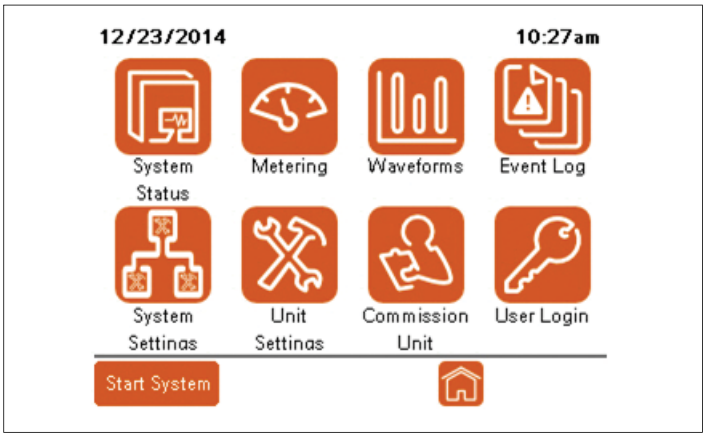
HCU2 harmonic correction unit

Dynamic harmonic correction

Eaton's HCU2 active harmonic filters are engineered to provide dynamic harmonic correction by actively injecting the required currents into an electrical distribution system to cancel the entire spectrum of harmonic currents at the point of connection.



HMI home screen icons

Common applications

Typical applications include locations with large amounts of nonlinear loads including 6- and 12-pulse PWM alternating current (AC) variable frequency drives, direct current (DC) drives, as well as other switch-mode power supply equipment. This equipment can be found in water and wastewater treatment facilities, industrial manufacturing and warehousing plants, military bases and commercial locations.

Unlike passive filters, Eaton's HCU2 can provide effective harmonic correction for varying load conditions and harmonic spectrums by providing dynamic correction up to their rated capacity. The HCU2 also has the secondary benefit of providing power factor correction with any excess capacity after correcting all harmonic conditions.

Improvements from HCUE to HCU2

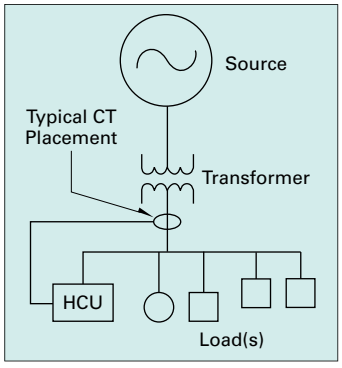
- Closed loop control: A higher degree of harmonic correction is available with closed loop control than open loop control
- Reduced kW losses: Lower kW losses result in lower operating expenses and reduced requirements for equipment room HVAC systems. The maximum heat loss for a 300 A, 480 V unit is 7.1 kW
- Reduced footprint: Wall-mounted 480 V NEMA® 1 units are available in 60, 120, 200 and 300 A ratings
- Ease of maintenance and service: A standard USB service port is provided for firmware updates

Features

- Fast-acting harmonic correction
- NEMA 1, NEMA 2, NEMA 12, IP31, IP54 enclosures, and chassis mount versions available
- 60, 120, 200 and 300 A units available (ampere rating given at 380–480 V)
- Touchscreen human machine interface (HMI)
- Communications connectivity
- Designed for use in environmentally controlled conditions

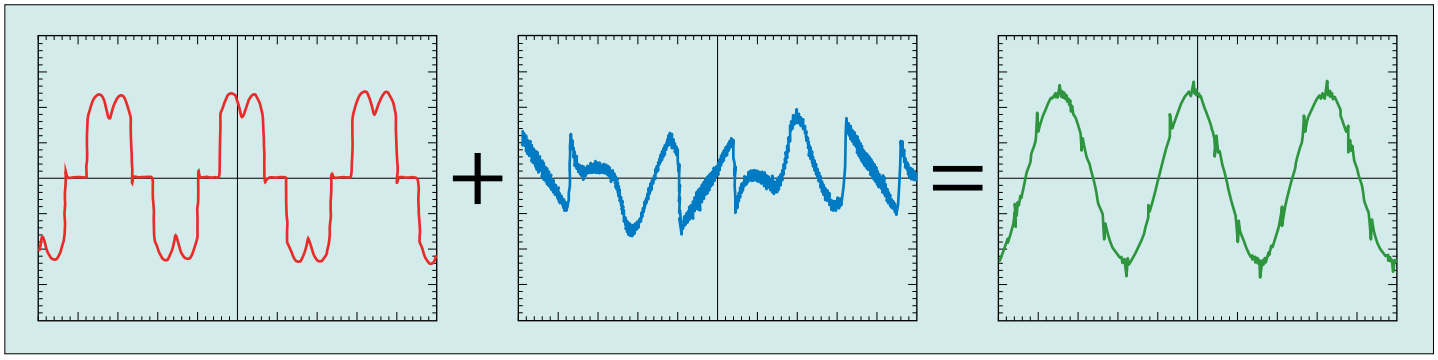
Benefits

- Can be sized to meet specific levels of harmonic correction, providing compliance with IEEE® 519 recommended levels
- Engineered to prevent overloading
- Scalable design can be expanded without impacting performance
- Broad spectrum of cancellation for robust protection (2nd to 51st harmonic)
- Helps improve power factor to maximize efficiency
- Easier and less expensive installation than passive filters, as active filter design reduces the need for detailed engineering studies
- HMI provides comprehensive control through icon-driven interface



Recommended placement

Powering Business Worldwide



Typical uncorrected 6-pulse rectifier (before) current + HCU2 injection current = corrected (after) current

Eaton HCU2 specifications

Specification	Description
Technical specifications	
Standard rms output current ratings	60 A, 120 A, 200 A, 300 A at 380 Vac to 480 Vac 47 A, 94 A, 157 A, 235 A at 600 Vac 40 A, 80 A, 133 A, 200 A at 690 Vac
Nominal frequency	50/60 Hz, ±3 Hz auto sensing
Number of phases	3-phase
Topology	Digital harmonic FFT Digital reactive power
Losses	To 480 Vac <3%; to 690 Vac <5%
CT VA loading	1.0 VA (5 A CT secondary)
Spectrum cancellation	2nd to 51st, discrete; fully selectable per harmonic order (amplitude and on/off)
Control basis	Closed loop (for new installations) Open loop compatible for retrofit applications
Harmonic attenuation	Closed loop: <3% THD(i); max. 20:1 THD(i) reduction with load harmonic current above 50% of HCU2 rating Open loop: <5% TDD Requires 3% or higher inductive impedance per nonlinear load
Harmonic operational features	% THDi set point % THDv set point
Harmonic avoidance	Output at specific harmonic order turned off if resonance or lack-of impedance detected; or manually turned off
Parallel operation	Up to 10 units per set of CT (to 51st order), any size combination Backward compatibility with Eaton HCUE operated in parallel Contact Eaton for applications of more than 10 units
Parallel operation options	Master/master Master/slave Multi-master/multi-slave Same as Eaton HCUE for retrofits
Parallel sequence options	Lead/lag with unit rotation: one unit operates to full capacity before next unit turns on; timed rotation Load share: All operating units function at the same ouput percentage
Parallel HMI control	Any unit permits viewing and changing parameter settings of complete system or any other unit in parallel system
Parallel communications	Proprietary COM bus between operating units
Power factor correction	Optimized unity PF, leading (capacitive) or lagging (inductive) power factor (Cos f) to target
Control response time	25 µs
Harmonic correction time	2 cycles
Reactive correction time	1/4 cycle
Display	144 mm QVGA TFT 64k-color touchscreen
Display parameters	Hundreds of parameters are available. Examples include THDi, THDv, oscilloscope for viewing many selected parameters, phasor diagrams, load power, measured currents for Ih, Is, If, I neg seq, PF (Cos f), injected currents for Ih, I reactive, I neg seq, etc.

Specification	Description
Technical specifications (continued)	
Communications capability	Modbus® RTU, Modbus TCP/IP
Discrete input/outputs	4 input and 4 output dry contacts; assignable
Noise level (ISO3746)	<70 dB at 1 meter from unit surface
Earthing (grounding) systems	EMC filter ground switch for Isolated Terra, high resistance ground or corner grounded systems
Environmental condition	
Operating temperature	0 °C to 40 °C
Relative humidity	0–95%, noncondensing
Seismic rating	Complies with IBC and ASCE7
Operating altitude	1000 m, (derate 1%/100 m above), maximum 4800 m
Automatic rollback of output	Occurs whenever heatsink temperature sensor exceeds temperature limit
Ambient temperature protection	Absolute shutdown if air inlet temperature reaches 51 °C
Preset output limits (rms)	Programmable set limit due to altitude or ambient temperature—becomes fixed output limit
Reference standards	
Design	CE EMC Certification IEC/EN 60439-1, EN 61000-6-4 Class A, EN 61000-6-2
Protection (enclosure)	IP00, IP20, IP31, IP54, NEMA 1, NEMA 2, NEMA 12, UL Type Open (chassis mount)
Standards compliance/ certification	cULus (UL 508 , CSA 22.2 No. 14) CE Certified, ABS, Lloyds, other local standards
Installation	
Wall mount	Chassis mount (UL Type open) and NEMA 1 configurations
Free-standing	IP31, IP54, NEMA 2 and NEMA 12
Circuit protection	NEMA 1 and chassis mount—external means required Free-standing enclosures—incoming circuit breaker with mechanical door interlock
AIC rating (input circuit breaker)	To 415 Vac—200 kA cULus; 125 kA IEC To 480 Vac—200 kA cULus; 75 kA IEC To 600 Vac—100 kA cULus; 100 kA IEC To 690 Vac—No cULus; 100 kA IEC
Cable entry	Wall mount and chassis mount—bottom only Free-standing—top and bottom entry through gland plates
PCBA protection	Conformal coating on all PCBs Pollution Degree 2
Cooling configuration	Separate air plenums for heatsink section and PCBA section: Heatsink (high heat plenum) input from bottom and exhaust out top. All components in high heat plenum rated IP54 or better ≥ no filtering required PCBA air supply must be clean and dry (filtering may be required) No conductive particles permitted

Harmonic correction unit ratings

Model	Voltage (V)	Frequency (Hz)	Total current amperes (rms)	Watt losses (kW)	HCU2 enclosure type	Version	Integral disconnect
HCU2060D5N1	380–480	50/60	60	1.3	Wall mount NEMA 1	UL/CSA	No
HCU2120D5N1	380–480	50/60	120	2.8	Wall mount NEMA 1	UL/CSA	No
HCU2200D5N1	380–480	50/60	200	5.4	Wall mount NEMA 1	UL/CSA	No
HCU2300D5N1	380–480	50/60	300	7.1	Wall mount NEMA 1	UL/CSA	No
HCU2060D5IP00	380–480	50/60	60	1.3	Chassis mount	UL/CSA	No
HCU2120D5IP00	380–480	50/60	120	2.8	Chassis mount	UL/CSA	No
HCU2200D5IP00	380–480	50/60	200	5.4	Chassis mount	UL/CSA	No
HCU2300D5IP00	380–480	50/60	300	7.1	Chassis mount	UL/CSA	No
HCU2060D5IP31	380–480	50/60	60	1.3	Floor mount IP31	CE	Yes
HCU2120D5IP31	380–480	50/60	120	2.8	Floor mount IP31	CE	Yes
HCU2200D5IP31	380–480	50/60	200	5.4	Floor mount IP31	CE	Yes
HCU2300D5IP31	380–480	50/60	300	7.1	Floor mount IP31	CE	Yes
HCU2060D5N2	380–480	50/60	60	1.3	Floor mount NEMA 2	UL/CSA	Yes
HCU2120D5N2	380–480	50/60	120	2.8	Floor mount NEMA 2	UL/CSA	Yes
HCU2200D5N2	380–480	50/60	200	5.4	Floor mount NEMA 2	UL/CSA	Yes
HCU2300D5N2	380–480	50/60	300	7.1	Floor mount NEMA 2	UL/CSA	Yes
HCU2060D5N12	380–480	50/60	60	1.3	Floor mount NEMA 12	UL/CSA	Yes
HCU2120D5N12	380–480	50/60	120	2.8	Floor mount NEMA 12	UL/CSA	Yes
HCU2200D5N12	380–480	50/60	200	5.4	Floor mount NEMA 12	UL/CSA	Yes
HCU2300D5N12	380–480	50/60	300	7.1	Floor mount NEMA 12	UL/CSA	Yes
HCU2060D5IP54	380–480	50/60	60	1.3	Floor mount IP54	CE	Yes
HCU2120D5IP54	380–480	50/60	120	2.8	Floor mount IP54	CE	Yes
HCU2200D5IP54	380–480	50/60	200	5.4	Floor mount IP54	CE	Yes
HCU2300D5IP54	380–480	50/60	300	7.1	Floor mount IP54	CE	Yes
HCU2047D6IP31	600	50/60	47	1.8	Floor mount IP31	CE	Yes
HCU2094D6IP31	600	50/60	94	3.9	Floor mount IP31	CE	Yes
HCU2157D6IP31	600	50/60	157	7.2	Floor mount IP31	CE	Yes
HCU2235D6IP31	600	50/60	235	9.9	Floor mount IP31	CE	Yes
HCU2047D6N2	600	50/60	47	1.8	Floor mount NEMA 2	UL/CSA	Yes
HCU2094D6N2	600	50/60	94	3.9	Floor mount NEMA 2	UL/CSA	Yes
HCU2157D6N2	600	50/60	157	7.2	Floor mount NEMA 2	UL/CSA	Yes
HCU2235D6N2	600	50/60	235	9.9	Floor mount NEMA 2	UL/CSA	Yes
HCU2047D6IP54	600	50/60	47	1.8	Floor mount IP54	CE	Yes
HCU2094D6IP54	600	50/60	94	3.9	Floor mount IP54	CE	Yes
HCU2157D6IP54	600	50/60	157	7.2	Floor mount IP54	CE	Yes
HCU2235D6IP54	600	50/60	235	9.9	Floor mount IP54	CE	Yes
HCU2047D6N12	600	50/60	47	1.8	Floor mount NEMA 12	UL/CSA	Yes
HCU2094D6N12	600	50/60	94	3.9	Floor mount NEMA 12	UL/CSA	Yes
HCU2157D6N12	600	50/60	157	7.2	Floor mount NEMA 12	UL/CSA	Yes
HCU2235D6N12	600	50/60	235	9.9	Floor mount NEMA 12	UL/CSA	Yes
HCU2040D7IP31	690	50/60	40	2.1	Floor mount IP31	CE	Yes
HCU2080D7IP31	690	50/60	80	4.5	Floor mount IP31	CE	Yes
HCU2133D7IP31	690	50/60	133	8.2	Floor mount IP31	CE	Yes
HCU2200D7IP31	690	50/60	200	11.4	Floor mount IP31	CE	Yes
HCU2040D7N2	690	50/60	40	2.1	Floor mount NEMA 2	UL/CSA	Yes
HCU2080D7N2	690	50/60	80	4.5	Floor mount NEMA 2	UL/CSA	Yes
HCU2133D7N2	690	50/60	133	8.2	Floor mount NEMA 2	UL/CSA	Yes
HCU2200D7N2	690	50/60	200	11.4	Floor mount NEMA 2	UL/CSA	Yes
HCU2040D7IP54	690	50/60	40	2.1	Floor mount IP54	CE	Yes
HCU2080D7IP54	690	50/60	80	4.5	Floor mount IP54	CE	Yes
HCU2133D7IP54	690	50/60	133	8.2	Floor mount IP54	CE	Yes
HCU2200D7IP54	690	50/60	200	11.4	Floor mount IP54	CE	Yes
HCU2040D7N12	690	50/60	40	2.1	Floor mount NEMA 12	UL/CSA	Yes
HCU2080D7N12	690	50/60	80	4.5	Floor mount NEMA 12	UL/CSA	Yes
HCU2133D7N12	690	50/60	133	8.2	Floor mount NEMA 12	UL/CSA	Yes
HCU2200D7N12	690	50/60	200	11.4	Floor mount NEMA 12	UL/CSA	Yes

Catalog numbering system

HCU2 060 D5 N2

Equipment type
HCU2 = Harmonic correction unit

Ampere rating
380–480 V only
060 = 60 A **120** = 120 A **200** = 200 A **300** = 300 A
600 V only
047 = 47 A **094** = 94 A **157** = 157 A **235** = 235 A
690 V only
040 = 40 A **080** = 80 A **133** = 133 A **200** = 200 A

Voltage	
D5 = 380–480 V	**D7** = 690 V
D6 = 600 V	

Enclosure type
IP00 = Chassis mount
N1 = NEMA 1 wall mount
N2 = NEMA 2 floor mount
N12 = NEMA 12 floor mount
IP31 = IP31 floor mount
IP54 = IP54 floor mount

To learn more about the Eaton HCU2, contact your local sales representative or visit

Eaton.com/pc

For technical support and application engineering assistance, please contact Eaton's TRC at

1-800-809-2772 option 4, option 2 or email pfc@eaton.com

Eaton
1000 Eaton Boulevard
Cleveland, OH 44122
United States
Eaton.com

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