (mm)

HCU100 Layout Dimensions

The HCU100 series offers 100 amperes of corrective current in a wall-mounted NEMA 1 enclosure. The enclosed model comes standard with a digital interface module for control, diagnostics and programming. Input fuses are included. The enclosed unit includes a removable panel for bottom conduit entry.

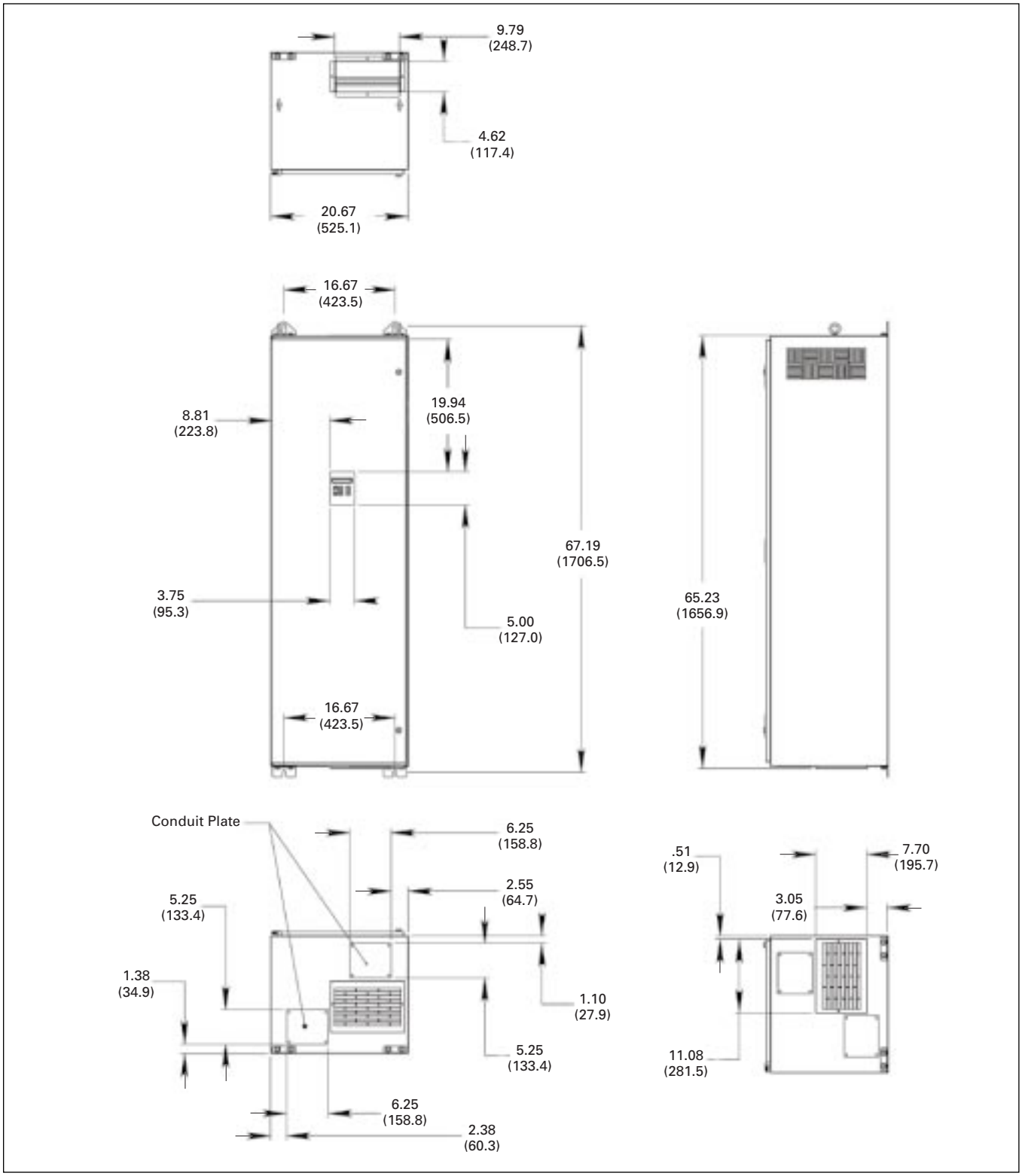

Figure 4. HCU100 — 100 Amperes — Dimensions in Inches (mm)

HCU300 Layout Dimensions

The HCU300 series offers 300 amperes of corrective current for large capacity applications. It is available in a floor-standing NEMA 1 enclosure (including a door-interlocking disconnect). The enclosed model comes standard with digital interface module for control, diagnostics and programming. Input fuses are included. The enclosed unit includes a removable panel for top conduit entry.

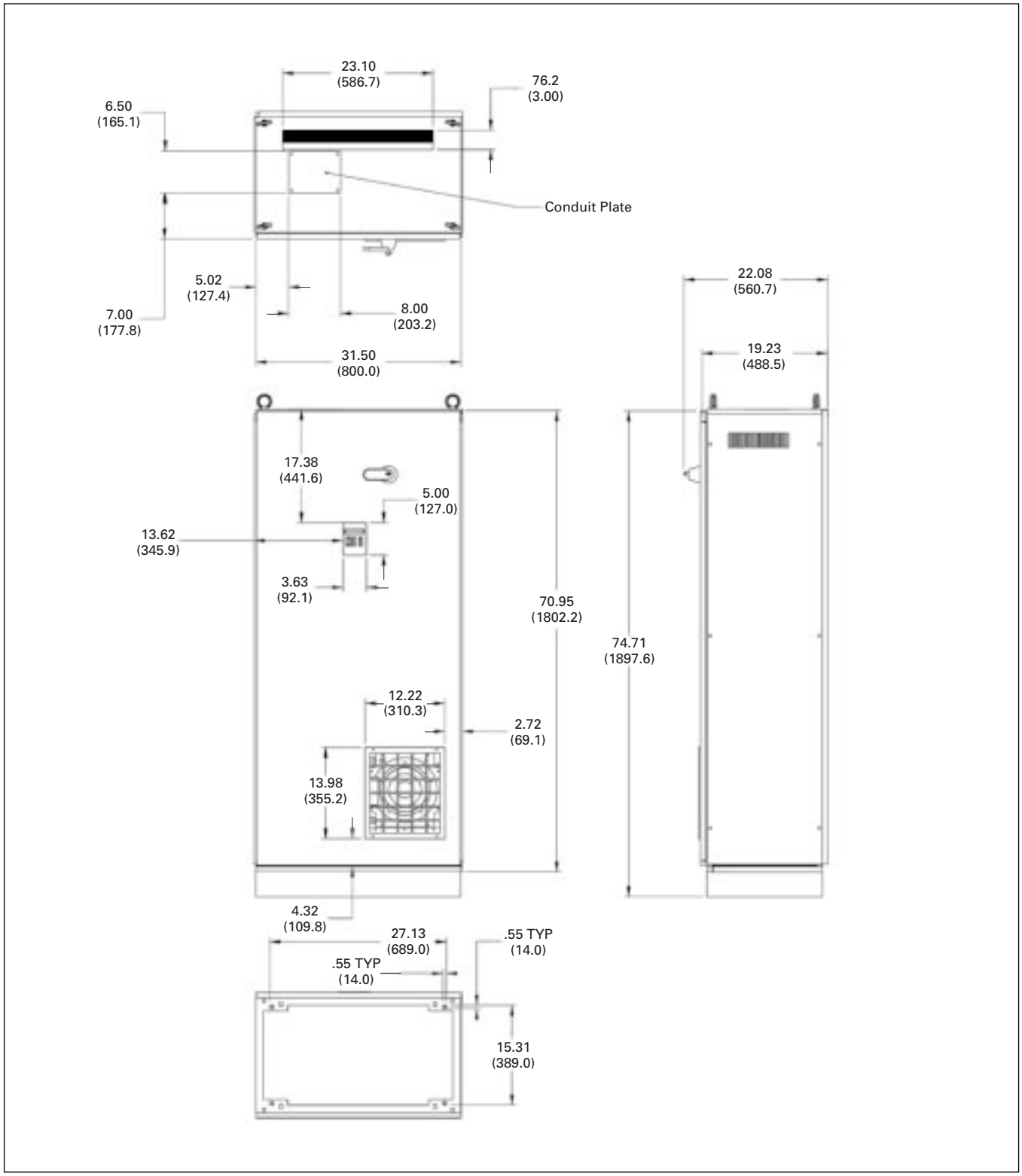

Figure 5. HCU300 — 300 Amperes — Dimensions in Inches (mm)

Harmonic Correction Unit (NEMA 1 Enclosure) — Guide Specification

To reduce current harmonics and correct power factor on low voltage electrical systems.

1.0 General

1.1 Summary

This specification defines the electrical and mechanical characteristics and requirements for harmonic correction units in order to meet 5% total harmonic current distortion [THD(I)], 5% total demand distortion [TDD], and <5% total harmonic voltage distortion [THD(V)] levels at selected points within the electrical system.

1.2 Standards

The harmonic correction unit shall be designed in accordance with the applicable sections of the following documents. Where a conflict arises between these documents and statements made herein, the statements made in this specification shall govern.

- ANSI IEEE standard C62.41-1991 [surge withstand capacity]
- CSA 22.2, No. 14 and 66 [CSA requirements for power electronics]
- FCC Part 15, Sub Part J, Class A [RFI/EMI emission standards]
- ANSI IEEE standard 519-1992 [Harmonic limits]
- UL 508C [UL requirements for power conversion equipment]
- EN 50178 [European Union requirements for power assemblies]
- EN 60439 [European Union requirements for low voltage assemblies]
- EN 55011 [European Union requirements for electromagnetic compatibility]
- IEC 529, IP20 (NEMA 1) [type of enclosure]
- ICBO Building Code, Section 16, Seismic Zone 4 [vibration standard]

The products shall include third party approvals by UL or CSA.

1.3 System Description

1.3.1 System Description

A. Voltage: 480V, 3-phase, 3-wire, plus ground.

B. **Output Load Capacity:** Rated capacity shall be the specified current capacity at the voltage required as indicated within this specification and shown on the respective electrical drawings included within this document.

C. **Field Installable Capacity Upgrade:** Additional power correction capacity shall be added by installing additional units in parallel to previously installed power correction systems. A maximum of 3 units shall be installed in parallel per set of current transformers.

D. Current Transformers:

1. Split core type current transformers shall be installed as defined herein and shown in the electrical drawings contained in these documents.
2. Two current transformers per power correction system location are required and mounted on phases A and B.
3. A third current transformer is required if single- or 3-phase line to neutral connected loads are present downstream from the location of the CTs.
4. Current ratings of the current transformers shall be according to full load current of the circuit on which installed.
5. Current transformers rated for 400 Hz shall be used.

1.3.2 Modes of Operation

A. The harmonic correction unit shall be designed to electronically inject harmonic current to cancel load produced harmonic current such that the upstream power harmonic current and voltage are reduced to below 5% TDD and 5% THD(V) as defined by ANSI IEEE standard 519-1992 for load demand and voltage distortion limits. TDD as used herein refers to the total load demand of the applied circuit. The applied circuit may be a single nonlinear load, an entire distribution bus load, or the facility load at the point-of-common coupling (PCC).

B. Reactive current compensation (aka displacement power factor correction) shall be activated via a digital keypad/display mounted on the door of the enclosure. When reactive current compensation is activated, the harmonic correction unit shall first perform harmonic current correction and then use the remaining capacity to inject reactive current compensation to the specified level herein defined.

1.3.3 Performance Requirements

A. Input Power:

1. Voltage: 480V, 3-phase, plus ground
2. Voltage Tolerance: +/- 10% of nominal
3. Frequency: 60 Hz, +/- 5%
4. Current Limit: 100% of rating
5. Surge Withstand Capability: ANSI/IEEE standard C62.41-1991 without damage
6. Input Fuses: Rated at 200,000 AIC (amperes interrupting capacity), Class T

B. Output Performance

1. Performance of the harmonic correction unit shall be independent of the impedance of the power source. All performance levels shall be attained whether on the AC lines or backup generator or output of UPS.
2. Harmonic Correction:
   a. Limit 2nd through 50th order harmonic current to <5% TDD as defined in ANSI/IEEE standard 519-1992 at each installed location. Harmonic levels for individual harmonic orders shall comply with respective levels established in ANSI/IEEE standard 519-1992.
   b. Limit the THD(V) added to the electrical system immediately upstream of the power correction system location(s) to less than or equal to 5% as defined in ANSI/IEEE standard 519-1992. The power correction system shall not correct for utility supplied voltage distortion levels.
3. Reactive Current Compensation: to .90 lagging displacement power factor. Leading power factor is not permitted.

C. Current transformers

1. Current transformers shall be rated for the total rated rms current of the total load at each installed location.
2. Two current transformers, mounted on phases A and B, are to be installed per location.
3. A third current transformer is required if single- or 3-phase line to neutral connected loads are present downstream from the location of the CTs.
4. Each current transformer shall have a current output of 5 amperes. Current capacity of each current transformer shall be 5000, 3000, 1000 or 500, as required for the electrical system where installed. No other ratings are acceptable.
5. Each current transformer shall be rated for 400 Hz.

1.4 Environmental Conditions

The harmonic correction unit shall be able to withstand the following environmental conditions without damage or degradation of operating characteristics or life.

1. Operating Ambient Temperature: 0ºC (32ºF) to 40ºC (104ºF).
2. Storage Temperature: -40ºC (-40ºF) to 65ºC (149ºF).
3. Relative Humidity: 0 to 95%, non-condensing.
4. Altitude: Operating to 2000 meters (6,500 feet). Derated for higher elevations.
5. Audible Noise: Generated by power correction system not to exceed 65 dbA measured 1 meter (3 feet) from surface of unit.
6. Vibration: Seismic Zone 4.

2.0 Product

2.1 Enclosure

A. Each harmonic correction unit shall be provided in a NEMA Type 1 enclosure.

B. All units shall meet Seismic Zone 4 vibration requirements when installed according to installation requirements defined herein.

C. Freestanding units shall include a door-interlocked disconnect that provides power interruption when the door is opened. Disconnect shall be lockable in the power-off position. Wall mount units shall be disconnected from the power source by a disconnect device or circuit breaker contained in the power distribution center.

D. NEMA 1 Enclosed units shall include lifting provisions by forklift truck and lifting lugs.

E. All units shall include 200,000 AIC rated fuses with Class T actuation.

F. All units shall be provided with a grounding lug. Grounding by the contractor is to be performed according to local and national standards.

G. The paint shall be ASA61

2.2 Operator Controls and Interface

A. All units shall include a digital interface model (DIM) that includes an alphanumeric display consisting of 2-lines with 20 characters per line. All information shall be in English. Operators include run, stop, setup, enter, and up/down scroll.

B. The display shall provide operating data while functioning. Standard operating parameters available for display are AC line voltage, total rms load current, harmonic current of load, reactive current of load, output harmonic and reactive current of power correction system.

C. When the output of the power correction unit is at full rated capacity, the display shall indicate at-maximum capacity and actuate an at-maximum capacity relay.

D. All fault conditions shall be displayed as they occur. Diagnostic information shall be provided in English and clearly indicate the nature of the fault.

E. The run pushbutton shall include a green LED. LED shall be lighted when unit is running.

F. Contacts shall be provided for operator information for power-on, run, fault and at-maximum capacity. Each contact shall be rated for 1 ampere at 120/240 volts. One form C contact shall be provided for each relay.

G. An RS485 serial communication port shall be provided for remote control and diagnostic information.

2.3 Design

A. Each unit of the harmonic correction units shall meet FCC Part 15, Sub Part J, Class A requirements for both radiated and conducted EMI.

B. Each unit shall be designed with a current limiting function to protect the semiconductors. When this level is attained, a message shall be displayed indicating the output capacity is at-maximum capacity and actuate the at-maximum capacity relay. Operation shall continue indefinitely at this level without tripoff or destruction of the power correction unit.

C. Two distinct levels of faults shall be employed. Non-critical level faults will provide automatic restart and a return to normal operation upon automatic fault clearance. Critical level faults stop the function of the unit and await operator action.

1. Faults such as AC line overvoltage, AC line undervoltage, AC line power loss, and AC line phase imbalance shall be automatically restarted. Upon removal of these fault conditions, the power correction system shall restart without user action. Automatic restart will not occur if 5 faults have occurred in less than 5 minutes. During the fault condition, except line loss, the display shall state the type of fault and indicate that automatic restart will occur. The run relay and run LED shall be disabled. The fault relay shall not be enabled unless time out occurs. Upon AC line loss, the power-on relay shall be disabled and no display shall be provided.

2. All other types of faults shall be considered critical and stop the power correction system. The display shall indicate the fault condition and “stop.” The run LED and relay shall be disabled and the fault relay enabled. User shall be required to initiate a power reset (turn power off and on) to restart the power correction system.