hammond
POWER SOLUTIONS

DV/DT FILTERS

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HPS dV/dT Filters

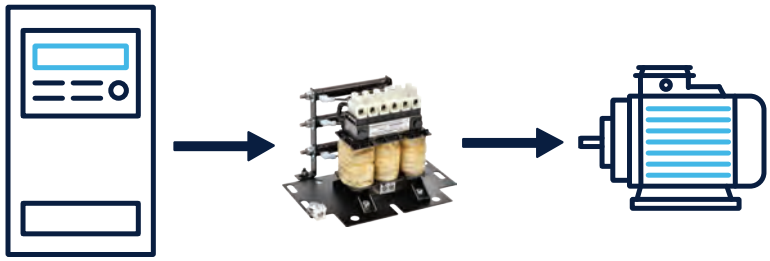
The HPS dV/dT filters are designed for use between variable frequency drives (VFD's) and motors when long cable lengths are used.

The HPS dV/dT filter (D1) combines an inductor and parallel resistor network to mitigate both high frequency ringing and voltage spikes between the VFD and motor and within the motor's windings.

The HPS dV/dT filter can mitigate the effects of reflected wave voltages greater than what a reactor alone can accomplish. This filter provides protection to the motor by slowing down the rate of voltage increase (dV/dT) and minimizes the damaging peak voltages that occur within the motor's windings and along the length of cables feeding the motor.

HPS dV/dT Operation Principle

The term "dV/dT" refers to the change in voltage over change in time. With regards to VFD's, dV/dT is explained as the rapid change in voltage at the beginning or end of the square wave pulses that make up the pulse width modulated (PWM) output of a VFD that powers the motor. As the square wave pulses travel the electrical cable to the motor, the differences in impedance between the cable and motor windings cause some energy in the pulse to be "reflected". In applications where the distance between the motor and VFD is long, the voltage of two pulses can combine in the cable or motor windings. This creates voltage spikes that can be more than twice the VFD's DC bus voltage. Applications with long cables between the VFD and the motor can experience peak voltages up to 1600V in a 480V system and up to 2100V in a 600V system. These high peak voltages will cause premature motor insulation failures resulting in down time and lost revenue.



Applications

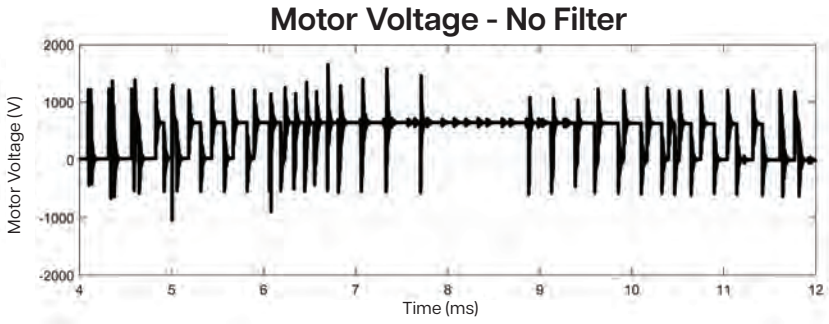
The HPS dV/dT filter series are designed for applications with long cables between the VFD and the motor. VFD manufacturers often have recommendations on when to use dV/dT filters within their manuals. They should always be installed close to the VFD. Typical applications include:

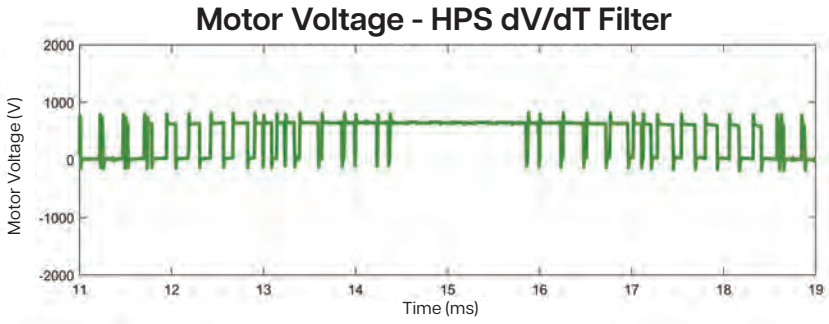
- Oil & Gas Pumps
- Wastewater Treatment Plants
- HVAC Systems
- Pulp & Paper
- Irrigation Fields



The Reflected Wave Phenomenon

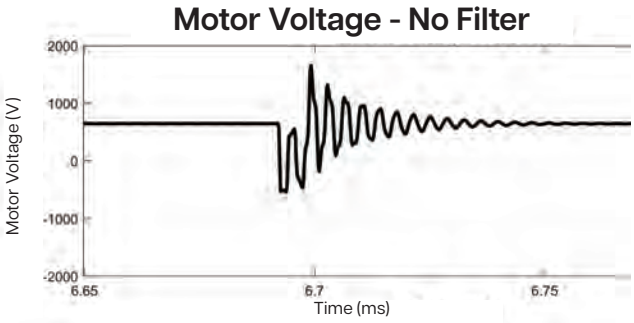
The reflected wave phenomenon in motor drives systems refers to the overvoltage at the motor or along the cables feeding it. The reflected wave phenomena occurs due to a mismatch between the cable's characteristic impedance and the motor's surge impedance. In addition, the high switching frequency and the fast rise time of the switching devices (IGBT) of the variable frequency drive (VFD) increase the magnitude of the reflected wave's voltage. The high rate of change in voltage with respect to time (dV/dT) of the IGBTs causes a high voltage to be developed in the windings of motors, resulting in motor insulation stress.

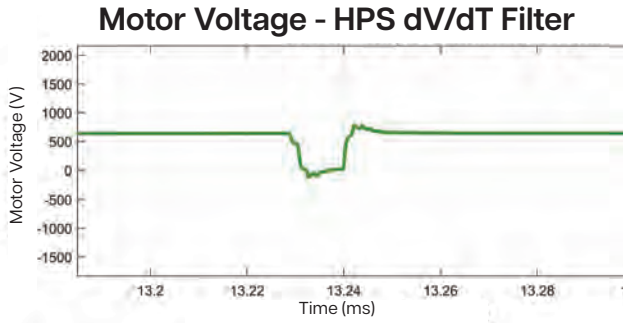




HPS dV/dT filter series is engineered to mitigate reflected wave by reducing:

- Peak voltage seen by the motor
- Rise time of the pulses
- Pulses ringing





HPS dV/dT filter

Typical Performance

Electrical Product Characteristics

System Voltage Rating:	Up to 600V (480V-600V applications)
Current Rating:	2A to 750A (consult HPS for higher ratings)

Technical Product Characteristics

Inverter Switching Frequency:	2kHz to 4kHz (consult HPS for higher switching frequency)
Inverter Operating Frequency:	Up to 60Hz
Insulation System:	130°C (2A - 54A), 180°C (>55A)
Voltage Drop:	<3%
Motor Lead Length:	Up to 1000ft (600ft & 1000ft models available[1], [2]
Peak Voltage At Motor:	150% of DC bus voltage
Approvals:	cUL Listed

Environmental Conditions

Ambient Operating Temperature:	Open Style: Up to 50°C
	Enclosed Style: Up to 40°C
Altitude:	<1000M
Cooling Method:	Natural convection
Enclosure Type:	Open, Type 1 , Type 3R

Notes:
[1] VFD rated cable recommended
[2] Maximum motor cable size to achieve 5% voltage drop (including 2% from the filter)
Maximum lead length and carrier frequency can vary depending on motor cable type

Selection Guide

System Voltage, the input voltage to the VFD, has a major effect on the reflected wave phenomenon. Typically, the reflected wave is twice of the DC bus voltage.

√2*System Voltage=DC Bus Voltage

√2=>1.414*480 VAC=679 VDC Bus

Reflected Wave=2*679 Volts ~ 1360 volts

Modern motor insulation systems can typically handle reflected wave issues from 208 VAC and 240 VAC systems due to the lower DC bus voltage. North American 480 VAC and 600 VAC systems can experience motor damage from reflected waves. Please consult with HPS for any application that may require the use of dV/dT filters at voltages below 480V or output carrier frequencies above 4kHz. In addition to mitigating reflective wave issues, dV/dT filters can also lower the VFD's output voltage rise time and reduce the peak voltage seen by the motor and cabling. This can have the added benefit of reducing the motors temperature rise and audible noise.

Select the filter based on Full Load Amps (FLA) of the motor.

Part Number Guide

Family		Model	Voltage	Current Rating				Enclosure	Cable Length
C	D	1	X	0	0	2	5	F	

Example

Family	Model	Voltage	Current Rating (Amps)	Enclosure	Cable Length
CD - dV/dT Filter	1 - D1 Model	X - up to 600V (480V & 600V applications)	3A to 750A 3A 0003 17A 0017 108A 0108	F - Open Frame E - Type 1 C - Type 3R[1]	1 600 ft 1 - 1000 ft*

**Default options - ignore if all following characters are default values.*

600 ft Cable Length

NEC 480 HP - Ref. ONLY	NEC 600 HP - Ref. ONLY	Part Number	Current Rating (A)	Enclosure Style	Dimension Figure	Overall Dimensions Inches [mm]			Weight Lbs. [kg]	Watts Loss
						Width	Depth	Height		
0.5-1.5	0.5-2	CD1X0003F	3	Open	1	8.00 [203.20]	6.00 [152.40]	5.50 [139.70]	4.00 [1.80]	38
		CD1X0003E		Type 1	N1	10.00 [254.00]	8.00 [203.20]	8.13 [206.51]	9.00 [4.10]	
		CD1X0003C		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
2	3	CD1X0004F	4	Open	1	8.00 [203.20]	6.00 [152.40]	5.50 [139.70]	4.00 [1.80]	40
		CD1X0004E		Type 1	N1	10.00 [254.00]	8.00 [203.20]	8.13 [206.51]	9.00 [4.10]	
		CD1X0004C		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
3	5	CD1X0007F	7	Open	1	8.00 [203.20]	6.00 [152.40]	5.50 [139.70]	4.00 [1.80]	46
		CD1X0007E		Type 1	N1	10.00 [254.00]	8.00 [203.20]	8.13 [206.51]	9.00 [4.10]	
		CD1X0007C		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
5	7.5	CD1X0009F	9	Open	1	8.00 [203.20]	6.00 [152.40]	5.50 [139.70]	6.00 [2.70]	42
		CD1X0009E		Type 1	N1	10.00 [254.00]	8.00 [203.20]	8.13 [206.51]	9.00 [4.10]	
		CD1X0009C		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
7.5	10	CD1X0012F	12	Open	1	8.00 [203.20]	6.00 [152.40]	5.50 [139.70]	6.00 [2.70]	45
		CD1X0012E		Type 1	N1	10.00 [254.00]	8.00 [203.20]	8.13 [206.51]	9.00 [4.10]	
		CD1X0012C		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
10	15	CD1X0017F	17	Open	1	8.00 [203.20]	6.00 [152.40]	5.50 [139.70]	6.00 [2.70]	53
		CD1X0017E		Type 1	N1	10.00 [254.00]	8.00 [203.20]	8.13 [206.51]	9.00 [4.10]	
		CD1X0017C		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
15	20	CD1X0022F	22	Open	1	8.00 [203.20]	6.00 [152.40]	5.50 [139.70]	6.00 [2.70]	66
		CD1X0022E		Type 1	N1	10.00 [254.00]	8.00 [203.20]	8.13 [206.51]	9.00 [4.10]	
		CD1X0022C		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
20	25	CD1X0027F	27	Open	2	8.00 [203.20]	6.00 [152.40]	7.25 [184.15]	14.0 [6.20]	32
		CD1X0027E		Type 1	N1	10.00 [254.00]	8.00 [203.20]	8.13 [206.51]	9.00 [4.10]	
		CD1X0027C		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
25	30	CD1X0035F	35	Open	2	8.00 [203.20]	6.00 [152.40]	7.25 [184.15]	14.0 [6.20]	42
		CD1X0035E		Type 1	N1	10.00 [254.00]	8.00 [203.20]	8.13 [206.51]	9.00 [4.10]	
		CD1X0035C		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
30	40	CD1X0045F	45	Open	2	8.00 [203.20]	6.00 [152.40]	7.25 [184.15]	14.0 [6.20]	52
		CD1X0045E		Type 1	N1	10.00 [254.00]	8.00 [203.20]	8.13 [206.51]	9.00 [4.10]	
		CD1X0045C		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
40	50	CD1X0054F	54	Open	2	8.00 [203.20]	6.00 [152.40]	7.25 [184.15]	14.0 [6.20]	65
		CD1X0054E		Type 1	N1	10.00 [254.00]	8.00 [203.20]	8.13 [206.51]	9.00 [4.10]	
		CD1X0054C		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
50	60	CD1X0065F	65	Open	3	9.00 [228.60]	7.50 [190.50]	7.00 [177.80]	28.0 [12.4]	78
		CD1X0065E		Type 1	N2	14.00 [355.60]	14.00 [355.60]	12.13 [308.11]	38.0 [17.2]	
		CD1X0065C		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
60	75	CD1X0080F	80	Open	3	9.00 [228.60]	7.50 [190.50]	7.00 [177.80]	28.0 [12.4]	97
		CD1X0080E		Type 1	N2	14.00 [355.60]	14.00 [355.60]	12.13 [308.11]	38.0 [17.2]	
		CD1X0080C		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
75	100	CD1X0108F	108	Open	3	9.00 [228.60]	7.50 [190.50]	7.00 [177.80]	28.0 [12.4]	147
		CD1X0108E		Type 1	N2	14.00 [355.60]	14.00 [355.60]	12.13 [308.11]	38.0 [17.2]	
		CD1X0108C		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	

Selection Guide Continued

1000 ft Cable Length

NEC 480 HP - Ref. ONLY	NEC 600 HP - Ref. ONLY	Part Number	Current Rating (A)	Enclosure Style	Dimension Figure	Overall Dimensions Inches [mm]			Weight Lbs. [kg]	Watts Loss
						Width	Depth	Height		
0.5-1.5	0.5-2	CD1X0003F1	3	Open	1	8.00 [203.20]	6.00 [152.40]	5.50 [139.70]	4.00 [1.80]	50
		CD1X0003E1		Type 1	N1	10.00 [254.00]	8.00 [203.20]	8.13 [206.51]	9.00 [4.10]	
		CD1X0003C1		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
2	3	CD1X0004F1	4	Open	1	8.00 [203.20]	6.00 [152.40]	5.50 [139.70]	4.00 [1.80]	52
		CD1X0004E1		Type 1	N1	10.00 [254.00]	8.00 [203.20]	8.13 [206.51]	9.00 [4.10]	
		CD1X0004C1		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
3	5	CD1X0007F1	7	Open	1	8.00 [203.20]	6.00 [152.40]	5.50 [139.70]	4.00 [1.80]	58
		CD1X0007E1		Type 1	N1	10.00 [254.00]	8.00 [203.20]	8.13 [206.51]	9.00 [4.10]	
		CD1X0007C1		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
5	7.5	CD1X0009F1	9	Open	1	8.00 [203.20]	6.00 [152.40]	5.50 [139.70]	6.00 [2.70]	54
		CD1X0009E1		Type 1	N1	10.00 [254.00]	8.00 [203.20]	8.13 [206.51]	11.0 [5.00]	
		CD1X0009C1		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
7.5	10	CD1X0012F1	12	Open	1	8.00 [203.20]	6.00 [152.40]	5.50 [139.70]	6.00 [2.70]	57
		CD1X0012E1		Type 1	N1	10.00 [254.00]	8.00 [203.20]	8.13 [206.51]	11.0 [5.00]	
		CD1X0012C1		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
10	15	CD1X0017F1	17	Open	1	8.00 [203.20]	6.00 [152.40]	5.50 [139.70]	6.00 [2.70]	64
		CD1X0017E1		Type 1	N1	10.00 [254.00]	8.00 [203.20]	8.13 [206.51]	11.0 [5.00]	
		CD1X0017C1		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
15	20	CD1X0022F1	22	Open	1	8.00 [203.20]	6.00 [152.40]	5.50 [139.70]	6.00 [2.70]	76
		CD1X0022E1		Type 1	N1	10.00 [254.00]	8.00 [203.20]	8.13 [206.51]	11.0 [5.00]	
		CD1X0022C1		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
20	25	CD1X0027F1	27	Open	2	8.00 [203.20]	6.00 [152.40]	7.25 [184.15]	14.0 [6.20]	37
		CD1X0027E1		Type 1	N1	10.00 [254.00]	8.00 [203.20]	8.13 [206.51]	19.0 [8.60]	
		CD1X0027C1		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
25	30	CD1X0035F1	35	Open	2	8.00 [203.20]	6.00 [152.40]	7.25 [184.15]	14.0 [6.20]	47
		CD1X0035E1		Type 1	N1	10.00 [254.00]	8.00 [203.20]	8.13 [206.51]	19.0 [8.60]	
		CD1X0035C1		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
30	40	CD1X0045F1	45	Open	2	8.00 [203.20]	6.00 [152.40]	7.25 [184.15]	14.0 [6.20]	57
		CD1X0045E1		Type 1	N1	10.00 [254.00]	8.00 [203.20]	8.13 [206.51]	19.0 [8.60]	
		CD1X0045C1		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
40	50	CD1X0054F1	54	Open	2	8.00 [203.20]	6.00 [152.40]	7.25 [184.15]	14.0 [6.20]	70
		CD1X0054E1		Type 1	N1	10.00 [254.00]	8.00 [203.20]	8.13 [206.51]	19.0 [8.60]	
		CD1X0054C1		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
50	60	CD1X0065F1	65	Open	3	9.00 [228.60]	7.50 [190.50]	7.00 [177.80]	28.0 [12.4]	89
		CD1X0065E1		Type 1	N2	14.00 [355.60]	14.00 [355.60]	12.13 [308.11]	38.0 [17.2]	
		CD1X0065C1		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
60	75	CD1X0080F1	80	Open	3	9.00 [228.60]	7.50 [190.50]	7.00 [177.80]	28.0 [12.4]	108
		CD1X0080E1		Type 1	N2	14.00 [355.60]	14.00 [355.60]	12.13 [308.11]	38.0 [17.2]	
		CD1X0080C1		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
75	100	CD1X0108F1	108	Open	3	9.00 [228.60]	7.50 [190.50]	7.00 [177.80]	28.0 [12.4]	158
		CD1X0108E1		Type 1	N2	14.00 [355.60]	14.00 [355.60]	12.13 [308.11]	38.0 [17.2]	
		CD1X0108C1		Type 3R	DH1	21.50 [546.00]	20.1 [510.00]	22.0 [559.00]	29.0[13.15]	
100	125	CD1X0130F1	130	Open	4	11.25 [285.75]	9.00 [228.60]	7.50 [190.50]	45.0 [40.4]	248
		CD1X0130E1		Type 1	CH2	23.50 [596.90]	16.5 [419.10]	17.90 [454.66]	76.0 [34.5]	
		CD1X0130C1		Type 3R	DH1	21.50 [546.00]	20.10 [510.00]	22.00 [559.00]	83.0 [37.6]	
125	150	CD1X0160F1	160	Open	4	12.63 [320.80]	9.00 [228.60]	7.50 [190.50]	55.0 [25.0]	263
		CD1X0160E1		Type 1	CH2	23.50 [596.90]	16.5 [419.10]	17.9 [454.66]	86.0 [39.0]	
		CD1X0160C1		Type 3R	DH1	21.50 [546.00]	20.10 [510.00]	22.00 [559.00]	93.0 [42.2]	
150	200	CD1X0200F1	200	Open	5	14.50 [368.30]	9.00 [228.60]	10.25 [260.35]	65.0 [29.5]	328
		CD1X0200E1		Type 1	CH2	23.50 [596.90]	16.5 [419.10]	17.9 [454.66]	96.0 [43.5]	
		CD1X0200C1		Type 3R	DH1	21.50 [546.00]	20.10 [510.00]	22.00 [559.00]	103 [46.7]	

1000 ft Cable Length

NEC 480 HP - Ref. ONLY	NEC 600 HP - Ref. ONLY	Part Number	Current Rating (A)	Enclosure Style	Dimension Figure	Overall Dimensions Inches [mm]			Weight Lbs. [kg]	Watts Loss
						Width	Depth	Height		
200	250	CD1X0250F1	250	Open	5	14.50 [368.30]	9.00 [228.60]	10.25 [260.35]	70.0 [31.8]	378
		CD1X0250E1		Type 1	CH4	26.10 [662.94]	20.50 [520.70]	25.90 [657.86]	110 [49.9]	
		CD1X0250C1		Type 3R	DH2	25.80 [655.00]	23.80 [604.00]	28.80 [731.00]	120 [54.4]	
250	300	CD1X0305F1	305	Open	5	16.50 [419.10]	13.50 [342.90]	12.75 [323.85]	85.0 [38.5]	434
		CD1X0305E1		Type 1	CH4	26.10 [662.94]	20.50 [520.70]	25.90 [657.86]	125 [56.7]	
		CD1X0305C1		Type 3R	DH2	25.80 [655.00]	23.80 [604.00]	28.80 [731.00]	135 [61.2]	
300	350	CD1X0365F1	365	Open	5	16.50 [419.10]	12.50 [317.50]	12.75 [323.85]	105 [47.6]	484
		CD1X0365E1		Type 1	CH5	28.10 [713.74]	21.30 [541.02]	28.90 [734.06]	161 [73.0]	
		CD1X0365C1		Type 3R	DH3	28.30 [719.00]	27.00 [687.00]	36.00 [914.00]	203 [92.1]	
350	450	CD1X0415F1	415	Open	5	16.50 [419.10]	12.50 [317.50]	12.75 [323.85]	115 [52.2]	514
		CD1X0415E1		Type 1	CH5	28.10 [713.74]	21.30 [541.02]	28.90 [734.06]	171 [77.6]	
		CD1X0415C1		Type 3R	DH3	28.30 [719.00]	27.00 [687.00]	36.00 [914.00]	213 [96.6]	
400-450	500	CD1X0515F1	515	Open	5	16.50 [419.10]	12.50 [317.50]	12.75 [323.85]	135 [61.2]	574
		CD1X0515E1		Type 1	CH5	28.10 [713.74]	21.30 [541.02]	28.90 [734.06]	191 [86.6]	
		CD1X0515C1		Type 3R	DH3	28.30 [719.00]	27.00 [687.00]	36.00 [914.00]	233 [106]	
500	600	CD1X0600F1	600	Open	6	16.50 [419.10]	13.50 [342.90]	14.75 [374.65]	170 [77.1]	684
		CD1X0600E1		Type 1	CH6	33.50 [850.90]	23.00 [584.20]	31.20 [792.48]	256 [116]	
		CD1X0600C1		Type 3R	DH4	31.50 [800.00]	29.50 [749.00]	44.50 [1130.0]	297 [135]	
600	700	CD1X0750F1	750	Open	6	16.50 [419.10]	13.50 [342.90]	14.75 [374.65]	200 [90.7]	1124
		CD1X0750E1		Type 1	CH6	33.50 [850.90]	23.00 [584.20]	31.20 [792.48]	286 [130]	
		CD1X0750C1		Type 3R	DH4	31.50 [800.00]	29.50 [749.00]	44.50 [1130.0]	327 [148]	

**Typical watt losses at 480V system, 2kHz switching frequency, 60Hz*

NOTE: The motor HP ratings above are for reference only.

CORE & COIL DRAWINGS

Fig. # 1

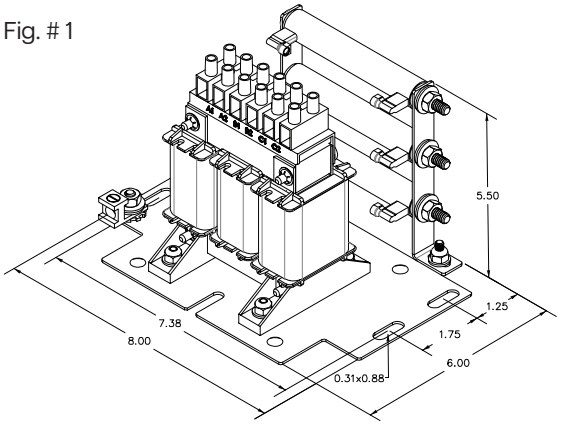


Fig. # 2

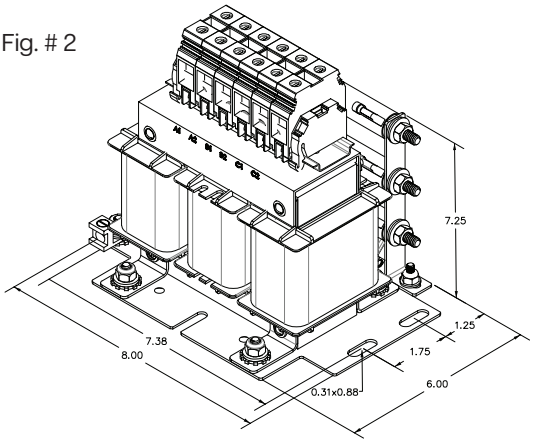


Fig. # 3

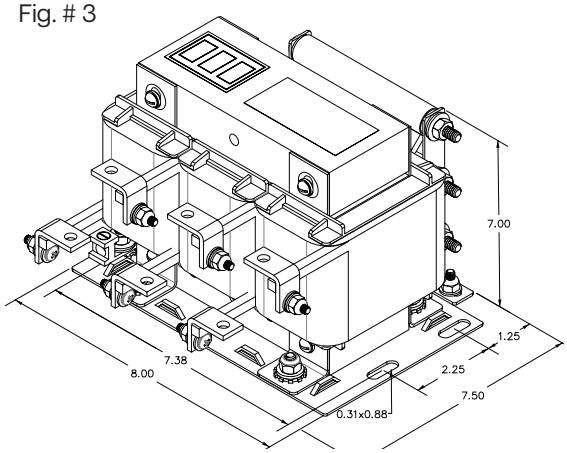


Fig. # 4

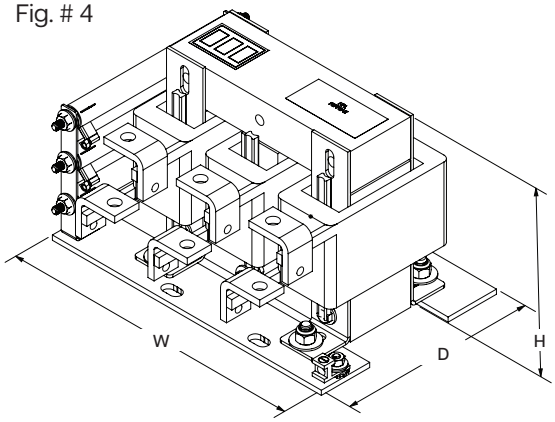


Fig. # 5

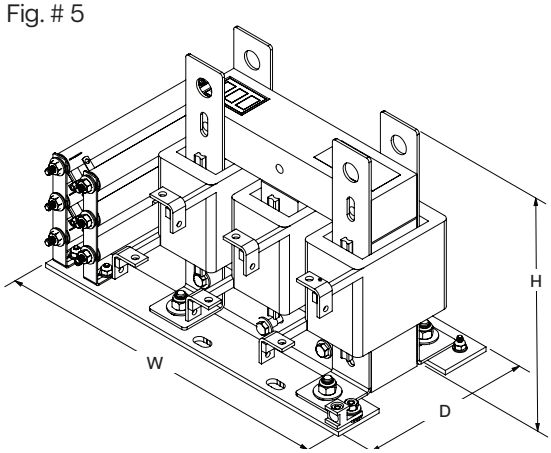
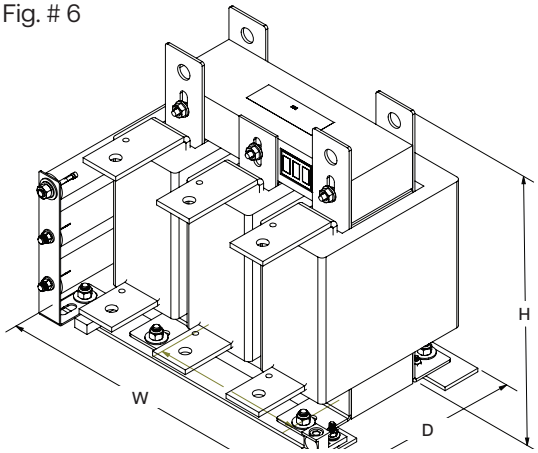
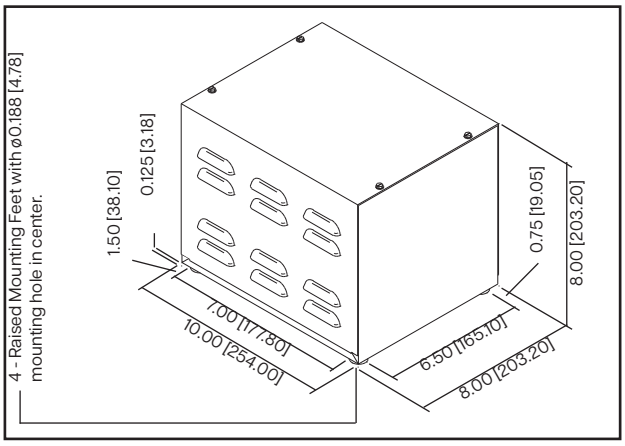


Fig. # 6



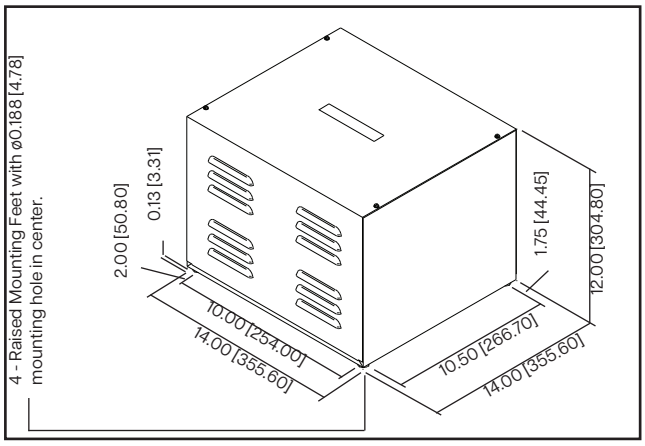
TYPE 1 ENCLOSED DRAWINGS

‘N1’ SERIES ENCLOSURE



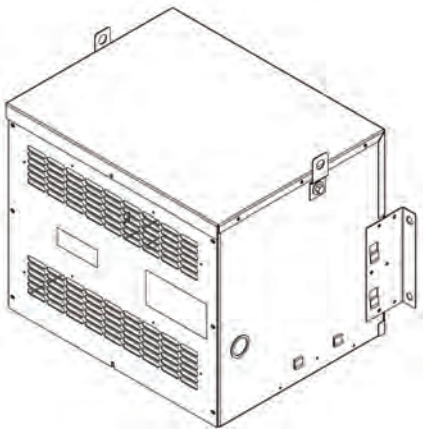
All dimension in inches [mm]

‘N2’ SERIES ENCLOSURE

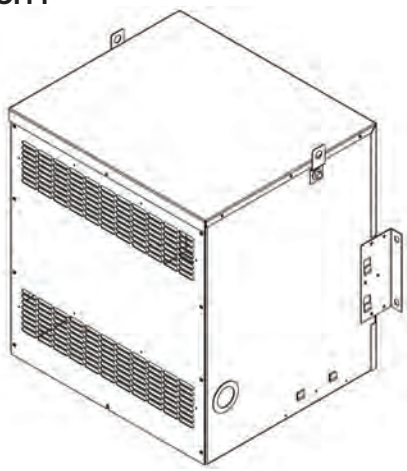


All dimension in inches [mm]

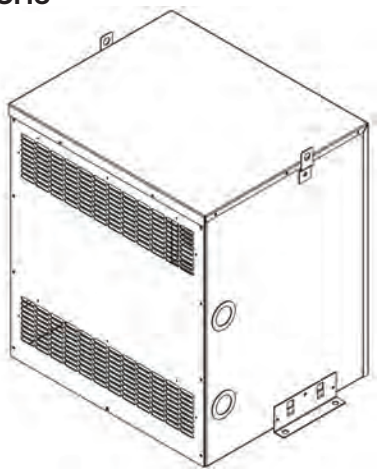
CH2



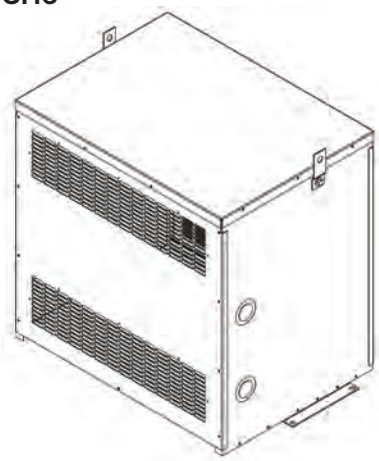
CH4



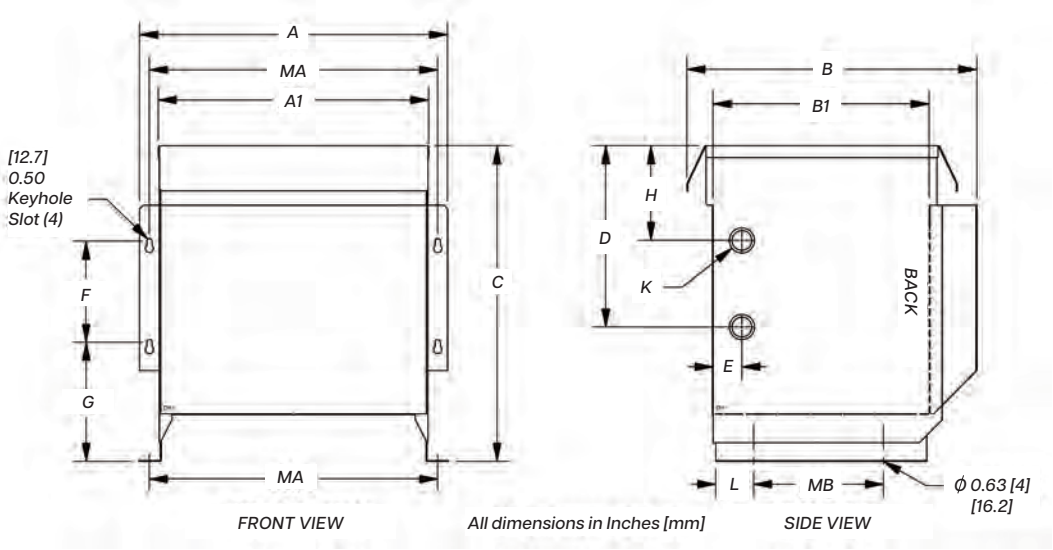
CH5



CH6



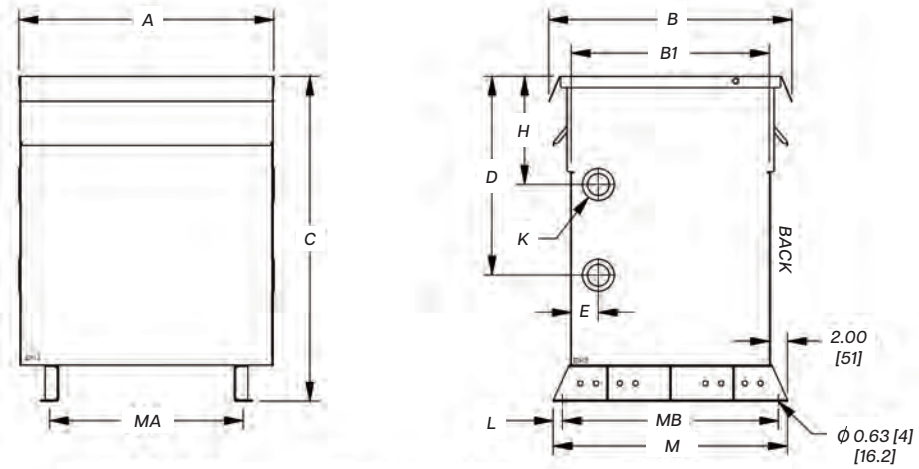
TYPE 3R ENCLOSED DRAWINGS



FRONT VIEW *All dimensions in Inches [mm]* *SIDE VIEW*

Case Style	Dimensions in Inches [Millimeter]													
	A	A1	B	B1	C	D	E	F	G	H	K	L	MA	MB
DH1	21.5 [546]	18.8 [477]	20.1 [510]	15 [381]	22 [559]	12.6 [320]	2 [51]	7 [178]	8.3 [211]	6.6 [168]	1.38 X 1.75 K.O. [35 x 44 K.O.]	2.6 [66]	20 [508]	9 [229]
DH2	25.8 [655]	23.3 [592]	23.8 [604]	18 [457]	28.8 [731]	17 [432]	2 [51]	8 [203]	10.3 [262]	8.6 [218]	1.75 X 2.50 K.O. [44 X 63 K.O.]	3.8 [96]	24.6 [625]	9 [229]

[1] *Knockout (K) sizes are actual diameters of knockout, not conduit sizes.*



FRONT VIEW *All dimensions in Inches [mm]* *SIDE VIEW*

Case Style	Dimensions in Inches [Millimeter]											
	A	B	B1	C	D	E	H	K	L	M	MA	MB
DH3	28.3 [719]	27 [687]	22 [559]	36 [914]	22 [559]	3 [76]	12 [305]	2.00 X 3.00 K.O [50 X 76 K.O.]	1 [25]	26 [660]	21.5 [546]	24 [610]
DH4	31.5 [800]	29.5 [749]	24.5 [622]	44.5 [1130]	27.5 [698]	3 [76]	14.5 [368]	2.00 X 3.00 K.O. [50 X 76 K.O.]	1 [25]	28.5 [724]	23.5 [597]	26.5 [673]

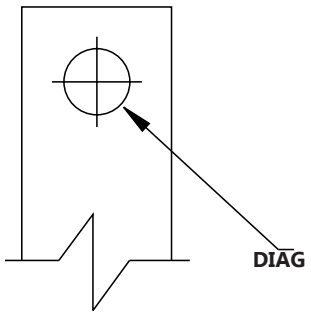
[1] *Knockout (K) sizes are actual diameters of knockout, not conduit sizes.*

Conduit Size vs. Actual Knockout Size Reference Table

Standard Conduit Size	Actual Knockout Diameter
0.50 [12.70]	0.88 [22.23]
0.75 [19.05]	1.13 [28.58]
1.00 [25.40]	1.38 [34.93]
1.25 [31.75]	1.75 [44.45]
1.50 [38.10]	2.00 [50.80]
2.00 [50.80]	2.50 [63.50]
2.50 [63.50]	3.00 [76.20]
3.00 [76.20]	3.63 [92.08]
3.50 [88.90]	4.13 [104.78]

Please note the above table is not applicable for Stainless Steel enclosures.
All dimension in inches [mm]

Termination Details



1A = 0.28" Dia.
1B = 0.44" Dia.
1C = 0.56" Dia.

Diagram 1

AMP Rating	Terminal Detail
3	13-10 AWG
4	13-10 AWG
7	13-10 AWG
9	12 - 8 AWG
12	12 - 8 AWG
17	12 - 8 AWG
22	12 - 8 AWG
27	10 - 2 AWG
35	10 - 2 AWG
45	10 - 2 AWG
54	10 - 2 AWG
65	Dia. 1A
80	Dia. 1A
108	Dia. 1A
130	Dia. 1B
160	Dia. 1B
200	Dia. 1B
250	Dia. 1B
305	Dia. 1B
365	Dia. 1B
415	Dia. 1B
515	Dia. 1C
600	Dia. 1C
750	Dia. 1C

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CENTDP-BBH2-EN
May 2025