

# Power Quality Solutions for HVAC



# HVAC Solutions

Today's HVAC systems have moved beyond the traditional perception of personal comfort and now encompass a much more sophisticated and complex level of technology, which has elevated the importance of power quality. MTE Corporation helps HVAC systems by delivering a wide array of optimized, power quality solutions.

With the rising emphasis on energy efficiency, increased control and sensing, regulatory demands, and more, the number of variable frequency drives (VFDs) has surged within these advanced HVAC systems to enhance overall performance expectations. VFDs are used throughout the HVAC industry to control the speed of blowers, fans, pumps, and compressors. However, with this increase in VFD usage comes an increase in power quality issues, leading to equipment damage, costly downtime and reduced efficiency. MTE power quality solutions mitigate the harmonic problems associated with VFDs, resulting in longer system life and better overall performance for your HVAC system.

## MTE solutions are applicable to all commercial HVAC Systems



### ROOFTOP & AIR HANDLING UNITS

Often found on schools, hotels, and office buildings, packaged roof top units (RTU) and air handling units (AHU) make up 31% of the US HVAC market. VFDs are incorporated readily in both systems to manage targeted zone control throughout building ductwork.



### CHILLERS

Often found in hospitals, high rise buildings or factories, the chiller units rely on helical rotary compressors, capable of adjusting speed through the use of VFDs. Some chillers feature multiple individual compressors for increased flexibility of airflow and efficiency, which increases the total number of VFDs.



### COOLING TOWERS

VFDs are used to control the fan speed to maintain water temperature instead of constantly turning the fans on and off. Cooling towers are typically used in conjunction with Chillers and Air Handling Units.



### BLOWERS & FAN MOTORS

VFDs are used together with fan motors to control the power and speed at which air is efficiently distributed through the HVAC system. Accurately regulating airflow results in increased comfort and energy savings for the consumer.

## Power Quality Challenges for HVAC Systems



### Ownership and Maintenance Costs

Increased use of VFDs can cause electrical harmonics which are detrimental to motor life and cause electrical component wear.



### Regulations

Stringent standards, such as ASHRAE 90.1 and 2023 DOE result in additional usage of VFDs and non-linear loads, thereby increasing unwanted harmonics in the system.



### Aging Infrastructure

Retrofitting HVAC systems into legacy building power infrastructure, from decades past, creates additional harmonic, load, power factor, and sensor interference issues.



### "Green" Energy Systems

VFDs can help HVAC systems meet increasingly demanding efficiency requirements, but the resulting harmonics must be mitigated.



### Increased ECM Fan Usage

ECM fans improve energy efficiencies in < 10 HP applications, but VFD technology adds harmful harmonics throughout the building electrical system.

## LINE SIDE POWER QUALITY

### CHALLENGE

Modern HVAC systems strive for high efficiency and high output, while meeting or exceeding regulatory demands. The variable controls used to deliver optimal performance, can create harmonic loads throughout the system.

## LOAD SIDE POWER QUALITY

### CHALLENGE

Aging HVAC systems tied to older electrical infrastructure, and new HVAC systems using variable frequency drives (VFDs), present harmonic challenges. Factor in the increased use of sensors, used for both safety and efficiency purposes, and the need for power quality solutions grows.

### MTE LINE SIDE SOLUTIONS

#### FEATURES

- Harmonic Mitigation
- Adaptive Passive Technology
- Integrated Reactor Design
- Low KVAR

#### BENEFITS

- IEEE-519 utility compliance
- Compliance to IEEE-519, even below 50% load
- Increases power factor, saving utility costs
- Lowers current distortion back to line and protects VFD from damage/failure due to transient voltages
- Generator compatible

### MTE LOAD SIDE SOLUTIONS

#### FEATURES

- Voltage Distortion Mitigation
- Common Mode Attenuation

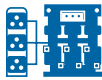
#### BENEFITS

- Motors and cable protected from damage/failure due to VFD PWM signal
- Motor bearings protected from premature failure
- Critical sensors and safety detection systems protected from malfunction and failure

# Featured HVAC Solutions

## LINE SIDE SOLUTIONS

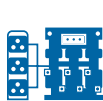
HF



### Matrix® AP

- Meets IEEE-519 requirements
- Adapts to load changes
  - » IEEE-519 compliant down to 50% load
- Improves system efficiency and reliability
- Extends service life of electrical equipment

HF



### Matrix® E-Series

- Helps support IEEE-519 compliance
- 8% THID at full load, 12% THID at 40% load
  - » w/  $\geq 6\%$  impedance (DC choke/reactor)
- 12% THID at full load, 17% THID at 40% load
  - » w/out DC choke/reactor
- Modular design for easy panel integration

RZ



### RLW/RL Reactors

- Protects against surges and transients
- Reduces
  - » Nuisance over-voltage tripping
  - » Harmonic distortion (30-35%)

## LOAD SIDE SOLUTIONS

MP



### SineWave Nexus®

- Only comprehensive motor protection solution on the market
  - » 5-year motor bearing warranty
- Eliminates common mode and differential mode noise
- Pricy "VFD" cable and insulated bearings not required
- Extends the life of non-inverter and inverter duty motors

MP



### dV Sentry®

- Reduces dangerous peak voltages and eliminates reflective waves
- Reduce peak common mode voltage by over 50%
- Combines a dV/dt filter and common mode choke into one compact solution

MP



### dV E-Series™

- Peak voltage protection and rise time reduction extends the life of motor and cables
- Small footprint and easy terminations make for smooth installation
- Lighter, more efficient, and run cooler than other dV/dt filters
- Optimal dV/dt solution for leads less than 1,000 ft

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**MTE**  
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