Mitsubishi Electric Corporation

# General-Purpose Inverter

## Features

- The advanced optimal excitation control (*1) has made possible large starting motor torque while maintaining the energy-saving effects realized by the conventional optimal excitation control.
- Functions optimal for the use with fans and pumps, such as a function to maintain operation during instantaneous power failure and PID control are included.
- Its capacity to control not only general-purpose motors, but also PM motors allows it to meet further needs for energy saving.
- The motor constants for the high-performance energy-saving motor (SF-PR series), premium high-efficiency IPM motor (MM-EFS series) and synchronous reluctance motor (RF-SR series) (*2) are built in, allowing energy-saving operations simply by setting parameters.
- The off-line auto-tuning function allows operation of motors with the optimal operating characteristics when motors of other manufacturers are used or wiring is long.
- "The self-power management" operated with an external DC 24 V power supply enables reduction of standby power consumption.
- "Multiple ratings," which allow selection of a rating in accordance with the load of fans and pumps, enable selection of an inverter with the optimal capacity for a motor to be used.
- The trace function can import data which occurred during operating troubles into a PC via a USB memory device and the trouble can be analyzed.
- The reliability has improved by increasing the lifespans of parts which have fixed lifespans and with the lifespan diagnosis function.
- The use of a 5-digit 12-segment LED display on the standard control panel enables an easy-to-understand display.

*1 Achieved with the combination of the advanced magnetic flux vector control and the optimal excitation control
*2 Compatible only with synchronous reluctance motor drive inverters (FR-A800-SYN, FR-F800-SYN)

## Basic Outline and Theory

(1) Increased energy-saving due to optimal excitation control
The power consumption of loads with a squared relation between rotation speed and load, such as fans and pumps, is proportional to the rotational speed cubed. Therefore, controlling the rotation speed using an inverter significantly reduces power consumption (Figure 1). With rotation speed control based on an inverter, V/F control, which carries out control so that the voltage and frequency ratio become constant, is common. However, optimal excitation control that controls voltage so that the efficiency of the motor is maximized in order to further increase energy-saving effects was developed. For example, the efficiency of a general-purpose motor (SF-PR four-pole, 15 kW) operated with the optimal excitation control is approx. 15 % higher than the efficiency of the motor operated with the V/F control on the condition that the motor is operated at a load factor of 10 % (Figure 2). Since optimal excitation control is effective during acceleration and deceleration, it is also effective for energy-saving for the purpose of repeating starting and stopping. In addition, the newly developed advanced optimal excitation control realizes generation of large torque by a motor at the start-up while maintaining the motor efficiency achieved with the conventional optimal excitation control unchanged. It enables energy-saving motor operation with short acceleration time and with the motor efficiency at the constant-speed operation maximized without cumbersome adjustment of parameters (such as acceleration/deceleration time and torque boost).

(2) Further energy savings with the synchronous reluctance motor (RF-SR type motor)
The advanced high-efficiency technology reduces the generated loss by 20% in comparison with our SF-PR type motor (IE3), and achieves the efficiency class rating of IE5.
The unit enables conservation of resources by not using any rare earth materials, and a reduction of waste power as this is a highly efficient energy-saving motor.

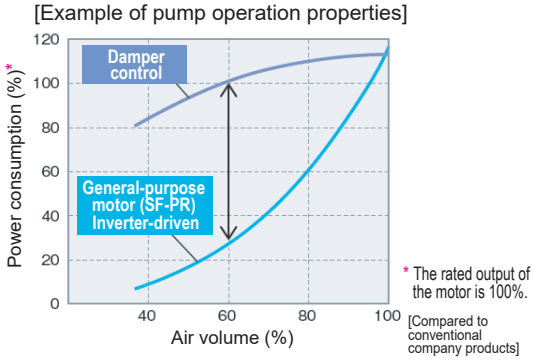



Figure 1: An example of operating characteristics of a blower

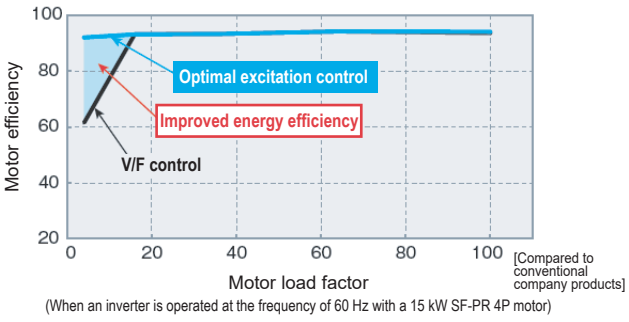
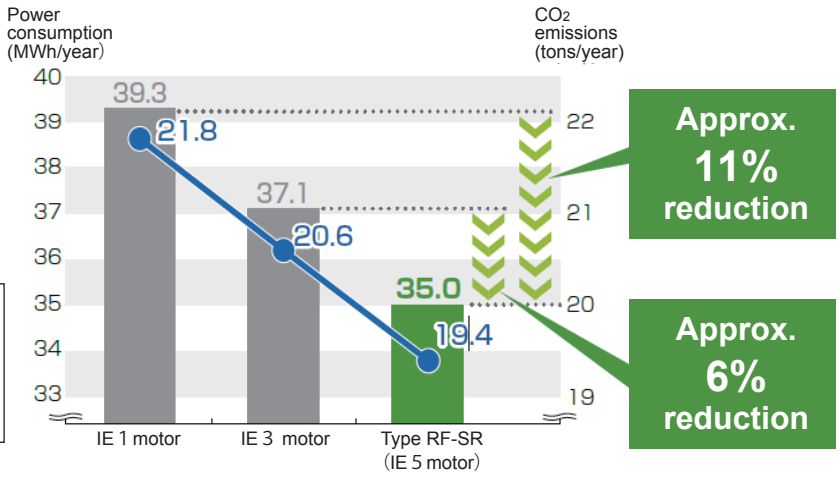



Figure 2: Energy saving with the optimal excitation control

●**Power consumption and $CO_2$ emissions can be reduced, when compared with general IE1 and IE3 motors, by achieving the efficiency class rating of IE5.**

■**Comparison of power consumption (MWh/year) and $CO_2$ emissions (tons/year)**




Calculation conditions

- Load condition 5.5kW/3,000 min
- Operating time 17 hours/day for 335 days
- Inverter efficiency 96.2%
- $CO_2$ conversion factor 0.555kg/kWh

Synchronous reluctance motor
Type RF-SR

Inverter for driving synchronous reluctance motor
FR-A800-SYN
FR-F800-SYN

**Contact:** **Mitsubishi Electric Corporation**
Tokyo Bldg., 2-7-3, Marunouchi, Chiyoda-ku, Tokyo 100-8310
Tel: +81-3-3218-2111
URL: http://www.mitsubishielectric.co.jp/