AN SL INDUSTRIES COMPANY

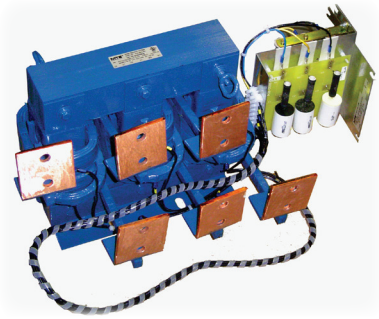
Series A dV/dt Filters

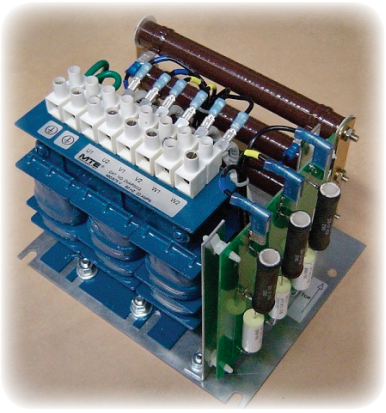
Series A - Selection Table & Technical Specifications Guide

MTE SERIES A dV/dt FILTERS are designed to protect AC motors from the destructive effects of peak voltages facilitated by long cable runs between the inverter and motor. Depending on the switching time of the power semiconductor used in the inverter and the size of the motor, cable lengths as short as eight feet can result in peak motor voltages that exceed the rating of the motor's insulation system. The longer the cable, the greater the problem.

GUARANTEED RESULTS - The MTE dV/dt Filter is guaranteed to meet its maximum peak motor voltage specification (150% of bus voltage) with up to 1,000 feet of cable between the filter and the motor. It is also rated for a maximum dV/dt of 400V per microsecond. In specific applications, the filter has provided excellent performance with cable runs up to 3,000 feet. The dV/dt Filter has a "3% insertion impedance" which ensures motor torque is not affected by added voltage drops from the filter. Additional benefits include cooler running motors (typically 20-40°C cooler) and a 5dbA reduction in audible motor noise.

EASY TO APPLY TECHNOLOGY ADVANTAGE - The MTE dV/dt Filter is a passive fourth order device that reduces transmission line effects of motor cables by dampening the rate of voltage increase and minimizes the peak voltage that occurs at the motor terminals. MTE Series A dV/dt Filters are designed for use with inverters operated at switching frequencies between 900Hz and 8kHz.





The dV/dt Filter has a continuous current rating of 100% RMS, with intermittent current ratings of 150% for 1 minute and 200% for 10 seconds.

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PRODUCT SELECTION: Please refer to the selection tables in this brochure or visit the MTE website at www.mtecorp.com for complete product selection. ***Please note that Series A dV/dt Filters can only be used with PWM inverters with switching frequencies between 900Hz and 8kHz.***

BASIC SPECIFICATION RANGES - The dV/dt Filter is available in voltage ranges of 380VAC to 600VAC & for motor sizes from 0.5 Hp to 600 Hp. For applications with motors rated 100 hp & below & standard NEMA B motors (MG1 Part 30) are prone to failure as a result of high voltage spikes & will benefit from an MTE dV/dt filter. The dV/dt Filter has a continuous current rating of 100% RMS & intermittent current ratings of 150% for 1 minute & 200% for 10 seconds. The maximum peak motor terminal voltage with 1000 ft cable or less is guaranteed not to exceed 150% of bus voltage.

INSTALLATION OPTIONS: Panel-mount or NEMA 1, 2 and 3R enclosures are available.

Typical uses include:

- Submersible Pumps
- HVAC Equipment
- Process Automation Lines
- Protect Motors from Long Lead Effects
- Reduce Output Voltage dV/dT
- Reduce Motor Temperature
- Reduce Motor Audible Noise

Model Number Code Configuration: DV A X Y _ _ _ _ YY

- dV/dt filter
- Series Version. A, X
  - "X" denotes non-standard configurations
- Mechanical Configuration
  - P = Panel Mount
  - G = General Purpose NEMA 1 or 2
  - W = NEMA 3R
- Indicates Physical Size: A, B, C, D, etc. (A is smallest)
- Current Rating (i.e. 0045 is 45 Amps)
- Options

MTE dV/dt Filter Selection Tables

DRIVING POWER QUALITY

Reflected Wave Phenomenon:

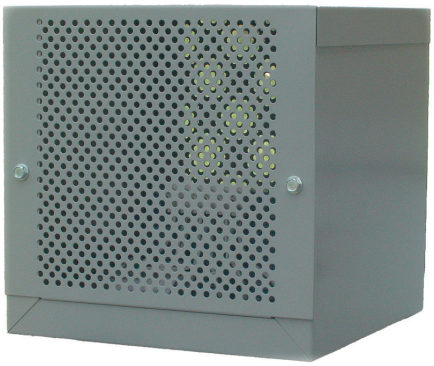
Reflected voltage wave generation occurs as a function of the output voltage rise time (dV/dt), the length of the cables in the system, and the impedance characteristics of the motor. Motor cables become complex transmission lines with increasing distributed parallel capacitance, series inductance and resistance, which build up with length. At one end of the transmission line is a low impedance inverter drive. At the other end of the transmission line is the is the soft impedance motor. The PWM variable switched energy from the drive will reach a resonance as the leading edge works against the soft impedance motor and reflects back, then adds to the next energy wave from the drive. This effect can cause voltage at the motor terminals to reach 2 to 4 times the drive's normal DC bus voltage.

The Solution:

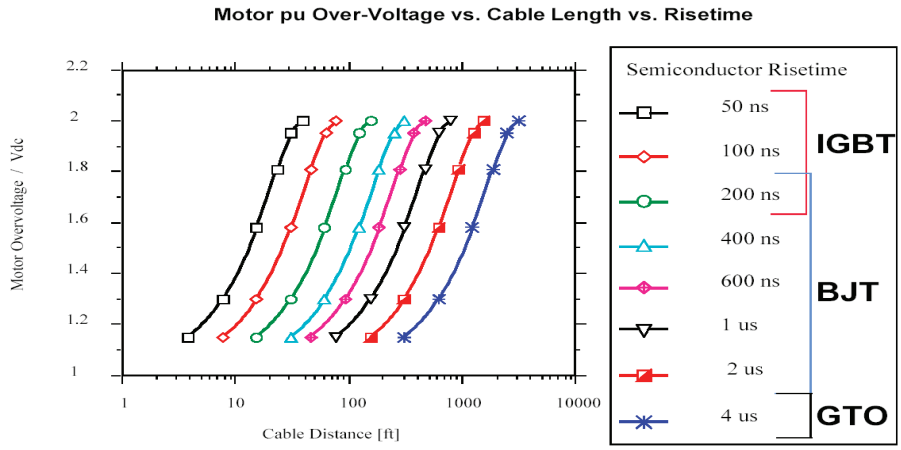
The MTE dV/dt Filter is a passive fourth order device that reduces transmission line effects of motor cables by dampening the rate of voltage increase and minimizes the peak voltage that occurs at the motor terminals.

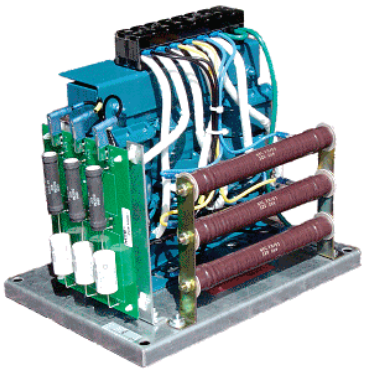
When to add an MTE dV/dt Filter

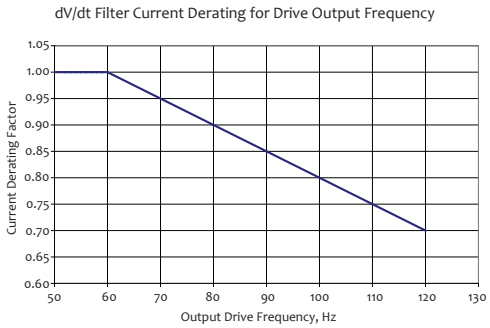
Rise Time (microseconds)	Critical Lead Length (meters)	Critical Lead Length (feet)
2.00	100	328
1.0	50	164
0.50	25	82
0.10	5	16
0.05	2.5	8

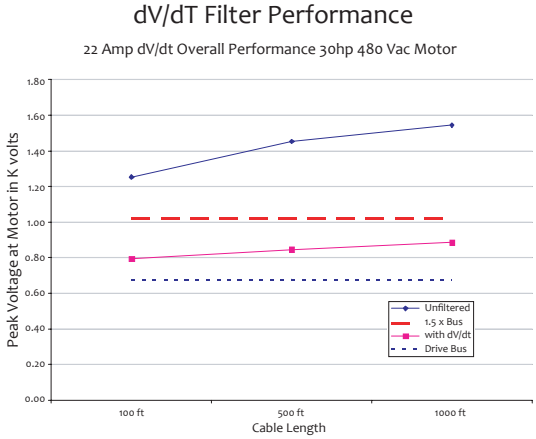


Effects of Transients on the Motor









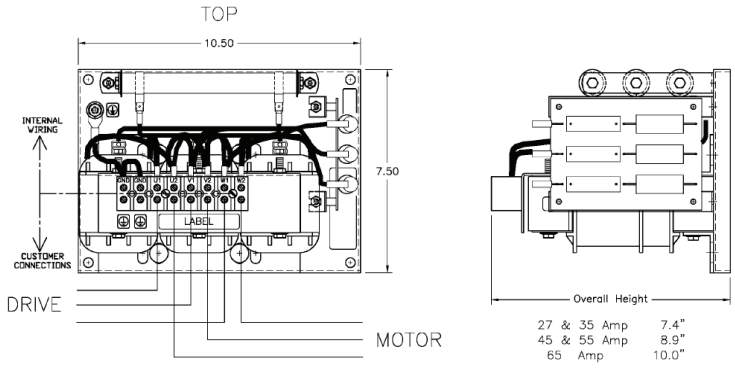
Selection Table Series A dV/dt Filter Technical Data - 380VAC to 600VAC

Filter Amps	380 Volts		480 Volts	550-600 Volts	Open Panel			NEMA 1-2		NEMA3R		watts
	KW	HP	HP	HP	Cat PN.	WT Lbs	Open filter size	Cat. No.	Cab	Cat. No.	Cab	
3	.5 - 1.1	.5 - 1.5	.5 - 1.5	.5 - 2	DVAP0003	13	6.5"H x 8"W x 6.8"D	DVAGA0003	13V	DVAWA0003	12C3	313
4	1.5	2	2	3	DVAP0004	13	6.5"H x 8"W x 6.8"D	DVAGA0004	13V	DVAWA0004	12C3	309
7	2.2-3	3	3	5	DVAP0007	14	6.5"H x 8"W x 6.8"D	DVAGA0007	13V	DVAWA0007	12C3	325
9	4	5.5	5	7.5	DVAP0009	14	6.5"H x 8"W x 6.8"D	DVAGA0009	13V	DVAWA0009	12C3	334
12	5.5	7.5	7.5	10	DVAP0012	14	6.5"H x 8"W x 6.8"D	DVAGA0012	13V	DVAWA0012	12C3	345
17	7.5	10	10	15	DVAP0017	18	6.5"H x 8"W x 6.8"D	DVAGA0017	13V	DVAWA0017	12C3	354
22	11	15	15	20	DVAP0022	19	6.5"H x 8"W x 6.8"D	DVAGA0022	13V	DVAWA0022	12C3	369
27	-	-	20	25	DVAP0027	22	7.5"H x 10.5"W x 7.4"D	DVAGB0027	17V	DVAWB0027	17C3	411
35	15	20	25	30	DVAP0035	26	7.5"H x 10.5"W x 7.4"D	DVAGB0035	17V	DVAWB0035	17C3	436
45	18.5-22	25 - 30	30	40	DVAP0045	32	7.5"H x 10.5"W x 8.9"D	DVAGB0045	17V	DVAWB0045	17C3	402
55	-	-	40	50	DVAP0055	33	7.5"H x 10.5"W x 8.9"D	DVAGB0055	17V	DVAWB0055	17C3	429
65	30	40	50	60	DVAP0065	39	7.5"H x 10.5"W x 10"D	DVAGB0065	17V	DVAWB0065	17C3	423
80	37	50	60	75	DVAP0080	52	11"H x 12"W x 7.2"D	DVAGB0080	17V	DVAWB0080	17C3	440
110	45-55	60-75	75	100	DVAP0110	51	11"H x 12"W x 7.2"D	DVAGB0110	17V	DVAWC0110	17C3	476
130	-	-	100	125	DVAP0130	64	15"H x 14"W x 9.3"D	DVAGC0130	26C2	DVAWC0130	26C3	554
160	75-90	100-120	125	150	DVAP0160	73	15"H x 14"W x 9.3"D	DVAGC0160	26C2	DVAWC0160	26C3	574
200	110	150	150	200	DVAP0200	82	15"H x 14"W x 9.3"D	DVAGC0200	26C2	DVAWC0200	26C3	593
250	132	175	200	250	DVAP0250	101	15"H x 14"W x 9.3"D	DVAGC0250	26C2	DVAWC0250	26C3	623
305	160	220	250	300	DVAP0305	106	15"H x 14"W x 9.3"D	DVAGD0305	26C2	DVAWD0305	26C3	703
365	185-200	250-270	300	350	DVAP0365	97	10.5"H x 16.5"W x 11.8"D	DVAGD0365	26C2	DVAWD0365	26C3	947
415	-	-	350	450	DVAP0415	119	11.3"H x 16.5"W x 12"D	DVAGD0415	26C2	DVAWD0415	26C3	972
515	250	340	400-450	500-550	DVAP0515	122	11.8"H x 16.5"W x 11.5"D	DVAGD0515	26C2	DVAWD0515	26C3	985
600	315	430	500	600	DVAP0600	111	12.3"H x 16.5"W x 11.3"D	DVAGD0600	26C2	DVAWD0600	26C3	985

dV/dt Filter Selection:

Select filters based on the current rating of the motor for both variable torque and constant torque applications. MTE Series A dV/dt Filters have been designed to meet motor current requirements based on NEC motor ratings. For applications that use motors that exceed NEC current ratings, use the next larger dV/dt Filter. MTE Series A dV/dt Filters are available as open frame panel mount or enclosures with ratings including NEMA 1, NEMA 2, and NEMA 3R.

Open Panel dV/dt Filter



Type	Size inches	3R Depth	Weight
CAB-13V	13"H x 13"W x 13"D	-	18#
CAB-17V	24"H x 17"W x 18.4"D	-	27#
CAB-12C	24"H x 13"W x 18"D	23"	58#
CAB-17C	31"H x 18"W x 21"D	26"	75#
CAB-26C	47"H x 27"W x 25"D	30"	144#

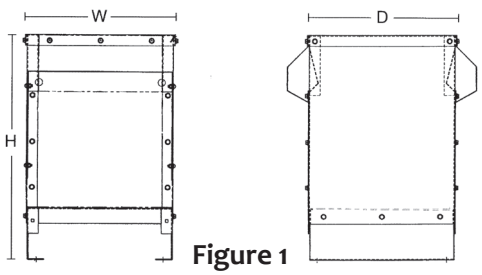


Figure 1
General Purpose Enclosure
NEMA 1, 2 , & 3R

Product Specifications - dV/dt Filters

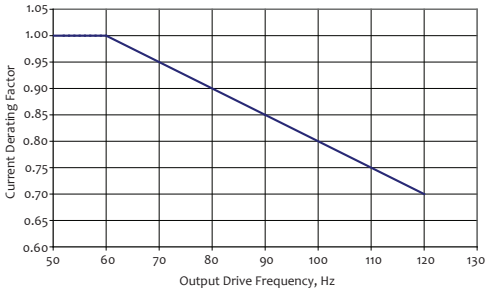
Refer to the Series A dV/dt Filter User Manual for Detailed Specifications

Performance:	
Maximum Peak Motor Terminal Voltage with 1000 ft cable:	150% of bus voltage
Maximum dV/dt:	400 Volts per microsecond
Ratings:	
Continuous Current Rating	100% RMS
Intermittent Current Ratings:	150% for 1 minute
	200% for 10 seconds
Minimum Inverter Switching Frequency:	900Hz
Maximum Inverter Switching Frequency:	8kHz
Nominal Inverter Operating Frequency:	60Hz
Minimum:	6Hz
Maximum with de-rating:	120Hz
Altitude without de-rating:	1000 meters
Maximum ambient temperature:	50° C open filters
	40° C enclosed filters
Insertion Loss:	3% of rated voltage maximum
Audible Noise:	
Maximum Audible Noise Level at Two Meters for Standard Configuration:	76dB-A
Output Compatibility/Loading:	Conventional 3 phase motors, "No Load / Open Circuit" continuous operation
Agency Approvals, UL& cUL:	Listed to UL508 type MX and CSA-C22.2 No 14-95, File E180243 3HP to 1000HP, 120VAC to 600VAC, 50/60Hz Three Phase

Note: Short Circuit rating not required under Exception No.1 of UL508A SB4.2.1

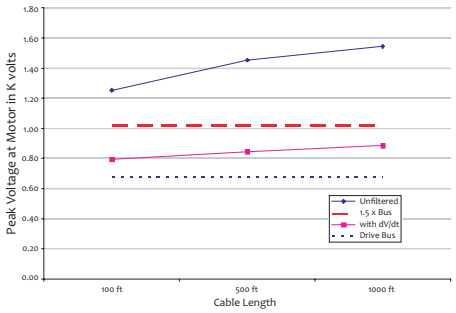
Data subject to change without notice.

dV/dt Filter Current Derating for Drive Output Frequency

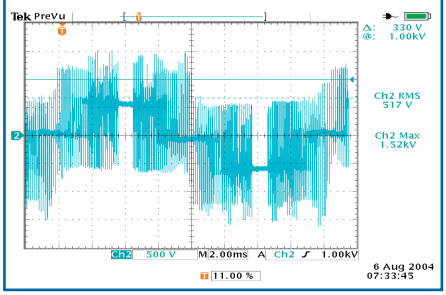


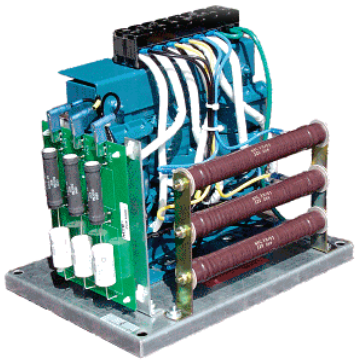
dV/dT Filter Performance

22 Amp dV/dt Overall Performance 30hp 480 Vac Motor

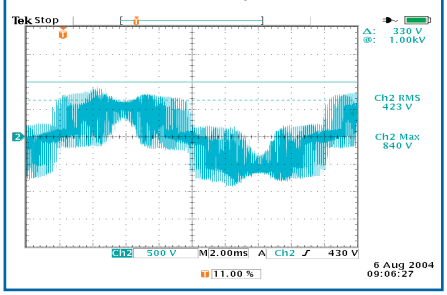


1000 ft Full Load, 8kHz Switching, Unfiltered Shielded Cable





1000 ft Full Load, 8kHz Switching with MTE dV/dt Filter



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