TMdrive®-MVe2 Product Application Guide

Medium Voltage Multilevel IGBT Drive
Up to 5,500 HP (5,000 kVA), 3.3 kV to 11 kV
The TMdrive®-MVe2 is an enhancement to the family of TMEIC medium voltage general purpose drives offering:

- Regeneration
- Smaller footprint
- Unity line-side power factor
- Reduced part-count
- High availability

<table>
<thead>
<tr>
<th>Design Feature</th>
<th>Customer Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active line side converter</td>
<td>• Unity (1.0) power factor across entire speed range</td>
</tr>
<tr>
<td></td>
<td>• Line side harmonics much lower than IEEE 519-2014</td>
</tr>
<tr>
<td></td>
<td>• Standard regenerative braking</td>
</tr>
<tr>
<td>Conservative electronic design &amp; dry film-type capacitors</td>
<td>• Highly reliable operation, expected 16-year MTBF</td>
</tr>
<tr>
<td></td>
<td>• No need for periodic capacitor replacement</td>
</tr>
<tr>
<td>Multilevel drive output voltage waveform</td>
<td>• No derating of motor for voltage insulation or heating required</td>
</tr>
<tr>
<td></td>
<td>• Applies easily to existing motors without the need for an expensive output filter</td>
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<td></td>
<td>• Eliminates the need for special VFD rated cables</td>
</tr>
<tr>
<td></td>
<td>• No Neutral Shift</td>
</tr>
<tr>
<td>Input isolation transformer with static shield included in drive package</td>
<td>• Simplifies design and installation</td>
</tr>
<tr>
<td></td>
<td>• Less total space required, plus easy integration in MCC building</td>
</tr>
<tr>
<td></td>
<td>• Better motor protection than transformerless design</td>
</tr>
<tr>
<td></td>
<td>• High frequency transients are attenuated</td>
</tr>
<tr>
<td>Power conversion module in a single drawer type package</td>
<td>• Reduction in spare parts</td>
</tr>
<tr>
<td></td>
<td>• Minimal personnel training for maintenance</td>
</tr>
<tr>
<td></td>
<td>• 30 minutes Mean Time to Repair (MTTR)</td>
</tr>
<tr>
<td>Synchronous bumpless transfer of the motor to the utility line</td>
<td>• Allows control of multiple motors with one drive</td>
</tr>
<tr>
<td></td>
<td>• No motor current or torque transients when the motor transitions to the AC line</td>
</tr>
</tbody>
</table>

Covering a broad range of medium voltage drive applications
Oil & Gas
For Oil and Gas applications, the MVe2 family of variable frequency drives seamlessly integrates with the rest balance of process with a choice of 3/3.3 kV, 4.16 kV, 6/6.6 kV, 10kV or 11 kV options. The MVe2 can be applied to existing motors and cabling, making them an excellent option in modernization/retrofit applications, including:

- Oil pumps
-Expanders
-Gas compressors
-Extruders
-Fans
-Mixers

Power Generation
Traditional mechanical methods of controlling flow are inefficient and require considerable maintenance. In the Power Generation/Utilities industry, the MVe2 provides more reliable, accurate and energy-efficient control of flow while eliminating the maintenance associated with dampers, vanes or valves for:

- Induced and forced draft fans
-Primary and secondary air fans
-Boiler feed water pumps
-Condensate extraction pumps

Mining
Accurate torque control is a key in controlling large conveyors. The MVe2’s flux vector algorithm provides the accuracy and response for constant torque applications. Mining applications include:

- Raw material conveyor
-Grinding mills
-Pumps
-Crushers
-Shredders
-Hoists

Industrial
Regardless of the torque profile, MVe2 drives are designed to meet motor control needs in a variety of industries:

- Steel
-Water & wastewater treatment
-Rubber & plastics
-Test stands
-Agriculture
-Paper & pulp
-Recreational/Entertainment
A Look Inside

Differentiating Features
- Compact design saves valuable floor space making retrofits of old equipment easier
- Compartmentalized panels provide voltage class segregation and top or bottom cable feeds
- Integral isolation transformer provides reliable operation and simplifies installation.
- Significant reduction in parts, reducing spare parts requirements

Input Power Disconnect Option†
- A visible, bolted pressure, isolation switch offers mechanical interlocking to allow for maintenance personnel to service the drive.
- The fused (Class E rated) vacuum contactor provides critical fault current protection to the drive.

Main Power Input
Four voltage levels are available:
- 3-3.3 kV, 3-phase, 50/60 Hz
- 4-4.16 kV, 3-phase, 50/60 Hz
- 6-6.6 kV, 3-phase, 50/60 Hz
- 10-11 kV, 3-phase, 50/60 Hz

Internal Pre-Charge AC Reactor*
An ac reactor and medium voltage contactor mitigate the transformer magnetizing inrush current, minimizing stress on the fusing and power components.

Input Isolation Transformer Standard.
The input transformer has multiple secondary windings to feed IGBT inverters (cell inverters). This design provides galvanic isolation between the power system and the motor-inverter system. Electrostatic shield is standard.

Kirk Key Interlocks†
For additional safety, Kirk key locks are provided standard on all drives.

Filtered Air Intake
Washable input air filters have front access for periodic maintenance.

* Available in select frame sizes
† For 4 kV drive, CSA listed in U.S. and Canada only.
Inverter/Converter Phase-Leg Assemblies
Each modular phase leg assembly includes:
• Robust IGBTs
• Gate driver circuit board
• DC bus capacitors, dry-film type for long life
• Fiber optic link interface circuit board

A phase leg assembly can be easily racked out and replaced in 30 minutes in case of failure.

Control
Single 32-bit microprocessor-based control board combines several key drive functions:
• Power semiconductor gating
• Speed and torque regulation
• Motor and drive protection
• I/O mapping
• Diagnostic functions
• High speed data capture buffering
• Hosting of optional LAN interface
• Drive is configured from the TMdrive-Navigator

Communications
An optional communications card can be provided to connect the VFD to the DCS/SCADA system.

Application Specific Controls
Each drive is matched to project requirements with custom control components.

Remote Connectivity Module
Standard.

On-board Windows® based computer provides access to live variables, parameters & historical fault data.

Power & Motor Cabling Terminations
Conveniently located power cable terminations can be accessed from the front or rear. A metal cover prevents exposure to live parts when drive is running.

Lightning Arrestors†
Incoming power is protected by distribution class lightning arrestors for suppression of transient surges.

Control & Power Cables
Gland plates are provided to enable cable entry. Top and bottom entry options are selectable onsite.

Blower Assemblies
Quiet (<80 dB(A) at 1m), fans circulate air throughout enclosures pulling air from the front filter assemblies and venting it out the top of the cabinets. Redundant fan assemblies can be provided as an option.

...Beautifully Packaged.
Utility & Motor

High Input Power Factor. *Reduced Electricity Charges.*

The PWM converter maintains a unity power factor across the entire speed range eliminating the need for correction equipment and utility penalties.

Extremely Low Harmonics. *No line-side filter required.*

The MVe2 line side harmonics are much lower than IEEE 519-2014 requirements. Less than 2% current distortion is seen by utility.

Utility Interruption Protection.

Momentary power loss & voltage unbalances can cause harmful effects to a motor. The MVe2 VFD control remains active during instantaneous power loss for up to 2 seconds. For power outages longer than 2 seconds, the VFD can regain motor control of a spinning load.

Utility Energy Return

The power regeneration function enables stopping of large inertia loads in a short time. During deceleration the rotational energy is returned to the power supply. This reduces energy consumption and electricity costs versus conventional models that can only provide for a coasting stop.

High Efficiency. *Reduced HVAC Costs.*

The MVe2 has a full load efficiency of 96.5%, including auxiliaries and isolation transformer. As an option the input insulation transformer can be mounted outdoors, reducing the heat load by 50%.
Engineered Motor-Drive Packages. **Single point of contact.**
Through TMEIC’s extensive application expertise, we deliver motor-drive solutions that support your technical and commercial needs from concept to decommissioning.

**Apply to Existing Motors**
The multilevel PWM output waveform approximates a sine wave, reducing dv/dt. Less than 2% $I_{THD}$ and $V_{THD}$.
- 3-4.16kV: 9 levels (0 to peak) / 17 levels (peak to peak)
- 6-6.6 kV: 13 levels (0 to peak) / 25 levels (peak to peak)
- 10-11 kV: 21 levels (0 to peak) / 41 levels (peak to peak)

**Rapid Acceleration / Deceleration**
The standard regenerative braking function provides for rapid acceleration and deceleration with quick speed response.

*Example of the actual test result of the standard 4.16 kV VFD*
# Field Installation...

**Client Input Interface**

- **Main Power**
  - Input transformer
  - VT
  - Control circuit
  - Power supply unit
  - 3.3 kV, 6.6 kV, 10 kV, 11 kV (Other voltage inputs available)
- **Fan Power**
  - 460 V (Other options available)
- **Control Input (Digital/Analog)**
  - Start/Stop Sign
  - Emergency stop signal
  - Speed reference: 0-10 V, 4-20 mA
- **LAN Communications (Optional)**

**TMdrive-MVe2**

- **Transformer panel**
  - Main circuit power supply
  - 3.3 kV, 4 kV, 6.6 kV, 10 kV, 11 kV (Other voltage inputs available)
- **Inverter panel**
  - Example: 4 kV class
- **Control/output panel**
  - Control circuit
  - Programable outputs
  - Output frequency 4-20 mA
  - Output current 4-20 mA
  - +5 V
  - +24 V
  - +15/-15 V to control circuit
  - Located in each panel

**Client Motor Interface**

- **Motor Power**
- **Control Output (Digital/Analog)**
  - Input shut-off device trip signal
  - Located in each panel
  - To control circuit
  - To the trip circuit of incoming circuit breaker
- **Spares**

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Field Installation... Made Easy.
Maintenance

Quick & Safe.

An optional lifter cart enables the operator to quickly rack-in/out the power modules.

A convenient isolation switch kills the main power to the VFD to allow for safe servicing.

Drawer type cell inverters shorten MTTR to 30 minutes

Aluminum mesh air filters can be removed and cleaned while the VFD is running.

System configurations

...flexible and scalable.

The MVe2 can be applied to your process in flexible configurations.

<table>
<thead>
<tr>
<th>Running duty</th>
<th>Running and/or starting duty</th>
</tr>
</thead>
</table>

- **Running duty**
  - Mains
  - Input
  - VFD
  - Electric motor

- **Running and/or starting duty**
  - Mains
  - Input
  - VFD
  - Electric motor

When appropriately rated, the MVe2 can be applied for continuous duty applications providing:
- Speed/process control
- Unity line side pf
- Quick deceleration
- Constant/variable torque
- Reduction in in-rush current

TMEIC provides integrated packing of:
- Industrial Control Building
- Output/Bypass Switchgear
- Motor Control Centers
- Control Systems

The MVe2 can be rated either for starting duty and/or running duty. With the appropriate switchgear lineup, the MVe2 control can automatically accelerate the connected motor to match the incoming utility voltage, frequency and phase. The load can then be bumplessly transferred to power source with no surges in torque or current. This allows for sequential starting of multiple motors with a single VFD. In a redundant arrangement, any motor can be started with either VFD, or can be configured as a hot-standby.

An optional lifter cart enables the operator to quickly rack-in/out the power modules.
TMdrive-MVe2 Architecture

...Simplified.

Switching Devices
Switching devices are insulated gate bipolar transistors (IGBT).

DC Link Long Life Capacitors
Dry film type capacitors eliminate need for replacement (no electrolytic capacitors).

Easy Rack-Out
Convenient handles enable easy removal of power modules.

Cooling Heat Sink
Heat is transferred from the switching device to the heat sink.

Input Fuse
Fused inputs to converter.

Control Board
- Board passes pulse width modulated control signal to gate drivers
- Gate driver circuit boards connect directly to IGBTs

Rack In-Rack Out
...in 30 minutes.
# Frame Sizes to Fit Your Application

## 4-4.16 kV

<table>
<thead>
<tr>
<th>VFD Outline</th>
<th>Maximum Weight lbs. (kg)</th>
<th>Approximate Motor Shaft HP (kW) at 4.16 kV</th>
<th>Rated Output Current (A)</th>
<th>Inverter kVA output at 4.16 kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame 100</td>
<td>9,300 (4,218)</td>
<td>536 (400)</td>
<td>69</td>
<td>500</td>
</tr>
<tr>
<td>Frame 200</td>
<td>9,300 (4,218)</td>
<td>1,085 (810)</td>
<td>138</td>
<td>1,000</td>
</tr>
<tr>
<td>Frame 300</td>
<td>14,285 (6,480)</td>
<td>1,500 (1,120)</td>
<td>191</td>
<td>1,380</td>
</tr>
<tr>
<td>Frame 400</td>
<td>14,285 (6,480)</td>
<td>2,145 (1,600)</td>
<td>262</td>
<td>1,890</td>
</tr>
</tbody>
</table>

## 3-3.3 kV

<table>
<thead>
<tr>
<th>VFD Outline</th>
<th>Maximum Weight lbs. (kg)</th>
<th>Approximate Motor Shaft HP (kW) at 3.3 kV</th>
<th>Rated Output Current (A)</th>
<th>Inverter kVA output at 3.3 kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame 100</td>
<td>8,400 (3,800)</td>
<td>220 (164)</td>
<td>35</td>
<td>200</td>
</tr>
<tr>
<td>Frame 200</td>
<td>8,800 (4,000)</td>
<td>330 (246)</td>
<td>53</td>
<td>300</td>
</tr>
<tr>
<td>Frame 300</td>
<td>11,700 (5,300)</td>
<td>440 (328)</td>
<td>70</td>
<td>400</td>
</tr>
<tr>
<td>Frame 400</td>
<td>12,350 (5,600)</td>
<td>1,040 (776)</td>
<td>166</td>
<td>950</td>
</tr>
</tbody>
</table>

* 1: 110% OL for 60 sec. Panel heights include cooling fans. VFD capable of 80% regeneration at nominal voltage at unity power factor.

† Applicable for CSA listed VFD in U.S. and Canada. Frame designation indicates power cell rating for replacement parts and other purposes.
## Frame Sizes to Fit Your Application

### 6-6.6 kV

<table>
<thead>
<tr>
<th>VFD Outline</th>
<th>Maximum Weight lbs. (kg)</th>
<th>Approximate Motor Shaft hp (kW) at 6.6 kV</th>
<th>Rated Output Current (A) I phase AC*</th>
<th>Inverter kVA output at 6.6 kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame 100</td>
<td>8,400 (3,800)</td>
<td>440 (328)</td>
<td>35</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td></td>
<td>660 (490)</td>
<td>53</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td></td>
<td>880 (656)</td>
<td>70</td>
<td>800</td>
</tr>
<tr>
<td>Frame 200</td>
<td>10,360 (4,700)</td>
<td>1,320 (985)</td>
<td>105</td>
<td>1,200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,760 (1,312)</td>
<td>140</td>
<td>1,600</td>
</tr>
<tr>
<td>Frame 300</td>
<td>15,000-15,800 (6,750-7,150)</td>
<td>2,085 (1,555)</td>
<td>166</td>
<td>1,900</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2,400 (1,790)</td>
<td>192</td>
<td>2,200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2,850 (2,126)</td>
<td>227</td>
<td>2,600</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3,300 (2,460)</td>
<td>263</td>
<td>3,000</td>
</tr>
</tbody>
</table>

* 1: 110% OL for 60 sec.  Panel heights include cooling fans.  VFD capable of 80% regeneration at nominal voltage at unity power factor.  Frame designation indicates power cell rating for replacement parts and other purposes.

### 10-11 kV

<table>
<thead>
<tr>
<th>VFD Outline</th>
<th>Maximum Weight lbs. (kg)</th>
<th>Approximate Motor Shaft HP (kW) at 11 kV</th>
<th>Rated Output Current (A) I phase AC*</th>
<th>Inverter kVA output at 11 kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame 100</td>
<td>16,500 - 17,600 (7,800 - 8,000)</td>
<td>700 (522)</td>
<td>35</td>
<td>660</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,100 (820)</td>
<td>53</td>
<td>990</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,400 (1,044)</td>
<td>70</td>
<td>1,320</td>
</tr>
<tr>
<td>Frame 200</td>
<td>16,500 - 17,600 (7,800 - 8,000)</td>
<td>2,200 (1,640)</td>
<td>105</td>
<td>2,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2,900 (2,160)</td>
<td>139</td>
<td>2,640</td>
</tr>
<tr>
<td>Frame 300</td>
<td>29,500 - 29,800 (13,350 - 13,500)</td>
<td>3,400 (2,536)</td>
<td>162</td>
<td>3,080</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4,000 (2,984)</td>
<td>191</td>
<td>3,630</td>
</tr>
<tr>
<td>Frame 400</td>
<td>29,500 - 29,800 (13,350 - 13,500)</td>
<td>4,700 (3,500)</td>
<td>226</td>
<td>4,290</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5,500 (4,100)</td>
<td>263</td>
<td>5,000</td>
</tr>
</tbody>
</table>

*1: 110% OL for 60 sec.  Panel heights include cooling fans VFD capable of 80% regeneration at nominal voltage at unity power factor.  Frame designation indicates power cell rating for replacement parts and other purposes.
### Cabinet Minimum Clearance Space

<table>
<thead>
<tr>
<th>Drive Class</th>
<th>Frame</th>
<th>Front Side Space</th>
<th>Rear Side Space</th>
<th>Upper Space</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-3.3 kV</td>
<td>1, 2</td>
<td>1,700 mm (5.6 ft / 67 in)</td>
<td>–</td>
<td>300 mm (1 ft / 11.8 in)</td>
</tr>
<tr>
<td></td>
<td>3, 4</td>
<td>1,700 mm (5.6 ft / 67 in)</td>
<td>–</td>
<td>210 mm (0.68 ft / 8.3 in)</td>
</tr>
<tr>
<td>4-4.16 kV</td>
<td>1, 2, 3, 4</td>
<td>1,700 mm (5.6 ft / 67 in)</td>
<td>–</td>
<td>220 mm (0.72 ft / 8.7 in)</td>
</tr>
<tr>
<td>6-6.6 kV</td>
<td>1, 2</td>
<td>1,700 mm (5.6 ft / 67 in)</td>
<td>–</td>
<td>300 mm (1 ft / 11.8 in)</td>
</tr>
<tr>
<td></td>
<td>3, 4</td>
<td>1,700 mm (5.6 ft / 67 in)</td>
<td>–</td>
<td>210 mm (0.68 ft / 8.3 in)</td>
</tr>
<tr>
<td>10-11 kV</td>
<td>1, 2</td>
<td>1,900 mm (6.2 ft / 75 in)</td>
<td>1,000 mm (3.3 ft / 40 in)</td>
<td>300 mm (1 ft / 11.8 in)</td>
</tr>
<tr>
<td></td>
<td>3, 4</td>
<td>1,900 mm (6.2 ft / 75 in)</td>
<td>1,000 mm (3.3 ft / 40 in)</td>
<td>210 mm (0.68 ft / 8.3 in)</td>
</tr>
</tbody>
</table>

### Application Notes

1. Inverter Power (kVA) = Motor Shaft Power (kW) / Motor pf x Motor Eff
   Rated Output Current = Inverter Power (kVA) / 1.732 x Motor Voltage (L–L)
   - Ratings based on motor pf = 0.87, Motor Eff = 0.94, ambient temperature is 32°F–104°F (0°C–40°C)
   - Ratings based on a variable torque load (fans, pumps, centrifugal compressors)
   - For constant to secure load consult TMEIC.
   - Altitude above sea level is 0-3300 ft (1-1000 m).

2. Optional bypass circuit can be separately mounted.
3. Redundant cooling fans available as an option.
4. No rear access required except for 10-11 kV VFDs or 13.8 kV VFDs.
5. Incoming power cabling and motor cabling are bottom entry, top entry is standard for CSA design, option for IEC
6. Air is pulled through the filters in the cabinet doors and vented out top.
7. Available options include motor cooling fan control, cabinet space heater, sync motor control, smooth transfer to and from utility, motor space heater control, RTD, monitor redundant fans, output sine wave filters, and others.
8. For conservative sizing of HVAC equipment, use 3kW of heat rejection per 100 hp of motor power.
9. The panels include channel bases attached to the cabinets before shipment.
10. This table presents only a sample of voltages and horsepower ratings. Other options such as 13.8 kV input are available.
Specifications

**VFD Power Input**
- Mains input voltage: • Up to 13.8 kV, 3-phase, ±10%
  • Complete power loss ride-thru of 300 ms.
- Input frequency: • 50/60 Hz
  • ±5%
- Power factor: • Unity at all loads and speed
- Harmonics: • Lower than IEEE 519-2014 standard
  • No line-side filters required, <2% l_{THD}
- Converter type: • AC fed active front end
- Power semiconductor technology: • Low loss IGBT
- Transformer: • Dry type, aluminum wound, H-type
- Auxiliary power: • Control power (internal)
  • Fan power: 380V-690V (external)

**VFD Power Output**
- Output Voltage: • 3/3.3 kV, 4.16 kV, 6/6.6 kV, 10/11 kV
- Output Frequency: • 0-120 Hz for 3/3.3 kV, 4.16 kV, 6/6.6 kV
  • 0-72 Hz for 10/11 kV inverters
- Output Voltage Levels: • 9/17-levels for 3/3.3 kV, 4.16 kV
  • 13/25 levels for 6/6.6 kV
  • 21/41 levels for 10/11 kV
- Number of cell modules in series per phase: • 2 for 3/3.3 kV and 4.16 kV
  • 3 for 6/6.6 kV, 5 for 10/11 kV
- Overall Efficiency: • >96.5%
  • Including auxiliaries & isolation transformer
- Power Semiconductor Technology: • Low loss IGBT

**Control I/O**
- Digital Input: Qty. (5)
- Dedicated Function Input: Qty. (1)
- Configurable (programmable) Function Input: Qty. (4)
- Digital Relay Output: Qty. (8)
- Digital 24V Outputs: Qty. (4)
- Speed feedback encoder input: High resolution tach, 10 kHz, 5 or 15 V DC diff.
  input, A quad B, with marker
- Motor temperature sensor option: High resolution temperature protection relay: 100 Ohm platinum RTD, 14 channels

**Display and Diagnostics**
- PC Configuration: TMDrive-Navigator for configuration, local and remote monitoring, animated block diagrams, dynamic live and capture buffer based trending, fault diagnostics, commissioning wizard, and regulator tune-up wizards.
  • Ethernet 10 Mbps point to point or multi-drop, each drive has its own IP address.
- Keypad and Display: Backlit LCD, animated displays
  • Four configurable bar graphs
  • Optional multilingual display
  • Parameter editing
  • Drive control
- Remote Connectivity Module: Fanless industrial computer in the VFD with proprietary fault upload software for troubleshooting and diagnostics

**Environmental**
- Operating Temperature: • 0°C to 40°C (32°F to 104°F) at rated load
  • Up to 50°C with derating
- Storage Temperature: • -25°C to +70°C, indoor storage only
- Relative Humidity: • Up to 85%, non-condensing
- Altitude: • Up to 1000m (3300 ft)
  • Higher altitude available with derating
- Vibration: • 0.3G max
  • 2Hz<f<9Hz: Half amplitude sine wave is within 0.9m
  • 9Hz<f<100Hz: Vibration acceleration is <3m/s²
- Cooling: • Air-cooled with fans on top and air intake on front
  • For 10/11kV inverter, air intake in rear also

**Mechanical**
- Enclosure: • NEMA 1, Gasketed
  • IP 30, except fan opening
  • Color: Munsell 5Y7/1
- Cable Entrance: • Top or bottom
  • Selectable on-site
- Noise: • ~76-80 dBA at 3.1 ft from enclosure
- Mean Time To Repair (MTTR): • 30 minutes to replace power module
- Mean Time Between Failure (MTBF): • 16 years
- Code conformance: • Applicable IEC, JIS, JEM, UL, CSA and NEMA standards
- Equipment marking: • 4.16 kV variant only

**Motor Control and Protection**
- Vector Control Accuracy: • Speed response: 20 rad/sec
  • Speed regulation without speed sensor ± 0.5%
  • Speed Control Range: 5 - 100%
- Control: • Non-volatile memory for parameters and fault data
  • Vector control with/without speed feedback, or Volts/Hz
  • Designed to keep running after utility supply transient voltage drop outs of 300 ms
  • Synchronous transfer to line (option)
  • Synchronous motor control (option)
- Major Protective Functions: • Inverter overcurrent, overvoltage
  • Cooling fan abnormal
  • Motor ground fault
  • Low or loss of system voltage
  • Over-temperature
  • DC bus voltage
  • Voltage/current unbalance
  • 5/20 min. overload
  • Loss of speed reference
  • Input Voltage phase loss
  • VFD output open
  • Transformer overheat

For specifications not mentioned here, contact TMEIC.
Empower Your Crew: Local and Remote Control

TMdrive Navigator

The MVe2 keypad, coupled with the Windows® based TMdrive Navigator brings productivity to your commissioning and maintenance activities.

The Navigator tool helps maintain TMEIC drives in the field. Any user can easily access current drive expertise & know-how.

Compatible with OS Windows 7 and Professional 32-bit

High speed data is automatically captured and saved in the event of a drive fault. Users can capture high speed data based on their own trigger conditions or perform high resolution real-time trending.

Live block diagrams provide a real-time graphical view of drive functions. Functions can be configured directly from the graphical view.

Product documentation is integrated into tool. Users can capture their own notes to benefit future troubleshooting.

Operator Keypad (Standard)

High Function Display
- LCD backlight gives great visibility & long life
- Bar graphs, icons, menus, and digital values combine to provide concise status information, often eliminating the need for traditional analog meters

RJ-45 Ethernet port is used for the TMdrive Navigator

Instrumentation Interface
- Two analog outputs are dedicated to motor current feedback
- Five analog outputs are mapped to variables for external data logging and analysis

Easy to understand navigation buttons allow quick access to information without resorting to a PC based tool

Switch to local mode to operate the equipment from the keypad

Interlock button disables the drive

Multilingual Keypad (Optional)

An optional touch screen display is available with 9 languages built in. The graphic display is easy to read and understand and contains all of the same functions as the standard keypad.
At TMEIC, we provide highly reliable automation systems, additionally TMEIC offers remote connectivity with RCM®. Protection for your investment, by reducing downtime and lowering repair costs.

Remote drive connectivity requires an internet connection between your facility and TMEIC for retrieval of fault logs and files for diagnosing drive upsets. The RCM® enables seamless integration between drives and support engineers.

### Features

- **Reduced downtime & mean-time-to-repair**
  - Quick support saves thousands in lost production
  - TMEIC engineers can quickly connect to the drive and diagnose many issues in minutes.

- **Secured connection**
  - Customer-controlled access
  - All remote activity is conducted with permission of the customer. Drive start/stop is not permitted remotely.

- **Fault upload utility**
  - Proprietary fault upload software
  - RCM® can monitor key real-time parameters. Historical drive faults are pushed automatically to the computer. This enables TMEIC engineers to analyze the issue resulting in the fault and provide a more coherent solution.

- **Industrial computer**
  - Rugged computer for the most demanding applications
  - Fanless computer withstands high vibration and temperature ranges in a small DIN-rail mounted footprint

- **Multiple ethernet/serial ports**
  - Flexible connectivity
  - The module can be connected to two separate LANs along with a host of serial talking USB devices.
Customer Service

North American Sales and Service Network

Whether the equipment is up and running or experiencing downtime, live help from TMEIC is a phone call away. With bases in North America and around the world, regional TMEIC companies and TMEIC motor service shops provide reliable support whenever needed.

- 77 TMEIC VFD Service Engineers
- 25 Motor service locations
- Authorized VFD service providers

Service 24/7 – Talk to a service engineer, we’re available when you need us
**Quote Contact Information**

Customer Reference: ____________  Quote Due Date: ________________
Project Name: ________________  Equipment Delivery Date: ____________
Contact Name: ________________  # of Units Required: ________________
Contact Number: ________________  TMEIC Representative: ________________

*Please complete one request for each unique motor rating

---

**Driven Equipment & Motor Details**

*Type of load: □ Fan □ Pump □ Compressor
□ Other (specify): ________________

□ Torque profile: □ Variable □ Constant
□ Other (specify): ________________

Gear box ratio: □ ____________ to ____________ □ None

Speed range: ____________ Hz to ____________ Hz

Load torque/speed curve provided: □ Yes □ No
Ref: ________________

Regeneration: □ Yes □ No

Breakaway torque:
□ 0% - 100% □ 101% - 150% □ >150%

% Overload Rating for 1 minute: ____________

*Motor power (HP): ________________
*Motor voltage (V): ________________
*Motor full load (A): ________________
*Motor Speed (RPM): ________________
□ New Motor □ Existing Motor

Service factor: ____________

Motor space heater (Control): □ By ASD □ By Others
Motor RTD: Qty. ____________ Type ____________ □ To ASD
□ To others (specify): ________________

Encoder: □ Yes □ No
Cable distance from motor to ASD: ____________ ft

---

**Utility Supply & Environment**

*System Voltage:
□ 2400V □ 3300V □ 4160V □ 6900V □ 13800V □ Other: _______ V ± _______%

Power System One-line Diagram Provided: □ Yes □ No
Ref: ________________

*Line frequency: □ 60 Hz □ 50 Hz

ASD auxiliary three-phase power:
□ End user supplied □ Internal to ASD

Control power:
□ End user supplied □ Internal to ASD

UPS: □ Yes □ No; □ By TMEIC □ By others

*Site location: ________________

Elevation: ________ meters above sea level

ASD enclosure □ NEMA 1 or □ NEMA 3R

Electrical room provided by: □ TMEIC □ Others

Elec. room max. ambient: ________ °C

Humidity: ________ % (non-cond.)

Elec. room min. ambient: ________ °C

Humidity: ________ % (non-cond.)

Outdoor contamination (eg: corrosive gases): ________________

ASD cabinet space heater? □ Yes □ No

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| Site cooling water for ASD use | Yes | No |

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TMEIC AC Drives Offer Complete Coverage

Global Office Locations:

TMEIC Corporation
Office: 1325 Electric Rd., Roanoke, VA, 24018, U.S.A.
Mailing: 2060 Cook Drive, Salem, VA, 24153, U.S.A.
Tel.: +1-540-283-2000; Fax: +1-540-283-2001
Email: info@tmeic.com; Web: www.tmeic.com

Houston Branch: Houston, TX;
Tel: +1-832-767-2680; Email: OilGas@tmeic.com

TMEIC Power Electronics Products Corporation
Factory: 6102 North Eldridge Parkway, Houston, TX 77041
Mailing: 13131 W. Little York Road, Houston, TX 77041

TMEIC–Sistemas Industriais da América do Sul Ltda.
São Paulo/SP, Brazil
Tel: +55-11-3266-6161; Fax: +55-11-3253-0697

Toshiba Mitsubishi-Electric Industrial Systems Corp.
Tokyo, Japan; Tel: +81-3-3277-5511; Web: www.tmeic.co.jp

TMEIC Europe Limited
Uxbridge, Middlesex, United Kingdom
Tel.: +44 870 950 7220; Fax: +44 870 950 7221
Email: info@tmeic.eu; Web: www.tmeic.com/europe

TMEIC Industrial Systems India Private Limited
Hyderabad, India;
Tel.: +91-40-4434-0000; Fax: +91-40-4434-0034
Web: www.tmeic.in; Email: inquiry_india@tmeic.in

Mumbai Branch: Mumbai, Maharashtra, India
Tel: +91-22-6155-5444; Fax: +91-22-6155-5400

TMEIC Power Electronics Systems India Private Ltd.
Bangalore, India,
Tel: +91-80-6746-6000; Fax: +91-80-6746-6100

Toshiba Mitsubishi-Electric Industrial Systems (China) Corp.
Beijing China; Tel.: +86 10 5873-2277; Fax: +86 10 5873-2208
Email: sales@tmeic-cn.com

Shanghai Branch: Shanghai Works
Tel: +86-21-69925007; Fax: +86-21-69925065

Yangcheng TMEIC Power Electronics Corporation
Yangcheng, Jiangxi, China

Shanghai Bao-ling Electric Control Equipment Co., Ltd.
Shanghai, China; Tel: +86-21-5660-3659; Fax: +86-21-5678-6686

Guangzhou Toshiba Baiyun Ryoki Power Electronics Co., Ltd.
Guangzhou, China; Tel: +86-20-2626-1625 Fax: +86-20-2626-1290

TMEIC Asia Company Limited
Hong Kong, China; Tel: +852-2243-3221; Fax: +852-2795-2250
Singapore Branch: Tel: +65-6292-7226 FAX: +65-6292-0817
Taiwan Office: Tel: +886-7-2239425 Fax: +886-7-2239122

P.T. TMEIC Asia Indonesia
Jakarta; Tel: +62-21-2966-1699; Fax: +62-21-2966-1689

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