

# Frequency Converter System (M-G Set)

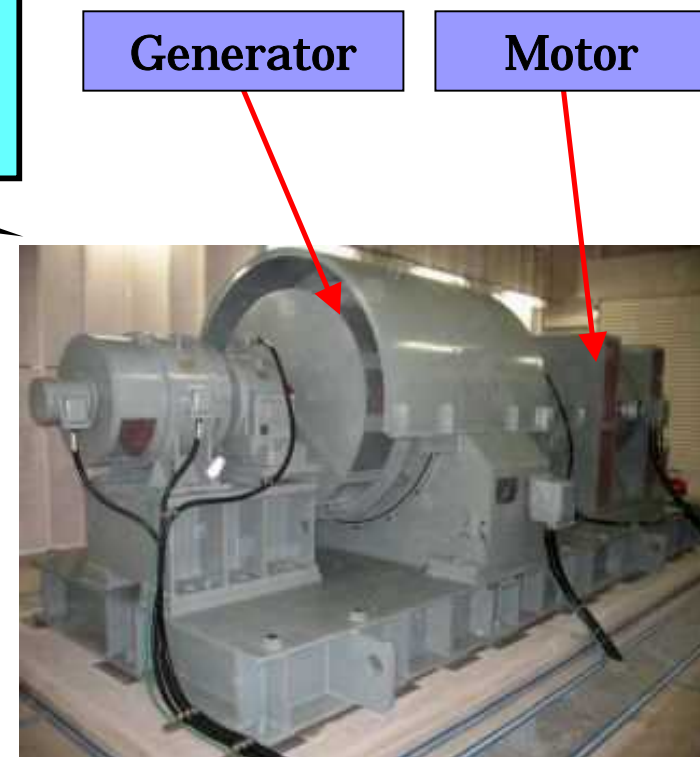
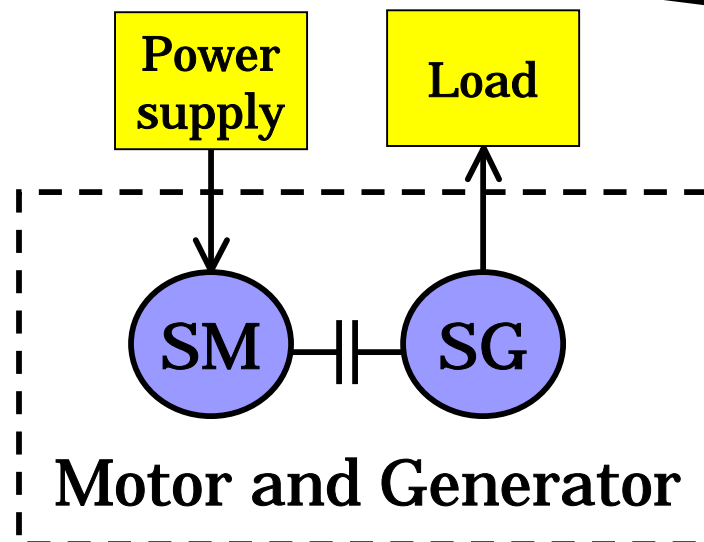
**NISHISHIBA ELECTRIC CO.,LTD.**

## What is the M-G set?

A device that converts electrical energy to rotary energy by using its motor and converts rotary energy to electrical energy by using its generator

Various combinations of motor with generator enable supply of special power supply (frequency conversion and voltage conversion) and stable power supply.

This is the M-G set.  
It converts frequency or voltage according to its use.



## Uses of the M-G set

### 1 As a 50/60 Hz convertible power supply

When a 60 Hz (50 Hz) power supply is necessary in a 50 Hz (60 Hz) region

#### Factory power supply

If the commercial power supply is different from the power supply frequency of the factory equipment

Example: When 60 Hz (50 Hz) equipment is brought into a 50 Hz (60 Hz) region

### 2 As a variable frequency power supply

When you need a power supply that changes frequency according to the use

Combining the motor with an inverter enables adjustment to a wide range of frequencies.

### 3 As a variable voltage power supply

When you need a power supply that changes voltage according to the use

A special design enables adjustment to a wide range of voltages.

#### Onboard power supply

Power supply to ships (60 Hz) tied up at a port in a 50 Hz region

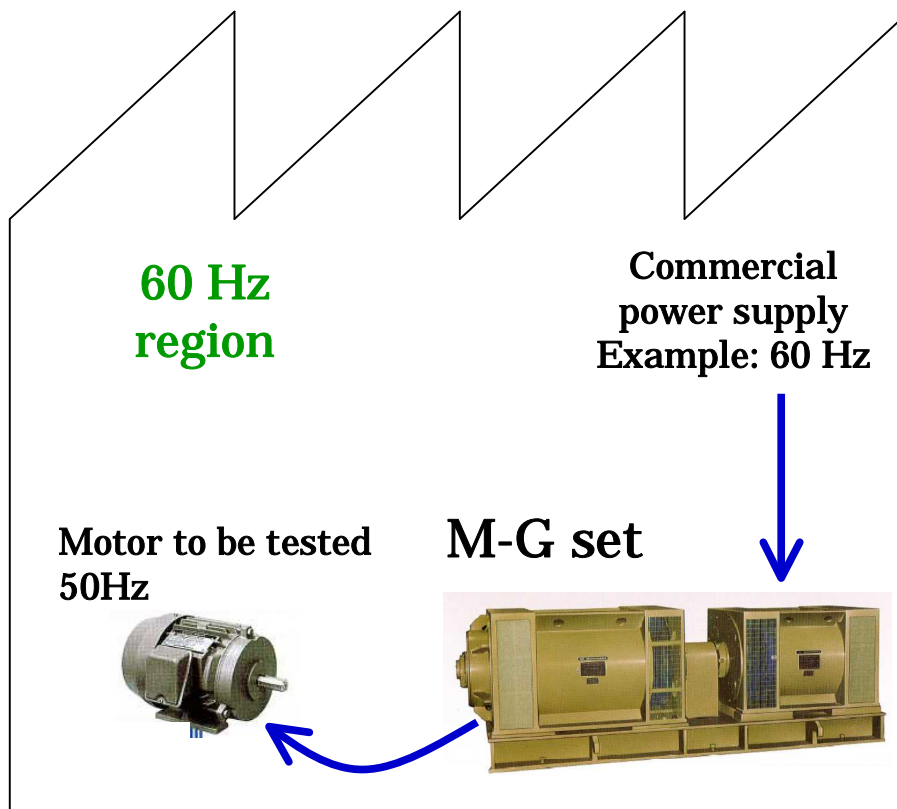
#### Test power supply

Used as a test power supply for induction motors, fans, transformers, pumps, controllers, home electronics (such as washing machines and air-conditioners), and other equipment

Example: When frequency or voltage needs adjustment in a product test

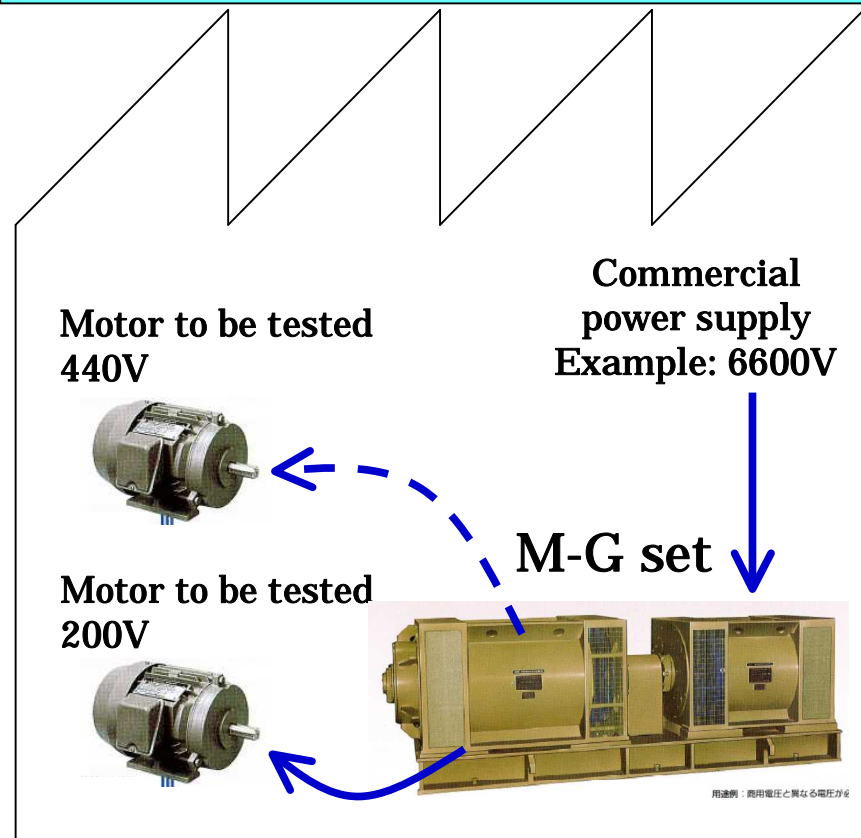
## As a test power supply for motors and other equipment

Used as a power supply for testing motors and other equipment having a different frequency



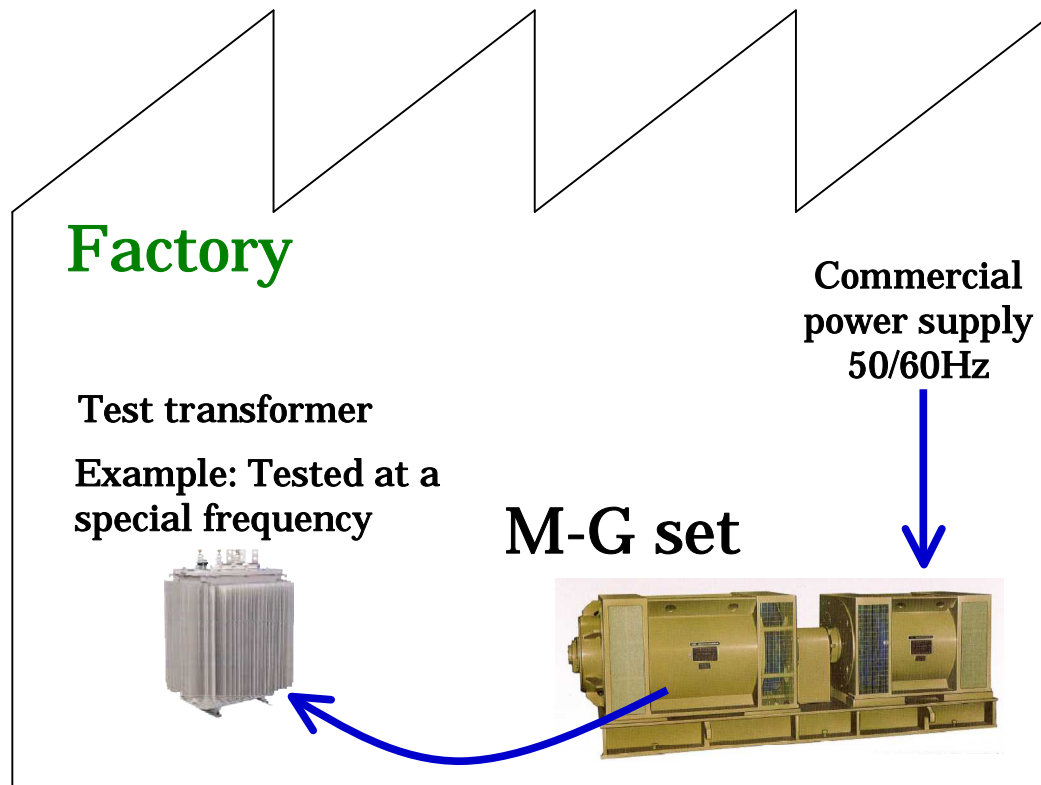
Applied also as a test power supply for controllers and other equipment

Used as a power supply for testing motors and other equipment having a different voltage



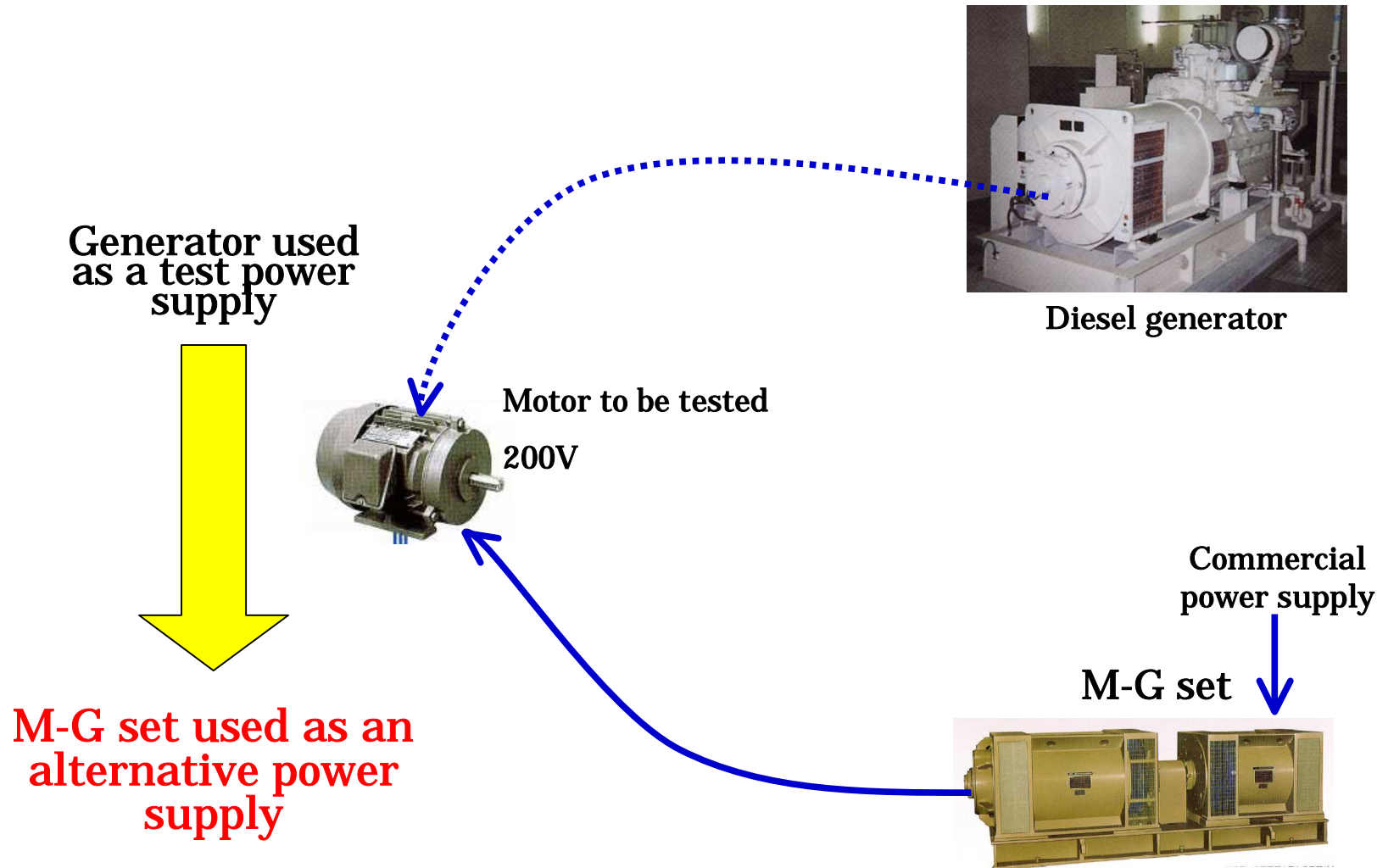
## As a special frequency power supply

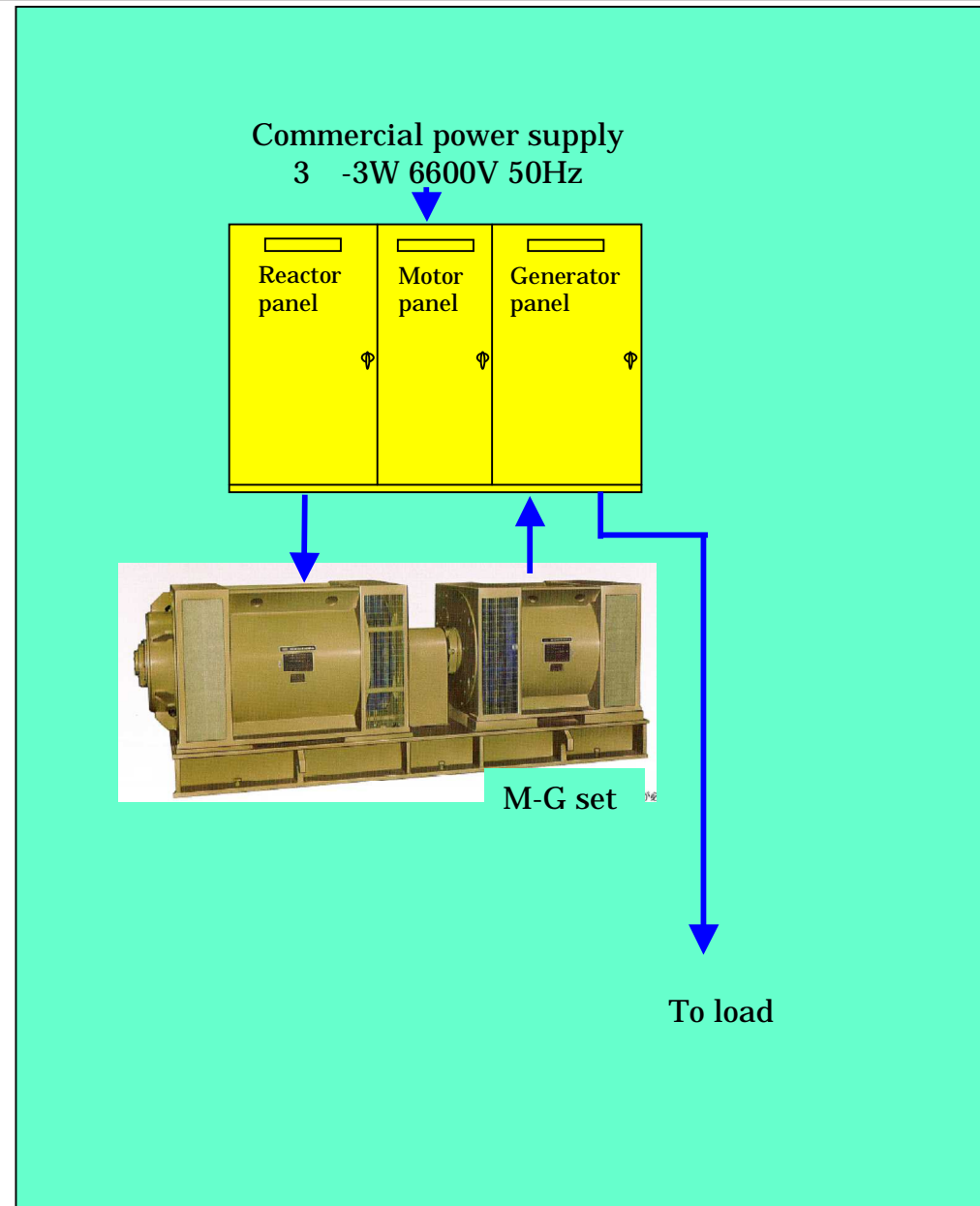
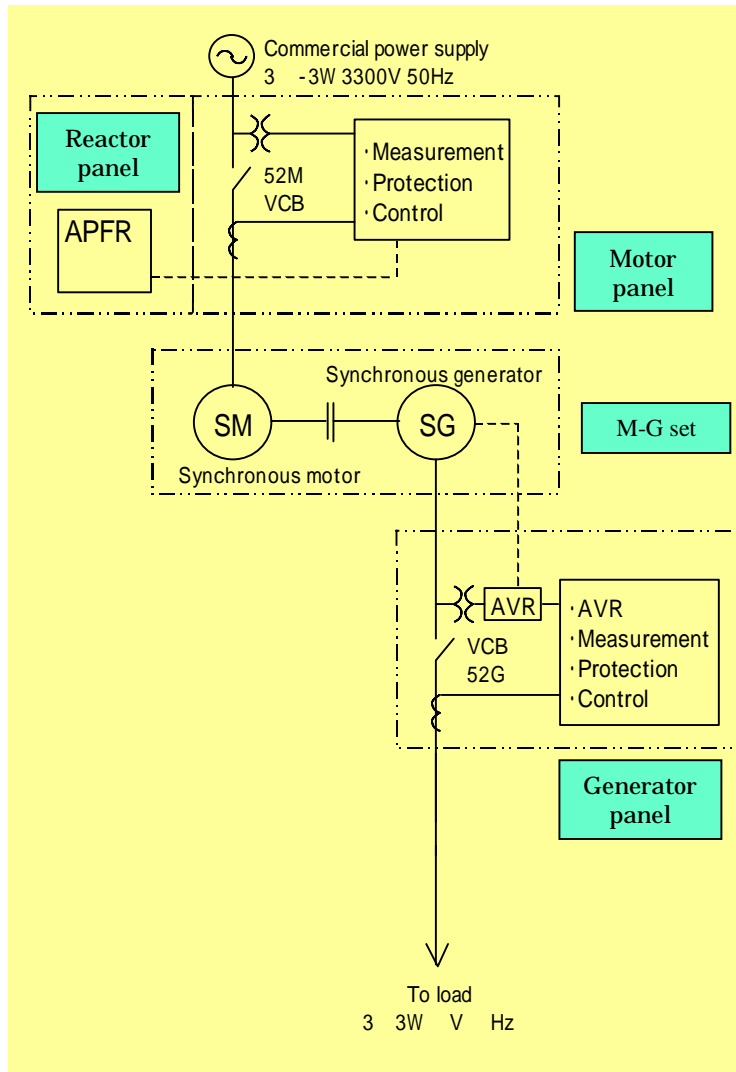
Used as a test power supply for transformers

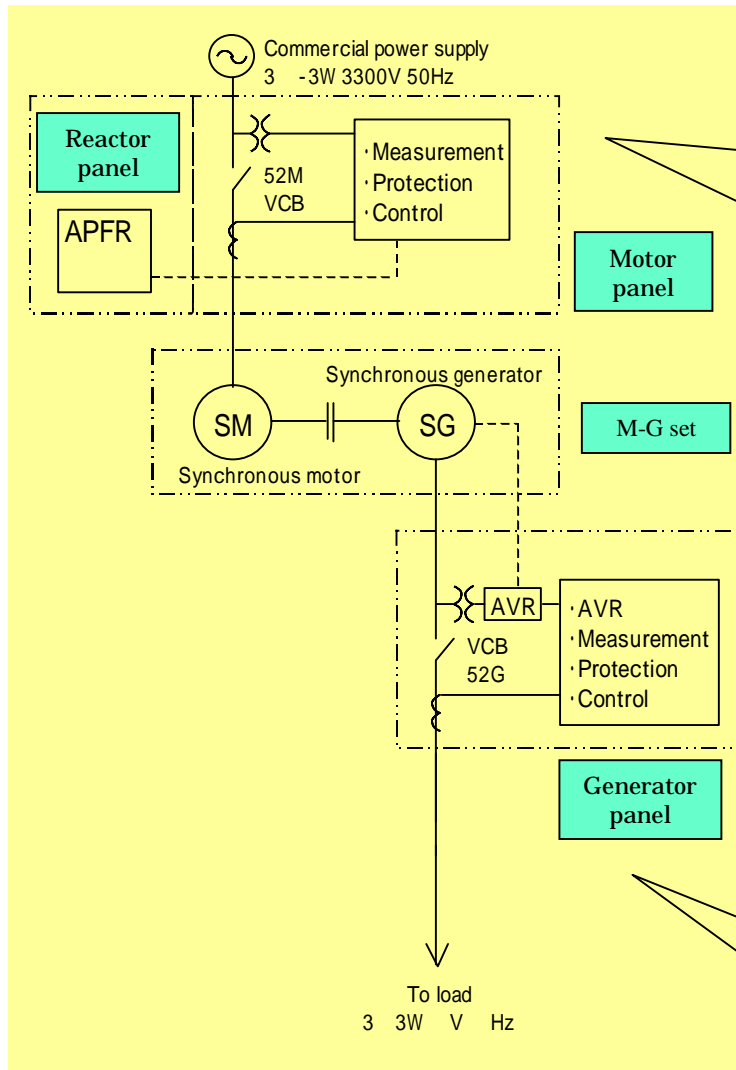


(Applied as a variable frequency power supply, etc.)

## Alternative use of a diesel generator



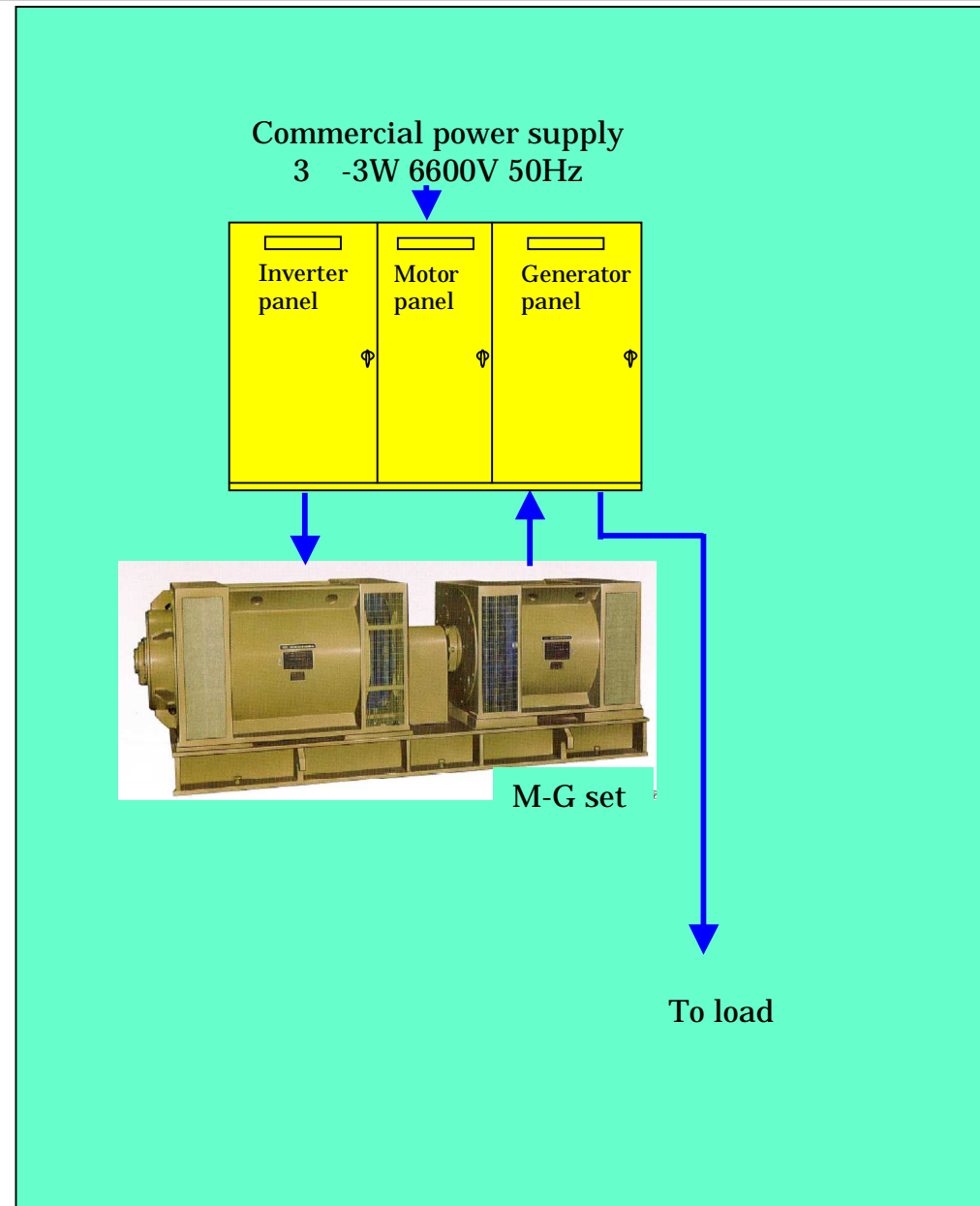
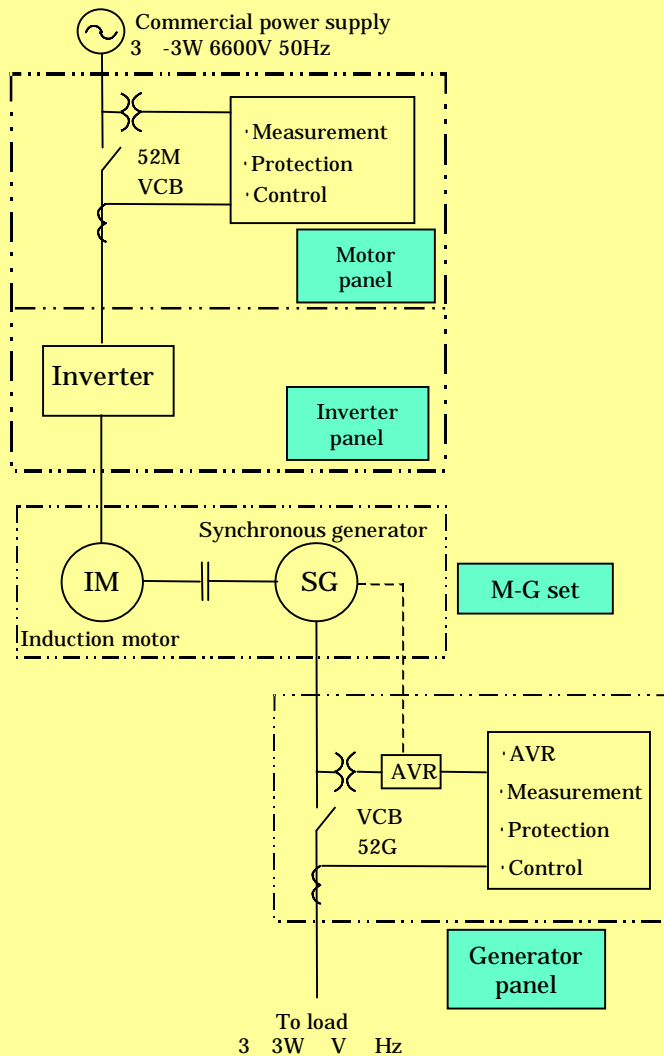


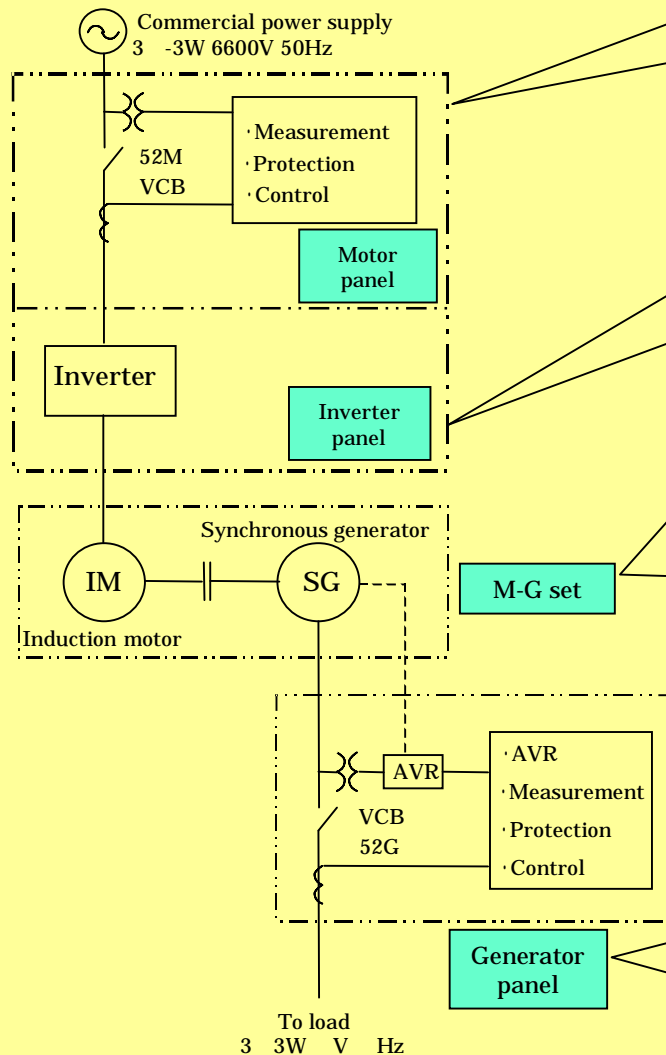


**Motor panel, reactor panel**  
 They incorporate a starting circuit, protective circuit, and measurement circuit for motors.  
 They also incorporate an automatic power factor regulator (APFR) as well.

**M-G set (synchronous motor - synchronous generator)**  
 The synchronous motor can adjust the field current, thereby controlling the operating power factor.  
 The M-G set uses a synchronous motor (10-pole) and a synchronous generator (12-pole), so that the output frequency of the generator can be kept at 60 Hz unless the frequency of the input power supply of the motor changes.

**Generator panel**  
 The automatic voltage regulator (AVR) is used to control the output voltage of the generator at a constant level.





**Motor panel**

It incorporates a starting circuit, protective circuit, and measurement circuit for motors.

**Inverter panel**

It converts the commercial power supply input by using an inverter and changes the motor speed.

**M-G set (induction motor - synchronous motor)**

It uses an induction motor and a synchronous generator.

It can convert the frequency of the input power supply of the motor by using an inverter, thereby changing the output frequency of the generator.

**Generator panel**

It uses an automatic voltage regulator (AVR) to control the output voltage of the generator at a constant level at all times.

## Characteristics of Nishishiba's M-G set

- The company has numerous good results and high durability and reliability as a manufacturer specializing in rotors.
- The set has a neat waveform, so that it allows precise measurement and produces hardly any noise.
- It has a wide setting range in frequency and voltage and is adaptable to specific specifications.



**M-G set**



**Control panel**

## Characteristics of Nishishiba's M-G set

- Many results as a manufacturer specializing in rotors!  
Experience of delivering about 200 sets and know-how accumulated over 40 years

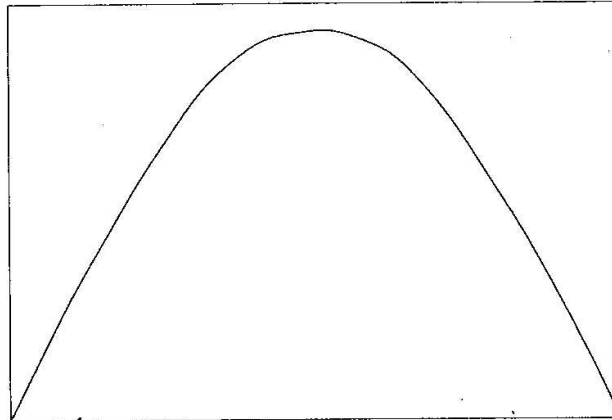
### Coping with a wide range of systems

<b>Capacity</b>	<b>: up to 10,000 kVA</b>
<b>Output voltage</b>	<b>: up to 13,800 V</b>
<b>Output frequency</b>	<b>: up to 400 Hz</b>

## Voltage waveform of generators

The output voltage waveform of the synchronous generator is a neat sine wave and does not include harmonics.

- Example of measurement of a no-load voltage waveform



- Properties: Waveform distortion, 5% or less

## Overload resistance and short-circuit current

The generator is of the rotary type, so that it has high overload resistance and can supply power to loads that need large starting currents such as those from motors.

- Overload resistance : 110% - 60 minutes
- Over-current resistance : 150% - 15 seconds

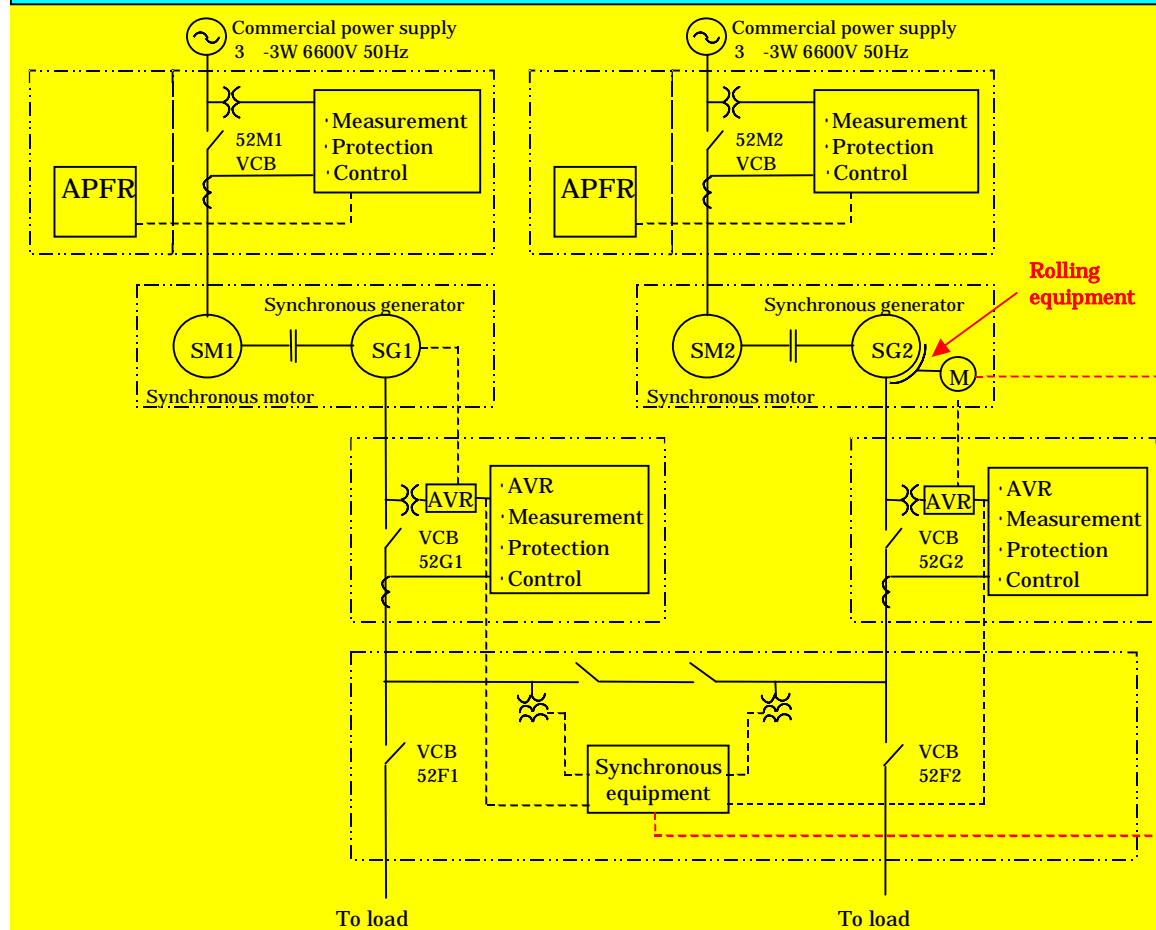
**Other properties (characteristics)**

<b>Item</b>	<b>Properties and characteristics</b>
<b>Installation conditions</b>	<p>It can be used under general conditions with an ambient temperature of -5 to 40 ° C and a humidity of 85% or less. Therefore, although air supply and ventilation equipment in consideration of temperature rises is necessary, no air-conditioning equipment is necessary.</p>
<b>Instantaneous voltage drop</b>	<p>Even if an instantaneous voltage drop occurs in the commercial power supply system, the flywheel effect of the rotor keeps the load side unaffected.</p> <p>A flywheel can be added to extend the warranty period of instantaneous voltage drops.</p>
<b>Harmonics</b>	<p>The output side uses no inverter or other harmonics-generating equipment, so that the load side is completely protected from the effects of harmonics.</p>

## Parallel operation of the M-G set

If there is a great change in the load capacity of the customer, several units can be installed and the number of units used can be switched over to ensure an efficient operation.

### Example of connecting a single unit when two units are operating in parallel



To run two or more generators synchronously, the voltage, frequency, and phase must be matched and the units must be electrically linked together. But the input is a commercial power supply, so that a device (rolling equipment) must be installed to rotate the generator stator in order to adjust the phase difference.

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