TMEiC

We drive industry

Motor & Drive

TMdrive™ XL Series

Engineered Drive Systems
Large Capacity Applications

TMEIC Corporation

TMEIC as a global leader in the field of electrical products and engineering has developed variable frequency products under the TMdrive trademark by integrating leading technology and service capabilities of Toshiba Corporation, Mitsubishi-Electric Corporation.
Based on more than a century of experience in converting electrical power into productive performance, TMEIC offers the best drive system solution that delivers peak performance, reliable quality, optimum profitability and safe operation.

●Innovative Concepts of TMdrive series

1 Advanced power semi-conductor technology

- **GCT (Gate Commutated turn-off Thyristor)** : The largest switching power device
- **IEGT (Injection Enhanced insulated Gate bipolar Transistor)** : The largest voltage gate power device
- **IGBT (Insulated Gate Bipolar Transistor)** : New generation IGBT

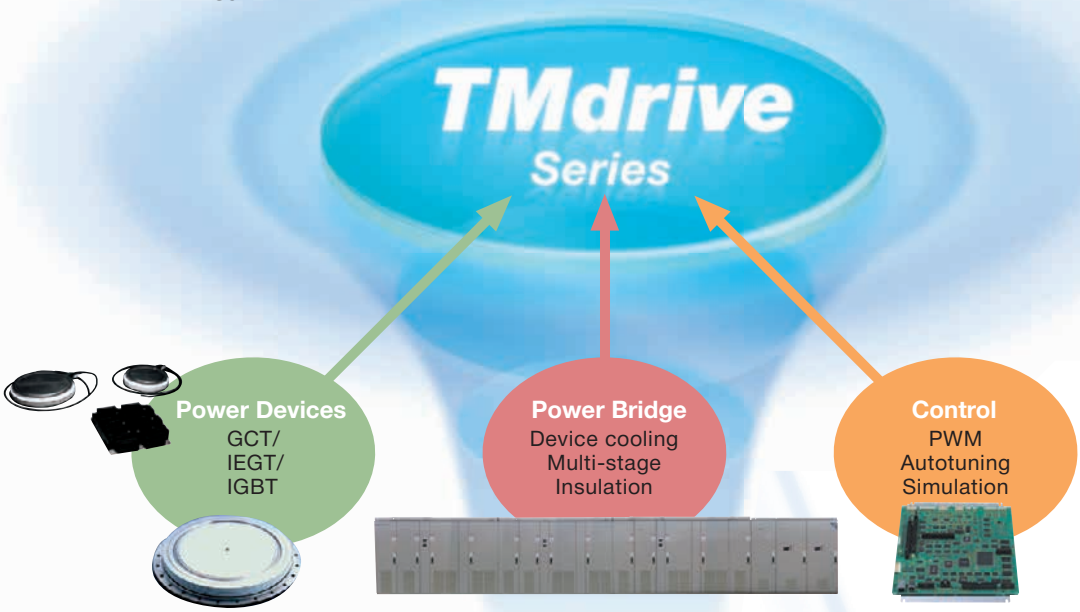
2 Flexible rating

- **Global standard voltage** (up to 11kV class)
- **Large capacity** (up to 120MVA)

3 High reliability and high performance

- **Rock Solid Reliability** : Proven power conversion topology, devices and redundancy
- **Power System Friendly** : High efficiency, high power factor, low harmonic distortion
- **Compact Design** : High power to foot print ratio
- **Flexibility** : Global standard LAN system, PC monitoring, Remote maintenance

●Technology Evolution



13.8kV Class series for Soft start application

TMdrive-MVe3 Type-D	Air-cooled inverter for general purpose applications up to 50MVA

10/11kV Class series

TMdrive-MVe3 Type-D	Air-cooled inverter for general purpose applications up to 19.5MVA
TMdrive-MVe3 Type-P	Air-cooled inverter for general purpose applications up to 7.3MVA

6kV Class series

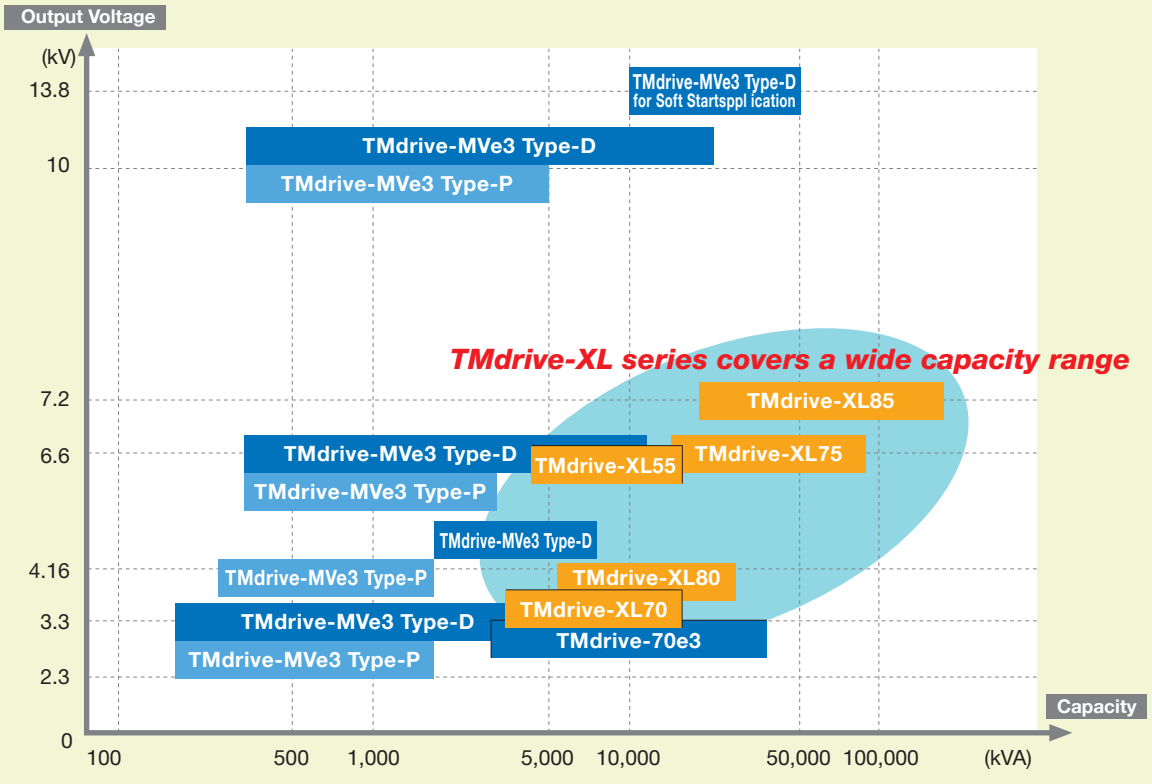
TMdrive-XL85	Water-cooled inverter for large compressors or other large capacity applications up to 120MVA
TMdrive-XL75	Water-cooled inverter for large compressors or other large capacity applications up to 92MVA
TMdrive-XL55	Water-cooled inverter for compressors or other large capacity applications up to 14.4MVA
TMdrive-MVe3 Type-D	Air-cooled inverter for general purpose applications up to 11.4MVA
TMdrive-MVe3 Type-P	Air-cooled inverter for general purpose applications up to 8.3MVA

3kV Class series

TMdrive-XL80	Water-cooled inverter for compressors or other large capacity applications up to 30MVA
TMdrive-XL70	Water-cooled inverter for compressors or other large capacity applications up to 22MVA
TMdrive-70e3	Water-cooled inverter for large capacity applications up to 44MVA
TMdrive-MVe3 Type-D	Air-cooled inverter for general purpose applications up to 5.7MVA
TMdrive-MVe3 Type-P	Air-cooled inverter for general purpose applications up to 2.8MVA

2/4kV Class series

TMdrive-MVe3 Type-P	Air-cooled inverter for general purpose applications up to 5.2MVA (4.16kV)



TMdrive-XL85 (30MVA, Reference: converter panel of 1 phase)

TMdrive-XL75 (15/23MVA)

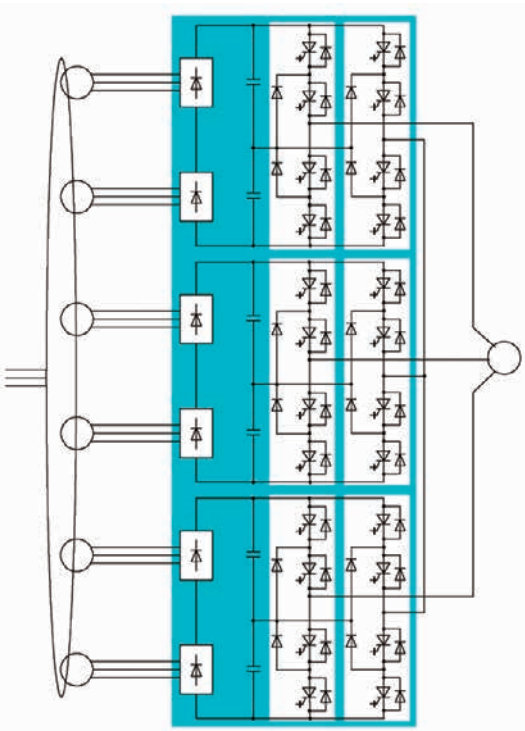
TMdrive-XL55 (7.2MVA)

Proven technology

- 15 years of 5-level inverter experience
- 1000+ units in the field

Proven Power Devices

- GCT : Gate Commutated Turn-off Thyristor
- IEGT : Injection Enhanced Insulated Gate Bipolar Transistor
- IGBT : Insulated Gate Bipolar Transistor



5-Level Main Circuit

GCT Drive : TMdrive-XL85 / XL80

- **Rated Single Unit Capacity** : 30MVA (XL85), 15MVA (XL80)
- **Maximum Capacity** : 120MVA (XL85), 30MVA (XL80)
- **Rated Output voltage** : 7.2kV (XL85), 3.8kV (XL80)
- **Line-side converter** : 36-pulse Diode rectifier (XL85), 24-pulse Diode rectifier (XL80)
- **Inverter** : 5-level PWM inverter (XL85), 3-level PWM inverter (XL80)
- **Cooling method** : Water-cooled
- **Maintenance** : Front access only (XL85), Front and rear access (XL80)
- **Redundancy (option)** : Main and/or control circuit (XL85),
- **Motor type** : Induction motor Synchronous motor
- **Applications** : Large capacity Compressor/Fan /Blower and Pumps (XL85 / XL80), Extruder/Mixer (XL80)

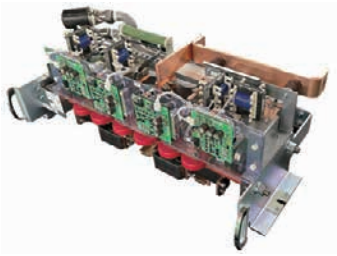
GCT (6kV-6kA) World Largest Medium Voltage Rated Device

GCT Power Module

IEGT Drive : TMdrive-XL75 / XL70

- **Rated Single Unit Capacity** : 15MVA/23MVA (XL75), 4MVA/6MVA/9MVA/11MVA (XL70)
- **Maximum Capacity** : 92MVA (XL75), 22MVA (XL70)
- **Rated Output voltage** : 6.6kV (XL75), 3.65MVA (XL70)
- **Line-side converter** : 36-pulse Diode rectifier (XL75), 24-pulse Diode rectifier (XL70)
- **Inverter** : 5-level PWM inverter (XL75), 3-level PWM inverter (XL70)
- **Cooling method** : Water-cooled
- **Maintenance** : Front access only
- **Redundancy (option)** : Main and/or control circuit (XL75 only)
- **Motor type** : Induction motor Synchronous motor
- **Applications** : Large capacity Compressor/Fan /Blower and Pump

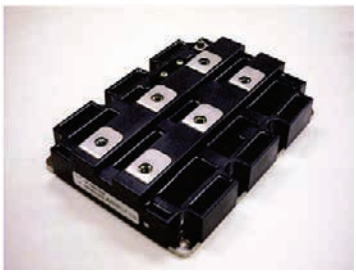
IEGT Power Module (23MVA)



IEGT Power Module (15MVA)

IGBT Drive : TMdrive-XL55

- **Rated Single Unit Capacity** : 7.2MVA
- **Maximum Capacity** : 14.4MVA
- **Rated Output voltage** : 6.6kV
- **Line-side converter** : 36-pulse Diode rectifier
- **Inverter** : 5-level PWM inverter
- **Cooling method** : Water-cooled
- **Maintenance** : Front and rear access
- **Redundancy (option)** : Control circuit
- **Motor type** : Induction motor Synchronous motor
- **Applications** : Compressor/Fan/Blower/Pump



IGBT (4.5kV-0.9kA)

Type		55	70				75		80	85
Rating	Output Capacity (MVA)	7.2	4	6	9	11	15	23	15	30
	Max. Capacity (MVA)	2x7.2	2	2x6	2x9	2x11	4x15	4x23	2x15	4x30
	Output Voltage (kV)	6.6	3.65				6.6	6.6	3.8	7.2
	Output Current (A)	636A	633	949	1430	1740	1325	2015	2400	
	Overload	110%-60sec.								
Applicable approx. Motor Power	Induction Motor (MW)	5.7	3.2	4.7	7.1	8.7	11.9	18.3	12.5	23.8
	Synchronous Motor (MW)	6.4	3.5	5.3	7.9	9.7	13.2	20.3	13.9	26.5
Power Device		IGBT	IEGT						GCT	
Cooling method		water-cooled								
Main Circuit Topology		5-level	3-level				5-level		3-level	5-level
No. of Input pulse		36	24				36		24	36
Harmonics		Comply IEEE519 without harmonic filter								
Input Voltage	Main circuit (kV)	Flexible by isolation transformer								
	Aux. circuit								Same as control circuit	
	Control circuit	380, 400, 440, 460, 480, 575, 690V (50/60Hz)								
Permissible fluctuation	Voltage (%)	+/-10								
Output frequency (*1) (Hz)		Max. 250	66				Max. 250		Max. 200	
Control method		V/f constant, open-loop								
Communication protocol (option)		DeviceNet, Profibus-DP, Modbus-TCP/IP or IS-bus								
Redundancy	Main	–	–				Max. 3+1		–	Max. 3+1
	Control	1+1								
Panel Dimensions (*6)(*7)	Width (mm)	5700	6300		4400	4700	10200		6000	14100
	Height (mm)	2350								
	Depth (mm)	1740	700		1800		1300		1800	
Approx. Weight (*6) (kg)		6800	4850		6750	7350	13860	14800	10000	23150
Heat dissipation in air (kW)		6	6		15	22	15	20	25	30
Cooling water temperature		32 (*4)	32 (*4)				40 (*4)			
Cooling water q'ty (L/min)		111	145		250		460		550	1100
Enclosure	Maintenance access	Front/ Rear	Front only						Front/ Rear	Front only
	Degree of Protection (*5)	IP31 (Indoor)								
Cable entry direction	Main	Bottom (*2)							Top (*3)	Bottom (*2)
	Control	Bottom								
Ambient conditions	Temperature	0 to 40°C (Max. 45°C with derating)								
	Relative humidity	5 to 95% (no dew condensation)								
	Altitude	Up to 1000m (Derated at higher altitude)								
	Vibration	0.5G or less (10 to 50Hz)								

Remarks: (*1) Output current will be reduced at higher frequency
(*2) Top entry is available as option
(*3) Bottom entry is available for output as option
(*4) Output current will be derated with higher temperature
(*5) IP42 is available for as option
(*6) Excluding dimensions and weight of exciter panel
(*7) Include standerd cooler panel

Arc Flash protection for safety

TMdrive-XL75 is certified by type test of internal arc performance according to IEC 62271-200, 2011.
The front doors are equipped with louvers and flappers at the top so that the arc will be exhausted only upwards.

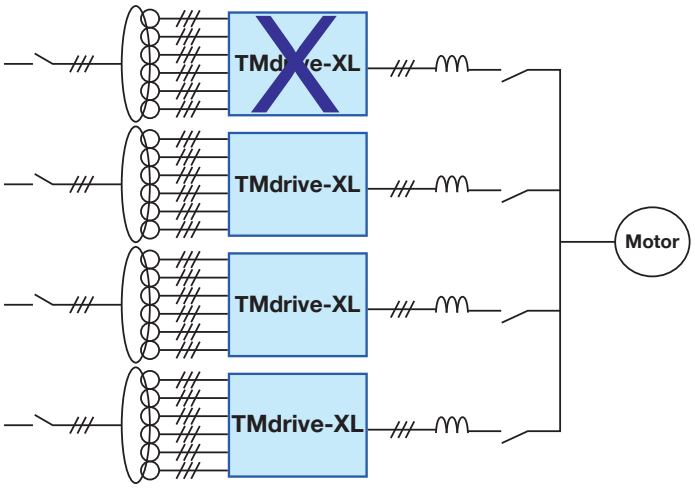
Mechanical door interlock system for personnel safety

The doors of the medium voltage panels are equipped with a key interlock which ensures that a door cannot be opened as long as the main circuit breaker is closed.
The interlocking system operates in conjunction with the grounding switches and the mechanical interlock from the main circuit breaker.
The interlocking system ensures that the main power cannot be closed to the converter until all doors have been closed and the grounding switches have been turned to position “not grounded”.
The interlocking system also ensures that the doors of the medium voltage panels cannot be opened until the DC link capacitors have been discharged and the grounding switches have been turned to position “grounded”.
The doors of the control and cooling panels are not part of the interlocking system and can always be opened.
A key exchange box is provided in the door of the control panel.

DC-link earthing switch for safe grounding

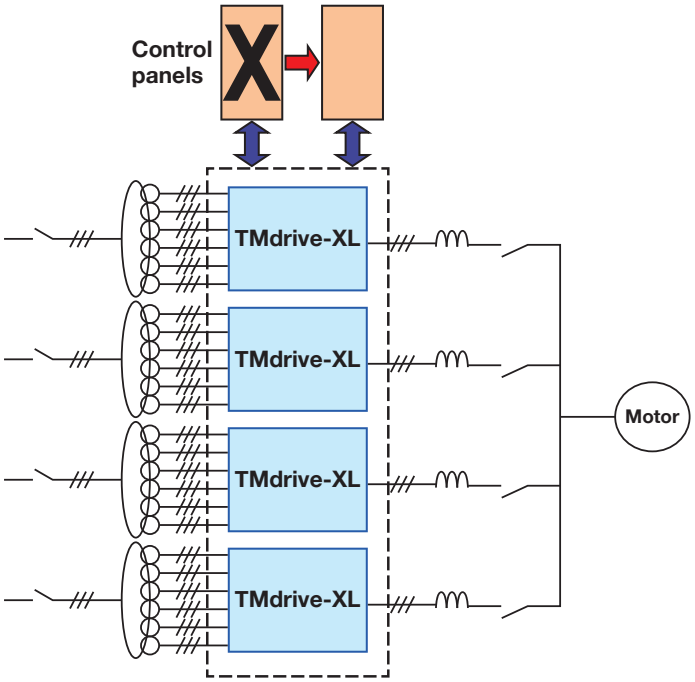
Each converter panel is equipped with a grounding switch.
The switch connects the DC link to ground. The grounding switch is mechanically interlocked.
The switches can only be actuated if a key is inserted on the door of the converter.
The switches are manually operated by means of a removable lever.
The “grounded”, “ungrounded” position is indicated as the position of the lever.

Main Circuit Redundancy (XL75 / 80 / 85 only, need additional panel)



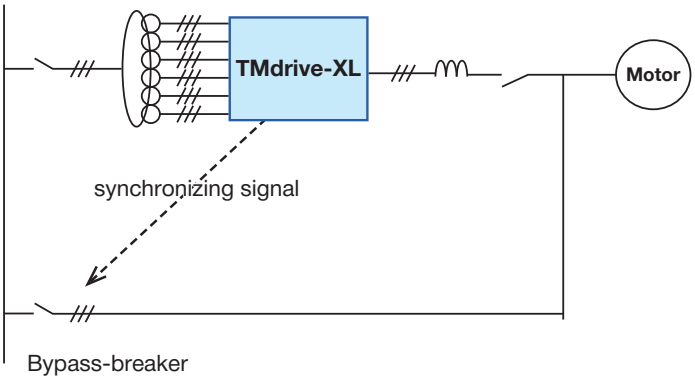
1) 1, 2, 3, & 4 banks of main inverters operation
2) In case of failure on main circuit, the failed inverter is tripped
3) The healthy inverters return to operation immediately
4) Continue operation

Control Circuit Redundancy (XL55 / 75 / 80 / 85 only, need additional panel)



1) One or multiple banks of main inverters operation
2) In case of failure on normal control panel, the normal control panel is tripped
3) Switch control panel from normal to stand-by
4) Continue operation

Soft Start system



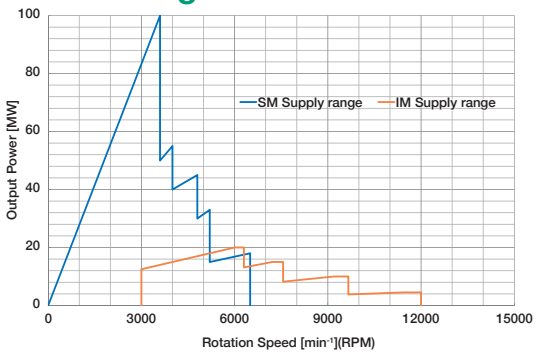
1) Accelerate up to the rated frequency by VSD
2) To adjust the output voltage and phase angle
3) Bypass-breaker ON operation
4) Soft start completion

High speed, variable speed and large capacity 2-pole motors can drive any kind of compressor in LNG plants, pipeline station or petrochemical industries, in combination with TMEIC inverters.

Benefits

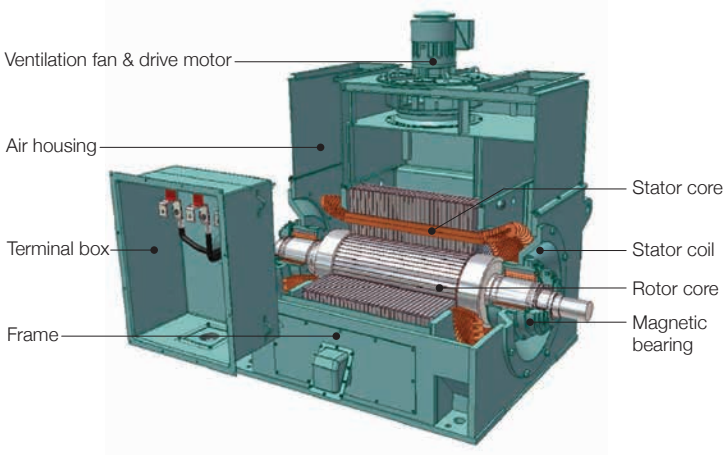
- High reliability proved by extensive experience in air-cooled machine
  - Low noise
  - Advanced VPI insulation system
  - Easy motor enclosure conversion
- Wide output range : Up to 100MW
- High efficiency : Typical 98.5% at 100MW
- Easy operation and maintenance

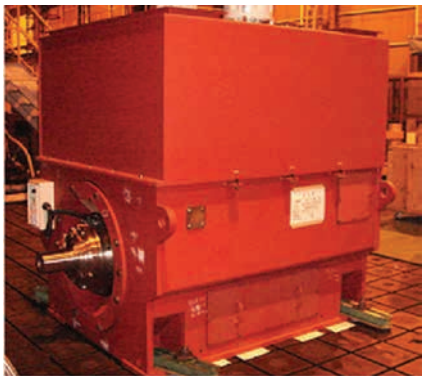
Our offering*



Induction Motor

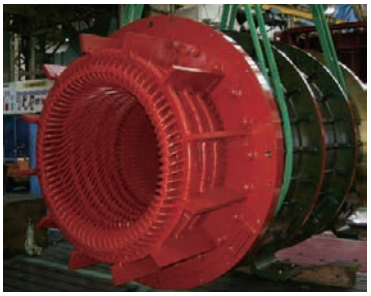
Example of motor construction



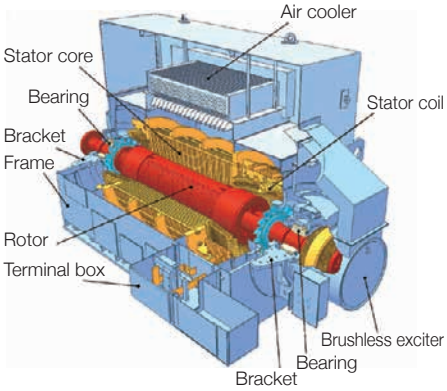


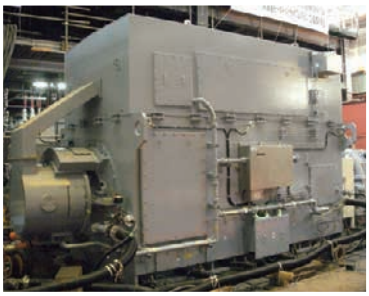
8MW-10000min-1 (RPM) IM with Magnetic bearing

Synchronous Motor



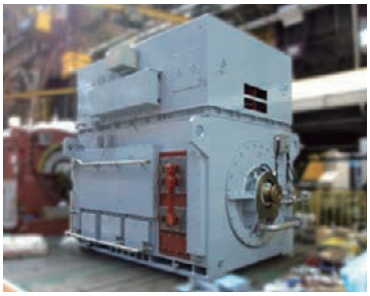
VPI treated Stator Coil





2P 25MW 3600min-1 (RPM) SM

2 pole Cylindrical Rotor



2P 18MW 5200min-1 (RPM) SM

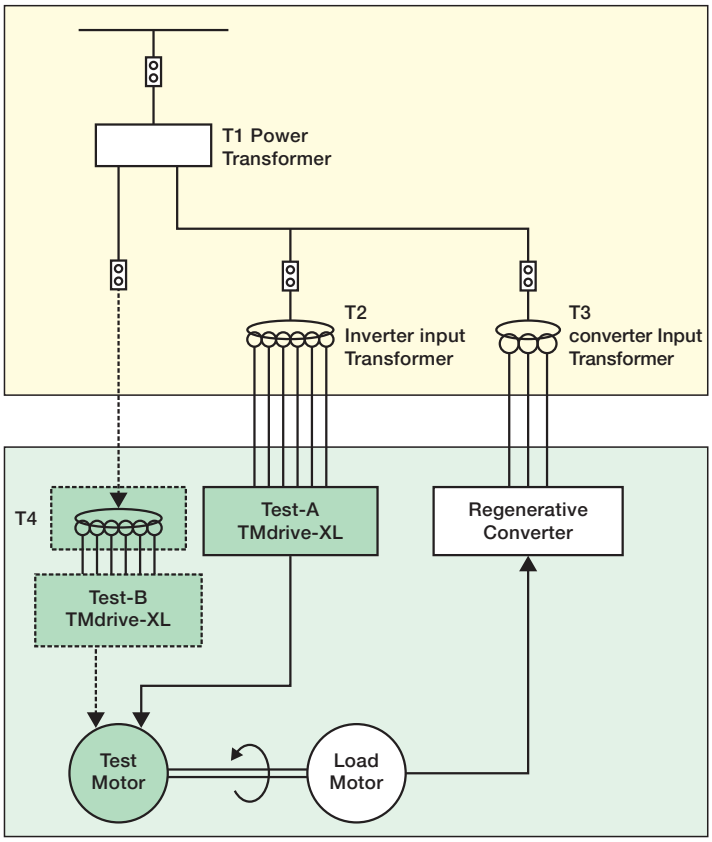
*This is a manufacturer's standard criterion. Actual ratings will depend on system conditions.

Full Load System Test Facility

TMEIC has a new full-load system test facility for large variable frequency drives and high power motors. This facility in Nagasaki factory, provides for a witnessed integrated system test of the project specific transformer, drive, and motor, under full load. Tests can be run with or without the customer's transformer.

This integrated system test minimizes the total project lead time by reducing on-site commissioning work and risks of problems at the site. The factory system tests will:

- Verify system operation, power characteristics, and efficiency
- Verify specifications such as voltage, current, heating
- Measure selected items such as input harmonics and mechanical vibration



Large Drive and Motor Test Facility Block Diagram

Test Facility External Equipment

- Power transformer
- Inverter transformers
- Medium voltage cubicles
- Water cooling tower

Test Facility Indoor Equipment

- Regenerative converter
- TMdrive-XL inverter under test
  (not shown, to be installed upper side of deck)
- Motor and generator (not shown)

Innovative drive system

- Liquefied Natural Gas compressor
- Gas pipeline compressor
- Industrial compressors
- Propulsion systems
- Blowers and fans
- Pumps

Superior benefits

- Increased Plant Availability
- Design Flexibility
- Increased Thermal Efficiency
- Reduced EPC schedule
- Improved Safety
- Reduced CO_2 Emissions
- Harmonic Free
- Low operating Cost
- Flexible input Voltage
- Wide Controllable Speed Range

TMEiC

We drive industry

TMEIC Corporation

Web: www.tmeic.co.jp

Contact URL https://www.tmeic.com/contact-us

To users of our inverters:

Our inverters are designed to control the speeds of three-phase induction motors and synchronous motors for general industry.

PRECAUTIONS

- Read the entire “Instruction Manual” carefully for important information about safety, handling, installation, operation, maintenance, and parts replacements.
- When using our inverters for equipment such as nuclear power control equipment, aviation and space flight control equipment, traffic equipment, and safety equipment, and there is a risk that any failure or malfunction of the inverter could directly endanger human life or cause injury, please contact our headquarters, branch, or office printed on the front and back covers of this catalogue. Such applications must be studied carefully.
- When using our inverters for critical equipment, even though the inverters are manufactured under strict quality control, always fit your equipment with safety devices to prevent serious accident or loss should the inverter fail (such as failure to issue an inverter trouble signal).
- Do not use our inverters for any load other than three-phase induction motors, and synchronous motors.

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