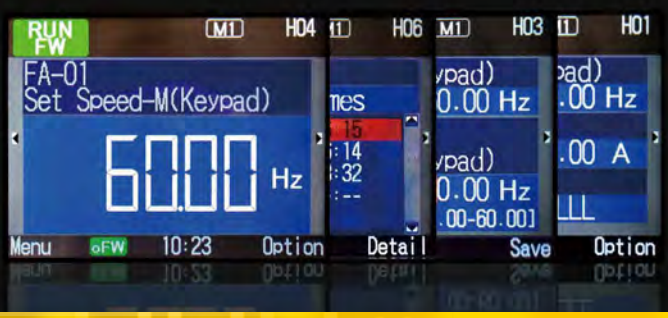
HITACHI
Inspire the Next

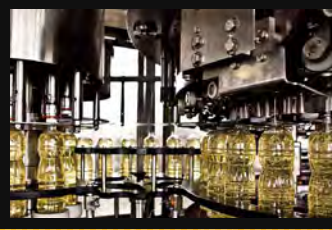
HITACHI Variable Frequency Drives

SJ series P1

NEW

Intuitively innovative!





At the point where ease
of use meets high performance

BE A NEXT STANDARD

P1

Hitachi Industrial Equipment Systems Co., Ltd.

Powerful and Acc

SJ series P1, setting the new global standard

1. Easy access to all the functionality

P.3-6

The intuitive color TFT operator and Various convenient features.

2. A High Performance drive for the most demanding of applications

P.7-8

Variety of motor (IM/PM) can be adjustable to drive.
Stable operation than ever!

3. Versatility through multi mode operation, to meet your specific application needs

P.9-10

SJ-P1 meet a wide range of needs by achieving variety of functions necessary for drive systems.

Corresponds to variety of industries.

Fan P.11

Pump P.11

Crane P.13

Transport P.7

Injection molding P.13

essible

Color TFT Operation Panel
P.3

Option slot
P.10

USB connector for PC setting software (ProdriveNext)
P.15-16

Control Circuit terminals
P.6, 24, 25

Main circuit terminals.
P.6

Winder & re-winder
P.14

Machine Tools
P.14

Corresponding to the global standard.
Input voltage is Max.AC500 Voltage.
(400V class)

CE c UL us LISTED

P.10

ISO 14001

ISO 9001
JQA-1153

Hitachi variable frequency drives (inverters) in this brochure are produced at the factory registered under the ISO 14001 standard for environmental management system and the ISO 9001 standard for inverter quality management system.

1 Accessibility

Easy access to all the functionality

Intuitive, easy-to-use LCD operator is standard

version UP

Easily monitor, set, or review operational data and parameters.

●Operation Panel Description.

Monitor display example

●Features of the operation panel!

"Visualization Icon" Easy to understand the inverter status!

RUN, STOP, TRIP,OVERLOAD, FAN LIFE NOTICE and other is very obvious. For this Icon, error diagnosis is also easy.

Example of "Operation visualization Icon"

RUN FW	The motor is in forward running.	LIM	Output frequency is limited by such as overload.
RUN RV	The motor is in reverse running.	ALT	The inverter is in overload notice or thermal notice.
TRIP	Inverter is in trip status.	NRDY	The inverter can not be operated in the RUN command.
STOP	Operation command is entered, but the inverter is forced stop.	FAN	The inverter is in Fan life notice state.
STOP	The inverter is stopped, because Operation command is OFF or frequency command is 0Hz.	C	The inverter is in Capacitor of Logic board notice state.

Monitor display example

Background color can be selected!
Selectable from Blue / Green / Black. Easy visualization can be achieved in every cases!

"Setting visualization icon"
Some of the setting is easy to understand.

Large character display
Great visibility thanks to the large character display.

Assist bar
Show function of F1, F2, and RUN key to assist user operation. Also clock information can be shown in this area.

Real-time at the alarm occurrence is recorded!

Alarm record available based on Real-time-clock.
Date and time can be set in the operator by placing battery.
Speedy fault diagnosis and root cause investigation will be possible, since alarm is record on actual time.
(Note:Battery is prepared by user.)

Multiple languages.

Japanese and English display available as standard.
Other languages also available in near future.

version UP Improvement or added items from the SJ700.

EzSQ EzSQ application case. refer to P15-16 for details.

PM motor PM motor specific function.

●Example of main screen transition and parameter setting.

Check at once! **Monitor while setting!** **Easy to see!** **Quick trouble shoot!**

Quick View

Multi-monitor (3lines)

Up/down/ left/ right keys

Verify View

Reference screen

Up/down/ left/ right keys

Clear View

Large monitor screen

Up/down/ left/ right keys

Error View

Trip history screen

F1 F1 key ○ SEL key

Trip information details

F1 F1 key ○ SEL key

Up/down/left/right keys

Either monitoring changes or parameter change is selected by the △▽ key.

F1 F1 key ○ SEL key

Up/down/ left/right keys

Select change parameter

Determined by F2 key
Canceled by F1 key

F1 F1 key ○ SEL key

Up/down/ left/right keys

Select the setting value with the arrow keys

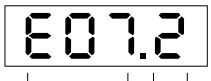
Other features!

- Setting data can be saved in the memory of the operation panel! Data can be kept safe even if the inverter fails.
- Operation panel can be also used as copy unit!
- If the battery is used, the real-time data is retained even when the power is cut off of the inverter.
- Operation panel can be extended connected by option cable ICS-1 or ICS-3.

(Note) While the power is supplied, please do not remove the operation panel!

● Trip monitor.

- Display of former models



Error code

Inverter status at trip point

●Inverter state is easy to understand when an error has occurred.

Shown that the **inverter is in trip condition.**

Shows the **cause of trip.**

Displays trip event information:
Output frequency at trip point/Motor current at trip point/
DC bus voltage at trip point/Cumulative inverter operation/
Cumulative power-ON time at trip point.

Scroll

State 1 to 5 indicates the inverter state at the time of the trip occurs.

(Note)Please refer to the user guide for more information.

(Note)These display is a state of the moment of error occurrence,the actual motor behavior might be different.

1 Accessibility

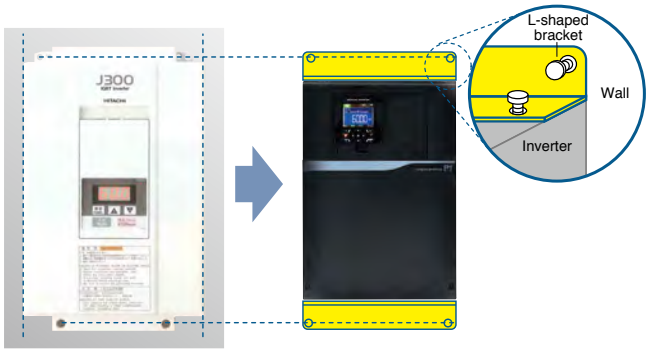
Easy access to all the functionality

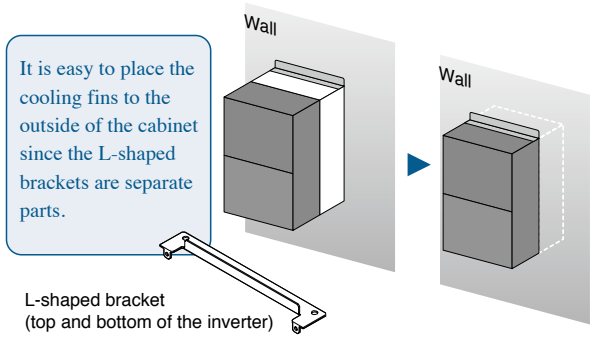
Various convenient features.

Direct field replacement, when needed!

version UP

Panel mounting portion is supplied as separate part. (5.5kW or more)
Even if its body size is different, it is possible to correspond in flexible ways.

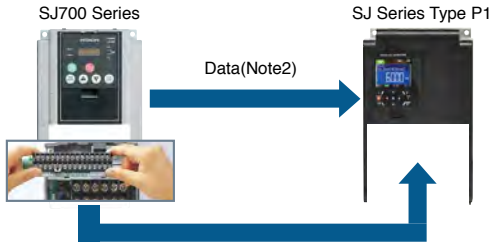




Possible to relocate the old terminal blocks (SJ300 / L300P / SJ700 / L700) as it is. (Under planning)

Speedy replacement can be achieved since old terminal blocks can be detached, and can be reused in the new inverter.

Note1: Dedicated connector board is required separately.
Note2: Data conversion can be made via PC setting software (ProDriveNext).



Removable control terminal block (upward-compatible).

Cooling fan and the main circuit capacitor is designed for 10 years life.

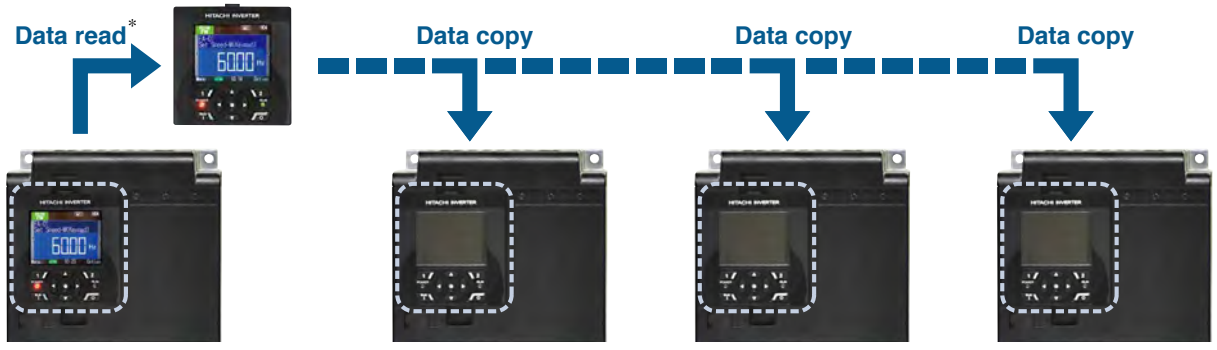
(Note: The ambient temperature is 40 °C (annual average).
Without corrosive gas, flammable gas, oil mist and dust.)
The above design life is a calculated value, not a guaranteed value.
Output current at the calculation is 80% of the rated current of the inverter.)

Fulfilling lifetime prediction functions.

Electrolytic capacitor of control circuit (internal estimation calculation).
Cooling fan.

Easy data copy to multiple inviters.

Operation panel is removable and memory is built.
Parameter data and EzSQ programing data can be copied to multiple inverters, which supports users to replace inverter in a short working time.



*Can not be read in the case of inverter failure.

version UP Improvement or added items from the SJ700.

EzSQ EzSQ application case. refer to P15-16 for details.

PM motor PM motor specific function.

Control circuit terminal designed for easy wiring! version UP

Adopt screw less terminal block (control terminal block).

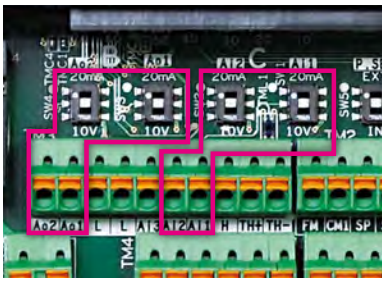
Rod terminal achieved easy wiring.

Modbus communication is standard. 2 communication terminal provided for Modbus communication as standard.

Daisy chain wiring of RS-485 is easy.

0-10V in/out and 4 to 20mA inputs and output are easily selected via DIP switch.

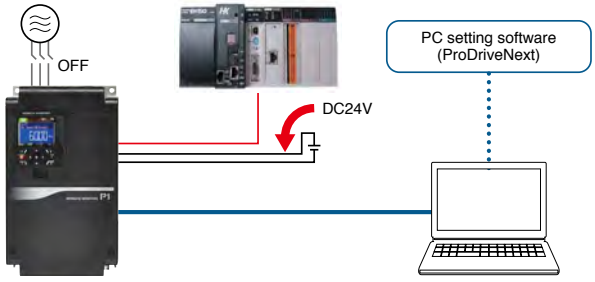
- 2 analog inputs (3 inputs in total).
- 2 analog outputs.



Programming ease through the use of 24 VDC to power up inverter CPU memory version UP

Normal power supply (R0, T0) to CPU. Also possible to utilize an external 24VDC control power supply.

Parameter setting is also possible with the main power is turned off. Thus saving time and effort. Possible use of logic standby power will also contribute to energy conservation.
Connecting to the PLC and Setting via PC configuration software are also available.



Quick diagnose during failure version UP

The SJ-P1 can store internal data to the internal retentive memory.
And upload the data to the PC when an error occurs !
Therefore, it is possible to rapidly diagnosis the issue.
[Data Trace Function (Is in developing)]

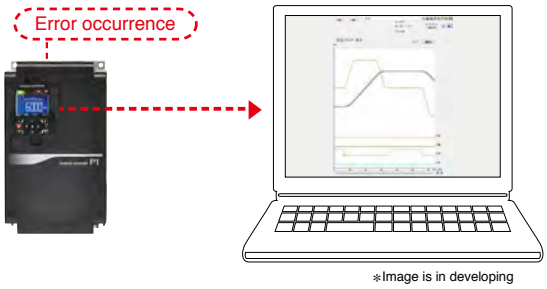


*Image is in developing

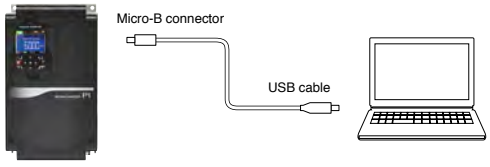
Easy customize by PC configuration software EzSQ

PC setting software. P.15-16

By PC configuration software (ProDriveNext), parameter setting, monitor, and diagnosis can be easily achieved!

Easy customization to your own inverter. P.17-18

Specific behavior can be easily programmed into the inverter by BASIC like program.



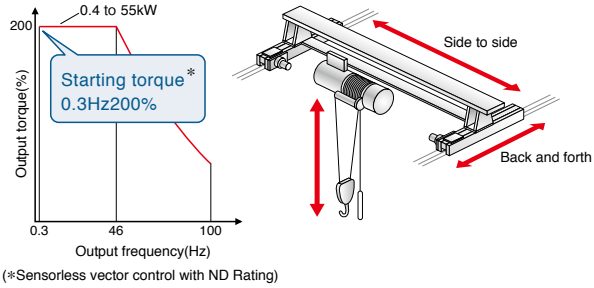
2 Driving Performance

A High Performance drive for the most demanding of applications

"Smooth operation" in critical and demanding applications, such as vertical lift

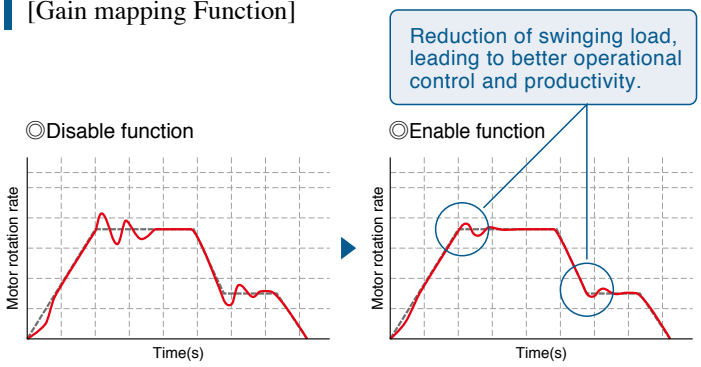
version UP

High starting torque at low speed range
while in control of heavy loads. (ND rating).
[Sensor less vector control(SLV)]
[OHz sensor less vector control]



(*Sensorless vector control with ND Rating)

Decreasing overshoot and undershoot contributes
to smooth and stabilized operation with reduced load shock.
[Gain mapping Function]



Cog-less motor operation for crane, lift, transport, etc.

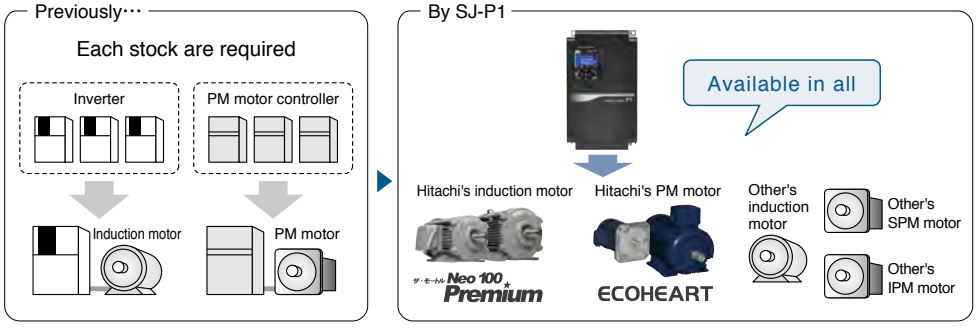
Trip-less operation for better productivity.

Refer to the Parameter AA121/HA-01～/Hb102～

Save on spare control costs!

version UP PM motor

Our multi-mode inverter can control both your induction motor, or a permanent magnet AC motor.
All while offering programmable current limit to protect from demagnetization of the PM motor.



Optimize performance.
[Auto-tuning function]

Complicated tuning procedures are avoided through the use of our auto-tuning function to optimize motor performance.

For long time operation (fan, pumps)

Significant energy savings can be obtained in comparison to an induction motor, even in 24 hours 365 days operation.

Refer to the Parameter AA121/bb160/HA-01～/Hd102～

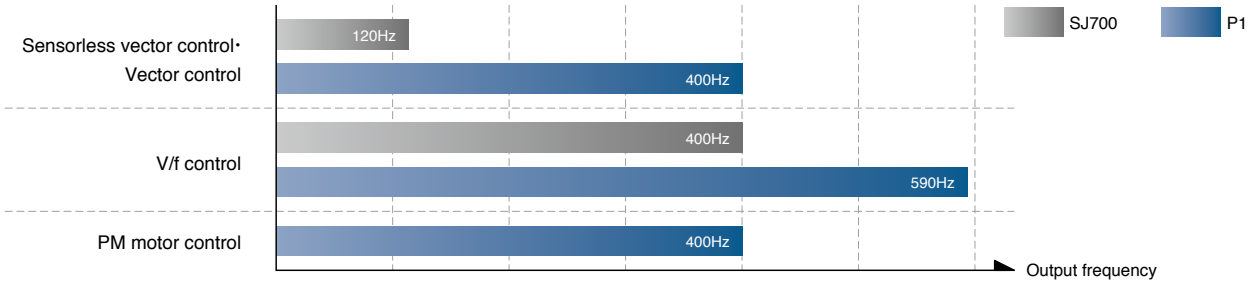
version UP Improvement or added items from the SJ700.

EzSQ EzSQ application case. refer to P15-16 for details.

PM motor PM motor specific function.

"High speed rotation" for non-traditional applications

590Hz operation is available for precise metal processing. For PM motor, also up to 400Hz. (actual output frequency depends on motor)



For metal tooling

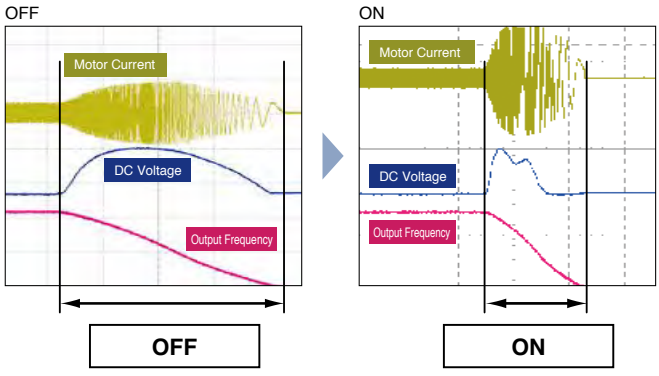
High speed rotation contributes the high quality of metal processing.

Refer to the Parameter Hb105/Hd105

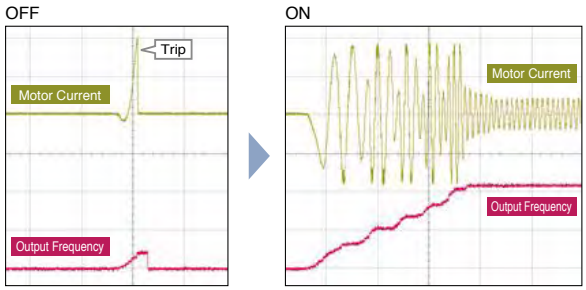
Reduce trips on acceleration and deceleration

Automatic speed adjustment manages ideal acceleration / deceleration speed to reduce the trip possibility from over current, over voltage, and impact load.

Over magnetize function



Over-current suppress function



∗Turn off this function for lifting equipment.

Refer to the Parameter bA140～/bA120～

∗Image of the output frequency and output current.

3 Flexibility

Versatility through multi mode operation,

SJ-P1 meet a wide range of needs by achieving variety of functions

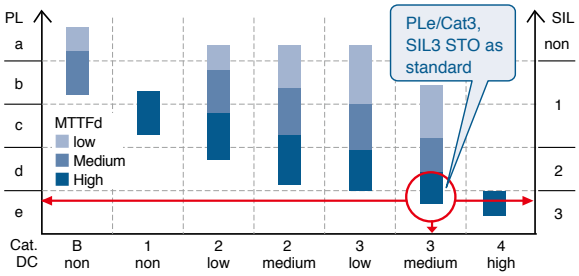
Certified "functional safety" international standard

version UP

Certified functional safety. (Certification in process)

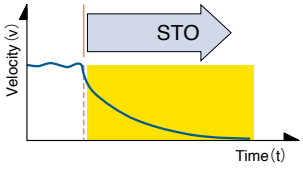
Third party certified electrical safety,
In compliance to IEC61508, IEC/EN/UL61800-5-2 SIL3 STO, available as standard.

- IEC/EN 60204-1 Stop Cat.0
- EN/ISO13849-1 Cat.3, PLe
- IEC61508, IEC/EN/UL61800-5-2, IEC/EN62061 SIL3 STO



Standard (without option card)

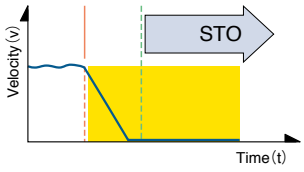
STO (Safe torque off)



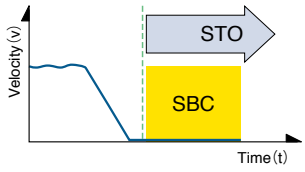
SS1, SLS and others are available with slot-in option card. (In design phase)

Optional (needs slot-in card)

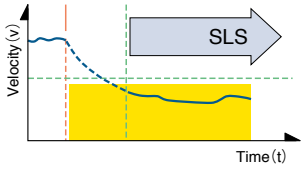
SS1 (Safe stop 1)



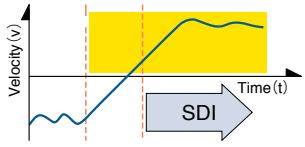
SBC (Safe brake control)



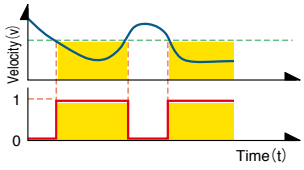
SLS (Safely-limited speed)



Safe direction



Safe speed monitor



"Save space and save cost" by multi rating function!

version UP PM motor

Triple-rated for Induction motor for various applications is selectable. Dual-rated for PM motor control.
Multiple rating helps to save space and cost.

Rating	VLD(Very Light Load)	LD(Light Load)	ND(Normal Load)
Induction motor	←	—	→
PM motor		←	→
Applications	Fan・Pump	Fan・Pump / Metal tooling・Conveyer	Metal tooling・Conveyer / Crane・Mixer
Overload current rating	110% 60sec, 120% 3sec	120% 60sec, 150% 3sec	150% 60sec, 200% 3sec
Example 400V/18.5kW Max rated output current	47.0A 	43.0A 	39.0A 

Refer to the Parameter Ub-03

to meet your specific application needs.

necessary for drive systems.

version UP Improvement or added items from the SJ700.

EzSQ EzSQ application case. refer to P15-16 for details.

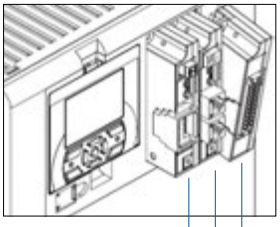
PM motor PM motor specific function.

Easy customize with "Plug-in" cassette

version UP

Cassette type option boards for intuitive installation.

- Visible indicators on the various option boards allow for user to verify functionality with ease.
- Tasks such as setting a station number is simplified by use of a rotary selection switch.
- Replacement is also simplified by the cassette design. Replacement after failure is also easy.



3 option slots

Options List. (Contact Sales Office for availability)
Ethernet
EtherCAT
PROFIBUS-DP
PROFINET
Feedback
Safety
Analog input and output

Network options available for system expansion.

- Modbus-RTU as standard
- Following fieldbus network available with option on slot (PROFIBUS-DP, PROFINET, EtherCAT, Ethernet)

(Modbus is a registered trademark of Modicon Inc. EtherCAT® is a registered trademark and patented technology licensed from Germany Beckhoff Automation GmbH. Other company names and product names mentioned are the property of the respective trademarks or registered trademarks.)

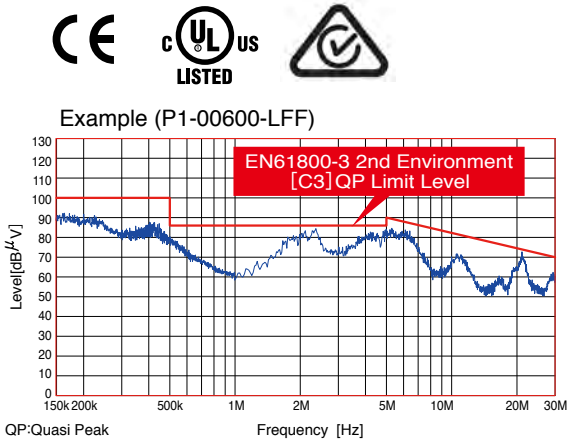
"High quality" to comply international standards

Corresponds to the EC directive, UL and cUL in order to guarantee the quality and safety. Equipped with a quality that is recognized in Europe.

EC directive	LVD : IEC61800-5-1 EMC directive : IEC61800-3
UL	Power Conversion Equipment/UL61800-5-1

Built-in noise filters corresponding to the European EMC Directive. (IEC61800-3 2nd Environment Category C3)

since complies with the RoHS, Environmental considerations also sufficient.

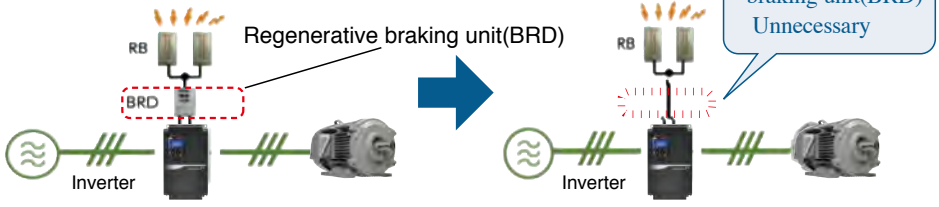


Braking circuit is built-in. Further "Space and Cost saving"!

version UP

The regenerative braking circuit is built-in, therefore a separate regenerative braking unit (BRD) is not necessary. Saving space and cost.

Applicable models
- 200V class 0.4 to 22kW
- 400V class 0.75 to 55kW (400V class 45kW and 55kW is the order)



Application Note

Expand energy savings in applications

The SJ-P1 inverter is applicable in a wide variety of industries. Introducing

Fan & Pump

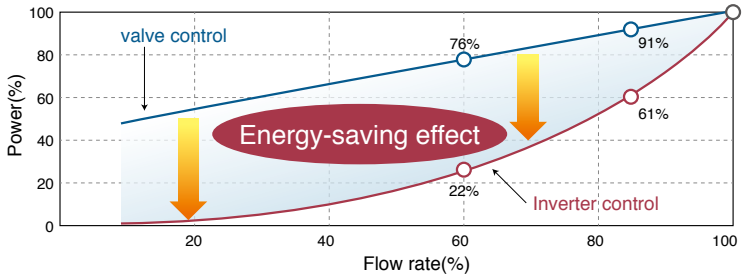
PM motor

【Energy saving by the inverter】

● Optimize for energy savings in pumping applications.

By utilizing the SJ-P1 inverter control versus the valve control, significant energy saving can be obtained over the various flow rates.

□Examples of energy-saving effect



【Further energy saving by the PM motor】

● Corresponds to both Induction motor and PM motor.

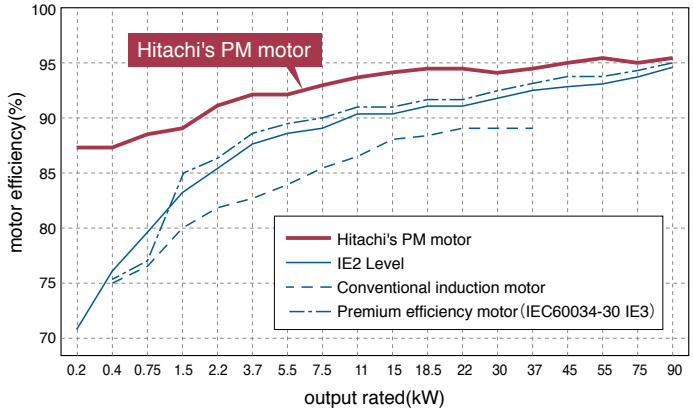
By using a PM motor, further energy savings can be realized.
(Please refer to the motor efficiency graph of right)

● Obtain the high performance from your PM motor by using our simple adjustment.

By PM motor auto-tuning function, the characteristics of the motor will be optimized for best performance possible.

□Efficiency comparison of the induction motor and the PM motor

※Data is 3600min-1 series , Dynamometer test



□Hitachi induction motor and PM motor

ザ・モートル Neo 100 Premium

IE3 Induction motor

ECOHEART

Small series (equivalent to IE3)

IE4 equivalent PM motor (the same frame as the induction motor)

Recommended function

● PM motor drive ● Multiple rating ● Modbus communication
● PID control ● PID Sleep mode ● PID Soft-start function Refer to the next page
● Automatic energy-saving function

such as fan, pump and compressor.

EzSQ application case. refer to P15-16 for details.

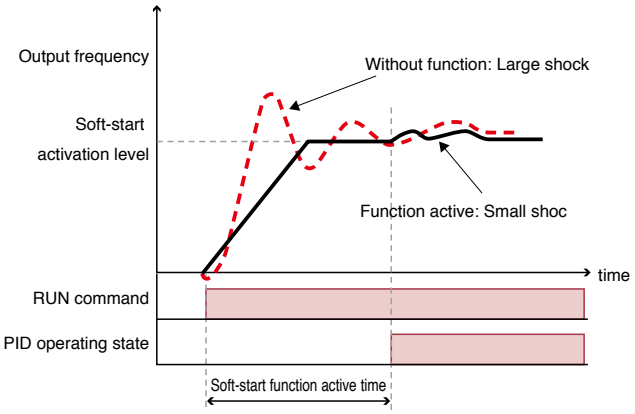
PM motor specific function.

more useful features of each application!

New application features! Fan & Pump

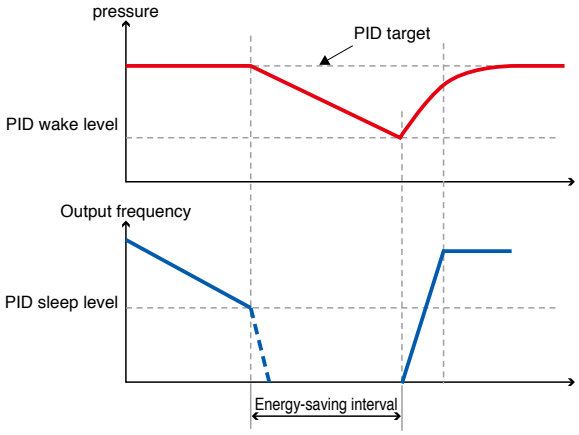
Optimal PID functions for Fan & Pump applications!

At the time of the PID function start-up, the SJ-P1 will reduce the output to eliminate water hammer effect on the system.



Refer to the Parameter AH-75～

Execute a stop command of the operation when it is unnecessary, saving energy and wear on motor and pump system.



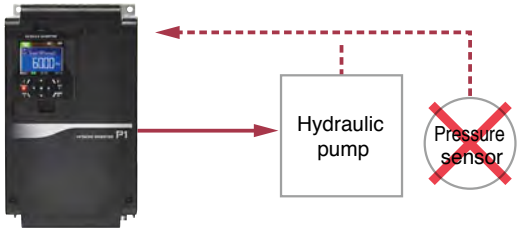
Refer to the Parameter AH-85～

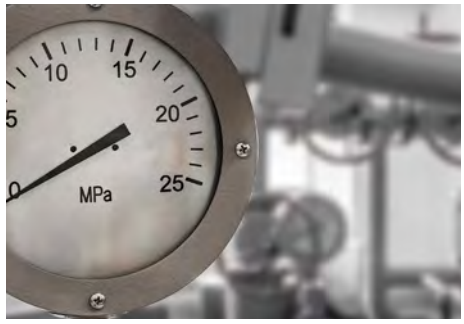
Hydraulic pump

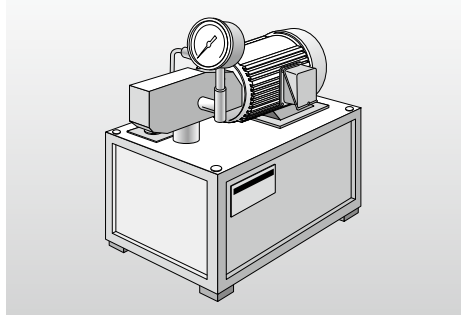
EzSQ

●Energy-saving achieved by EzSQ (programming function).

By increasing the rotation speed when pressure is necessary, and reducing the rotational speed during standby, the SJ-P1 will optimize energy consumption. In addition, EzSQ can utilize signals from external sources such as a pressure sensor and/or a relay circuit. Therefore, cost reduction and space saving can be achieved.







□Example of the results of the hydraulic pump energy-saving test

Inverter operation EzSQ (programming function)

Example of the results

Reduction of 45% of the cumulative power!

Recommended function

●Multiple rating ●PID control ●PM motor drive
●Sensorless vector control ●EzSQ(programming function)

Application Note

High Performance Applications

Hitachi inverters are used in a wide variety of industries because of its high

Crane, Lift, Automatic warehouse

EzSQ

- Provides smooth drive control even for heavy weights.

  Provide stable drive control even for the heavy weights (such as winding of the cranes) thanks to the high start-up torque (0.3Hz, 200%).

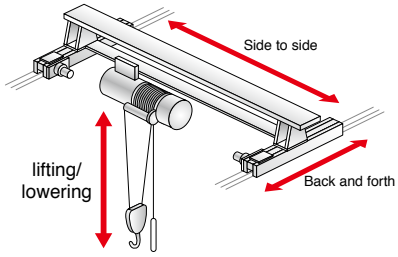
  *Note Hitachi Induction motor 4P (ND load/Sensor-less vector control)

- Reduce the shock such as swing load by multi setting speed response gain.

  Gain mapping function provides a vibration reduction and stable operation.
  It will be also effective in the tact time reduction.

- Space-saving and cost-down by the EzSQ(programming function).

  By using EzSQ, it is possible to reduce components by eliminating the host controller for the drive, thus saving-space and cost.



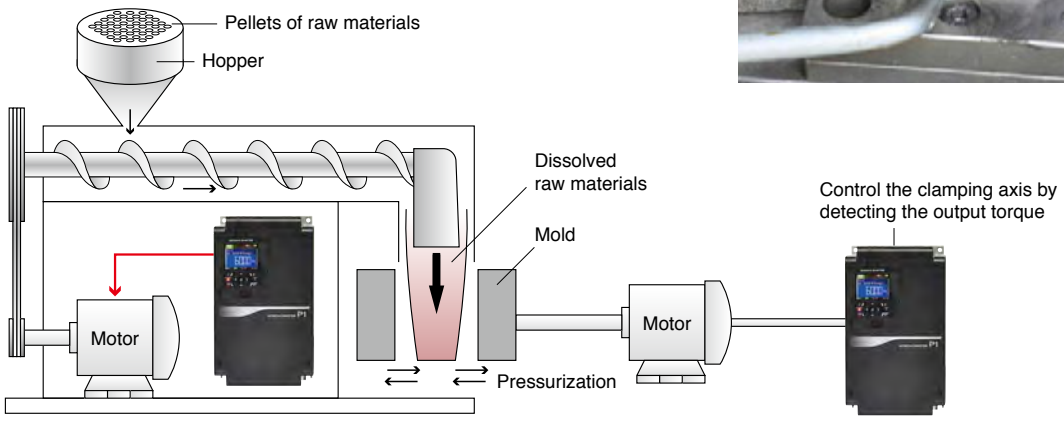
Recommended function

- Sensorless vector control
- Gain mapping function
- EsSQ(programming function)

Injection molding machine

- Torque control can be applied to the injection molding machine.

  "Overload warning signal" and "Over torque signal" can apply the operation timing of the injection and mold clamping axis.



Recommended function

- Torque control
- Torque limit function
- Overload signal
- Over torque signal
- Overload restriction function

EzSQ application case. refer to P15-16 for details.

PM motor specific function.

efficiency and high quality.

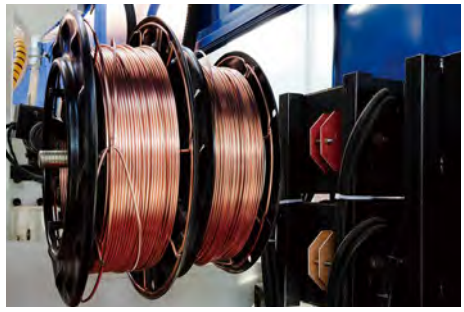
Winder

Utilizing Gain Control.

When you allow the speed response gain to be variable by the output frequency band, the drive is more stable.
This is suitable for winder and re-winder applications.

In Winding machine applications highly precise rotation is required.

For closed-Loop application optional feedback board is required (future availability planned).



Recommended function

- Vector control (feedback option board required, future availability planned)
- Gain mapping function
- Torque control

Grinder

EzSQ PM motor

Miniaturization by utilizing a PM motor.

Hitachi supports PM motor control.

Further support to high-quality machining applications.

Maximum output frequency is 590Hz (induction motor) and 400Hz (PM motor).

EzSQ expands the possibility for a wide variety of "small-lot" jobs.

By utilizing the EzSQ program operation function it makes it easy to match to the operation that is required of the Workpiece to a wide variety of small-lot production. In addition, reduce the part of the controller and peripheral devices.

Recommended function

- PM motor drive
- EsSQ(programming function)

PC setting Software

Hitachi's ProDriveNext Software

Easy configuration, such as start/stop and fault diagnosis.

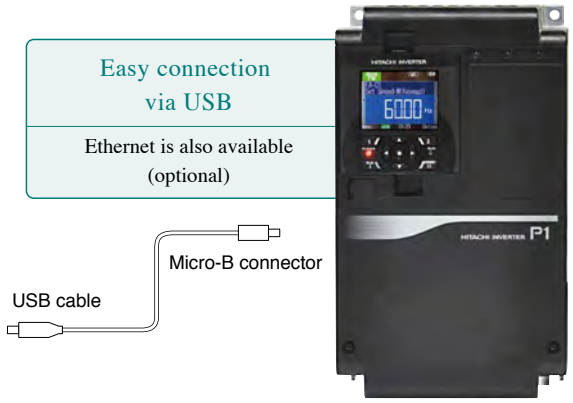
ProDriveNext(PC setting software)

ProDriveNext supports various functions.

Easy Setup & Easy data management
Enhancement parameter comparison

Easy connection via USB

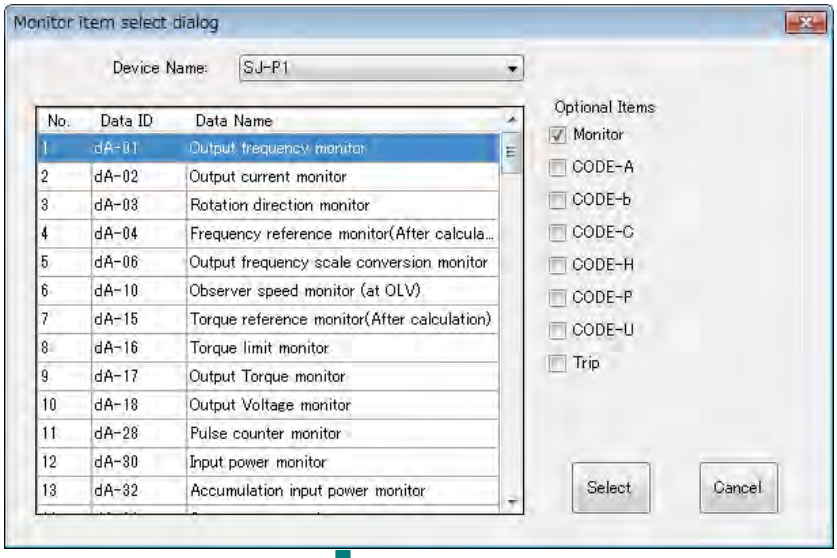
Ethernet is also available (optional)

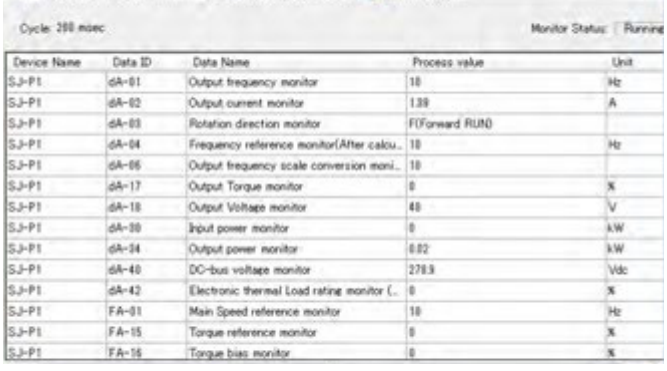


Monitor Function.

All display parameters can be monitored.

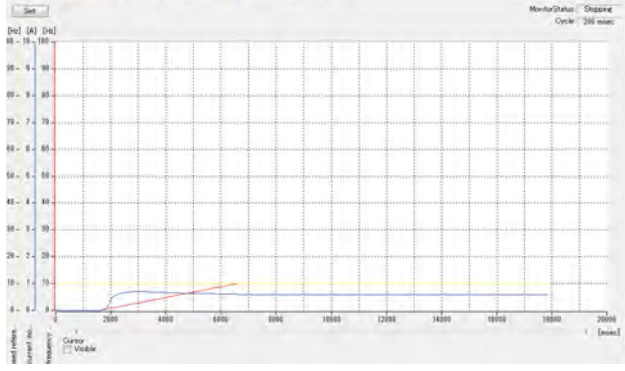
Monitor display format can be uniquely customized by selecting the required items, and can be displayed in a tabular or graphical format.





Device Name	Data ID	Data Name	Process value	Unit
SJ-P1	dA-01	Output frequency monitor	10	Hz
SJ-P1	dA-02	Output current monitor	1.39	A
SJ-P1	dA-03	Rotation direction monitor	F(Forward RUN)	
SJ-P1	dA-04	Frequency reference monitor(After calcu..	10	Hz
SJ-P1	dA-06	Output frequency scale conversion moni..	10	
SJ-P1	dA-17	Output Torque monitor	0	%
SJ-P1	dA-18	Output Voltage monitor	40	V
SJ-P1	dA-30	Input power monitor	0	kW
SJ-P1	dA-34	Output power monitor	0.02	kW
SJ-P1	dA-40	DC-bus voltage monitor	278.9	Vdc
SJ-P1	dA-42	Electronic thermal Load rating monitor (..	0	%
SJ-P1	FA-01	Main Speed reference monitor	10	Hz
SJ-P1	FA-15	Torque reference monitor	0	%
SJ-P1	FA-16	Torque bias monitor	0	%

【Table type monitor】



【Graph type monitor】

version UP Improvement or added items from the SJ700.

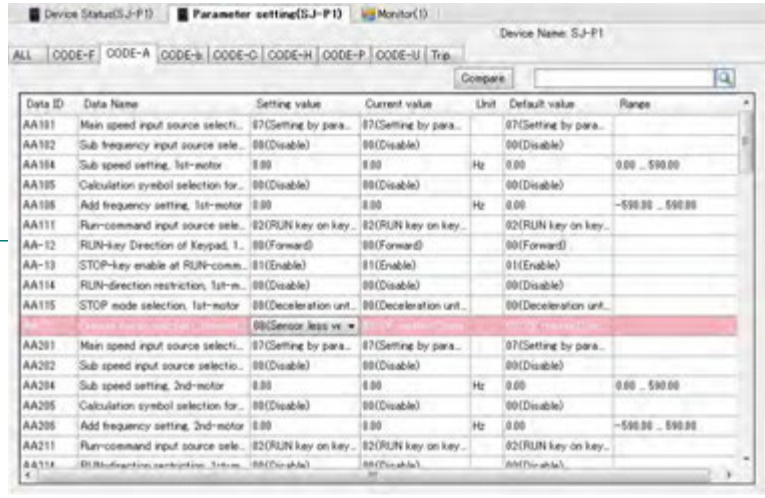
EzSQ EzSQ application case. refer to P15-16 for details.

EzSQ version UP

Parameter Setting.

Changes made by keyboard input.

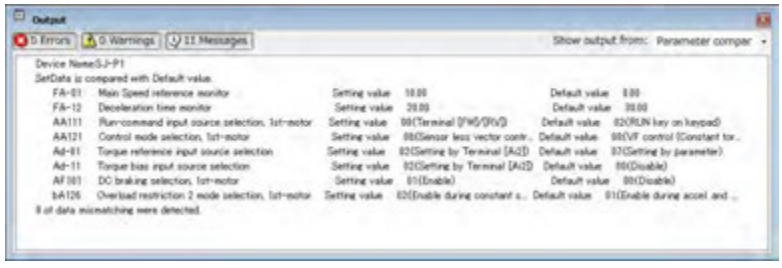
Changed parameters highlighted "PINK" which indicates that it needs to be download to the device.



【Parameter setting display】

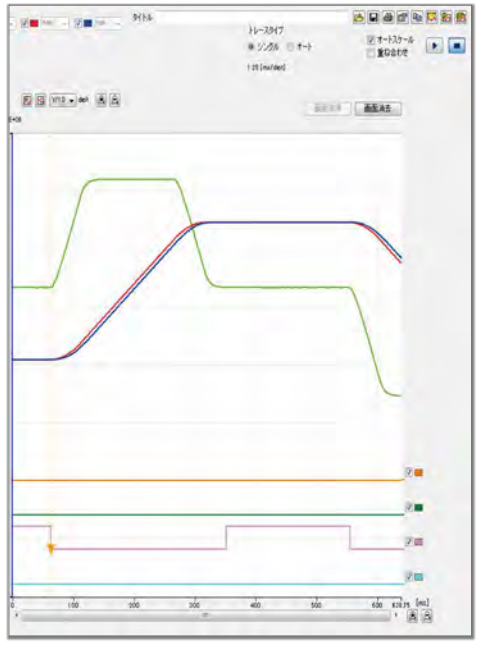
Extensive parameter comparison function.

Parameter management is supported by comparison functions below.
[Setting value] - [Current value],
[Setting value] - [Default value]
[Setting value] - [File value]



Data Trace function support an failure diagnosis.(planning)

By frequency reached, alarm or other signal trigger, the internal data of inverter is stored in real-time in the internal memory.
Operation adjustment and failure analysis becomes more quickly.



※Image is in developing

Please contact us for ProDriveNext software package.

PC setting Software

Easily Customizable

Hitachi's programming function (EzSQ) and inverter-to-inverter communi
your VFD for each application beyond available fixed parameters.

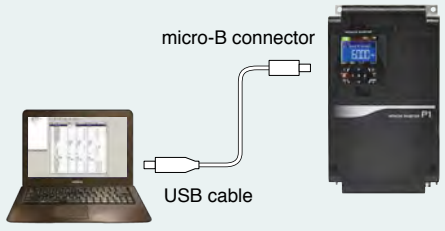
EzSQ EzSQ(programming function)

Line	Label	Mnemonic	Parameter1	Parameter2	Parameter3	Parameter4	Parameter5
7		case	1				
8		call	RUN_FW				
9		case	2				
10		call	RUN_RV				
11		case	3				
12		call	WAIT_RUN				
13		case else					
14		call	STOP				
15		end select					
16		goto	LOOP				
17							
18		sub	STOP				
19		UBw=	Xw	and	3		
20		if	UBw	<>	2	then	LBLO
21		FW=	1				
22		timer set	TD(0)	U(00)			
23		U(31)=			1		
24	LBLO	end sub					
25							

The program is easy to create with available condition branches and timer settings.

Hitachi's EzSQ makes it possible to achieve a level of control that cannot be realized by a general purpose inverter. Giving the unique added value of cost savings and improved performance.

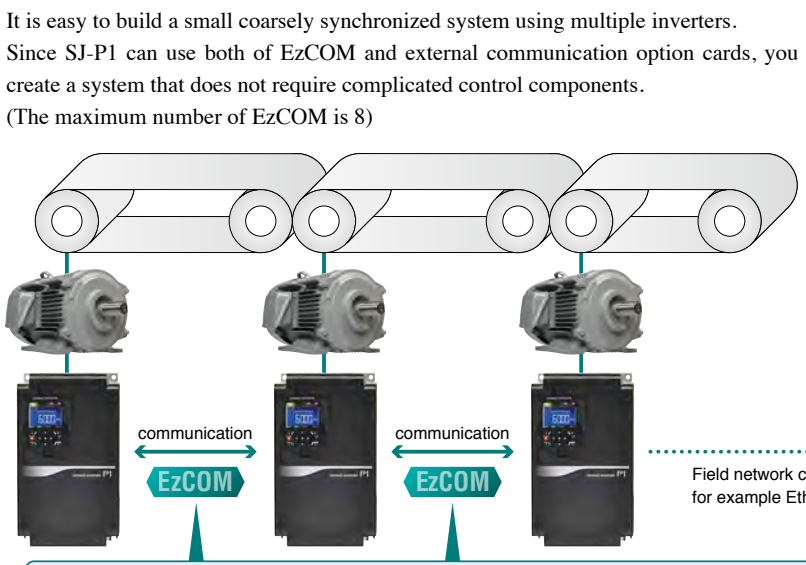
The program is created on a PC software (ProDriveNext).
It is easy to programming because similar BASIC!



EzCOM Inverter-to-Inverter communication

SJ-P1 makes it possible to have Inverter-to-Inverter communication without a PLC or PC. [EzCOM function]

It is easy to build a small coarsely synchronized system using multiple inverters.
Since SJ-P1 can use both of EzCOM and external communication option cards, you can create a system that does not require complicated control components.
(The maximum number of EzCOM is 8)



Field network communication,
for example EtherCAT

Available together, EzCOM communication and field network communication options.

By simple wiring and easy parameter settings, the synchronous operation can be achieved without the host controller (Resulting in Cost and Wiring Savings).

version UP Improvement or added items from the SJ700.

EzSQ EzSQ application case. refer to P15-16 for details.

cation(EzCOM) allows you to uniquely customize

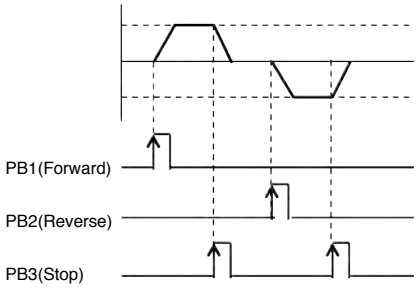
EzSQ Your own "Add-on-value" by EzSQ(programming function) EzCOM version UP

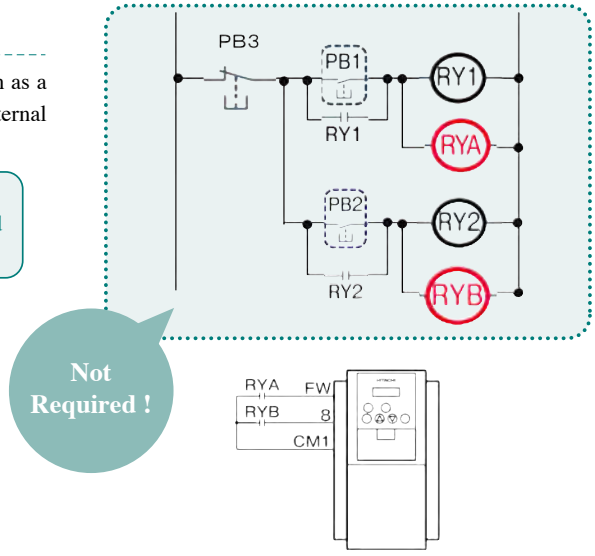
Application case 1

Reduction of the external circuit components.

In a system that would normally require external circuit components such as a relay, timer and switch, it is possible to reduce the use of those external components by using the EzSQ (programming function).

For example the Forward, Reverse, and Stop system shown below are part of the external relay circuit which are no longer required when using EzSQ function.





Application case 2

Advanced operation pattern is reproduced without sensors!

Mixing Machine:
At first mixing the material slowly and then increasing the mixing speed (by monitoring the load current). This speed change can be done automatically when using EzSQ.
Advanced speed patterns can be easily created for each application.

Application case 3

Multiple control is easy!

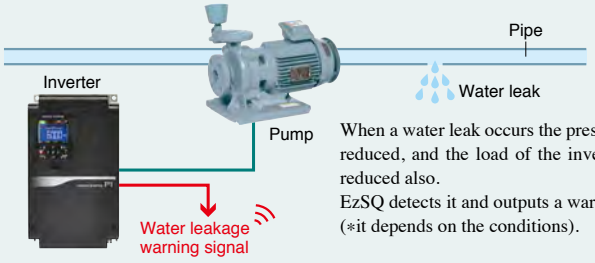
Winder:
EzCOM is a simple communication function that can be used for winders that would previously required multiple controllers.
Construction of multiple systems can be simply achieved by reducing wiring works. Maintenance is also easy.

Application case 4

Check for water leakage without sensors!

Pump control:
Attaching a sensor to various places of the drainage pipe is costly.
EzSQ program that outputs an alarm to calculate the water leakage from the operating status of the pump can be utilized in place of a sensor.

◎For example of Water leakage detections from pipe.



When a water leak occurs the pressure is reduced, and the load of the inverter is reduced also.
EzSQ detects it and outputs a warning (∗it depends on the conditions).

Further examples of EzSQ use

- For reducing maintenance cost…
  →Water leakage detections from pipe, Dust blowouts for fans.
- For additional protective features…
  →Avoiding water hammers, Multi speed adjustment during mixing process.
- For further energy savings…
  → Ideal output controls for fan & pumps, Sleep modes for conveyers non-regular used
- For stand-alone works on multi uses…
  →Automatic operations of the fan and pumps based on user customization PID

Contact Hitachi for more information!

EzSQ function can enable following.
With the combination of these, customized functions can be easily implemented.

- Collect information of inverter's internal data such as load current, frequency, and etc.
- Input and output IO (including analogue IOs) can be freely assigned to your own function.
- Arithmetic operations (internal calculation), Rewriting inverter parameters, Sequential programming(such as conditions branches), Internal timers, and more other functions…

Model configuration

• SJ series model name indication

P1 - 00175 - H F E

- Type Name
- Motor maximum rated current (at VLD rated current)
  - 00001: 0.1A
  - to
  - 99999: 9999.9A
- Power Source
  - L: 3-phase 200V class
  - H: 3-phase 400V class
- F: with keypad
- Region
  - E: Europe version
  - U: North America version
  - None:Japan version
- F: Integrated EMC filter

• Lineup

●Available

Applicable motor (kW)	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	132
3-phase 200 V (ND rating)	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○				
3-phase 400 V (ND rating)		●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○

(Note) The applicable motor refers to Hitachi standard 3-phase motor (4-pole).
To use other motors, be sure to prevent the rated motor current (50Hz) from exceeding the rated output current of the inverter.

Applicable motor capacity by rating

• Overload current rating

VLD (Very light duty): 110% 60sec, 120% 3sec
LD (Light duty): 120% 60sec, 150% 3sec
ND (Normal duty) : 150% 60sec, 200% 3sec

• 200V class

ND Rating Code	Model name	VLD (Very light duty)		LD (Light duty)		ND (Normal duty)	
P1-□□□-LF*F		motor capacity (kW) (4pole)	Rated current (A)	motor capacity (kW) (4pole)	Rated current (A)	motor capacity (kW) (4pole)	Rated current (A)
004	00044	0.75 (1)	4.4	0.75 (1)	3.7	0.4 (1/2)	3.2
007	00080	1.5 (2)	8.0	1.5 (2)	6.3	0.75 (1)	5.0
015	00104	2.2 (3)	10.4	2.2 (3)	9.4	1.5 (2)	8.0
022	00156	3.7 (5)	15.6	3.7 (5)	12.0	2.2 (3)	11.0
037	00228	5.5 (7.5)	22.8	5.5 (7.5)	19.6	3.7 (5)	17.5
055	00330	7.5 (10)	33	7.5 (10)	30	5.5 (7.5)	25
075	00460	11 (15)	46	11 (15)	40	7.5 (10)	32
110	00600	15 (20)	60	15 (20)	56	11 (15)	46
150	00800	18.5 (25)	80	18.5 (25)	73	15 (20)	64
185	00930	22 (30)	93	22 (30)	85	18.5 (25)	76
220	01240	30 (40)	124	30 (40)	113	22 (30)	95
300	01530	37 (50)	153	37 (50)	140	30 (40)	122
370	01850	45 (60)	185	45 (60)	169	37 (50)	146
450	02290	55 (75)	229	55 (75)	210	45 (60)	182
550	02950	75 (100)	295	75 (100)	270	55 (75)	220

• 400V class

ND Rating Code	Model name	VLD (Very light duty)		LD (Light duty)		ND (Normal duty)	
P1-□□□-HF*F		motor capacity (kW) (4pole)	Rated current (A)	motor capacity (kW) (4pole)	Rated current (A)	motor capacity (kW) (4pole)	Rated current (A)
007	00041	1.5 (2)	4.1	1.5 (2)	3.1	0.75 (1)	2.5
015	00054	2.2 (3)	5.4	2.2 (3)	4.8	1.5 (2)	4.0
022	00083	3.7 (5)	8.3	3.7 (5)	6.7	2.2 (3)	5.5
037	00126	5.5 (7.5)	12.6	5.5 (7.5)	11.1	3.7 (5)	9.2
055	00175	7.5 (10)	17.5	7.5 (10)	16	5.5 (7.5)	14.8
075	00250	11 (15)	25	11 (15)	22	7.5 (10)	19
110	00310	15 (20)	31	15 (20)	29	11 (15)	25
150	00400	18.5 (25)	40	18.5 (25)	37	15 (20)	32
185	00470	22 (30)	47	22 (30)	43	18.5 (25)	39
220	00620	30 (40)	62	30 (40)	57	22 (30)	48
300	00770	37 (50)	77	37 (50)	70	30 (40)	61
370	00930	45 (60)	93	45 (60)	85	37 (50)	75
450	01160	55 (75)	116	55 (75)	105	45 (60)	91
550	01470	75 (100)	147	75 (100)	135	55 (75)	112

Standard Specifications

• 200V class specifications

Model name (P1-□□□-L)			00044	00080	00104	00156	00228	00330	00460	00600	00800	00930	01240	01530	01850	02290	02950
Applicable motor capacity (4 poles) (kW) (*1)		VLD	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75
		LD	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75
		ND	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
Output	Rated output current (A)	VLD	4.4	8.0	10.4	15.6	22.8	33.0	46.0	60.0	80.0	93.0	124	153	185	229	295
		LD	3.7	6.3	9.4	12.0	19.6	30.0	40.0	56.0	73.0	85.0	113	140	169	210	270
		ND	3.2	5.0	8.0	11.0	17.5	25.0	32.0	46.0	64.0	76.0	95.0	122	146	182	220
	Overload current rating (*2)	VLD	110% 60sec / 120% 3sec														
		LD	120% 60sec / 150% 3sec														
		ND	150% 60sec / 200% 3sec														
	Rated output voltage		3-phase (3-wire) 200 to 240 V (corresponding to input voltage)														
	Rated capacity (kVA) 200V	VLD	1.5	2.8	3.6	5.4	7.9	11.4	15.9	20.8	27.7	32.2	43.0	53.0	64.1	79.3	102.2
		LD	1.3	2.2	3.3	4.2	6.8	10.4	13.9	19.4	25.3	29.4	39.1	48.5	58.5	72.7	93.5
		ND	1.1	1.7	2.8	3.8	6.1	8.7	11.1	15.9	22.2	26.3	32.9	42.3	50.6	63.0	76.2
	Rated capacity (kVA) 240V	VLD	1.8	3.3	4.3	6.5	9.5	13.7	19.1	24.9	33.3	38.7	51.5	63.6	76.9	95.2	122.6
		LD	1.5	2.6	3.9	5.0	8.1	12.5	16.6	23.3	30.3	35.3	47.0	58.2	70.3	87.3	112.2
		ND	1.3	2.1	3.3	4.6	7.3	10.4	13.3	19.1	26.6	31.6	39.5	50.7	60.7	75.7	91.5
Input	Rated input current (A) (*3)	VLD	5.2	9.5	12.4	18.6	27.1	39.3	54.8	71.4	95.2	110.7	147.6	182.1	220.2	272.6	351.2
		LD	4.4	7.5	11.2	14.3	23.3	35.7	47.6	66.7	86.9	101.2	134.5	166.7	201.2	250.0	321.4
		ND	3.8	6.0	9.5	13.1	20.8	29.8	38.1	54.8	76.2	90.5	113.1	145.2	173.8	216.7	261.9
	Rated input AC voltage (*4)		Main circuit power supply: 3-phase 200 to 240V 50/60 Hz, Control power supply: 1-phase 200 to 240V 50/60 Hz														
	Permissible AC voltage/ Frequency fluctuation		AC voltage : 170 to 264V 50/60 Hz, Frequency :±5%														
	Power supply capacity (kVA) (*5)	VLD	2.0	3.6	4.7	7.1	10.3	15.0	20.9	27.2	36.3	42.2	56.3	69.4	83.9	103.9	133.8
		LD	1.7	2.9	4.3	5.4	8.9	13.6	18.1	25.4	33.1	38.6	51.3	63.5	76.7	95.3	122.5
		ND	1.5	2.3	3.6	5.0	7.9	11.3	14.5	20.9	29.0	34.5	43.1	55.3	66.2	82.6	99.8
Carrier frequency range (*6)		VLD	0.5 to 10.0kHz														
		LD	0.5 to 12.0kHz														
		ND	0.5 to 16.0kHz														
Starting torque (*7)			200% / 0.3Hz														
Braking	Regenerative Braking		Internal BRD circuit (external discarge resistor)											Ext. regen. braking unit			
	Minimum resistance value (Ω)		50	50	35	35	35	16	10	10	7.5	7.5	5	–	–	–	–
Protective structure			IP00 (*8)														
Aprox. weight (kg)			4	4	4	4	4	7	7	7	16	16	16	22	30	30	43

• 400V class specifications

Model name (P1-□□□-H)			00041	00054	00083	00126	00175	00250	00310	00400	00470	00620	00770	00930	01160	01470
Applicable motor capacity (4 poles) (kW) (*1)		VLD	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75
		LD	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75
		ND	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
Output	Rated output current (A)	VLD	4.1	5.4	8.3	12.6	17.5	25.0	31.0	40.0	47.0	62.0	77.0	93.0	116	147
		LD	3.1	4.8	6.7	11.1	16.0	22.0	29.0	37.0	43.0	57.0	70.0	85.0	105	135
		ND	2.5	4.0	5.5	9.2	14.8	19.0	25.0	32.0	39.0	48.0	61.0	75.0	91.0	112
	Overload current rating (*2)	VLD	110% 60sec / 120% 3sec													
		LD	120% 60sec / 150% 3sec													
		ND	150% 60sec / 200% 3sec													
	Rated output voltage		3-phase (3-wire) 380 to 500V (corresponding to input voltage)													
	Rated capacity (kVA) 400V	VLD	2.8	3.7	5.8	8.7	12.1	17.3	21.5	27.7	32.6	43.0	53.3	64.4	80.4	101.8
		LD	2.1	3.3	4.6	7.7	11.1	15.2	20.1	25.6	29.8	39.5	48.5	58.9	72.7	93.5
		ND	1.7	2.8	3.8	6.4	10.3	13.2	17.3	22.2	27.0	33.3	42.3	52.0	63.0	77.6
	Rated capacity (kVA) 500V	VLD	3.6	4.7	7.2	10.9	15.2	21.7	26.8	34.6	40.7	53.7	66.7	80.5	100.5	127.3
		LD	2.7	4.2	5.8	9.6	13.9	19.1	25.1	32.0	37.2	49.4	60.6	73.6	90.9	116.9
		ND	2.2	3.5	4.8	8.0	12.8	16.5	21.7	27.7	33.8	41.6	52.8	65.0	78.8	97.0
Input	Rated input current (A) (*3)	VLD	4.9	6.4	9.9	15.0	20.8	29.8	36.9	47.6	56.0	73.8	91.7	110.7	138.1	175.0
		LD	3.7	5.7	8.0	13.2	19.0	26.2	34.5	44.0	51.2	67.9	83.3	101.2	125.0	160.7
		ND	3.0	4.8	6.5	11.0	17.6	22.6	29.8	38.1	46.4	57.1	72.6	89.3	108.3	133.3
	Rated input AC voltage (*4)		Main circuit power supply: 3-phase 380 to 500V 50/60 Hz, Control power supply: 1-phase 380 to 500V 50/60 Hz													
	Permissible AC voltage/ Frequency fluctuation		AC voltage:323 to 550V 50/60 Hz, Frequency :±5%													
	Power supply capacity (kVA) (*5)	VLD	3.7	4.9	7.5	11.4	15.9	22.7	28.1	36.3	42.6	56.3	69.9	84.4	105.2	133.4
		LD	2.8	4.4	6.1	10.1	14.5	20.0	26.3	33.6	39.0	51.7	63.5	77.1	95.3	122.5
		ND	2.3	3.6	5.0	8.3	13.4	17.2	22.7	29.0	35.4	43.5	55.3	68.0	82.6	101.6
Carrier frequency range (*6)		VLD	0.5 to 10.0kHz													
		LD	0.5 to 12.0kHz													
		ND	0.5 to 16.0kHz													
Starting torque (*7)			200% / 0.3Hz													
Braking	Regenerative Braking		Internal BRD circuit (external discarge resistor)												(*9)	
	Minimum resistance value (Ω)		100	100	100	70	70	35	35	24	24	20	15	15	10	10
Protective structure			IP00 (*8)													
Aprox. weight (kg)			4	4	4	4	7	7	7	16	16	16	22	30	30	30

*1: The applicable motor refers to Hitachi standard 3-phase motor (4-pole). To use other motors, be sure to prevent the rated motor current (50Hz) from exceeding the rated output current of the inverter. *2: Electronic thermal protection is valid in accordance to derating. *3: The rated input current, is the value of the rated output current. The value of the impedance at the supply side changes by the wiring, breaker, input reactor, etc. *4: In order to comply with the Low Voltage Directive (LVD), it must be connected to a neutral grounding supply. 200V class: -Pollution degree 2 -Overvoltage category 3. 400V class: -Pollution degree 2 -Overvoltage category 3 (In the case the input supply is 380 to 460Vac) -Overvoltage category 2 (If the input supply is 460Vac or more). *5: The power supply capacity is the value of the output rated current at 220V / 440V. The impedance at the supply side may be affected by the wiring, breaker, input reactor, etc. *6: Carrier frequency may be limited in the range according to the use of drive. *7: The values for the sensorless vector control are assigned according to the values in the ND rating in the Hitachi standard motor table. Torque characteristics may vary by the control system and the motor in use. *8: When the conduit box use is possible to respond to IP20. *9: Usually, an external regenerative braking is necessary. By your order it is possible to include the built-in braking circuit. By attaching the braking resistor the regenerative braking unit is no longer required.

Common specifications

Items			General Specifications		
PWM system			Sine-wave PWM system		
Output frequency range (*1)			0.00 to 590.00Hz		
Frequency accuracy			For the highest frequency, digital ±0.01%, analogue ±0.2% (25±10°C)		
Frequency resolution			Digital: 0.01Hz, Analogue: Max. frequency / 4000 (Ai1 terminal / Ai2 terminal: 12 bit / 0 to +10V or 0 to +20 mA, Ai3 terminal: 12 bit / -10 to +10V)		
Control system (*2)			IM	V/f control (constant torque / reduced torque / free), Automatic boost control,V/f control with encoder (constant torque / reduced torque / free), Automatic boost control with encoder, Cascade type sensorless vector control, 0Hz sensorless vector control, Cascade type vector control with encoder (position and torque).	
			SM/PMM	Synchronous startup for smart sensorless vector control.	
Speed fluctuation (*3)			±0.5% (sensorless vector control)		
Acceleration/deceleration time			0.00 to 3600.00s (Linear, S-curve, U-curve, Inverted-U-curve, EL-S-curve)		
Display			Output frequency, Output current, output torque, trip history, input/output terminal function, input/output power (*4), PN voltage, etc.		
Start functions			DC braking after the start, matching frequency after the start, active frequency matching start, Low-voltage start, retry restart.		
Stop functions			After free run stop, deceleration stop; DC braking or external DC braking operation (Braking force, time, adjustment of operation speed)		
Stall prevention function			Overload limit function, overcurrent supression, overvoltage suppresion function		
Protection functions (*5)			Overcurrent error, overload error, brake resistor overload, overvoltage error, memory error, undervoltage error, current detector error, CPU error, external trip error, USP error, ground error, supply overvoltage error, power loss error, temperature detector error, Cooling-fan rotation speed decrease, temperature error, phase input error, IGBT error, phase output error, thermistor error, brake error, low-speed range overload error, inverter overload, RS485communication error, RTC error etc.		
Other functions			V/f free setting (7 points), upper and lower frequency limit, frequency jump, curve acceleration and deceleration, manual torque boost, energy-saving operation, analogue output adjustment, minimum speed, carrier frequency adjustment, motor electronic thermal function(free is possible), inverter thermal function, external start-end(speed and rate), frequency input selection, trip retry, restart stop, various signal output, initialization setting, PID control, auto-decel at shut-off, brake control function, commercial switching function, auto-tuning (on/offline) etc.		
Inpout signal	Frequency setting	Panel	Up, down left and right keys to the set parameter.		
		External signal (*6)	Ai1 / Ai2 terminal (Current and Voltage is able to switched.)	0 to 10Vdc (input impedance: 10kΩ) / 0 to 20mA (input impedance: 100Ω)	
			Ai3 terminal	-10 to +10Vdc (Input impedance: 10kΩ)	
			Multi-speed terminal	16multi-speed (With the use of the intelligent input terminal)	
			Pulse train-input	Maximum 32 kHz ×2	
		External port	RS485serial communication (Protocol: Modbus-RTU, Maximum: 115.2kbps)		
	Forward / reverse Start / stop	Panel	By RUN / Stop key (With the set parameter, forward / reverse can be switched)		
		External signal	Forward (FW) / Reverse (RV) 3-wire input allowed (STA,STP,FR) (When input terminal functions are assigned)		
		External port	RS485serial communication (Protocol: Modbus-RTU, Maximum: 115.2kbps)		
	Intelligent input terminals		11 terminals (A or B terminal accept a pulse train)		
			FW (Forward rotation) / RV (Reverse rotation), CF1 to 4 (Multi-speed 1 to 4), SF1 to 7 (Multi-speed bit 1 to 7), ADD (Trigger for frequency addition), SCHG (Command change), STA (3-wire start) / STP (3-wire stop) / FR (Forward / reverse by 3-wire), AHD (Analogue command holding), FUP (Remote control up) / FDN (Remote control down), UDC (Remote data clearance), F-OP(Forcible operation), SET (2nd-motor), RS (Reset), JG (Jogging), DB (External DC braking), 2CH (2-stage acc / decel), FRS (Free-run stop), EXT (External trip), USP (Unattended start protection), CS (Commercial power supply switching), SFT (Software lock), BOK (Braking confirmation), OLR (Overload restriction selection), KHC (Accumulated input power clear), OKHC (Accumulated input), PID (PID1 disable), PIDC (PID1 integration reset), PID2 (PID2 disable), PIDC2 (PID2 integration reset), SVC1 to 4 (PID1 multistage target value 1 to 4), PRO (PID gain change), PIO1 (PID output change), SLP (SLEEP trigger) / WAKE (WAKE trigger), TL (Enable torque limit), TRQ1/2 (Torque limit 1/2), PPI (P/PI switching), CAS (Control gain switching), FOC (Forcing), ATR (Enable torque command input), TBS (Enable torque bias), LAC (Acceleration / Deceleration cancellation), Mi1 to 11 (General-purpose input1 to 11), PCC (Pulse counter clearance), ECOM (EzCOM activation), PRG (EzSQ programme start), HLD (Acc / decel stop), REN (Motion enable signal), DISP (Display lock), PLA (Pulse train input A), PLB (Pulse train input B), DTR (Data trace start), DISP (Display lock), SON (servo on), ORT (orientation), PCLR (Clearance of position deviation), STAT (pulse train position command input enable), PUP (Position bias (ADD)), PDN (Position bias (SUB)), CP1 to 4 (Multistage position settings selection 1 to 4), ORL (Limit signal of Homing function), ORG (Start signal of Homing function), FOT (Forward Over Travel), ROT (Reserve Over Travel), SPD (speed / position switching), PSET (Position data presetting),		
	Backup supply terminal		P+ / P-: DC24V input (Input allowable voltage: 24V±10%)		
	STO input terminal		2 terminals (Simultaneous input)		
	Thermistor input terminal		1 terminal (PTC / NTC resistor allowed)		
Output	Intelligent output terminals		Transistor output terminal 5, 1a contact relay 1 point, 1c contact relay 1 point		
	Intelligent alarm relay (1a, 1c)		RUN (While in run), FA1 to 5 (Reached frequency signal), IRDY (Inverter ready), FWR (Forward rotation), RVR (Reverse rotation), FREF (panel frequency reference), REF (panel motion operation), SETM (2nd-motor selected), AL (Alarm signal), MJA (Major failure signal), OTQ (Over-torque), IP (Power loss), UV (Undervoltage), TRQ (Torque limited), IPS (Decel. Power loss), RNT (RUN time exceeded), ONT (ON time exceeded), THM (Motor electronic thermal warning), THC (Electronic thermal warning), WAC (Capacitor life warning), WAF (Cooling-fan life warning), FR (Operation signal), OHF (heat sink overheat warning), LOC / LOC2 (Low-current indication signal), OL / OL2 (Overload warning signal 1/2), BRK (Brake release), BER (Brake error), ZS (0Hz detection signal), OD / OD2 (Output deviation for PID control), FBV / FBV2 (PID feedback comparison), NDc (Communication disconnection), Ai1Dc / Ai2Dc / Ai3Dc (Analogue Ai1 / Ai2 / Ai3 disconnection), WCAi1 / WCAi2 / WCAi3 (Window comparator Ai1 / Ai2 / Ai3), LOG1 to 7 (logical operation result 1 to 7), MO1 to 7 (General-output 1 to 7), OVS (Over-Voltage power supply), PCMP (Pulse counter compare output), WFT (Trace function waiting for trriger), TRA (Trace function data logging), PDD (Position deviation over), POK (Positioning completed),etc.		
	EDM output terminal		Functional safety diagnostic output		
	Output terminal monitor (*7)		The data of the monitor can be selected by the parameter of the output.		
EMC filter activation (*8)			EMC filter can be activated (method to switch bares)		
PC external access			USB Micro-B		
Environment	Ambient temperature (*9)		-10 to 50°C (ND), -10 to 45°C (LD), -10 to 40°C (VLD)		
	Storage temperature(*10)		-20 to 65°C		
	Level of humidity		20 to 90%RH(No condensation allowed)		
	Vibration tolerance (*11)		P1-00044-L (P1-004L) to P1-01240-L (P1-220L), P1-00041-H (P1-004H) to P1-00620H (P1-220H)		5.9m/s² (0.6G), 10 to 55Hz
			P1-01530L (P1-300L) to P1-04300L (P1-900L), P1-00770H (P1-300H) to P1-03160H (P1-1320H)		2.94m/s² (0.3G), 10 to 55Hz
	Installation Place (*12)		A maximum altitude of 1000 m, without gases or dust.		
Components life span			Main circuit smoothing capacitors is 10 years. / Cooling-fan is 10 years.		
Conformity standars (*13)			UL, cUL, CE marking, RCM, KC (planned), EAC (planned), NK (planned), functional safety (STO: SIL3, Cat 3/PLe)		
Optional slots			3 ports		
Option	Input / ouput		Analogue input / output option, relay output option		
	Communication		Ethernet (Modbus TCP), EtherCAT, PROFIBUS-DP, PROFINET		
	Feedback		Line drive output, push-pull output, resolver output		
	Temperature detector		Optional temperature measuring sensor		
Other optional components			Braking resistor, AC reactor, noise filter, operator cable, harmonics suppresion unit, noise filter, LCRfilter, analog panel, regenerative braking unit, PC software ProdriveNext, relay expansion terminal board		

*1: To operate the motor beyond 50/60Hz, please consult with the motor manufacturer about the maximum allowable rotation speed. *2: If the setting of the motor constant is not appropriate, there is a case when the starting torque is not sufficient or unstable. *3: Speed fluctuation will vary depending on your system and the motor of the use environment. Please contact us for more information. *4: Both Input power and the output power are reference (not actual) value. Not suitable for calculations for such as the actual efficiency. *5: IGBT error [E030] also occurs by IGBT damage not only by short-circuit protection. Depending on the operating status of the inverter, Overcurrent error [E001] occurs instead of the IGBT error [E030]. *6: The frequency command is the maximum frequency at 9.8V for input voltage 0 to 10Vdc, or at 19.8 mA for input current 4 to 20 mA. Characteristic change is adjusted by using external start-end function. *7: The analogue voltage and analogue current monitor are estimated outputs of the analogue meter connection. Maximum output value might deviate slightly from 10V or 20 mA by variation of the analogue output circuit. If you want to change the characteristics, adjust the Ao1 and Ao2 adjustment functions. There is monitor data that cannot be part of the output. *8: When the EMC filter is enabled, please connected to the power supply with neutral grounding. Otherwise, it may increase leakage current. *9: Derating is set in accordance to carrier frequency. *10: Storage temperature is the temperature during transport. *11: In accordance with the test methods of JIS C 60068-2-6: 2010 (IEC 60068-2-6:2007). *12: In case of utilization at an altitude of 1000 m or more, take into account that the atmospheric pressure is reduced by 1% for very 100 m up. Please apply a derating of a 1% from the rated current every 100 m. Conduct and evaluation and contact us if you plan on using it above 2500 m. *13: Insulation distance is in accordance with the UL and CE standards.

Memo

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