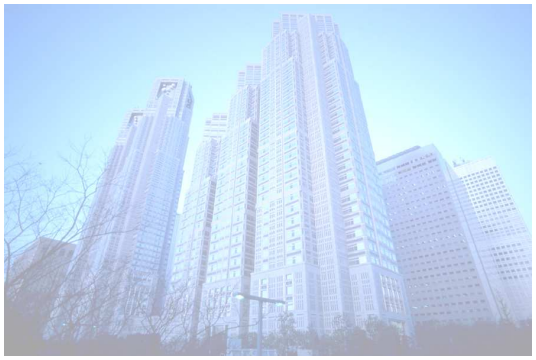
The Green Inverter

YASKAWA AC drive for Fan & Pump

E1000

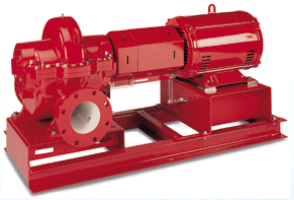


CE c UL us LISTED RoHS適合

Note: Same models are required now.

AC 400V Class 3.75 to 355kW

YASKAWA



Feature

1. Super Energy Saving

- ・High efficient control drive with an induction motor.
- ・Keep optimum efficient drive correspond with lord and temperature.
- ・Run not only induction motors, but also synchronous motors.
- ・Best efficient drive with synchronous motors.
- ・Synchronous motor is more efficient drive than high efficient induction motors.
- ・Drive constant torque compressor with high efficiency.
- ・Control stable pressure and high efficiency for constant torque compressor.

2. Friendly & Ecology

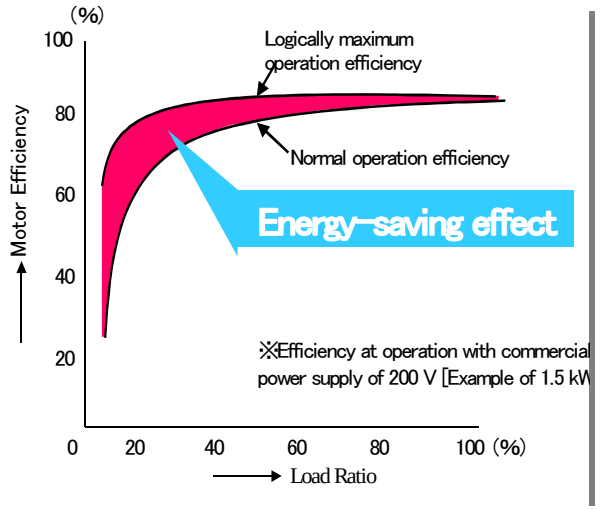
- ・Auto turning function for energy saving.
- ・Tackle power loss and recover for several application.
- ・High environment feature.
- ・Noise reduction.
- ・ High performance I/O signal function.
- ・High performance PID control.
- ・Easy setup and Customize for user.
- ・Meet various global communication networks with options.
- ・Easy maintenance.

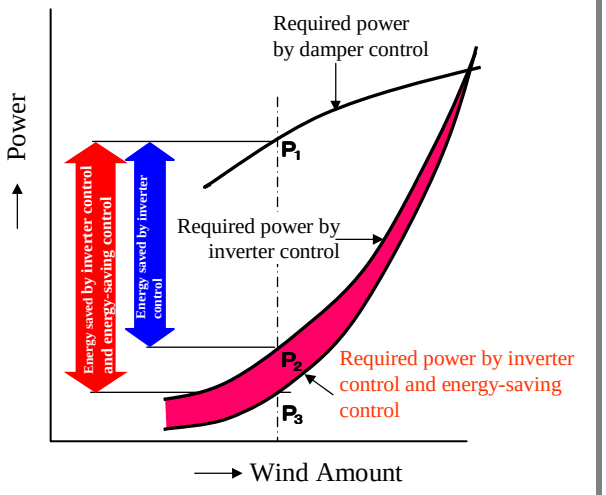
3. Safety & High Reliability

- ・Safety for environment.
- ・Long life design.
- ・Easy replacement.
- ・Protect function for machine.
- ・Keep Continues drive.

1. Super Energy Saving

Completion of Energy-saving Control for Induction motors





Ultimate energy-saving operation close to the logically maximum value

The lighter the load, the lower the efficiency .
Since energy-saving control operation improves the reduced efficiency up to the logical operation efficiency based on the Steinmetz's motor characteristics calculation, the motor operation cost can be reduced.
Using vector control and energy-saving control together can establish both high efficiency and excellent response.

Further Energy Saving

The graph on the left shows the blower wind amount in the units of required power at operation by inverter control, and by inverter + energy-saving control. Employing the inverter control obtains saved power of P2-P3 in addition to P1-P2 owing to energy-saving control.

1. Super Energy Saving

Search optimum efficient drive correspond with load and temperature **(For Induction motors)**

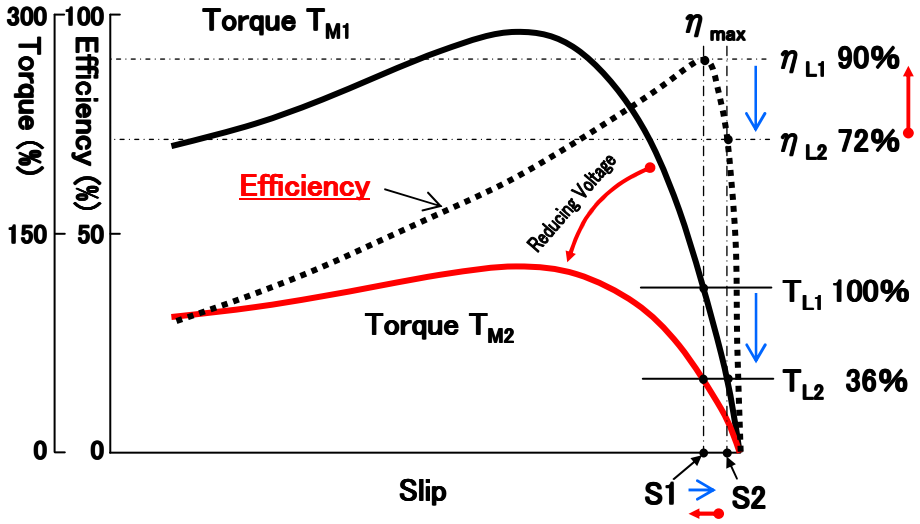
- In case of lighter lord, keep efficiency by reducing the voltage.

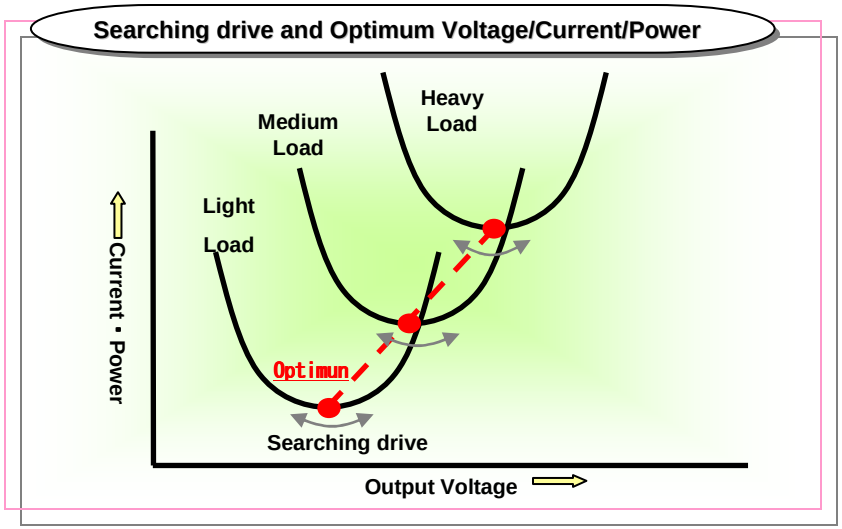
  In case of higher lord, return high torque by increasing the voltage.

- Searching the optimum drive point automatically,
  although character of motor and machine is changed during the running,
  Reduce the influence of aging and temperature.

Slip -Torque –Efficiency Character

Motor: 380V 7.5kW 4P

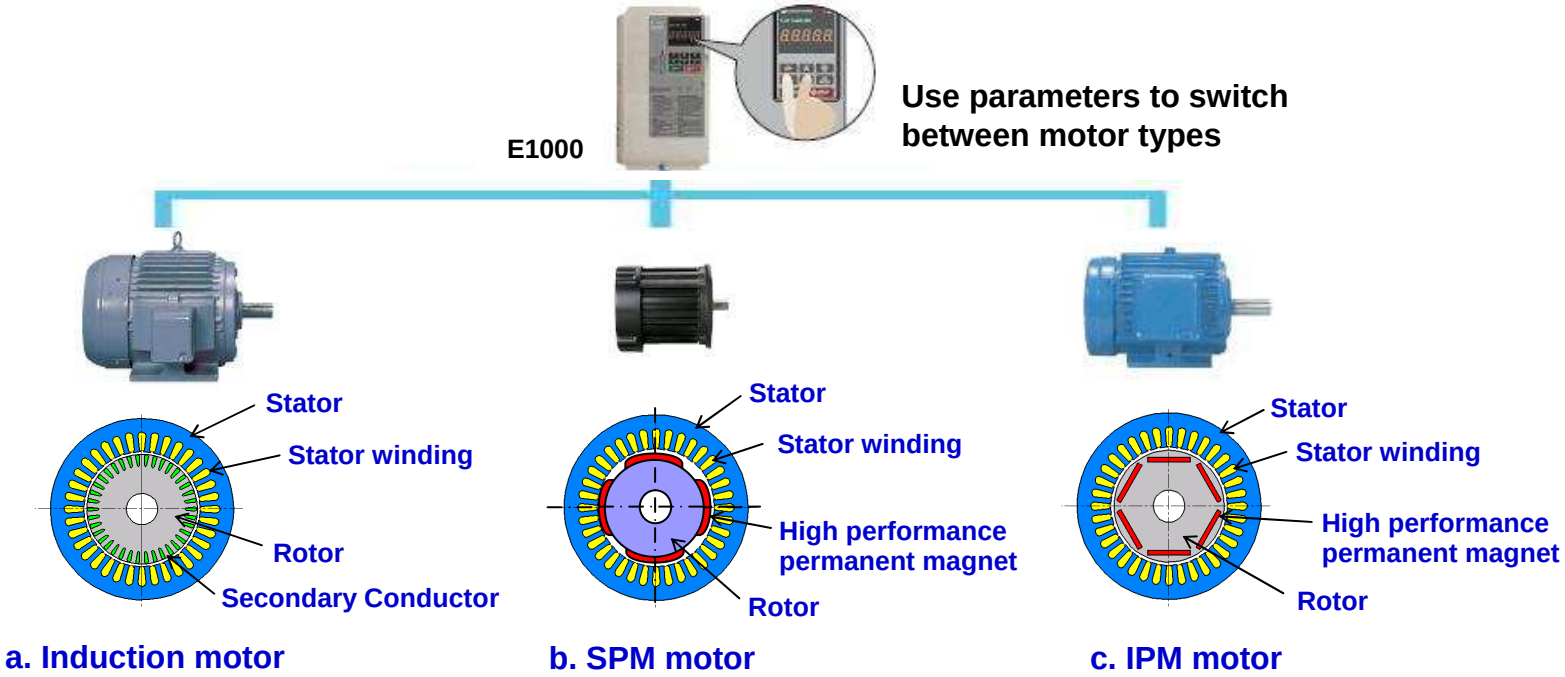




1. Super Energy Saving

The Most Advanced Drive Technology

- **Capable of driving any kind of motor.**
  E1000 runs not only induction motors, but also synchronous motors like IPM and SPM motors with high performance current vector control. *Currently developing PM motor compatibility for drives 450 kW and above.*
- **Minimize inventory equipment needed for your business by using the same drive to run induction and synchronous motors.**
- **Switch easily between motor types with a single parameter setting.**



a. Induction motor b. SPM motor c. IPM motor

Motor structure

1. Super Energy Saving

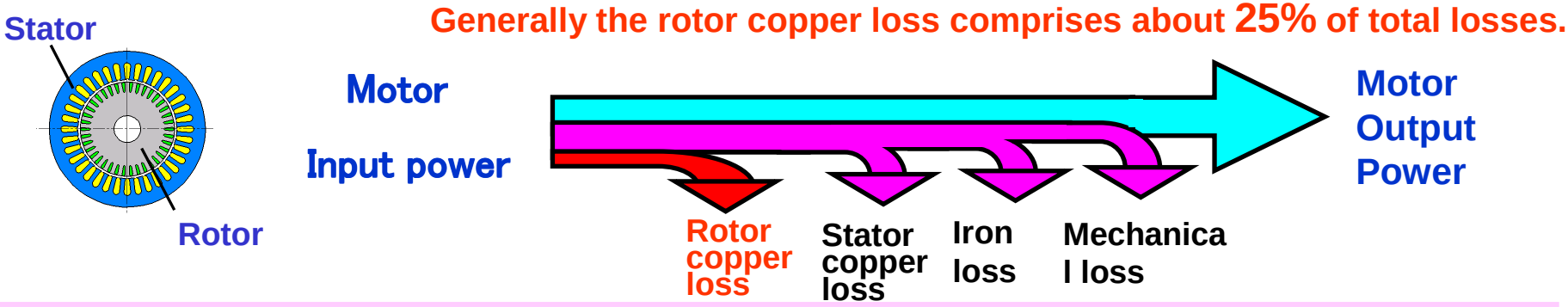
Low Motor Loss (Comparison of IM and PM)

● Induction motor

Torque is made by rotor current. This rotor current makes Rotor copper loss.

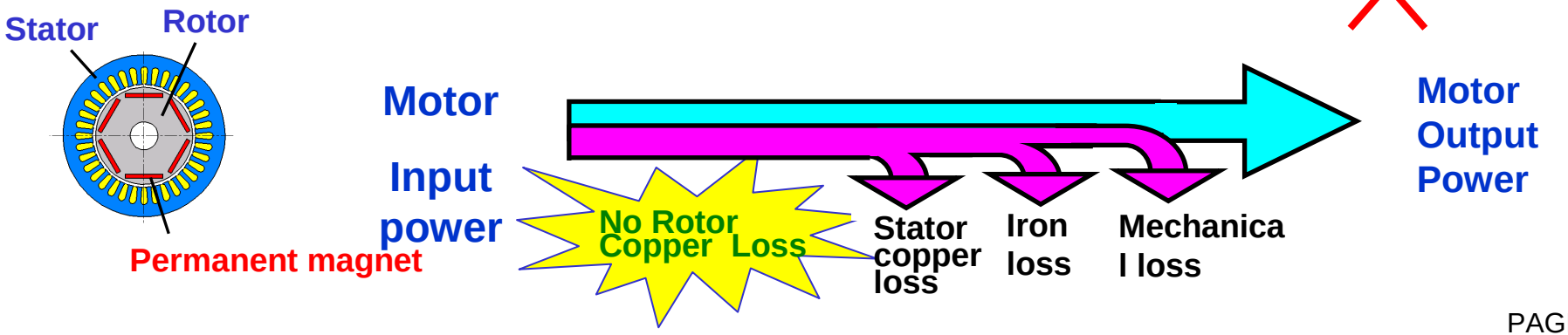
Motor output power = motor input power - stator copper loss- iron loss –mechanical loss – rotor copper loss

Generally the rotor copper loss comprises about 25% of total losses.



● Synchronous motor

Motor output power = motor input power - stator copper loss- iron loss –mechanical loss – rotor copper loss

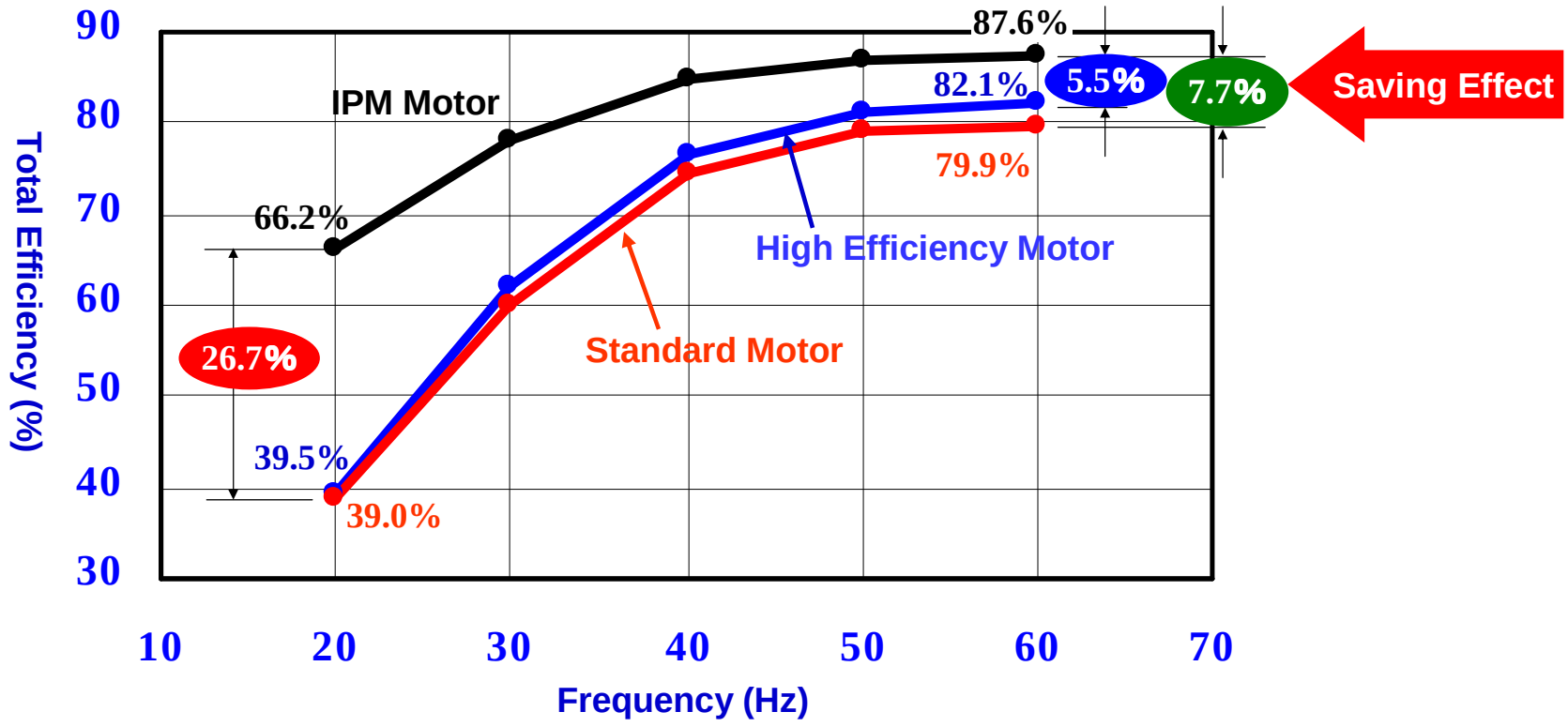


1. Super Energy Saving

Synchronous motors is more efficient drive than high efficient induction motors

High efficiency induction motor has good performance at rated speed and rated load.

The other hand, Synchronous motor has best performance on all range speed and load condition.



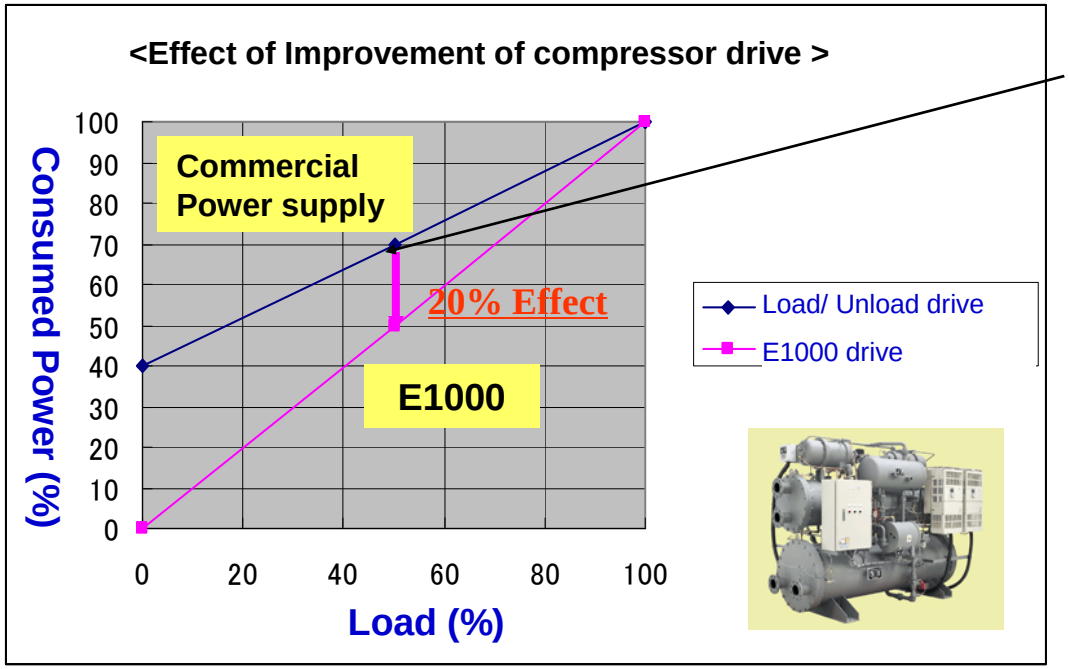
Frequency – Total Efficiency (200V 3.7kW)

1. Super Energy Saving

Drive constant torque compressor with high efficiency.（IM & SM)

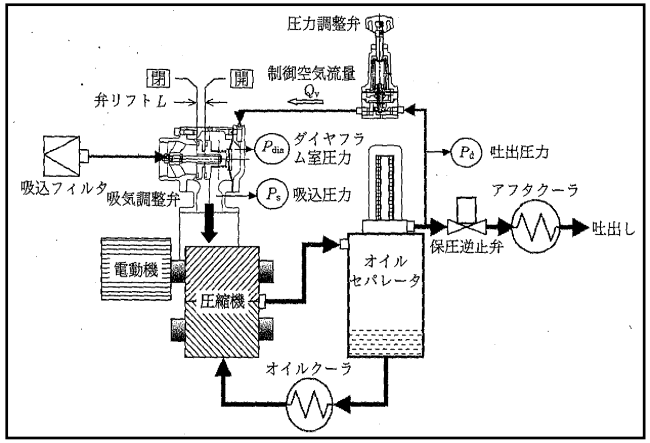
■Auto torque boost can start constant torque compressor easily.

■In case of load fluctuation occurs, hunting prevention control can drive machine stably.



Energy saving effect improves so that load is light.

e.g. Load is 50% → 20% energy saving is available.



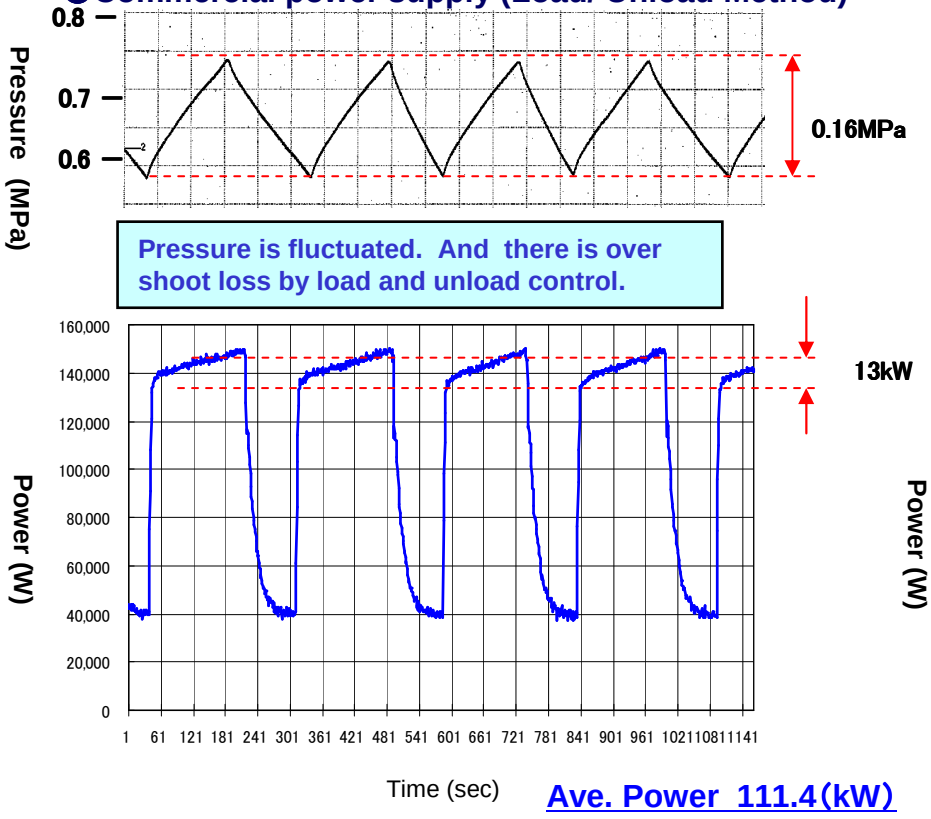
Compressor Structure

1. Super Energy Saving

Control stable pressure and high efficiency for constant torque compressor

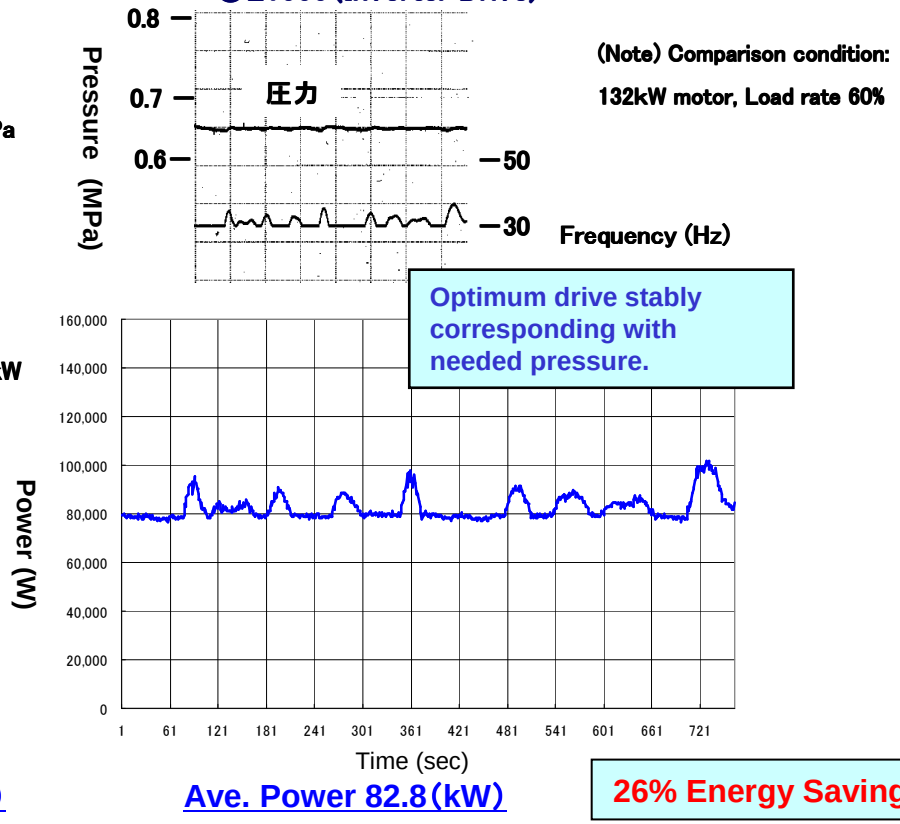
- Optimum drive by energy saving control and overshoot suppression.
- High performance PID prevents fluctuation of pressure and power, and drive stably.

●Commercial power supply (Load/ Unload Method)



Ave. Power 111.4(kW)

●E1000(Inverter Drive)



Ave. Power 82.8(kW)

26% Energy Saving

E 2. Friendly & Ecology

Loaded with Auto-Tuning Features

A variety of ways to automatically optimize drive settings and performance!

- **Auto-Tuning features set drive parameters for operation with induction motors and Synchronous motors to achieve the highest performance levels possible.**

Rotational Auto-Tuning	Applications requiring high starting torque, high speed, and high accuracy.
Stationary Auto-Tuning	Applications where the motor must remain connected to the load during the tuning process.
Line-to-Line Resistance	For re-tuning after the cable length between the motor and drive has changed, or when motor and drive capacity ratings differ.

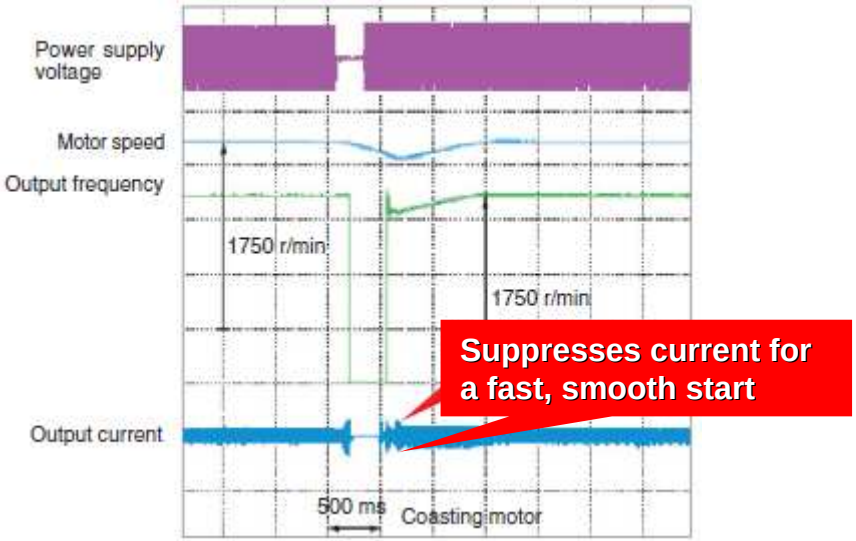
2. Friendly & Ecology

Tackling Power Loss and Recovery

- **E1000 offers two ways to handle momentary power loss.**
- **E1000 is capable of handling momentary power loss for induction motors as well as synchronous motors– without the use of a motor encoder..**

●Speed Search

Easily find the speed of a coasting motor for a smooth restart.

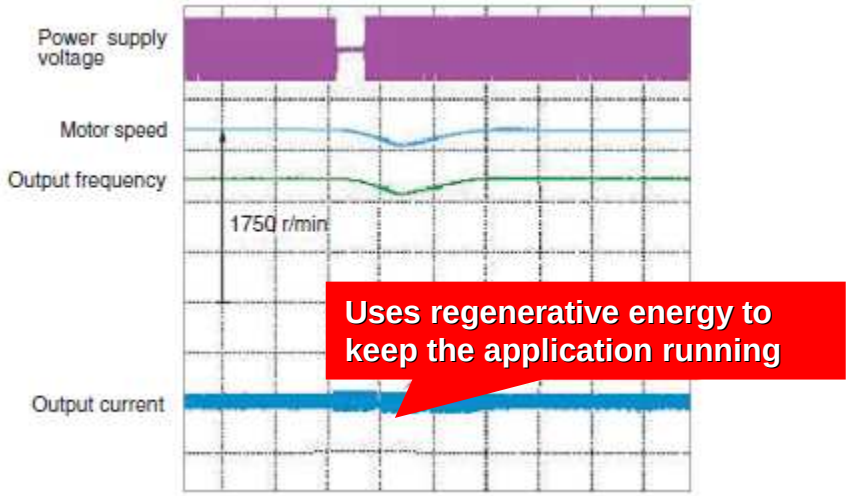


Applications

Perfect for fans, blowers, and other rotating, fluid-type applications.

●KEB

Keep the motor running without allowing it to coast.



Note: Requires a separate sensor to detect power loss. The drive may trip depending on load conditions, and the motor coast to stop.

Applications

Highly recommended for film lines and other applications requiring continuous operation.

2. Friendly & Ecology

Environmental Features

Protective Design

- A variety of protective designs are available to reinforce the drive against moisture, dust, and other harsh environments.

RoHS

- All standard products are fully compliant with the EU's RoHS directive.

RoHS
compliant

2. Friendly & Ecology

Low Noise

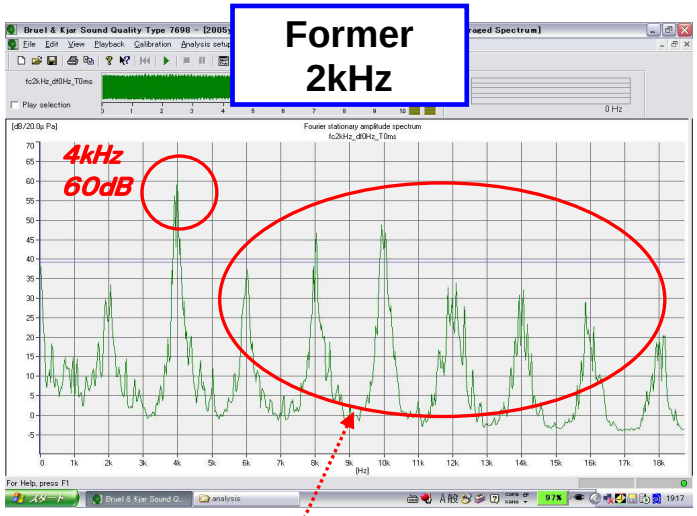
Noise Reduction

* Not available in models 450 kW and above.

■ **E1000 uses Yaskawa's Swing PWM function* to suppress electromagnetic and audible motor noise, creating a more peaceful environment.**

●**Comparing our former product line with our new Swing PWM feature**

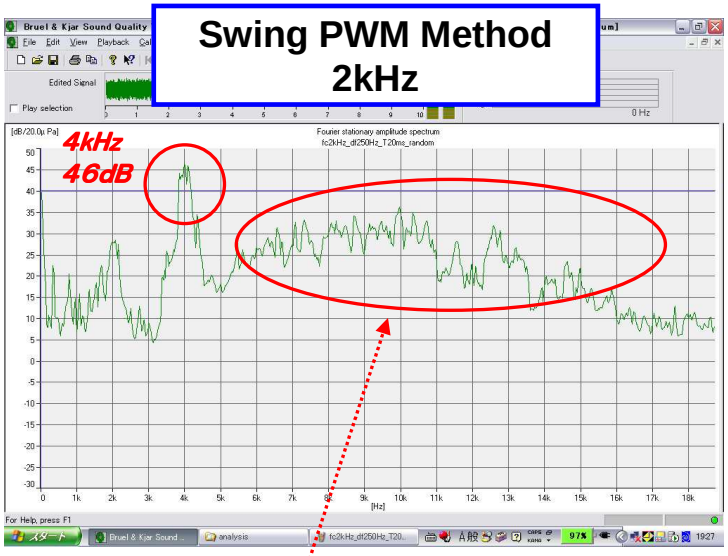
■**Former**■



Career 4kHz peak noise is higher. (Double of 2kHz) There are acute noise at multiple of 2kHz.

24% Quieter

■**E1000**■



Career 4kHz peak noise is lower. There is nothing of acute point.

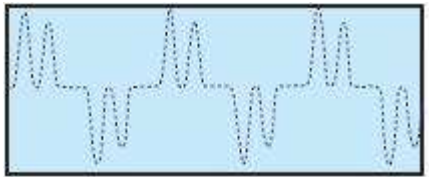
2. Friendly & Ecology

Environmental Features

Suppressing Power Supply Harmonics

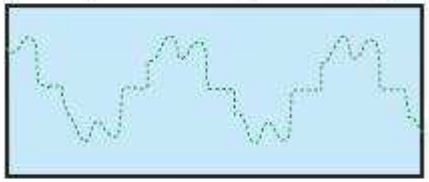
- A DC reactor minimizes harmonic distortion, standard on drives 30 kW and above.

No reactor



Waveform distortion 88%

DC reactor



Waveform distortion 40%

2. Friendly & Ecology

High performance I/O function (4-20mA output available)

*1: EN954-1 Cat.3, IEC/EN61508 SIL2

*2: 1 channel is selective for Voltage or Current

*3: 0V, +24V, External common selective.

*4: 4-20mA out available

PROFIBUS-DP
DeviceNet
CC-Link
CANopen

Communication Options available

8 × Multi Function Input *3

2 × Safety Input *1

3 × Multi Function Output *2

1 × Multi Function Pulse Input

1 × Fault Output (Relay)

3 × Multi Function Output (Relay)

1 × Safty Output (EDM)

2 × Multi function Analog Output*4 (±10V、4-20mA)

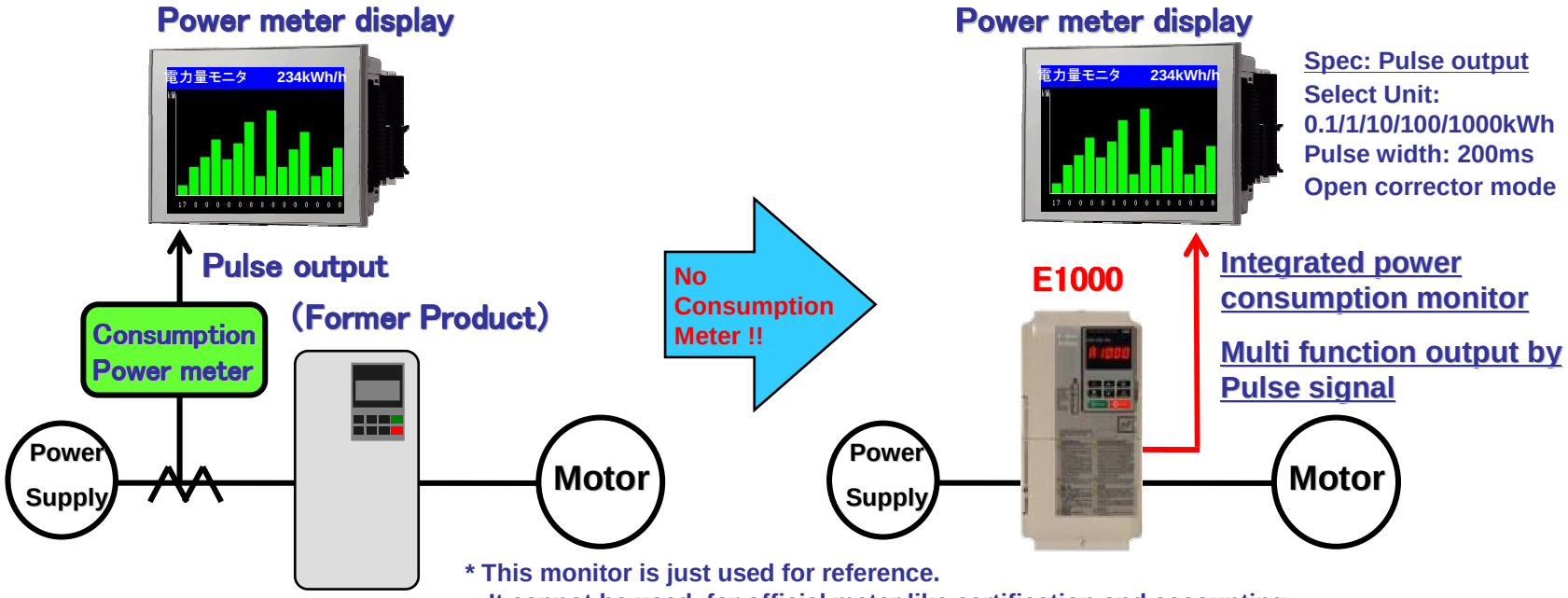
1 × Multi Function Pulse Output

RS-422/485
MODBUS

2. Friendly & Ecology

High Performance I/O function (Integrated Power Consumption Monitor)

- Available not only Power monitor but also Integrated Power Consumption monitor
- It can output to upper PLC by multifunction pulse monitor.
- It can output via communication options.



* This monitor is just used for reference.
It cannot be used for official meter like certification and accounting.

2. Friendly & Ecology

High performance PID control

Function

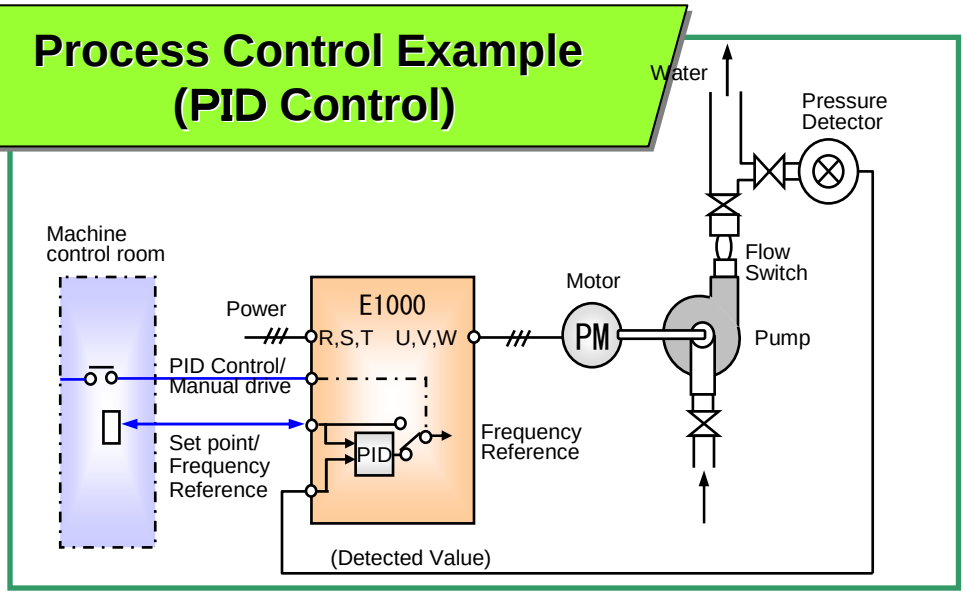
High performance PID control

- PID control and Frequency reference + PID control are selective.
- Set point and feedback value is available from varies selection (0～10V , 4～20mA, 0～20mA, Pulse signal).
- Varies controls are available by external multifunction like PID enable, PID disenable, Integral hold, Integral reset and so on.
- Multi analog and pulse input can be used as feedback signal.

Application

- Pressure, Flow, Temperature process control and so on.

Process Control Example (PID Control)



2. Friendly & Ecology

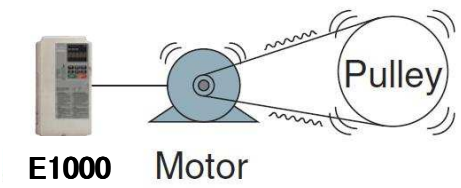
Customize Your Drive

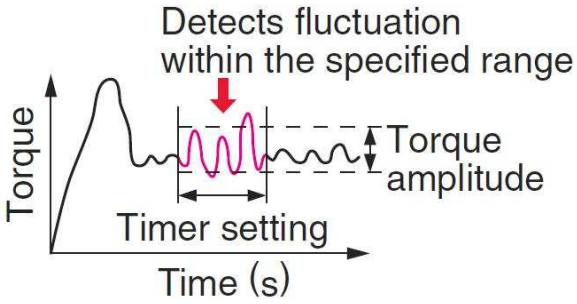
■ DriveWorksEZ visual programming tool with all models

Simply drag and drop icons to completely customize your drive.
Create special sequences and detection functions, then load them onto the drive.

●Create customized detection features

Example: Machine weakening analysis using torque pulse detection





■ USB for connecting to a PC

●USB port lets the drive connect to a PC

Note: Drives are also equipped with an RJ-45 comm. port that takes the existing WV103 cable used in Yaskawa's previous models. Simply remove the operator keypad for to the RJ-45 connector.

2. Friendly & Ecology

Breeze-Easy Setup

■ Immediate setup with Application Presets

A1000 automatically sets parameters needed for most major applications. Simply selecting the appropriate application instantly optimizes the drive for top performance, saving enormous time setting up for a trial run.

●Example using Application Presets

Several Application Presets are available to facilitate drive setup for Fan and pump applications.

Setting	Application
00	General-purpose
01	Water Supply Pump
03	Exhaust Fan
04	HVAC Fan
05	Air Compressor

2. Friendly & Ecology

All Major Serial Communication Protocols

- **RS-422/485 (MEMOBUS/Modbus) standard on all models.**
- **Option cards available for all major serial networks used across the globe: PROFIBUS-DP*, DeviceNet*, CC-Link*, CANopen*, LONWORKS*, MECHATROLINK-II*, among others.**

  * Available soon.
  Note: Registered trademarks of those companies.
- **Less wiring and space-saving features make for easy installation and maintenance.**

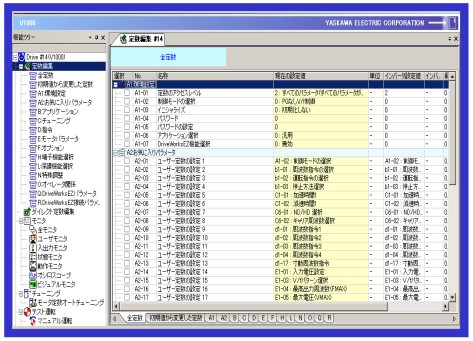
2. Friendly & Ecology

Easy Maintenance

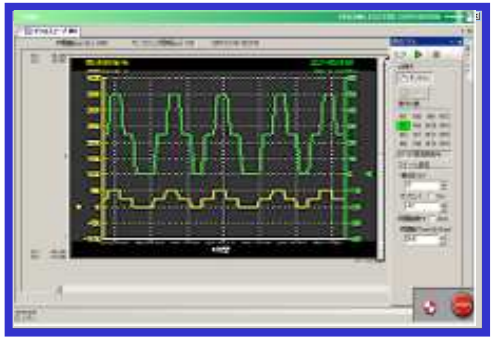
Engineering Tool DriveWizard Plus

- Manage the unique settings for all your drives right on your PC.
- An indispensable tool for drive setup and maintenance. Edit parameters, access all monitors, create customized operation sequences, and observe drive performance with the oscilloscope function.
- The Drive Replacement feature in DriveWizard Plus saves valuable time during equipment replacement and application upgrades by converting previous Yaskawa product parameter values to the new E1000 parameters automatically.
- USB for connecting to a PC.

Parameter setup/edit



Oscilloscope function



USB port lets the drive connect to a PC

Note: Drives are also equipped with an RJ-45 comm. port that takes the existing WV103 cable used in Yaskawa's previous models.Simply remove the operator keypad for to the RJ-45 connector.

2. Friendly & Ecology

Easy Maintenance

Simplification for drive setup and maintenance

■ Standard LED Digital operator has copy function.
It can Up/Down constants easily.

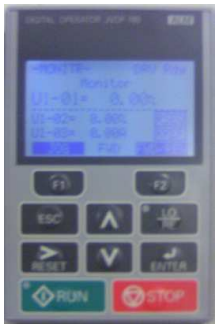
You can use and extend standard LAN cable on the market.

■LCD digital operator is option.

■Option USB copy unit can copy constants too.

■Setup mode can set the minimum constants for drive easily.

■Verify mode can confirm the changed constants easily.



●LCD operator (Option)

●LED operator (Standard)

●USB copy unit (Option)

●Verify Menu example

Changed Value

Name	Parameter	Default	Set Value
Frequency Ref. Selection1	b1-01	1	0
Acceleration Time1	C1-01	10.00 s	15.00 s
Deceleration Time1	C1-02	10.00 s	15.00 s
⋮	⋮	⋮	⋮

3. Safety & High Reliability

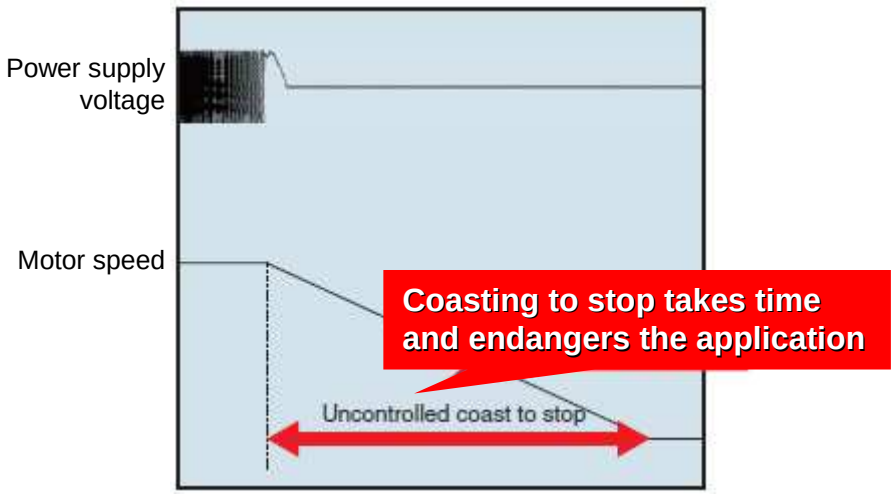
Safety

Controlled Stop Despite Power Loss

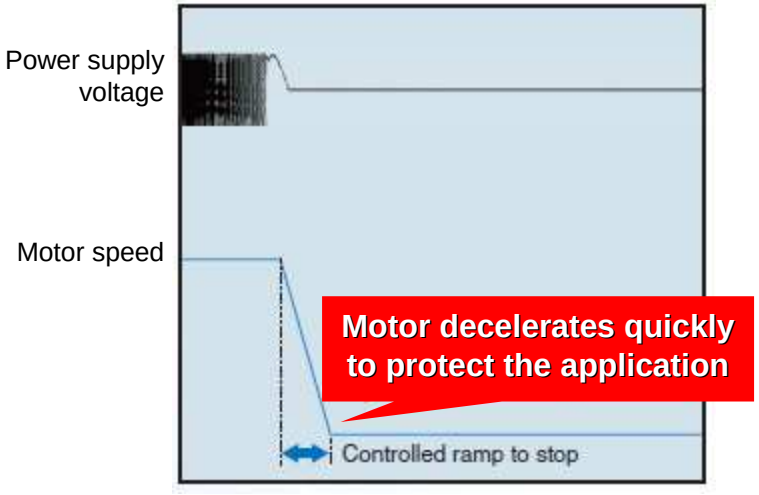
■ **Should a power outage occur, E1000 can bring the application to controlled stop quickly and safely using the KEB function.*** *Under development for models 450 kW and above.

● **Quickly ramp to stop with KEB function**

■ **Previous Models** ■



■ **E1000** ■



Applications

Perfect for spindle drive application and film production lines where stopping methods are crucial to the application to reduce production cost.

3. Safety & High Reliability

Long Performance Life

Ten Years of Durable Performance

■ **Cooling fan, capacitors, relays, and IGBTs have been carefully selected and designed for a life expectancy up to ten years.***

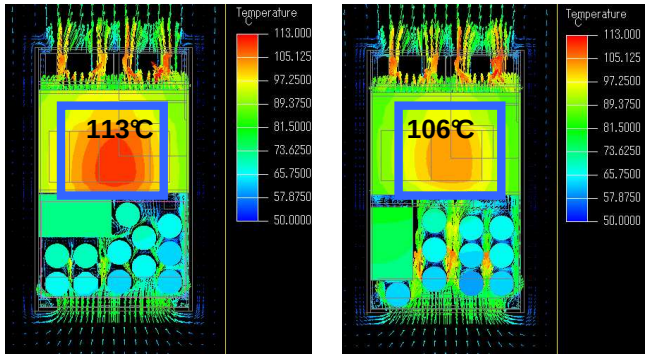
*Assumes the drive is running continuously for 24 hours a day at 80% load with an ambient temperature of 40ºC.

Performance Life Monitors

■**By Life judgment Forecast Function, alarm signal can output beforehand at the maintenance time (standard) of longevity parts.**

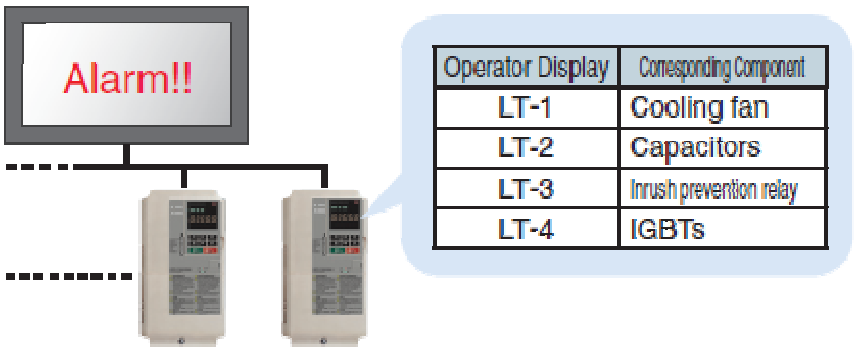
■**Digital Operator can monitoring the operation time, number of run command, peak current, overload and degradation parts condition.**

Resisted Temperature design
(Left: Former, Right: Optimum design)



∗ For example, 80% load with an ambient temperature of 50℃.

●**Drive outputs a signal to the control device indicating components may need to be replaced**



Operator Display	Corresponding Component
LT-1	Cooling fan
LT-2	Capacitors
LT-3	Inrush prevention relay
LT-4	IGBTs

3. Safety & High Reliability

Easy Maintenance

The First Terminal Board with a Parameter Back-Up Function

■ **The terminal block' s ability to save parameter setting data makes it a breeze to get the application back online in the event of a failure requiring drive replacement.**

● **E1000 Terminal Block**

Parameter

Name	Number	Setting
Access Level Selection	A1-02	0
Frequency Reference Selection 1	b1-01	1
Run Command Selection 1	b1-02	1

●**With less dust and easy maintenance top Fan**

3. Safety & High Reliability

Machine Protection

Function

Over torque & Under torque can be detected

- It can be detected without expensive mechanical detection system.
- It can be set for each dimension.

Application

Over torque detection

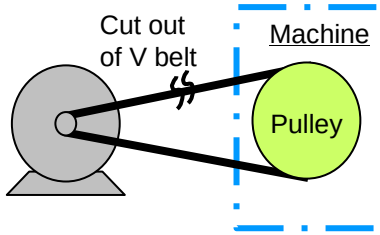
- Over load of machine and motor.
- Motor lock and machine lock by breakdown.

Under torque detection

- Cutting out of belt drive.
- Clogging of Fan and blower.
- Open of output power cable.

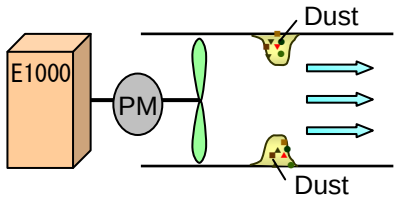
e.g. Under torque detection

Belt drive



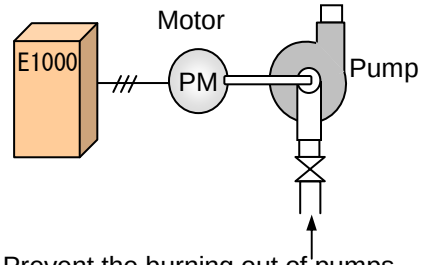
Detect the cut out of V belt by aging and fatigue.

Fans



Detect the clogging of fan and duct and power down.

Pumps



Prevent the burning out of pumps by detection of no lord drive.

3. Safety & High Reliability

Keep Continence Drive

Function

Continence operation

at Frequency reference loss

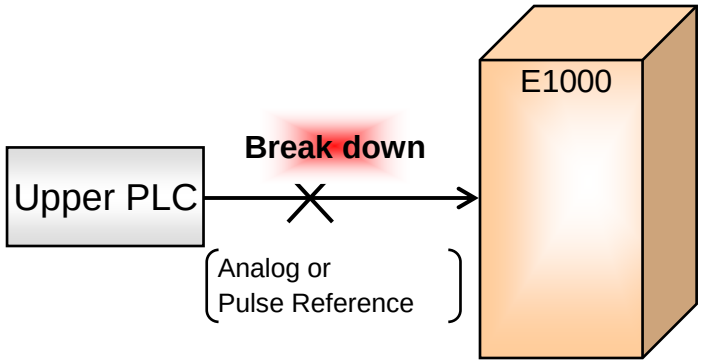
・If Frequency reference is lost during operation, Operation can be continued.

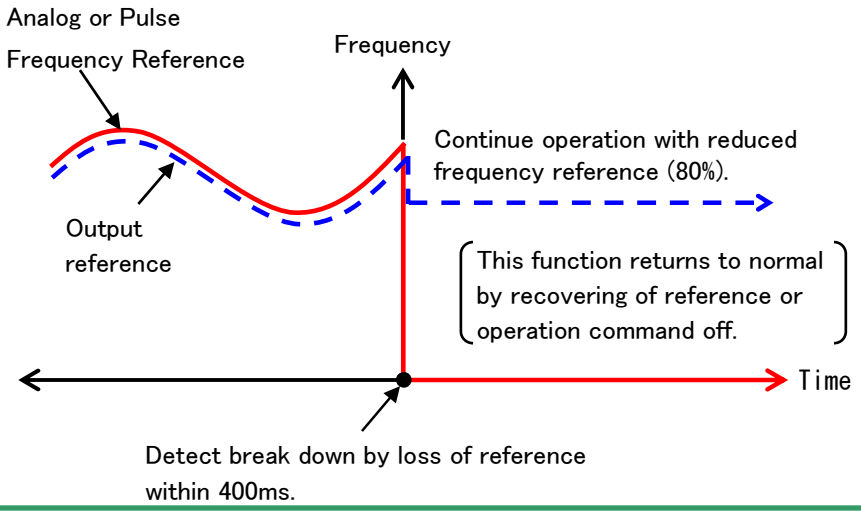
(This function is selected by parameter.)

Application

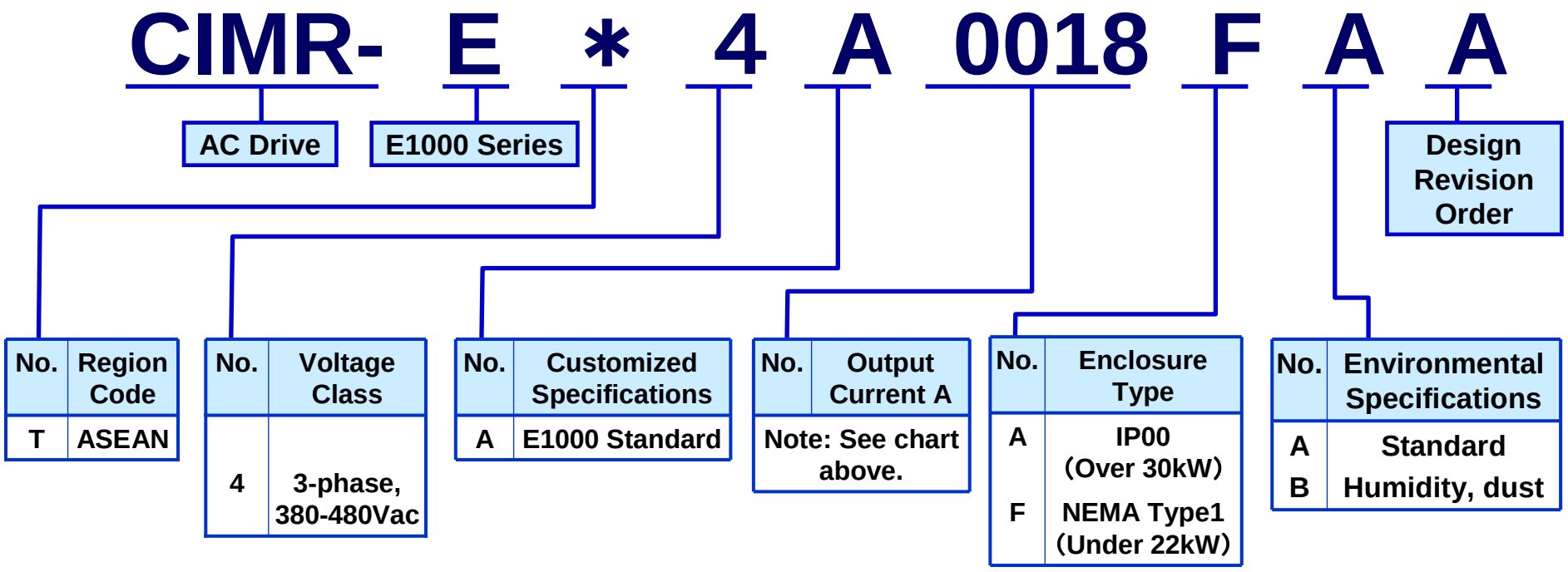
・Fluid application (Fans, Blowers Pumps) is needed continence operation.

e.g. Continence Operation at Frequency loss





Model Number Key



Note: Contact a Yaskawa representative for ASEAN mode, 200 Voltage class and Environmental Specifications.