

# Motor Protection



## MotorShield™ Sine Wave Output Filter

As Pulse Width Modulated (PWM) Drives are incorporated into various applications and processes, the increased energy savings and decreased maintenance on drives can be offset by increases in motor failures.

High voltage spikes caused by a phenomenon known as reflected wave ( $dv/dt$ ) occur when there are long cable runs between the drive and the motor. The impedance on either end of the cable run does not match, causing voltage pulses to be reflected back in the direction from which it arrived. As these reflected waves encounter other waves, their values add, causing higher peak voltage.

Peak voltages on a 480V system can reach 1,600V, and on a 600V system can reach 2,100V. These high peak voltages will cause a rapid breakdown of motor insulation, leading to motor failure.

TCI's MotorShield™ improves system performance by protecting the motor from the harmful effects of reflected waves and preventing motor failure associated with insulation failure, overheating, and noise.



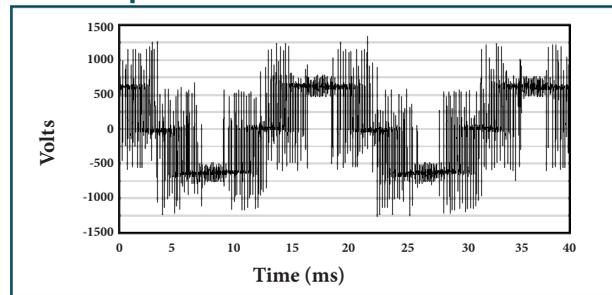
## Industry Application: Fans & Pumps

The MotorShield™ is designed to extend motor life in variable torque applications, such as fans and pumps with lead lengths up to 15,000 feet. Motors on these systems typically produce a large amount of heat as they run. The MotorShield™ is the perfect solution to prevent overheating and motor failure.

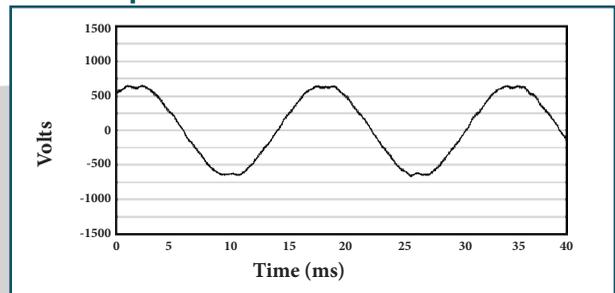
## Typical Applications

- Wastewater Treatment Plants
- Mining
- Material Handling
- Oil & Gas
- HVAC Systems
- Chemical Processing
- Power Plants
- Data Centers
- Renewable Energy
- Pulp & Paper

## Motor Input Waveform Without MotorShield™



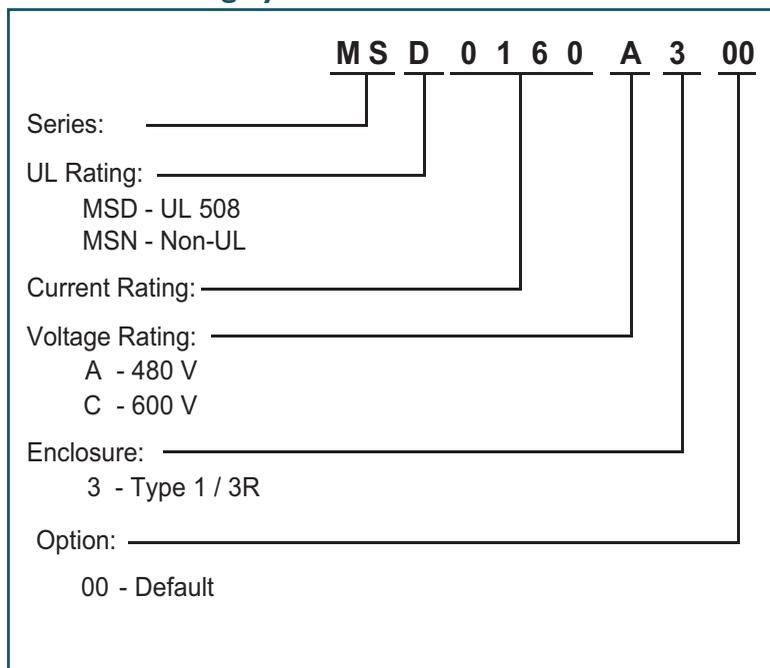
## Motor Input Waveform With MotorShield™



# Technical Specifications

Current Ratings	480V: 9 to 1080 amps
	600V: 8 to 500 amps
	Intermittent current: 150% for 1 minute out of every 60 minutes
VFD Output Voltage	480V and 600V, 3-phase, at fundamental base frequency configured to Volts per Hz
VFD Output Frequency	Up to 80 Hz
VFD Carrier Frequency	2 kHz to 16 kHz
Filter Performance	Maximum peak voltage of output waveform - 480V models: 1000V, 600V models: 1,500V
	Maximum dv/dt of output waveform - 480V models: 500V/μs, 600V models: 1,500V/μs
<b>Environmental Conditions</b>	
Maximum Elevation	3,300 ft (1,000 m), derating required for operation above this level
Ambient Operating Temperature Range	-30 °C (32 °F) to 40 °C (104 °F) Cooling provisions required for operation above this temperature
Ambient Storage Temperature Range	-40 °C (-40 °F) to 50 °C (122 °F)
Maximum Humidity, Operating or Storage	95%, non-condensing
<b>Reference Technical Standards</b>	
Enclosure Options	NEMA 1/3R enclosure
Insertion Impedance	6.5% nominally at 60 Hz & full load current
Capacitors	High endurance design (no PCBs)
Agency Approvals	UL & cUL Listed (up to 480 amps)

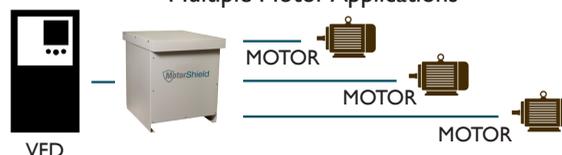
## Part Numbering System



### Extreme Long Lead Applications



### Multiple Motor Applications



### Low Voltage PWM Power Supply to Medium Voltage Motor



## Performance Guarantee

Properly sized and applied, the addition of a MotorShield™ Sine Wave Output Filter is guaranteed to bring the application into compliance with NEMA Standards Publication No. MG-1. If the system fails to meet MG-1 standards with the addition of a MotorShield™ filter, TCI will take back the output filter and pay shipping both ways. This offer is valid for 60 days from the installation date.

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