*Leader in Electrics & Automation*

Safety Instructions

- For your safety, please read user's manual thoroughly before operating.
- Contact the nearest authorized service facility for examination, repair, or adjustment.
- Please contact qualified service technician when you need maintenance.
  Do not disassemble or repair by yourself!
- Any maintenance and inspection shall be performed by the personnel having expertise concerned.


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2007. 06

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### New micro size drive of LS Industrial Systems

# STARVERT iE5

Optimum solution for small size motor control

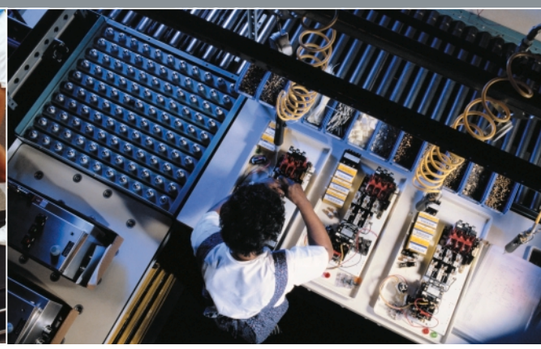
0.1~0.4kW 1Phase 200~230Volts
0.1~0.4kW 3Phase 200~230Volts




Automation Equipment





LS Industrial Systems
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# Experience the power!

## Slim and Power...

We have created the Micro class drive to provide
the optimal solution for small size motor controls.
You will be expereincing amazing power with this slim size.


**04** Key features of product
**06** Model and Specifications
**07** Standard Specification
**08** Wiring
**09** Terminal and loader fucntions
**10** Shifts between each code and group
**12** Function code table
**18** Protections
**19** Check & Remedy
**20** Peripheral device Specifications
**21** Dimension



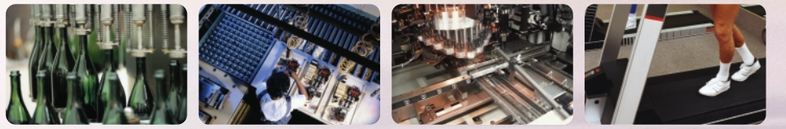


ISO9001 ISO14000 STARVERT iE5

# Small but variety!

Our iE5 is best fit for small machineries

such as packing machines, small conveyers, treadmills and etc...






## Smaller micro size

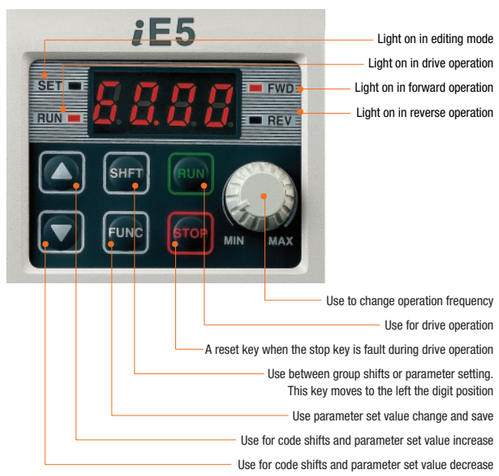
Our iE5 realizes 5% smaller micro size comparing to previous product.



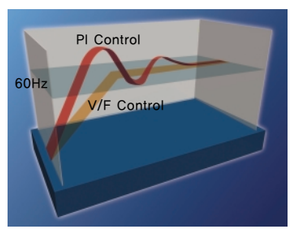

SV002 iE5-1

## Easy operation and control

The operation became easy by adopting the 6 keys and volume resistor types on the loader. Besides, convenience is guaranteed by limiting the total number of parameters as 100 parameters.

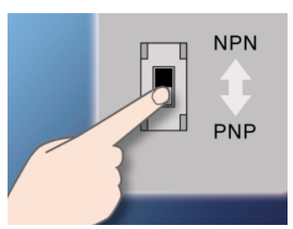



## PI Control



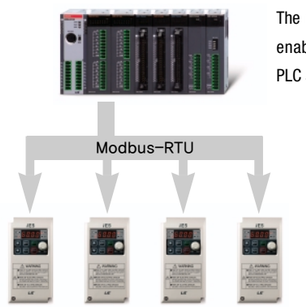

The PI Control is used to control the oil level, temperature and pressure of plant and process.This drive speed control fucntion compares between drive setting value and signal values guaged from sensors and actual contol is made through Proportion and Integral.

## PNP, NPN dual control Signal




iE5 provides both PNP and NPN minor signal powers so that no matter what signal type the external controller adopts, +24V power can be applied.

## Modbus communication interface (optional)




The optioanl modbus communication enables controlling drives through PLC and other controlling devices.

## Parameter copy function (Under development)




The parameters inputed to a drive can be duplicated and copied to other drives by this parameter copy unit.

## Model and Specifications

| Motor | 220V(Single phase) | 220V(3 phase) |
|---|---|---|
| 0.1kW(1/8HP) | SV001 iE5-1 | SV001 iE5-2 |
| 0.2kW(1/4HP) | SV002 iE5-1 | SV002 iE5-2 |
| 0.4kW(0.5HP) | SV004 iE5-1 | SV004 iE5-2 |

C : RS-485 communication is availiable as option
- : RS-485 communication is not availiable

Input voltage
1 : Single 220V class
2 : 3Phase 220V class

**SV 004 iE5 1 C**

LS Inverter Starvert series

Maximum motor capacity(kW)
(001 : 0.1kW ~ 004 : 0.4kW)

LS Inverter series name

| | |
|---|---|
| **SV004iE5-1** | Inverter model |
| INPUT 200 ~ 230V 1phase 5.5A 50/60Hz | Input voltage specification |
| OUTPUT 0 ~ INPUT V 3phase 2.5A 0.1~200Hz 0.5HP/0.4kW (D) | Output voltage, Rated output current, Frequency, Inverter capacity |
| 0010222100155 | Barcode and serial number |

**LS Industrial Systems Co., Ltd.** Made in Korea

## Standard Specification

### ■ Basic specification

| Model : SV□□□ iE5-□ | | 001-1 | 002-1 | 004-1 | 001-2 | 002-2 | 004-2 |
|---|---|---|---|---|---|---|---|
| Applicable motor | [HP] | 1/8 | 1/4 | 1/2 | 1/8 | 1/4 | 1/2 |
| | [kW] | 0.1 | 0.2 | 0.4 | 0.1 | 0.2 | 0.4 |
| Rated output | Rated capacity [kVA] | 0.3 | 0.6 | 0.95 | 0.3 | 0.6 | 1.14 |
| | Rated current [A] | 0.8 | 1.4 | 2.5 | 0.8 | 1.6 | 3.0 |
| | Output frequency [Hz] | 0 ~ 200 [Hz] | | | | | |
| | Output voltage [V] | 3 phase 200 ~ 230V | | | | | |
| Rated input | Applicable voltage [V] | 1 phase 200 ~ 230 VAC (±10%) | | | 3 phase 200 ~ 230 VAC (±10%) | | |
| | Input frequency[Hz] | 50 ~ 60 [Hz] (±5%) | | | | | |
| | Rated current [A] | 2.0 | 3.5 | 5.5 | 1.2 | 2.0 | 3.5 |

### ■ Control

| | |
|---|---|
| Control type | V/F Control |
| Frequency set resolution | Digital command : 0.01Hz<br>Analog command : 0.06Hz (Max.frq : 60Hz) |
| Frequency accuracy | Digital command :<br>0.01% of Max. Output frequency<br>Analog command :<br>0.1% of Max. Output frequency |
| V/F pattern | Linear, Squared, User V/F |
| Overload capacity | 150% / 1Min |
| Torque boost | Manual / Auto torque boost |

*Note1) The standard of rated capacity is 220V.
*Note2) The maximum output voltage does not increase over input voltage and the output voltage can be set below input voltage level.

### ■ Operation

| | | |
|---|---|---|
| Operation method | | Operaton method can be selected between loader, termanai and communication operation |
| Frequency set | | Analog method : 0~10(V), 0~20(mA), Loader volume<br>Digital method : Loader |
| Operation function | | PI Control, Up-Down , 3-wire operation |
| Input | Multi-function terminal (5 points) P1,P2,P3, P4,P5 | NPN / PNP Selectable |
| | | FWD/REV operation, Fault reset, Jog operation, Multi-step frequency(up/down), DC braking in stop mode, Frequency increase, Frequency decrease, 3 wire-operation external trip A and B, Shift to general operation from PI operation. Analogue command frequency set, Up/down save frequency delete |
| | Multi-function relay terminal | Fault and drive operation condition output (N.), N.C) AC250V below 0.3A and below DC 30V 1A |
| | Analogue output | 0~10Vdc(below 10mA) : can be selected among frequency, current, voltage, DC voltage |

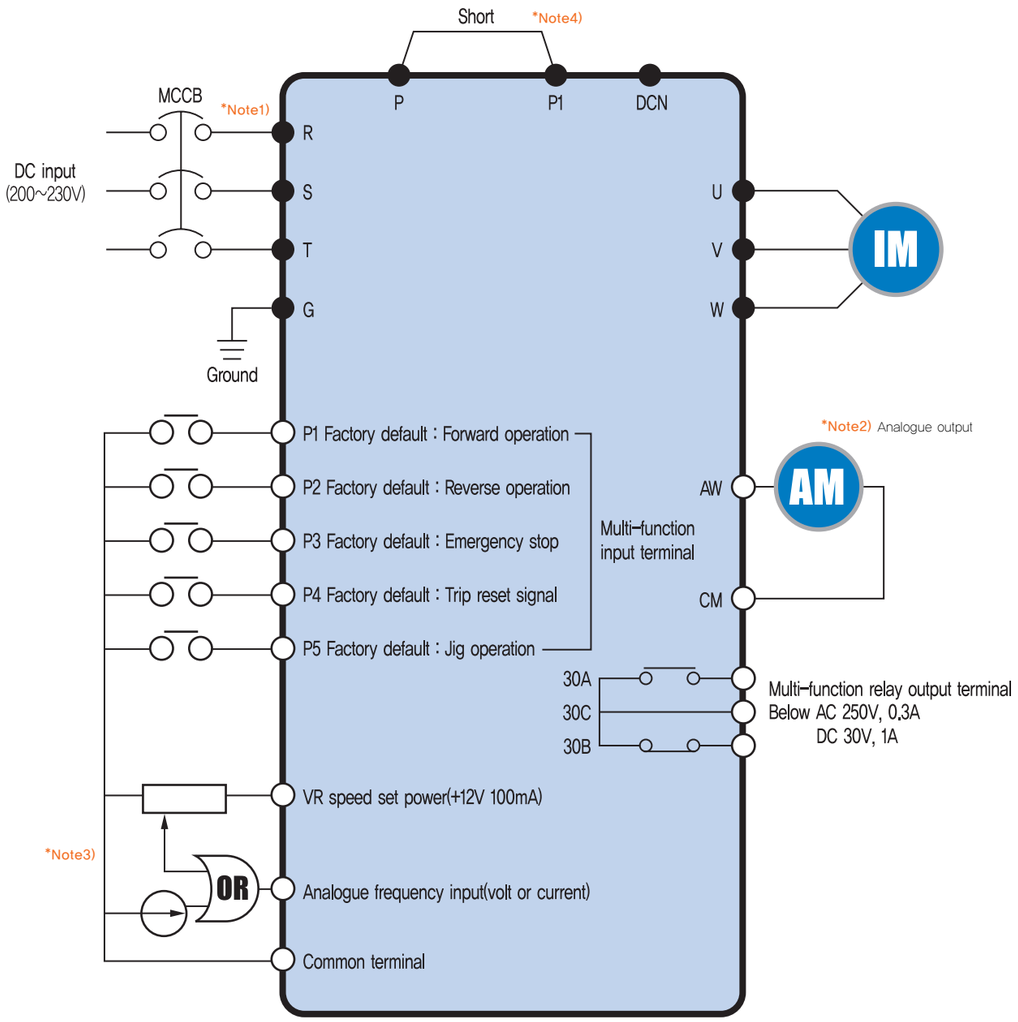
### ■ Protection

| | |
|---|---|
| Trip | Over voltage, Under voltage, Over current, Ground fault, Drive overload, Overload trip, Overheat, Condensor overload, Phase loss overload protection, Frequency command loss, Hardware fault |
| Alarm | Stall prevention |
| Momentary power loss | Below 15msec : Operation continued (should be within rated input voltage and rated output)<br>Over 15msec : Auto re-ignition operation. |

### ■ Guaranteed operation condition

| | |
|---|---|
| Coolilng | Open cooling |
| Enclosure | IP20 (open type) |
| Ambient temperature | -10℃~65℃ |
| Protection temperature | -20℃ ~ 65℃ |
| Humidity | Below 90% RH (non-condensation) |
| Altitude/Vibration | Below 1000m, 5.9m/sec square (0.6G) |
| Installation condition | No corrosive gas, No flammable gas, No oil mist, No dust |

## Wiring




*Note1) "●"and "○"means the main circuit and the control circuit respectably.
Please connect to the R and S terminals in case of single phase use.
*Note2) The analogue output is from zero to 10V.
*Note3) The voltage current and loader volume is possible for the external speed command .
*Note4) The P and PI terminals for DC reactor are connected as short circuit.

## Terminal Function

R S T P P1 DCN U V W

| | Terminal signal | Terminal name | Description |
|---|---|---|---|
| Main circuit | R, S, T | DC input | Connect 3 phase DC power |
| | U, V, W | Inverter output | Connect 3 phase induced motor |
| | P, P1 | DC reactor connection | Connect DC reactor. |
| | G | Ground | Ground connection terminal |

*Note) Please connect to the R and S terminals for single phase drive.

P1 P2 P3 P4 P5 VR AI AM CM 30A 30B 30C

| Classification | Terminal signal | Termnial name | Description |
|---|---|---|---|
| Input signal | P1, P2, P3, P4, P5 | Multifunction input terminal | Factory default vaule P1 (FX : forward operation) P2 (RX : Reverse operation) P3 (EST : Emergency stop) P4 (RST : Trip clear signal) P5 (JOG : Jog frequency operation) |
| | VR | Frequency set power | Analog frequency set power. Max, output is +12V 100mA. |
| | A I | Frequency set(Volt/Current) | DC 0~10V and DC 4~20mA can be set as basic frequency. |
| | CM | Frequency set common terminal | Analog frequency set signal and AM common terminal. |
| Output signal | AM-CM | Display | Among output frequency, output current and output voltage, one item can be selected as output. Factory set is output frequency. Max output voltage is 0~10V. (Below 10mA) |
| | 30A, 30C, 30B | Multifunctional relay | Inverter protection fucntion is activated as blocking the output and releaseing multifunction signal. AC 250V below 0.3A and below DC 30V 1A. |

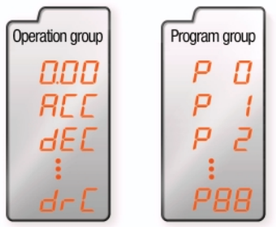
## Loader Function




| Classification | Display | Function | Fucntion description |
|---|---|---|---|
| LED | FWD | Forward | Light is on with forward operation. |
| | REV | Reverse | Light is on with reverse operation. |
| | SET | On setting | Light is on when parameter is being set. |
| | RUN | On operation | Light is off when the inverter is on Acc/Dcc and on with normal speed operation. |
| KEY | ▲ | Up key | For code shift or increasing parameter set value. |
| | ▼ | Down key | For code shift or decreasing parameter set value. |
| | RUN | Operation key | For inverter operation |
| | STOP | Stop/Reset | Stop command key during operation and also used as fault clear key. |
| | FUNC | Function key | Used for chaning paramter set vaule and saving its value |
| | SHFT | Shif key | Shift between groups and paramter setting or moving digit number to the left. |
| | Volume resistor | | For chaning operation frequency. |
| | NPN/PNP selection switch | | Turning to either NPN or PNP mode. |
| | Current/Voltage selection switch | | Swich for transforming the analog switch inputs into current or voltgae. |

## Shifts between each code and group

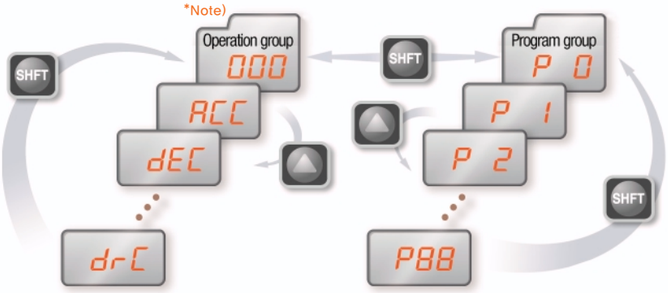
### ■ Diagram of function code shift method




The parameter group of iE5 consists of below two groups

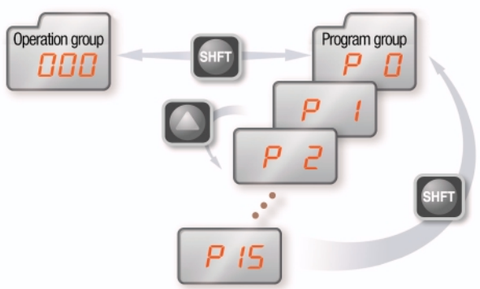
| Group name | Content |
|---|---|
| Operation group | Basic parameters for operation such as the Target frequency, Acc/Dec time and etc. |
| Program group | Additional fucntion set parameter |

● Shifts between groups can be enabled pressing the shift key at the zero code of the operation and program groups.



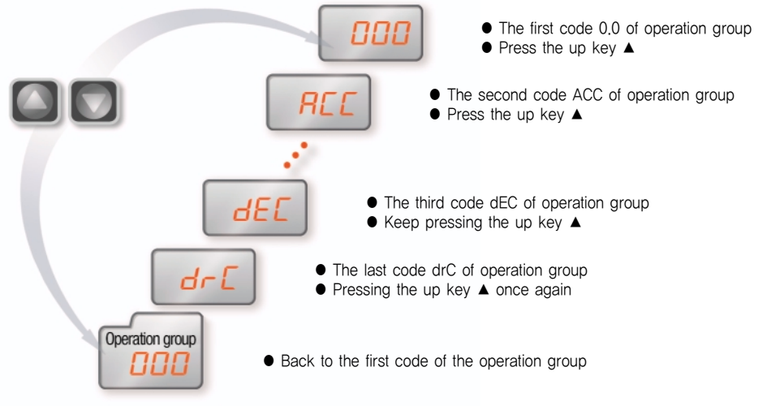

*Note) The target frequency can be set at the first group of operation group so that the factory default value has been set as 0.0 yet in cas of frequncy change, the changed frequency is displayed.

● If a user presses the shift key out of number 0, the activating parameter shifts to 0 and if the user presses once more the shift key can be shfited between groups.




## Shifts between each code and group

### ■ Operation group code shifts




### ■ Setting the operation group frequency to 30.05Hz (Keypad operation)




| | | | |
|---|---|---|---|
| ❶ 0.00 | ● Displays the first code information of the operation group<br>● Press the functiopn key (FUNC) | ❺ 00.05 | ● The third last digit is changed as 0<br>● Set as 3 by presssing the up key ▲ |
| ❷ 0.00 | ● The setting light is off<br>● The second dicimal point number can be changed<br>● Keep pressing the up key ▲ till the number reaches to 5 | ❻ 30.05 | ● Press the function key (FUNC) |
| ❸ 0.05 | ● Press the shift key<br>● The set number position shifts to left | ❼ 30.05 | ● Left displayed 30.05 blinks and asks if it has to be saved<br>● Press the function key (FUNC) |
| ❸ 0.05 | ● The set number position shifts to left<br>● Press twice the shift key | ❽ 30.05 | ● The setting light (SET) is off<br>● Saved target frequency is displayed after stopping the lgiht blink<br>● The saved data parameter is cancelled by pressing the Shift key (SHIFT), up key ▲ abd then the down key ▼ |

*Note) The saved paramete can be cancelled by pressing all keys except the function key (FUNC).





# Function code table

## ■ Operation group

| Display | Function | Setting range | Description | Factory deault | Mode change during run |
|---|---|---|---|---|---|
| **0.0** | Command frequency | 0 ~ 200 [Hz] | Operation frequency set.<br>Displays the command frequency during stop mode and displays the output frequency during run In case of multi-speed operation, the frequency will be zero speed.<br>The frequency setting can not be set over the maximum frequency(P16). | 0.0 | O |
| **ACC** | Acceleration time | 0 ~ 6000 [sec] | Zero times acc/dec time in case of multi-step speed acc/dec. | 5.0 | O |
| **dEC** | Acceleration time | | | 10.0 | O |
| **drv** | Operation command method | 0 ~ 3 | 0 Operation using the RUN key and the STOP key of loader<br>1 Terminal operation: FX : Forward operation command, RX : Reverse operation command<br>2 Terminal operation: FX : Opearion and Stop command, RX : Selecting reverse<br>3 Communication operation: Operation by communication | 1 | × |
| **Frq** | Frequency setting method | 0 ~ 4 | 0 Digital: Loader digital frequency setting 1<br>1 Digital: Loader digital frequency setting 2<br>2 Analog: Terminal AI input<br>3 Analog: Loader volume resistor<br>4 Analog: Communication option | 0 | × |
| **St1** | Multi step frequency 1 | 0 ~ 200 [Hz] | Speed 1 frequency set in case of multi step operation | 10.0 | O |
| **St2** | Multi step frequency 2 | | Speed 2 frequency set in case of multi step operation | 20.0 | O |
| **St3** | Multi step frequency 3 | | Speed 3 frequency set in case of multi step operation | 30.0 | O |
| **CUr** | Output current | – | Output current display | – | – |
| **rPM** | No of times of motor spin | – | Displaying no of time of motor spin(RPM) | – | – |
| **dCL** | Inverter DC voltage | – | Displaying the DC link voltage of inverter inside | – | – |
| **vOL** | Output voltage | – | Displaying output voltage | vOL | – |
| **nOn** | Fault status | – | Dispalying the trip type, frequency, current and operation condition of trip | – | – |
| **drC** | Spin direction selection | F, r | Setting the operation command method as 0<br>F Forward operation<br>r Reverse operation | P | O |

## ■ Program group

| Display | Function | Setting range | Description | Factory deault | Mode change during run |
|---|---|---|---|---|---|
| **P0** | Jump code | 0 ~ 88 | Shifting code number set | 1 | O |
| **P1** | Fault history 1 | – | Fault type and frequency, current, acc/dec and stop condition of fault.<br>The latest fault is saved as fault history no 1. | nOn | – |
| **P2** | Fault history 2 | – | | nOn | – |
| **P3** | Fault history 3 | – | | nOn | – |
| **P4** | Fault history delete | 0 ~ 1 | Deleting the fault history P1~P3 | 0 | O |
| **P5** | Forward/Reverse not allowed | 0 ~ 2 | 0 Forward/Reverse spining is possible<br>1 Forward spinning not allowed<br>2 Reverse spinning not allowed | 0 | × |
| **P6** | Acceleration pattern | 0 ~ 1 | 0 Liner pattern operation<br>1 S shape pattern operation | 0 | × |
| **P7** | Deceleration pattern | | | | |
| **P8** | Stop mode selection | 0 ~ 2 | 0 Deceleration stop<br>1 DC braking stop<br>2 Free run stop | 0 | × |
| **P9** | DC braking frequency | 0.1 ~ 60 [Hz] | DC braking start frequency.<br>DC braking frequency can not be set below the starting frequency P18. | 5.0 | × |

*Note1)



# Function code table

## ■ Program group

*Note1)

| Display | Function | Setting range | Description | Factory deault | Mode change during run |
|---|---|---|---|---|---|
| **P10** | Output block time before DC braking | 0 ~ 60 [sec] | Output is blocked for set up time and starts DC braking. | 0.1 | × |
| **P11** | DC braking volume | 0 ~ 200 [%] | DC current size that flows to motor.<br>The standard is motor rated current (P43). | 50 | × |
| **P12** | DC braking time | 0 ~ 60 [sec] | DC time that flows to motor. | 1.0 | × |
| **P13** | DC braking volume at ignition | 0 ~ 200 [%] | DC current volume that flows to motor before it spins.<br>Motor rated current (P43). | 50 | × |
| **P14** | DC braking time of ignition | 0 ~ 60 [sec] | DC current flows to motor for scheduled time at ignition. | 0 | × |
| **P15** | Jog frequency | 0 ~ 200 [Hz] | Jog operation frequency can be set.<br>The freqeuncy can not be set over maximum frequency(P16). | 10.0 | O |
| **P16** | Maximum frequency | 40 ~ 200 [Hz] | Frequency setting related maximum value of parameters.<br>The standard frequency of Acc/Dec lean.<br>☞ Note : Once the maximum frequency value is changed, all paramter values other than P17(standard frequency) are changed as the maximum frequencies that are all over the maximum frequencies. | 60.0 | × |
| **P17** | Standard frequency | 30 ~ 200 [Hz] | The output frequency within which the inverter output equals to the rated voltage of moto. | 60.0 | × |
| **P18** | Starting frequency | 0.1 ~ 10 [Hz] | The minimum parameter value of frequency level. | 0.5 | × |
| **P19** | Torque boost selection | 0 ~ 1 | 0 Manual torque boost<br>1 Automatic torque boost | 0 | × |
| **P20** | Forward operation torque boost | 0 ~ 15 [%] | The boost voulme, in case of forward operation, that flows to motor. In case of maximum output voltage. | 5 | × |
| **P21** | Reverse operation torque boost | 0 ~ 15 [%] | The boost voulme, in case of reverse operation, that flows to motor. The maximum output voltage is standard. | 5 | × |
| **P22** | V/F pattern | 0 ~ 1 | 0 Liner<br>1 Square | 0 | × |
| **P23** | Output voltage control | 40 ~ 110 [%] | Output voltage size control. The input volatge is standard. | 100 | × |
| **P24** | Overlaod trip selection | 0 ~ 1 | Blocking the inverter output in case of overload.<br>The overload protection function is activated if user sets as umber 1. | 1 | O |
| **P25** | Overload trip level | 50 ~ 200 [%] | Overload current size setting.<br>Motor rated current (P43) is standard. | 180 | O |
| **P26** | Overload trip time | 0 ~ 60 [sec] | Inverter blocks outpput if the overload trip level(P25) current flows for the overload trip time. | 60 | O |
| **P27** | Stall prevention selection | 0 ~ 7 | Decelerating in accelration or normal operation.<br>Deceleration is stopped during decleration operation.<br>bit 2: Stall prevention during decelation; bit 1: Stall prevention during normal decelation; bit 0: Stall prevention during accerlation decelation<br>0: – – –<br>1: – – v<br>2: – v –<br>3: – v v<br>4: v – –<br>5: v – v<br>6: v v –<br>7: v v v | 0 | × |
| **P28** | Stall prevention level | 30 ~ 150 [%] | Displaying the stall prevention current size during accleration or normal operation in terms of percent(%).<br>The motor rated current(P43) is standard. | 150 | × |
| **P29** | Up/Down freqeuncy save selection | 0 ~ 1 | Selecting the set frequency for up/down operation.<br>If user chooses number 1, it is saved onto up/down frequency(P30). | 0 | × |
| **P30** | Up/Down frequency save | – | Displaying up/down operation stop or before accerleration frequency. | 0.00 | – |
| **P31** | Dwell frequency | 0.1 ~ 200 [Hz] | Once operaiton command is inputted, first outputs the dwell frequency during dwell time(P32) and then stsrts accleration.<br>Dwell value can be set between the maximum frequency P16 and starting frequency P18. | 5.0 | × |
| **P32** | Dwell time | 0~10 [sec] | Dwell operation time setting | 0.0 | × |

*Note1) The P8 has to be set as 1 (DC braking stop)

## Function code table

### ■ Program group

| Display | Function | Setting range | Description | Factory deault | Mode change during run |
|---|---|---|---|---|---|
| P33 | User selection fault detect | 0 ~ 7 [bit] | Setting the fault detect item as per user selection.<br>The input/ouput phase loss, ground detect during run can be selected.<br>User selection fault detect [Trip] / Ground detect during run GCt / Input phase loss detect CoL / Output phase loss detect(Pot)<br>bit 2 / bit 1 / bit 0<br>0 – – –<br>1 – – v<br>2 – v –<br>3 – v v<br>4 v – –<br>5 v – v<br>6 v v –<br>7 v v v | 0 | O |
| P34 | Selecting start with power input | 0 ~ 1 | P34 is only used in case the operation command method is selected.<br>Either terminal number 1 or 2. Acceleration is getting started when the FX or RX terminla is on with power input. | 0 | × |
| P35 | Selecting start after trip | 0 ~ 1 | P34 is only used in case the operation command method is selected either terminal number 1 or 2.<br>In the condition that the FX and RX terminals are on, after trip, resetting starts acceleration. | 0 | O |
| P36 | Speed search selection | 0 ~ 15 [bit] | While motor is on spining, this function prevents the probable faults.<br>Starting with power input(P34) / Restart after instant power failure / Operation after trip (P35) / General Acceleration<br>bit 3 / bit 2 / bit 1 / bit 0<br>0 – – – –<br>1 – – – v<br>2 – – v –<br>3 – – v v<br>4 – v – –<br>5 – v – v<br>6 – v v –<br>7 – v v v<br>8 v – – –<br>9 v – – v<br>10 v – v –<br>11 v – v v<br>12 v v – –<br>13 v v – v<br>14 v v v –<br>15 v v v v | 0 | O |
| P37 | Speed search current level | 80 ~ 200 [%] | The current size during peed search operation is limited.<br>Motor rated current(P43) is standard. | 100 | O |
| P38 | Number of times of Auto-restart | 0 ~ 10 | Setting number of times that drive can operate automatically after trip.<br>If trips exceed the set times, drive does not restart automatically.<br>Only use when the operation command method(drv) of operation group is selected either terminal umber 1 or 2 and the operation command is inputted.<br>However, the Auto-restart does not work in case the protective functions such as OHT, LVT, EST and HWT are in active. | 0 | O |
| P39 | Auto re-start stand by time after trip | 0 ~ 60 [sec] | Re-start is operated after the auto re-start stand-by time of trip. | 1.0 | O |
| P40 | Motor capacity selection | 0.1 ~ 0.4 | | -*Note2) | × |
| P41 | Number of poles of motor | 2 ~ 12 | Used for number of spining times of motor of the operation group. | 4 | × |

*Note2) The initial vlaue of P40 is set for the drive capacity.



## Function code table

### ■ Program group

| Display | Function | Setting range | Description | Factory deault | Mode change during run |
|---|---|---|---|---|---|
| P42 | Motor rating Sleep frequency | 0 ~ 10 [Hz] | The difference value between input power frequency and motor name plate displayed rated spin times(rpm) is inputted. | -*Note3) | × |
| P43 | Motor rated current | 0.0 ~ 25.5 [A] | The printed rated current value of name plate is inputted. | - | × |
| P44 | Non-load current of motor | 0.0 ~ 25.5 [A] | After taking out load from motor, the current vaule which was measured in operation condition of rated spin times is inputted. | - | × |
| P45 | Carreir frequency selection | 1 ~ 10 [kHz] | As the set carrier value is larger the noise is smaller but the leaking current is bigger. | 3 | O |
| P46 | Control type selection | 0 ~ 2 | 0 V/F control<br>1 Sleep compensation control<br>2 PI control | 0 | × |
| P47 | PI control P gain | 0 ~ 999.9 [%] | Gain setting for PI control response. | 300.0 | O |
| P48 | PI control I time | 0.1~32.0 [sec] | | 1.0 | O |
| P50 | PI control F gain | 0 ~ 99.99 [%] | Feed forward of PI control | 0.0 | O |
| P51 | PI frequency highest limit | 0.1 ~ 200 [Hz] | Limits the frequency size that comes from PI calculation.<br>The setting value can be between the maximum frequency(P16) and starting frequency(18). | 60.0 | O |
| P52 | PI frequency lowest limit | 0.1 ~ 200 [Hz] | | 5.0 | O |
| P53 | Power input display selection | 0 ~ 15 | First displayed items on the loader with power input.<br>0 Operation frequency<br>1 Acceleration time<br>2 Deceleration time<br>3 Operation command method<br>4 Frequency command method<br>5 Multi-step frequency 1<br>6 Multi-step frequency 2<br>7 Multi-step frequency 3<br>8 Outout current (Cur)<br>9 Number of times of motor spin(rpm)<br>10 Drive DC voltage (DCL)<br>11 User selection (vOL)<br>12 Fault status 1<br>13 Operation direction selection<br>14 Output current display<br>15 Displaying number of times of motor spin | 0 | O |
| P54 | Gain of number of times of motor | 1 ~ 1000 [%] | By claculating the gear rate of load system, displays the number of times of motor. Monitoring is possible at the (rPM) code. | 100 | O |
| P55 | Constant number of AI filter input | 0 ~ 9999 | Contorlling the analog input response. | 10 | O |
| P56 | Minimum input of AI | 0 ~ 100 [%] | Minimum analog input value can be set as % of total input. | 0 | O |
| P57 | AI input maximum voltage matching | 0 ~ 200 | Anlog input minimum case frequency. | 0.0 | O |
| P58 | AI maximum input | 0 ~ 100 [%] | The maximum analog input value can be set as all input percent(%). | 100 | O |
| P59 | AI input maximum voltage matching frequency | 0 ~ 200 [Hz] | The maximum frequency value of analog input. | 60.0 | O |
| P60 | Volume input filter constant | 0 ~ 9999 | Response speed control of volume input operation. | 10 | O |
| P61 | Volume input minimum value | 0 ~ 100 [%] | The volume input minimum spin value can be set as all input percent(%). | 0 | O |
| P62 | Volume input maximum voltage matching frequency | 0 ~ 200 [Hz] | Volume input mainimu value frequency. | 0.0 | O |
| P63 | Volume input maximum value | 0 ~ 100 [%] | The volume input maximum value can be set as all iput percent(%). | 100 | O |
| P64 | Volume input maximum voltage mathcin frequency | 0 ~ 200 [Hz] | The volume input maximum value frequency. | 60.0 | O |
| P65 | Phase loss standard selection of analog speed command | 0 ~ 2 | 0 No operation<br>1 Operaton below half value of set<br>2 Operation below set value | 0 | O |

*Note3) All the values from P42 and P44 are modified to adopt the motor capaicty P40.

## Function code table

### ■ Program group

| Display | Function | Setting range | Description | | Factory deault | Mode change during run |
|---|---|---|---|---|---|---|
| P66 | Multi-function input terminal P1 function | 0 ~ 24 | 0 | Forward operation command(FX) | 0 | O |
| | | | 1 | Reverse operation command(RX) | | |
| P67 | Multi-function input terminal P2 function | | 2 | Emergency stop(EST-Emergency stop trip) : Temporal output block. | 1 | O |
| P68 | Multi-function input terminal P3 fucntion | | 3 | Fault reset (RST) | 2 | O |
| | | | 4 | Jog operation command (JOG) | | |
| P69 | Multi-function input terminal P4 fucntion | | 5 | Multi-step frequency-up | 3 | O |
| | | | 6 | Multi-step frequency-down | | |
| P70 | Multi-function input terminal P5 fucntions | | 7 | - | 4 | O |
| | | | 8 | - | | |
| | | | 9 | - | | |
| | | | 10 | - | | |
| | | | 11 | DC braking commnad | | |
| | | | 12 | - | | |
| | | | 13 | - | | |
| | | | 14 | - | | |
| | | | 15 | Up-down operation function : Frequency up | | |
| | | | 16 | Up-down operation function : Frequency down | | |
| | | | 17 | 3-wire operation. | | |
| | | | 18 | External trip signal input : A contact (EtA) | | |
| | | | 19 | External signal input : B contact (EtB) | | |
| | | | 20 | Changing operation mode from PI to normal operation. | | |
| | | | 21 | Changing opertion mode from option operation to master operation. | | |
| | | | 22 | Analog command freqeuncy fix | | |
| | | | 23 | Acc/Dec stop command | | |
| | | | 24 | Up/Down frequency delete | | |
| P71 | Input terminal status display | | BIT4 BIT3 BIT2 BIT1 BIT0 / P5 P4 P3 P2 P1 | | - | - |
| P72 | Multi-function input filter constant | 1 ~ 20 | Bigger setting value resuts in slower response speed. | | 15 | O |
| P73 | Analog output item selection | 0 ~ 3 | | Output item : Matching output 10[V] | 0 | O |
| | | | 0 | Output frequency : Maximum frequency | | |
| | | | 1 | Output current : 150% | | |
| | | | 2 | Output voltage : 282V | | |
| | | | 3 | Drive DC voltage : DC 400V | | |
| P74 | Analog output level control | 10 ~ 200 [%] | 10V is standard | | 100 | O |
| P75 | Detected frequency | 0 ~ 200 [Hz] | Please use when the oputput terminal function of relay output(P77) is chosen from 0~4. | | 30.0 | O |
| P76 | Detectable frequency range | | No more than the maximum frequency(P16) can be set. | | 10.0 | O |
| P77 | Multifunctional relay terminal function selection | 0 ~ 17 | 0 | FDT-1 | 17 | O |
| | | | 1 | FDT-2 | | |
| | | | 2 | FDT-3 | | |
| | | | 3 | FDT-4 | | |
| | | | 4 | FDT-5 | | |
| | | | 5 | Overload (OL) | | |
| | | | 6 | Drive overload (IOLt) | | |
| | | | 7 | Motor stall (STALL) | | |
| | | | 8 | Overvoltage fault (OVt) | | |
| | | | 9 | Lowvoltage fault (LVt) | | |
| | | | 10 | Cooling pin overheat (OHt) | | |
| | | | 11 | Command loss | | |
| | | | 12 | On operation | | |
| | | | 13 | On stop | | |
| | | | 14 | On nomal operation | | |
| | | | 15 | Speed search function is on | | |
| | | | 16 | Operation command is ready | | |
| | | | 17 | Fault output selection | | |



## Function code table

### ■ Program group

| Display | Function | Setting range | Description | | | | Factory deault | Mode change during run |
|---|---|---|---|---|---|---|---|---|
| P78 | Fault output selection | 0 ~ 7 [bit] | | After trip, when the number of Auto restart is set, P38 is activated | Except low voltage trip, in all other cases this function is activated | This function is activated with low voltage trip | 2 | O |
| | | | | bit 2 | bit 1 | bit 0 | | |
| | | | 0 | - | - | - | | |
| | | | 1 | - | - | v | | |
| | | | 2 | - | v | - | | |
| | | | 3 | - | v | v | | |
| | | | 4 | v | - | - | | |
| | | | 5 | v | - | v | | |
| | | | 6 | v | v | - | | |
| | | | 7 | v | v | v | | |
| P79 | Drive channel | 1 ~ 250 | Use with communication option | | | | 1 | O |
| P80 | Communication speed | 0 ~ 2 | Communication speed set | | | | 2 | O |
| | | | 0 | 2400 [bps] | | | | |
| | | | 1 | 4800 [bps] | | | | |
| | | | 2 | 9600 [bps] | | | | |
| P81 | Operation type selection when the speed commnad is lost | 0 ~ 2 | This function is used when the analog signal of terminal (Volume or AI) or communication are operated by frequency comannd. | | | | 0 | O |
| | | | 0 | Operating before comannd loss frequency | | | | |
| | | | 1 | Free run stop (Blocking output) | | | | |
| | | | 2 | Deceleration stop | | | | |
| P82 | Speed command loss determination time | 0.1 ~ 120 [sec] | If the frequency command is not inputted during speed command loss determination time the drive is operated by P81 seleted operation way. | | | | 1.0 | - |
| P83 | Communication stand-by time | 2 ~ 100 [ms] | In case of RS 485 communication, setting the stand-by time to the next TX output after TX signal. | | | | 5 | |
| P84 | Parity/STOP setting | 0 ~ 3 | Communication parity and STOP bit are set like following. | | | | 0 | |
| | | | | Parity bit | Stop bit | | | |
| | | | 0 | - | 1 Stop bit | | | |
| | | | 1 | - | 2 Stop bit | | | |
| | | | 2 | Odd Parity | 1 Stop bit | | | |
| | | | 3 | Even Parity | 1 Stop bit | | | |
| P85 | Parameter Initializing | 0 ~ 3 | User modified parameters can be initialized as factory default values. | | | | 0 | X |
| | | | 0 | - | | | | |
| | | | 1 | 2 Groups' parameters initialization | | | | |
| | | | 2 | Operation groups' parameters initialization | | | | |
| | | | 3 | Program group paramaters initilaization | | | | |
| P86 | Password registration | 0 ~ FFFF | Password inputted to prohibit the parameter change and values are set as HEXA. | | | | 0 | O |
| P87 | Parameter change prohibition | 0 ~ FFFF | The parameter change prohibition can be executed or cleared by the password. | | | | 0 | O |
| | | | UL(Unlock) | Parameter change is allowed | | | | |
| | | | L(Lock) | Parameter change is prohibited | | | | |
| P88 | Version of Software | - | Displays the SW version of drive. Please refer to the manual version. | | | | - | X |

## Protections

| Display | Protections | Descriptions |
|---|---|---|
| OCt | Over current | Drive output is blokced in case the output current is over 200% of rated current. |
| GFt | Ground current | In case the ground protection of starting point is used, the drive output is blocked if ground current flows that is generatd from the drive output side. |
| GCt | Ground current | Drive blocks its output if the over current is flowed to any phase of between U.V.W phase. In this case the over current is generally generated by unbalancing from ground falut. |
| I OL | Overload | If the output current of drive is over 150% of rated current for more than one minute, the output is blocked. The protection time is shortened as output current is increased |
| OLt | Overload trip | If output current is bigger than motor rated current(P25) the output is blocked |
| OHt | Cooling fan overheat | If the drive cooling fan is overheated, and if the ambient temperature of drive reaches to over recommended degree, the output of drive is blocked. |
| COL | Condenser overload | This fault is generated in case of single phase loss of three phase product or if DC voltage fluctuation level becomes big as the main condenser is aged. Yet the condenser overlaod detection time can be varied depend on the output current size. |
| POt | Output loss | More than one phase becomes loss among U.V.W, the dirve output is blocked. |
| Out | Over voltage | If the main circuit DC voltage of drive inside goes over 400V, the output is blocked. This over voltage is generated if the deceleration time is too short or the input voltage goes over recommneded level. |
| Lut | Low voltage | If drive inside main circuit voltage goes below 180V, drive blocks its output. |
| EEP | Parameter save fault | When the changed parameter is inputted to drive, if some faults are generated, this fault is displayed. This is displayed with power input. |
| HWt | Hardware fault | This is dispalyed with CPU or OS fault.<br>This is not cleared by the STOP/RST key of loader or by the reset terminal.<br>Fault is not cleared by STOP/RST keys of the keypad or reset terminal.<br>Please re-input power after off the drive power and the keypad display power is completely off. |
| EST | Output instant blocking | Drive output is blokced when the EST terminal is on.<br>⚠ Caution : with the "ON" of terminal operation command signal FX or RX, if the EST terminal is off drive restart its operation. |
| EtA | A Contact fault signal input | Once the multi-function input terminal selection(P66~P70) is selected as number 1 8(External trip signal input :A contact) and if this selected becomes "OFF" the drive blocks output. |
| Etb | A Contact fault signal input | Once the multi-function input terminal selection(P66~P70) is selected as number 1 9(External trip signal input :B contact) and if this selected becomes "OFF" the drive blocks output. |
| _ _ _L | Frequency phase loss | Displays fault status of frequency command. In case the analog input(0~10V), 0~20mA and option(RS485)operation, if the operational signal is not inputted, the operation is carried out by P81 that is selected from the speed command phase loss operation. |

## Check and Remedy

| Protections | Fault reason | Remedy |
|---|---|---|
| ⚠ Caution | The fault casued by over current may damage drive inside power semiconductor parts so that the reason of over current has to be cleared first and then start operation. | |
| OCt<br>Over current | • Acc/Dec time is too fast comparing to the load inertia(GD2)<br>• Load is bigger than rated value.<br>• Drive output is released during free run of motor.<br>• Output terminal and ground fault.<br>• Motor breaking is too speedy. | ▸ Please set the Acc/Dec time with higher margin.<br>▸ Please replace bigger capacity drive.<br>▸ Try to operate after stopping motor or pleae use the speed search function(H22) of function group 2.<br>▸ Please check the output wiring.<br>▸ Please check the mechanical break. |
| GFt GCt<br>Ground current | • Drive outputcable is on ground fault.<br>• Motor insulation is heated. | ▸ Please check the output terminal wiring.<br>▸ Please replace the motor. |
| I OL OLt<br>Drive overload Overload trip | • Load is bigger than rated value.<br>• Torque boost volume is too big. | ▸ Please use higher capacity motor and drive.<br>▸ Please reduce the torque boost volume. |
| OHt<br>Cooling fan overheat | • Cooling system fault.<br>• Cooling fan lifetime is over.<br>• High ambient temperature. | ▸ Please check the vents.<br>▸ Please replace cooling fan.<br>▸ Pleae keep the ambient temperature to 40℃. |
| COL<br>Condenser overload | • 1 phase is loss of three phase product.<br>• Internal condenser life is over. | ▸ Please check input power wiring.<br>▸ Please check the input power.<br>▸ Replacement may need please ask after sales service. |
| POt<br>Output phase loss | • Electronic contactor fault of output part.<br>• Output wiring fault. | ▸ Please check the electronic contactor of output part.<br>▸ Please check the output part wiring. |
| Out<br>Over voltage | • Dec time is too short comparing to the load inertia(GD2).<br>• Regenerative load is located at the output part.<br>• Main power is to high. | ▸ Please set the deceleration time with higher margin.<br>▸ Please down the main power below rated value. |
| Lut<br>Low voltage | • Mian power is too low.<br>• Bigger than power capacity load is contactd to the main power part.<br>• Electronic contactor fault of power part. | ▸ Please use over rated value power.<br>▸ Please use higher power.<br>▸ Please replace the electronic contactor. |
| EtA<br>A contact fault signal input<br>Etb<br>B contact fault signal input | • When the multi-function input terminal selection of the program group(P66~P70) is set as number 18 or 19 if these terminals are "ON" these fault messages are displayed. | ▸ Circuit fault and external faults. |
| _ _ _L<br>Frequency commnad loss | • No command at the V1 and I terminals.<br>• No signal input of communication option. | ▸ Please check the wiring and command level of V1 and I terminals.<br>▸ Please check the communicaitn cable of the master device. |
| EEP<br>Parameter save fault HWt<br>Hardware fault | | ▸ After software upgrade when the power is inputted as first time, these messages are displayed. In this case, please "OFF" the power first and then re-input the power. This is normal operation after software upgrade. |

## Peripheral device specifications

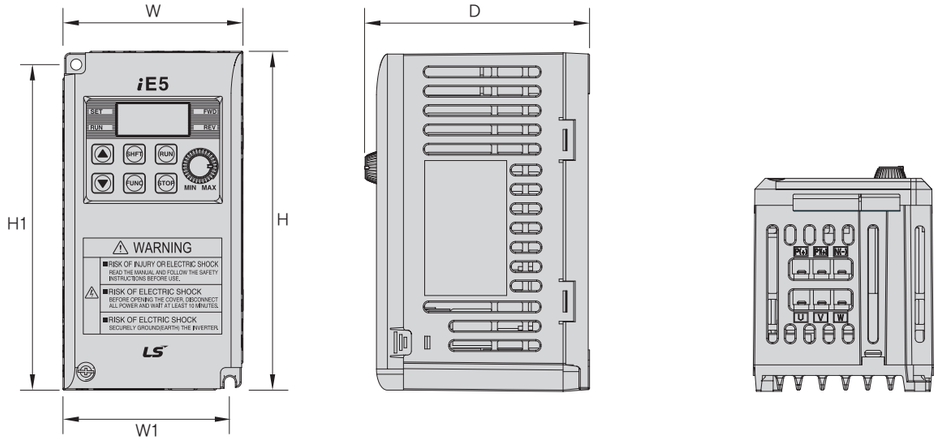
### ■ MCCB and MC standards

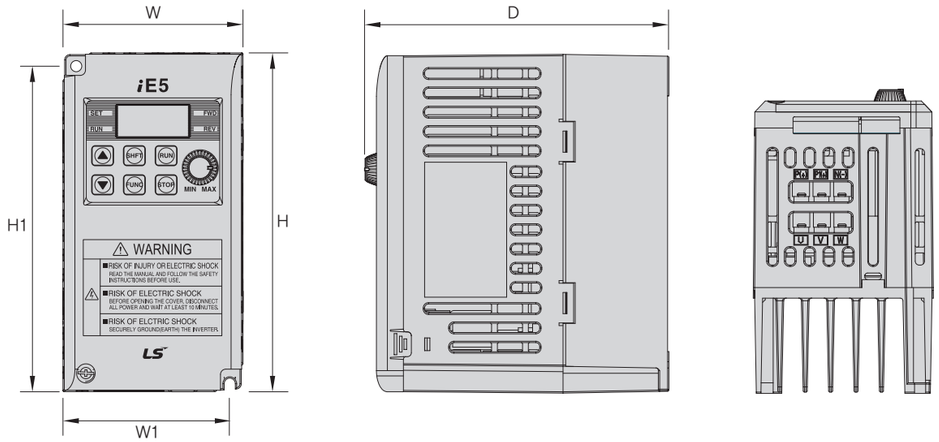
| Drive capacity | MCCB(LSIS) | | ELCB(LSIS) | | MC(LSIS) | |
|---|---|---|---|---|---|---|
| 001 iE5-1 | ABS33b | 5A | EBS33b | 5A | GMC-9 | 7A |
| 002 iE5-1 | | 10A | | 10A | GMC-12 | 9A |
| 004 iE5-1 | | 15A | | 15A | GMC-18 | 13A |
| 001 iE5-2 | | 3A | | 3A | GMC-9 | 7A |
| 002 iE5-2 | | 5A | | 5A | GMC-9 | 7A |
| 004 iE5-2 | | 10A | | 10A | GMC-12 | 9A |

### ■ Reactor specification

| Drive capacity | AC input fuse | AC reactor | DC reactor |
|---|---|---|---|
| 001 iE5-1 | 5A | 4.2mH, 3.5A | 10mH, 3A |
| 002 iE5-1 | 5A | 4.2mH, 3.5A | 10mH, 3A |
| 004 iE5-1 | 10A | 5.1mH, 5.4A | 7mH, 5A |
| 001 iE5-2 | 5A | 4.2mH, 3.5A | 10mH, 3A |
| 002 iE5-2 | 5A | 4.2mH, 3.5A | 10mH, 3A |
| 004 iE5-2 | 5A | 4.2mH, 3.5A | 7mH, 5A |

## Dimension




| Measure | 001 iE5-1 | 002 iE5-1 | 004 iE5-1 | 001 iE5-2 | 002 iE5-2 | 004 iE5-2 |
|---|---|---|---|---|---|---|
| W | 68 | 68 | 68 | 68 | 68 | 68 |
| H | 128 | 128 | 128 | 128 | 128 | 128 |
| D | 85 | 85 | 115 | 85 | 85 | 115 |
| H1 | 124 | 124 | 124 | 124 | 124 | 124 |
| W1 | 64 | 64 | 64 | 64 | 64 | 64 |
| ф | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 |

*Note) Please use the M4 bolt in case this drive is installed into the panels.