

IGBT Rectifier for Hydrogen Production

Features

- Standardized development of the IGBT rectifier for hydrogen production has been completed and the products released

Features

- Free of harmonic waves

The amount of harmonic current generated is significantly reduced through the incorporation of the PWM converter circuit.

Expensive harmonic filters and highly specialized harmonic engineering, such as harmonic analyses, are not required.

- Low direct current ripple

The amount of direct current ripple (pulsation) is significantly reduced, through the implementation of the IGBT chopper circuit.

The impact on the electrolytic cell by the ripples is minimized.

- High power factor

Operation with a power factor of 99% or higher is possible, irrespective of the operating point, through the utilization of a PWM converter.

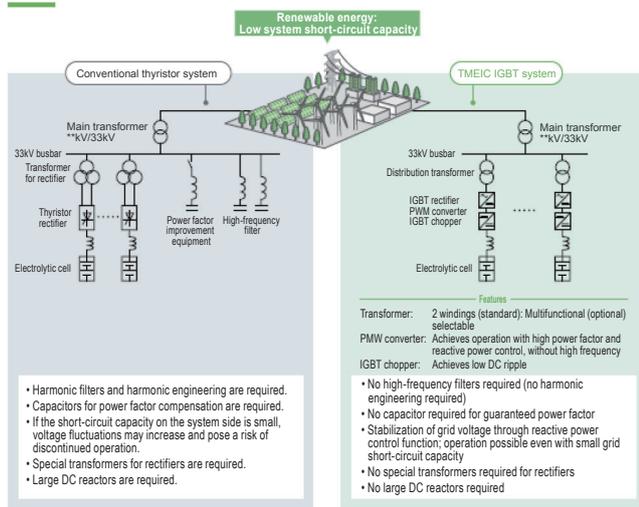
Comparison between the thyristor system and the IGBT system

IGBT rectifier for hydrogen production

- High efficiency
- High power factor
- No high frequency
- Low DC ripple

	Conventional thyristor system	TMEIC IGBT system
Main circuit configuration		
Efficiency	○	○
Power factor	× (0.85 or less)	○ (0.99 or more)
High frequency	×	○
DC ripple	× (20% or more)	○ (5% or less)

Comparison of overall systems



- High power factor

High efficiency is attained through the incorporation of high-performance IGBT elements and with the cutting-edge main circuit control technology.

Issues relating to power quality, such as power factor and harmonics, are important topics that can potentially lead to unexpected project delays and cost increases in green hydrogen projects.

Our IGBT rectifiers achieve power factor improvements and harmonic suppression at a high level. These contribute to the success of projects, by reducing the risks of project delays and additional costs.

Overview & Principles

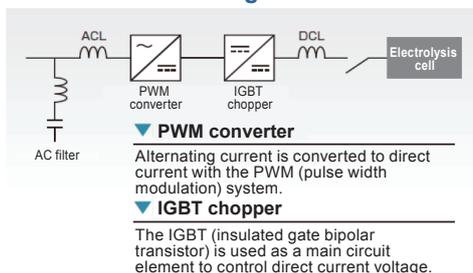
- Standardized development of IGBT rectifier, for hydrogen production, has been completed and the products released

The product lineup includes three products, Type 11, Type 12 and Type 22. The modular design is utilized, with the number of the PWM converters and IGBT chopper units adjusted, to respond to voltages and current ratings of various electrolytic devices (such as alkali, PEM, SOEC and the like).

PWM IGBT converters: Technologies incorporated with the PV-PCS are applied

IGBT choppers: Technologies implemented with the UPS are applied

Basic circuit configuration



Standard specifications

	Type 11	Type 12	Type 22
AC input specifications	50 / 60Hz, AC 420V / 440V +/- 10%		
Direct current output voltage	DC 100-720V		
Rectification system	PWM (IGBT) converter + IGBT chopper		
Power factor	0.99 or higher		
Harmonic wave	Harmonic guidelines, compliant with IEEE 519		
Direct current ripple	5% (rms) or less (at rated point)		
Control system	Constant current control		
Cooling system	Main circuit elements: water cooling; other main circuit components: air-cooling		
Ambient temperature	5 - 40°C		
Humidity	85% or below (no condensation)		
Altitude	1000 m and below		
Installation location	1	1	2
PWM converter panels - number of panels	1	2	2
IGBT chopper panels - number of panels	1800kW	1800kW	3600kW
DC output capacity (maximum)	3.75kA	7.5kA	7.5kA
DC output current (maximum)	Three-phase 200 VAC	Three-phase 200 VAC	Three-phase 200 VAC
Auxiliary power supply (please provide)	Cold air fan Pure water cooling system	Single-phase 200 VAC (UPS)	Single-phase 200 VAC (UPS) Single-phase 200 VAC (UPS)

■ Special Notes

TMEIC provides various solutions that are intended for realizing a hydrogen society. Solutions necessary for a carbon neutral society are also offered, aside from IGBT rectifiers, for the manufacture of hydrogen.

Solutions from TMEIC for realizing a hydrogen society



SOLAR WARE power conditioner for solar power generation



TMEIC has a track record of delivering world class highly efficient 50kW-class photovoltaic power conditioners, domestic and internationally, contributing to the sustainable expansion of renewable energy.

Large-scale battery storage system TMBCS



TMEIC has an extensive track record as a system integrator for large-scale storage battery systems, domestically and internationally, ranging in contributions from the effective use of renewable energy to the adjustment and stabilization of supply and demand for power.

IGBT rectifier for hydrogen production

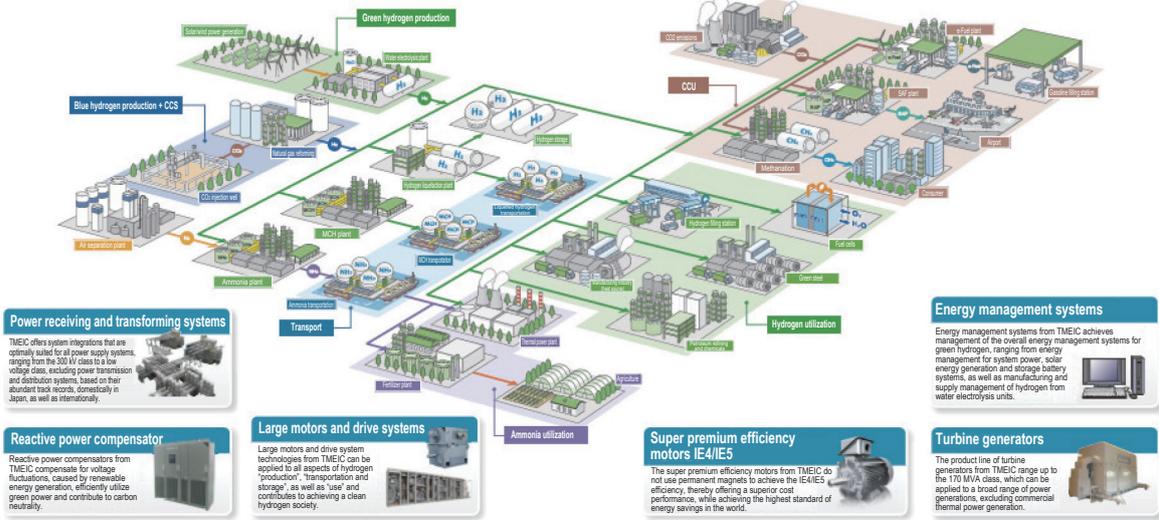


The IGBT rectifiers for hydrogen production from TMEIC is an optimal solution for green hydrogen production, by achieving "harmonic-free", "low DC ripple", "high power factor" and "high efficiency" to minimize stress on electrolytic cells and impact on the power system.

Motors for hydrogen compressor



The motors for the hydrogen compressor from TMEIC offer a broad range of options, from small 37 kW-class units to large units that exceed 10 MW, offering the optimum fit for hydrogen compression systems, with a variety of products that range from standard to customized models.



Power receiving and transforming systems



TMEIC offers system integrations that are optimally suited for all power supply systems, ranging from the 300 kV class to a low voltage class, excluding power transmission and distribution systems, based on their abundant track records, domestically in Japan, as well as internationally.

Reactive power compensator



Reactive power compensators from TMEIC compensate for voltage fluctuations, caused by renewable energy generation, efficiently utilize green power and contribute to carbon neutrality.

Large motors and drive systems



Large motors and drive system technologies from TMEIC can be applied to all aspects of hydrogen "production", "transportation and storage", as well as "use" and contributes to achieving a clean hydrogen society.

Super premium efficiency motors IE4/IE5



The super premium efficiency motors from TMEIC do not use permanent magnets to achieve the IE4/IE5 efficiency, thereby offering a superior cost performance, while achieving the highest standard of energy savings in the world.

Energy management systems



Energy management systems from TMEIC achieves management of the overall energy management systems for green hydrogen, ranging from energy management for systems power, solar energy generation and storage battery systems, as well as manufacturing and supply management of hydrogen from water electrolysis units.

Turbine generators



The product line of turbine generators from TMEIC range up to the 170 MVA class, which can be applied to a broad range of power generations, excluding commercial thermal power generation.

Track Record or Implementation Plans

The year 2030 has been set as the year to establish the first targets of carbon neutral measures in principal countries and regions, while the target for hydrogen related measures of principal countries is also set for the year 2030. The water electrolysis market is in its early stage (demonstration phase) however, it is expected to grow rapidly in the future. We are capable of responding to mass production requirements, once the water electrolysis market grows rapidly, since we have the world's top class manufacturing capabilities utilizing power electronics technologies.

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