



General-purpose Inverter

FREQROL

Energy Conservation



A renewed proposal for energy conservation

Energy conservation is an important challenge from the aspect of preserving the global environment and effectively using resources. We are proposing the incorporation of “inverter control” as an optimum measure for promoting and developing energy conservation of air-conditioning fans and pumps, a field in which major energy conservation effects can be anticipated.

Why can energy be conserved with an inverter?

As a means to control the air quantity of a blower, we have considered the case when the air quantity is controlled using an inverter for the motor drive instead of the conventional damper control (discharge side), this is shown in Fig. 1.

The difference between the motor’s power consumption when using damper control and inverter control is shown in Fig. 2. From this graph, we can see that energy conservation of 60% compared to the conventional damper control is attainable using inverter control when the air quantity set at 60%.

For example,

When considering a 30kW motor, if the power rates are 17 yen/kWh, the following values are obtained.

① Damper control

$$30\text{kW} \times 0.9 \times 17 \text{ yen} \times 24 \text{ hrs} \times 365 \text{ days} \doteq 4,020,000 \text{ yen}$$

② Inverter control

$$30\text{kW} \times 0.3 \times 17 \text{ yen} \times 24 \text{ hrs} \times 365 \text{ days} \doteq 1,330,000 \text{ yen}$$

$$\text{①} - \text{②} = \text{Energy conservation effect.....Approx. 2,700,000 yen}$$

This is the amount that can be saved in one year.

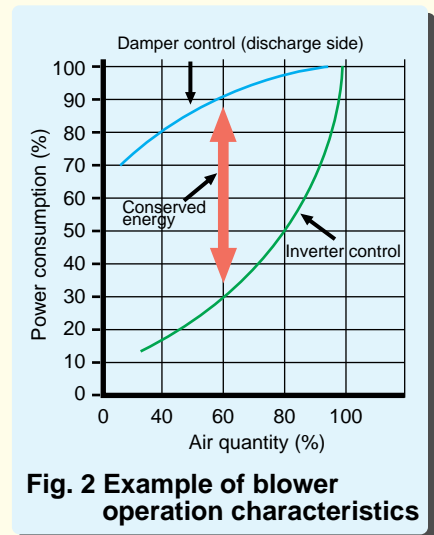


Fig. 2 Example of blower operation characteristics

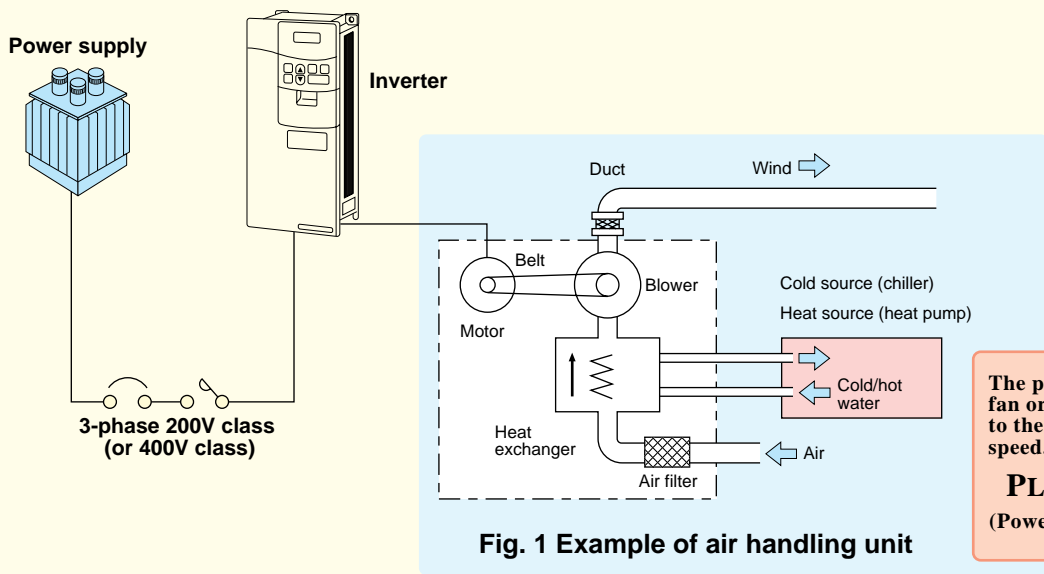


Fig. 1 Example of air handling unit

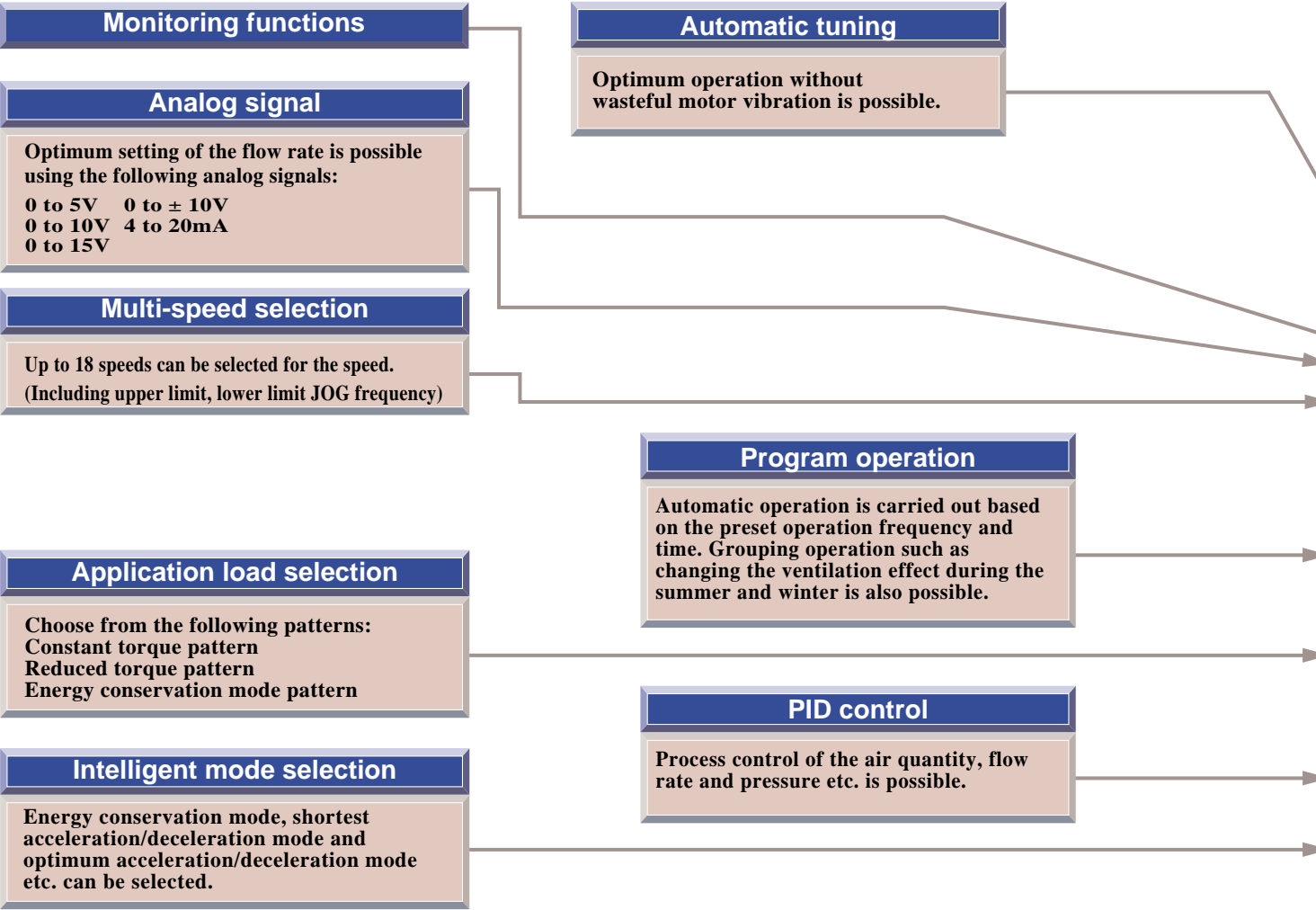
The power required for a fan or pump is proportional to the cube of the rotational speed.

$$P \propto N^3$$

(Power) (Rotational speed)

Energy conservation functions of the Mitsubishi general-purpose inverter **FREQROL-A**

Standard functions



Energy conservation mode

With a conventional general-purpose inverter it is not possible to control the loss of the motor. However, using the energy conservation mode (provided as part of the intelligent operation modes) it is possible to control the inverter output voltage so that the amount of motor loss is at the minimum. This gives even greater energy conservation effects.

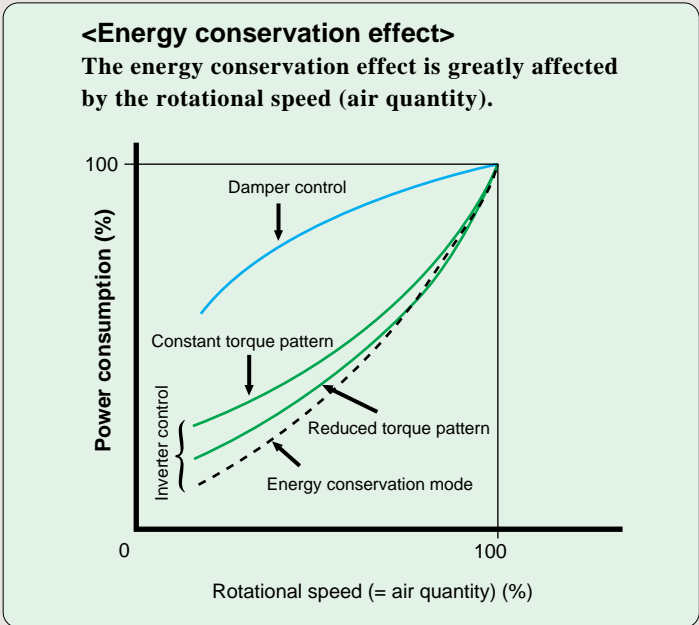


Fig. 3 Energy conservation effect

A500 Series

System compatibility with various built-in options

Commercial changeover sequence

The magnetic contactor sequence used to change between commercial power supply operation and inverter operation is carried out by the inverter.



FR-A5AX

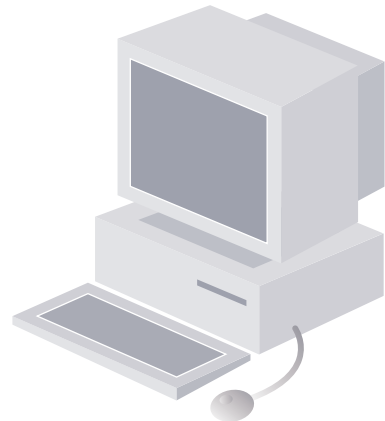
12-bit digital input

FR-A5AY

Digital output, Extension analog output

FR-A5NR

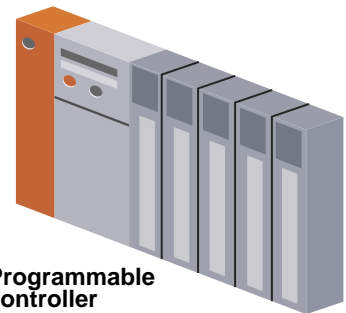
Computer link (RS-485)



Personal computer

FR-A5NC

CC-Link



Programmable controller

FR-A5AR

Relay output

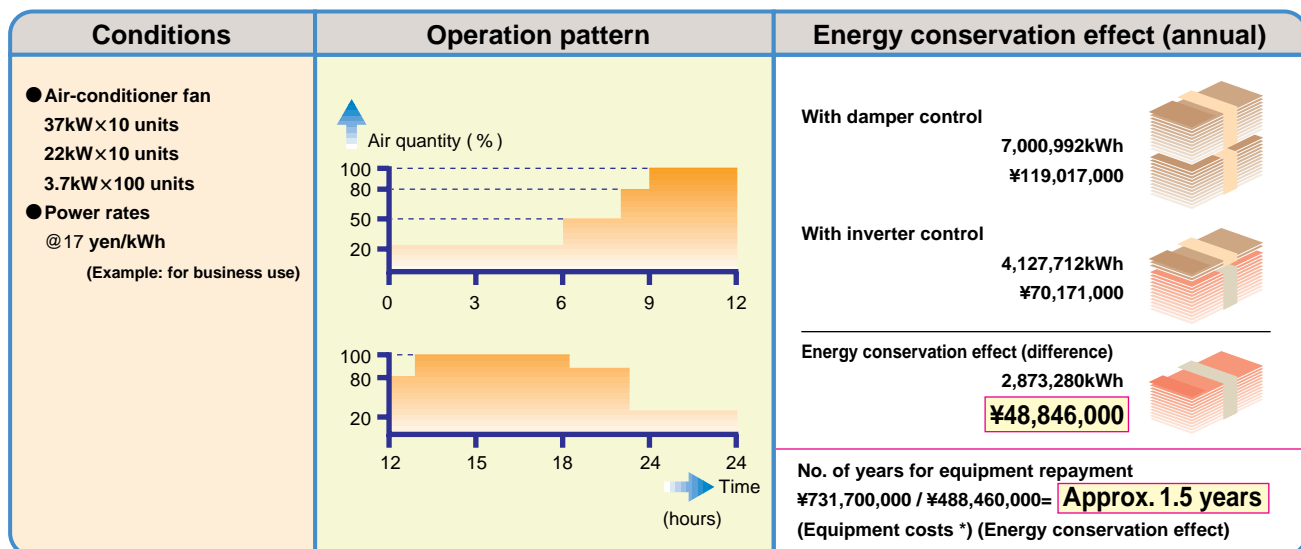
FR-A5AP

Orientation, PLG feedback, Pulse train input

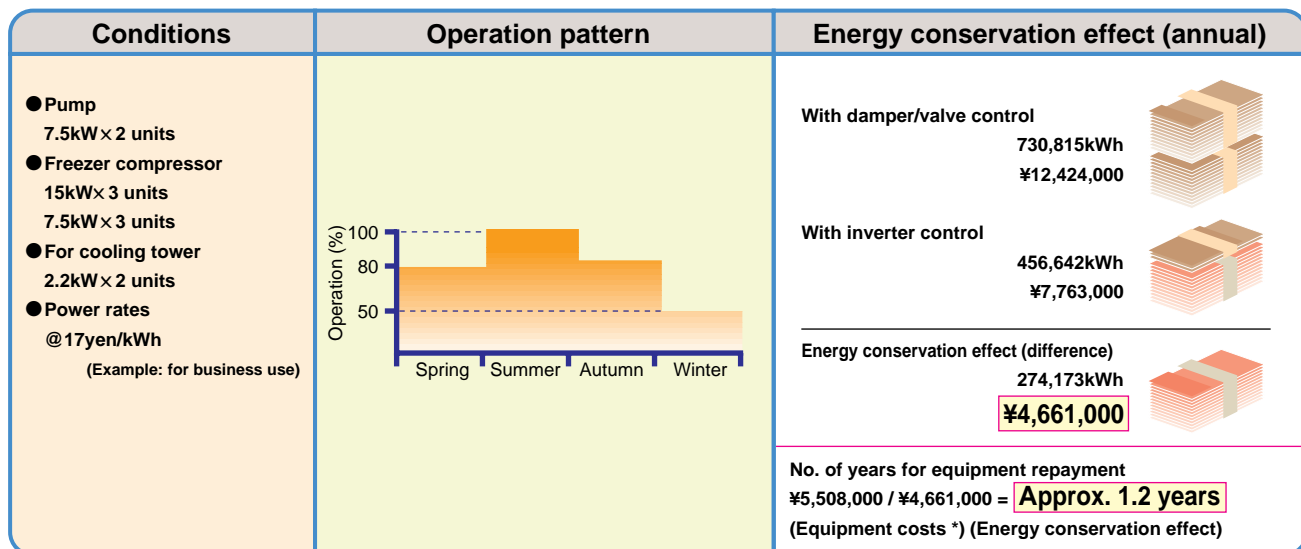
Examples of energy conservation

The longer the time of operation with medium air quantity, the higher the energy conservation effect by inverter control.

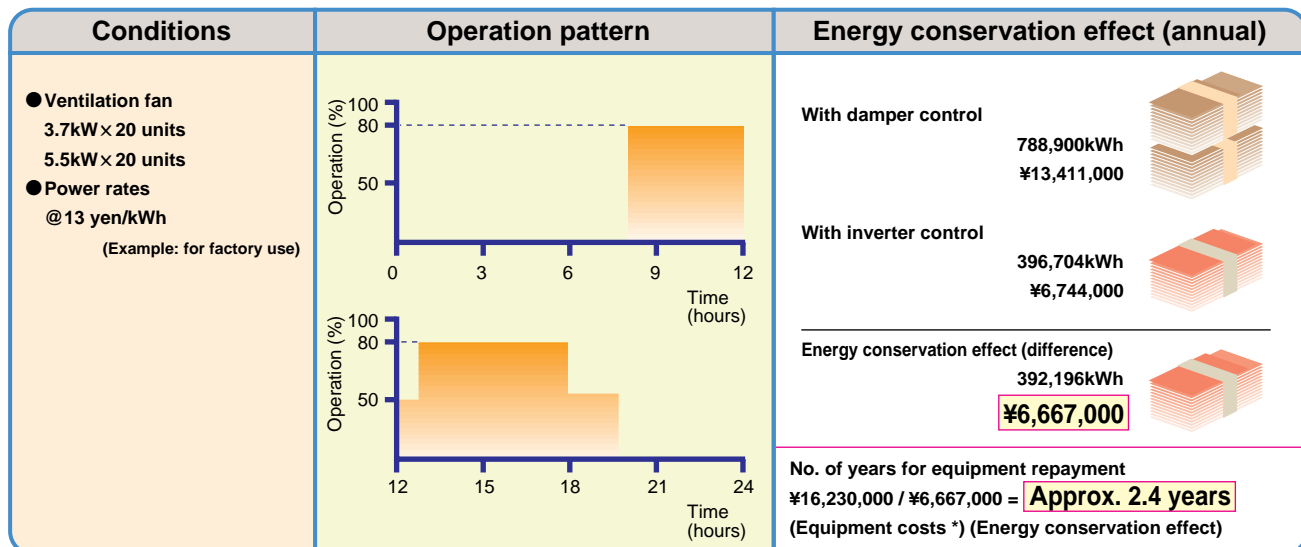
Example 1. Building air-conditioner



Example 2. Cooling water pump used in display case



Example 3. Ventilation fan in factory



* The equipment costs are set as "total of inverter's standard price x 1.5" allowing for the inverter, control panel and construction costs etc.

Mitsubishi's Inverter Family - Responding to Various Applications

Series name	Features	Series name	Features
SC-A	<p>Inverter speed controller</p> <ul style="list-style-type: none"> ● Operation is possible with simple settings. (Parameter settings are not required.) ● Operation is possible with the potentiometer and switches installed on the cover. (Box type) ● The box type, unit type and wall installation type (low-noise) are available to match applications. ● An electronic thermal relay is also mounted as a standard. ● The single-phase 100V input (40 to 100W) Series is also available. <p>Catalog No. K-174-6-C1357</p>	FREQROL-A201	<p>Inverter with built-in power regeneration function</p> <ul style="list-style-type: none"> ● A compact size has been realized by integrating the FREQROL-A200 inverter and power regeneration converter. (Installation space is 60 to 80% compared to conventional models.) ● 100% continuous regeneration is possible and the allowance toward overloads is sufficient with an overload withstand level of 150% for 60 seconds. ● Operation functions such as contact stop control and automatic tuning, optimum control for elevation applications are provided as a standard. <p>Catalog No. K-174-6-C0554</p>
FREQROL-E500	<p>Ultra-compact, high-performance inverter</p> <ul style="list-style-type: none"> ● With a combination of Mitsubishi's original general-purpose flux vector control and slip compensation, a torque of 150% at 1Hz can be generated. ● The frequency setting potentiometer is provided on the operation panel, so variable speed operation can be carried out easily. ● The volume is 85% of the Mitsubishi FREQROL-U100. (For 0.2kW) ● Mitsubishi's original Soft-PWM switching method, which suppresses the noise and keeps it to a minimum (to the same level as the Mitsubishi FR-Z Series inverter) is incorporated as standard. <p>Catalog No. K-174-6-C3107</p>	FREQROL-A100	<p>Inverter for fans and pumps</p> <ul style="list-style-type: none"> ● This inverter, incorporating low-noise measures for all capacities, is optimum for energy conservation. Sufficient functions for a fan/pump are provided, including the restart after instantaneous power failure function, the inverter/commercial power supply changeover sequence circuit and the energy conservation mode built into the inverter. ● P and P1 terminals have been provided for all capacities so that the optional power factor improvement DC reactor (FR-BEL) can be connected. <p>Catalog No. K-174-6-C1265</p>
FREQROL-A024	<p>Compact, high-performance inverter</p> <ul style="list-style-type: none"> ● This is a compact inverter with an A6 size (equivalent to a paperback). The installation space is 105mm x 150mm (0.1 to 0.75kW). ● The low speed torque is greatly improved with the general-purpose flux vector control, and at the same time, the 100% constant torque range of the Mitsubishi standard motor (0.4 to 1.5kW 4P) has been increased to 6 to 60Hz. ● A high response current limit function, effective for applications such as conveyors is standard. ● UL Standards approved parts, and totally enclosed types can also be manufactured. Automatic tuning and optimum control for elevation applications are provided as a standard. <p>Catalog No. K-174-6-C0036</p>	FREQROL-V200	<p>Vector inverter</p> <ul style="list-style-type: none"> ● Ultra-low noise vector control has been incorporated as a standard for all capacities. ● Through combination with the vector motor, a high torque (150% for 60 sec.) and high response (speed loop response 200rad/sec.) is realized. The speed control range has also been increased to 1:1500. ● Positioning control (increment method) is also possible with an option unit. ● Changeover between torque control and speed control is possible. ● The general-purpose inverter options (power regeneration converter etc.) can be used with this unit. <p>Catalog No. K-174-6-C2026</p>
FREQROL-A500	<p>High performance, high function inverter</p> <ul style="list-style-type: none"> ● By incorporating the advanced magnetic flux vector control, a further advanced version of the magnetic flux vector control, high precision operation without a PLG, or even higher precision operation with a PLG is possible. ● Handling and operation are made even easier with the operation panel (FR-DU04), communications (RS-485) and parameter user's groups are provided as standard. ● Mitsubishi's original Soft-PWM switching method, which suppresses the noise and keeps it to a minimum (to the same level as the Mitsubishi FR-Z Series inverter), is incorporated as standard. ● 240V power supplies and 480V power supplies can also be used as a standard. <p>Catalog No. K-174-6-C2835</p>	FREQROL-A500L	<p>Large capacity inverter for industrial machines</p> <ul style="list-style-type: none"> ● This is an ultra-compact unit type inverter. (A standalone panel type can also be manufactured.) ● The low speed range torque is increased with the advanced magnetic flux vector control. (150% at 1Hz) ● Operation is simple by directly inputting with the large LCD display interactive parameter unit. ● Multiple functions and various monitoring functions are provided. ● This inverter gives optimum performance for the variable speed operation of general-purpose large capacity industrial machines. ● The use of flux vector control is even easier with the standard provision of the automatic tuning function. <p>Catalog No. K-174-6-C3417</p>