## 5. Parameter Setting Mode

▶ How to use

### 5-1. Press MODE ⏎ Button and select parameter mode.

| P | r | 1 | | 1 | 7 | 6 | 0 |
|---|---|---|---|---|---|---|---|

Address         Data

Parameter composed with ADDRESS and DATA is shown.

### 5-2. Select ADDRESS which user wants.

Press UP ⏎ and DOWN ⏎ button and select the parameter number

ex) | P | r | | 4 | : When choosing ADDRESS No.4 parameter and

pressing SET ⏎ button, Enter into the DATA status.

### 5-3. Change DATA value which user wants.

When Data is in changeable conditions as pressing the SET ⏎ button over 1 Sec. (DATA part is blinking), Data value is changed if user presses UP ⏎ button and DOWN ⏎ button.

ex) | | 0 | 0 | | 1 | 5 | 0 | : In case of changing data to 150,

choose the DATA and press the SET ⏎ button.(over 1 Sec.)
Then DATA setting will be complete as stopping blinking of DATA part.
※When pressing button once, DATA will be changed by 1 and keeping pressing button, it's possible to change the DATA much faster.

## 6. Parameter Contents

| NO. | Function | Range | Standard value | Note |
|---|---|---|---|---|
| 1 | Max. Speed | 1460/1760 | – | r/min |
| 3 | Speed Limit | 50~1760 | 1760 | r/min |
| 4 | Acceleration Time | 0~15.0 | 0.1 | Second (S) |
| 5 | Rotation Direction | 0~1 | 0 | 0 : CW<br>1 : CCW |
| 6 | Gear Ratio | 1.0~999.9 | 1 | |
| 7 | Control Mode | 0~1 | 0 | 0 : Speed Control<br>1 : Torque Control |
| 8 | Zero Clamp | 0~5.0 | 0.0 | Voltage (V) |
| 9 | Speed Command Offset | 0~5.0 | 0 | Voltage (V) |
| 10 | Abnormal Signal Output | 0~1 | 0 | 0 : B Contact<br>1 : A Contact |
| 13 | Speed Control P Gain | 0~255 | 100 | |
| 14 | Speed Control I Gain | 0~255 | 50 | |
| 20 | Communication ID Setting | 1~254 | 1 | |
| 21 | IO Input Setting | 0~1 | 0 | 0 : CN3 IO Input<br>1 : RS485 Input |
| 22 | Speed Input Setting | 0~1 | 0 | 0 : CN4 PotentiometerInput<br>1 : RS485 Speed Command input |
| 23 | RS 485 Communication Speed Setting | 0~4 | 1 | 0 : 2,400bps<br>1 : 9,600bps<br>2 : 19,200bps<br>3 : 38,400bps<br>4 : 115,200bps |
| 30 | Internal Speed Setting 1 | 0~Max. Speed | 500 | r/min |
| 31 | Internal Speed Setting 1 | 0~Max. Speed | 1000 | r/min |
| 32 | Internal Speed Setting 1 | 0~Max. Speed | 1500 | r/min |
| 33 | Internal Torque Setting 1 | 0 ~ 100 | 10 | % |
| 34 | Internal Torque Setting 1 | 0 ~ 100 | 20 | % |
| 35 | Internal Torque Setting 1 | 0 ~ 100 | 50 | % |

### No.1 Max. Speed
· Function to check the max. speed – setting impossible
· Max. speed changes automatically according to input power's frequency(50/60Hz)
· 50Hz : 1460 r/min, 60Hz : 1760 r/min
· When inputting speed command voltage(VR), find maximum RPM operated at maximum input voltage (external : 5V, internal : 100)

### No.3 Speed Limit
· Set when user wants to limit motor speed
· Set value is only applied when set value is lower than max. speed of motor
· The speed limit is the same as max. speed if the speed limit is higher than max. speed
· Regarding torque motor, it's possible to attach T.G(Customized order)

### No.4 Acceleration Time
· Set the time taken to reach the parameter No.1
· Acceleration to the set maximum speed of the controller
· Acceleration time will be faster if it is closer to 0 in parameter
· Deceleration time cannot be set

RPM

Maximum Speed
(50Hz : 1460rpm
60Hz : 1760rpm)

Set Speed

Actual Acceleration time   Set Acceleration time (0~15sec)   Sec.

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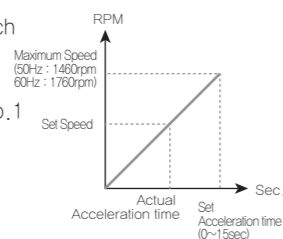
### No.5 Rotation Direction
· Change motor's rotation direction
ex) Parameter value is 0 : Rotate from FWD signal input to CW
Parameter value is 1 : Rotate from REV signal input to CCW

### No.6 Gear Ratio
· Input motor gear ratio
· Display RPM from gear output shaft (final output shaft)

### No.7 Control Mode
· Select motor speed or torque control
0 : Operate with speed control mode
1 : Operate with torque control mode

### No.8 Zero Clamp
· Zero Clamp is set from speed command voltage. If speed command voltage is in range of zero clamp's set value, motor doesn't operate and if over range of zero clamp's set value, motor operates.

〈Zero Clamp 1V Setting〉

Max RPM

MaxRPM(5V/1V)

RPM

Zero Clamp Ex1V Setting   VOLT   5V
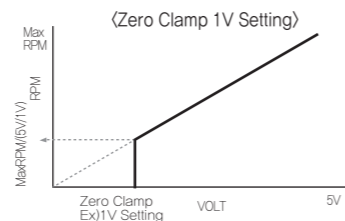
$$RPM = MaxRPM \times \frac{x}{5V}$$

※ If x−y ≤ 0, RPM is 0
(If the zero clamp voltage is larger than the speed command voltage, RPM is 0)

x : Speed Command Voltage
y : Zero Clamp Voltage

### No.9 Speed command offset
· It is operated more than offset value set from speed command voltage

〈Speed Command Offset 1V Setting〉

Max RPM

RPM

Speed Command Offset EX1V Setting   VOLT   5V
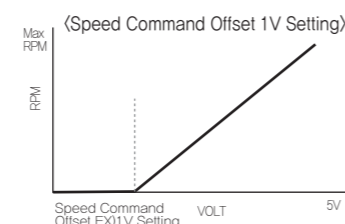
$$RPM = MaxRPM \times \frac{x-y}{5V-y}$$

※ If x−y ≤ 0, RPM is 0
(If the speed command offset voltage is larger than the speed command voltage, RPM is 0)

x : Speed Command Voltage
y : x : Speed Command Offset Voltage

### No.10 abnormal Signal contact level
· Set output contacts of alarm signal when the alarm occurs in the controller
Setting value 0 : Alarm signal B contact output
(normality : Com and short, Alarm: Com and Open)
Setting value 1 : Alarm signal A contact output
(normality : Com and Open, Alarm: Com and Short)

### No.13 Speed control P gain
· Parameter which determines responsibility of speed control
· Vibration and hunting occurs if value is too great

### No.14 Speed control I gain
· Parameter which determines responsibility of speed control
· Vibration and hunting occurs if value is too great

### No.20 Communication ID setting
· Select the controller's dialing code at communication control
· Choose the dialing code among 1 ~ 254
· Be careful not to overlap ID if using multiple communications

### No.21 IO Input Setting
· 0 : IO CN3 switch input control
· 1 : IO input control of RS485 communication

### No.22 Speed Input Setting
· 0 : IO CN4 variable resistance input control
· 1 : Speed input control of RS485 communication

* Please download the communication manual at our website, www.dkmmotor.com

### No.23 RS 485 Communication Speed Setting
· 0 : 2,400 bps, 1 : 9,600 bps, 2 : 19,200 bps, 3 : 38,400 bps, 4 : 115,200 bps

### No.30~32 Internal Speed Setting
· Operate on Speed Mode (Parameter No. 7: 0)
· Input internal speed setting value in r/min unit
· Operation according to internal/ external selection switch

| Internal Switch 1 (VCMD SEL1) | Internal Switch 2 (VCMD SEL2) | Operation |
|---|---|---|
| OFF | OFF | Input External Variable Potentiometer Speed |
| ON | OFF | Parameter No.30, Internal speed 1 Setting Value |
| OFF | ON | Parameter No.31, Internal speed 2 Setting Value |
| ON | ON | Parameter No.32, Internal speed 3 Setting Value |

### No.33~35 Internal Torque Setting
· Operate on Torque Mode (Parameter No. 7: 01)
· Input internal Torque setting value in % unit(0~100%)
· Operation according to internal/ external selection switch

| Internal Switch 1 (VCMD SEL1) | Internal Switch 2 (VCMD SEL2) | Operation |
|---|---|---|
| OFF | OFF | Input External Variable Potentiometer Torque |
| ON | OFF | Parameter No.33, Internal Torque 1 Setting Value |
| OFF | ON | Parameter No.34, Internal Torque 2 Setting Value |
| ON | ON | Parameter No.35, Internal Torque 3 Setting Value |

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DKM DIGITAL SPEED TORQUE CONTROLLER

# DX3000 manual

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We appreciate you for purchasing products of DKM Motor co., Ltd. Before using the product you have purchased, check to make sure that it is exactly what you ordered. Then, please use it following the instructions below.

## SAFETY INFORMATION

Alerts declared in the manual are classified to Danger, Warning and Caution by their criticality

| ⚠ DANGER | DANGER indicates imminently hazardous situation which, if not avoided, will result in death or serious injury. |
|---|---|
| ⚠ WARNING | WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. |
| ⚠ CAUTION | CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. |

### ⚠ DANGER
There is a danger of occurred electical shock in the input/output terminals so please never let your body or conductive substance is touched.

### ⚠ WARNING
1. Do not put around the explosive atmosphere, gas to be burnt, corrosive air, the location to be wet and combustibles.
If not, there will be the electric shock and the fire.
2. Installation, connection, operation, maintenance and diagnostic operation should be carried out by the person who has expertise.
3. Use the product after turning off the power.
It may cause an electric shock.
4. The power cable and the lead wire should not be bent, pulled and inserted by force. If not, the electric shock and the fire may occur.
5. In case of the motor and controlling unit are attached to the machine, never touch with hand or connect with the earth. If not, the electric shock may take place.
6. Within the 30 seconds after the power off, do not touch the output terminal of the controlling unit. If not, the electric shock may occur because of the residual volts.

### ⚠ CAUTION
1. The motor and the controlling unit should be used only by the designated compounding. If not, the fire may occur.
2. Do not operate with the wet hands. The electric shock may occur.
3. In case of moving, do not catch the output shaft, connecting part or the lead wire. There may be the injury by the drop.
4. The motor should be used after it is fixed tightly. If not, the injury and/or the damage of the unit may occur.
5. Do not touch the rotating part (output shaft, cooling fan) in running. It could be cause of injury.
6. If there are abnormal cases, turn off the power at once. If not, there will be the electric shock, injury and the damage.
7. Do not touch the motor for a while, if the motor's surface temperature exceeds 90℃.
8. Be sure to set the switch STOP before connecting to the power.
9. Make sure to check the rotating direction before connecting the machine. If not, the injury and/or the damage of the unit may occur.
10. Use products only according to the specification of motor and controlling unit. If not, there will be dangerous fire, electric shock, injury and/or damage of the unit.
11. Make sure to install the overload device because the protection device is not attached to the motor. It is desirable to install other protection devices other than overload protection device to prevent fire.
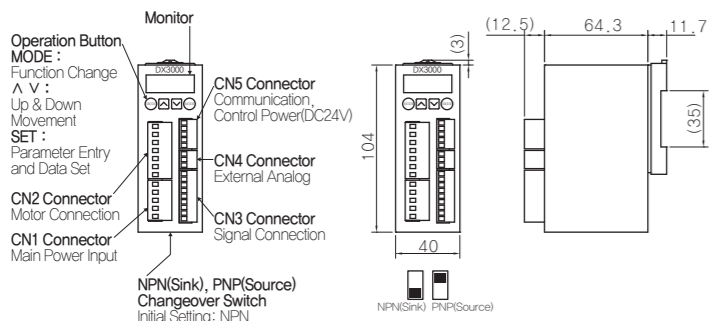
## BEFORE USE
■ Check specifications which you ordered such as voltage, output and so on.
■ Make sure a motor item whether the motor can be applicable with DSKM controller.
■ Avoid the place in vibration, deep impact, lots of dusty, inflammable gas and corrosive gas.
■ Use ambient temperature(−10 ℃ ~ 40 ℃) and ambient humidity (85% maximum and avoid direct sunlight, moisture and greasy place.
■ Install motor and controller as closely as possible. (within 2m)
■ Parallel Operation at high electric circuit may cause malfunction. Wire with separate circuit power supply.
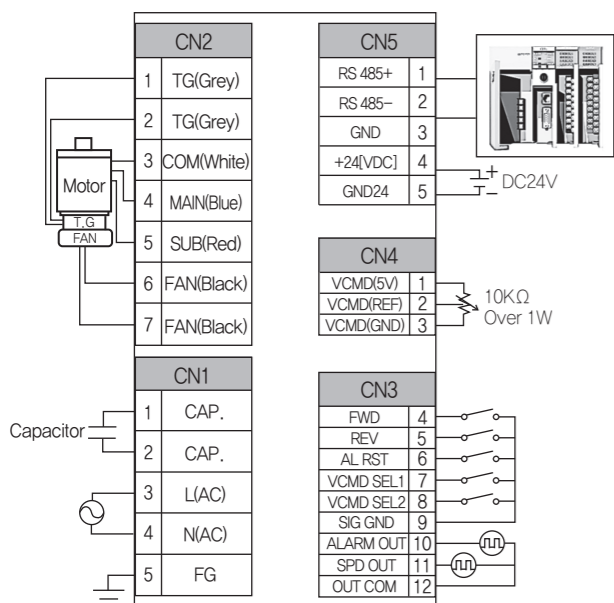
## Specification

| Model | | | DX3000 |
|---|---|---|---|
| General Specifications | Power supply | Motor Power | AC 220V 50/ 60Hz ±10% |
| | | Control Power | DC 24V ±10%, 0.5A |
| | Rated Current [A] | | 0~4A (Different from motor output) |
| | Max. Current [A] | | 6 |
| | Control Function | | Speed/ Torque Control |
| | Control Mode | | Phase−Duty Control |
| | Dimension [mm] | | 40(W) × 104(H) × 65(D) |
| | Speed Control Range | | 50Hz : 100 ~ 1460 r/min<br>60Hz : 100 ~ 1760 r/min |
| | Torque Control Range | | 0 ~ 100% (Maximum Torque) |
| | Feedback Sensor | | Tacho – 12 ppr |
| | Ambient Temperature | | −10 ℃ ~ 55 ℃ |
| Input & Output Specifications | Sequence Input | | Forward, Reverse, Alarm reset, Multiple Speed |
| | Sequence Output | | Speed output, Alarm Output |
| Built−in Functions | Protection Function | | Parameter error, AC low voltage alarm, Tacho error, EEPROM |
| | Condition Mark | | 4 Digit Display(7−Segment) |
| Communication | | | Serial Communication ( RS485 − MODBUS RTU ) |

## Dimension

Monitor

Operation Button
MODE :
Function Change
∧∨ :
Up & Down
Movement
SET :
Parameter Entry
and Data Set

CN5 Connector
Communication,
Control Power(DC24V)

CN4 Connector
External Analog

CN2 Connector
Motor Connection

CN3 Connector
Signal Connection

CN1 Connector
Main Power Input

NPN(Sink), PNP(Source)
Changeover Switch
Initial Setting : NPN

NPN(Sink)  PNP(Source)

(12.5)  64.3  11.7

(3)

104

40

(35)

## Controller Connection Diagram

| CN2 | |
|---|---|
| 1 | TG(Grey) |
| 2 | TG(Grey) |
| 3 | COM(White) |
| 4 | MAIN(Blue) |
| 5 | SUB(Red) |
| 6 | FAN(Black) |
| 7 | FAN(Black) |

Motor  T.G  FAN

| CN5 | | |
|---|---|---|
| RS 485+ | 1 | |
| RS 485− | 2 | |
| GND | 3 | |
| +24[VDC] | 4 | |
| GND24 | 5 | DC24V |

| CN1 | | |
|---|---|---|
| 1 | CAP. | |
| 2 | CAP. | |
| 3 | L(AC) | |
| 4 | N(AC) | |
| 5 | FG | |

Capacitor

| CN4 | | |
|---|---|---|
| VCMD(5V) | 1 | |
| VCMD(REF) | 2 | 10KΩ Over 1W |
| VCMD(GND) | 3 | |

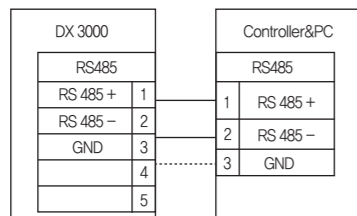| CN3 | |
|---|---|
| FWD | 4 |
| REV | 5 |
| AL RST | 6 |
| VCMD SEL1 | 7 |
| VCMD SEL2 | 8 |
| SIG GND | 9 |
| ALARM OUT | 10 |
| SPD OUT | 11 |
| OUT COM | 12 |

* After checking the rated capacitor of the motor, be sure to connect it according to the capacity.
* Please contact us if you want to connect DX3000 with other brand motor.

## Communication Connection Diagram

| DX 3000 | | | Controller&PC | |
|---|---|---|---|---|
| RS485 | | | RS485 | |
| RS 485 + | 1 | | 1 | RS 485 + |
| RS 485 − | 2 | | 2 | RS 485 − |
| GND | 3 | | 3 | GND |
| | 4 | | | |
| | 5 | | | |

* When attaching the communication GND, please attach PIN No. 3 of CN5.
* Please visit our website to download communication manual.

## Functions of CN1 Connector

| NO. | Name | Description | Remark |
|---|---|---|---|
| 1 | CAP. | Connect to capacitor | CAP. must be connected according to motor capacity |
| 2 | CAP. | Connect to capacitor | |
| 3 | L | Connect to AC power | AC220V ±10% 50/60Hz |
| 4 | N | Connect to AC power | |
| 5 | FG | Connect to earth | |

## Functions of CN2 Connector

| NO. | Name | Description | Remark |
|---|---|---|---|
| 1 | TG | Connect to Tacho Generator | Grey color |
| 2 | TG | Connect to Tacho Generator | Grey color |
| 3 | COM | Connect to Motor Power | White color |
| 4 | MAIN | Connect to Motor Power | Blue color |
| 5 | SUB | Connect to Motor Power | Red color |
| 6 | FAN | Connect to Motor Fan | Black color |
| 7 | FAN | Connect to Motor Fan | Black color |

*Please contact us if you want to connect DX3000 with other brand motor.

## Functions of CN3 Connector

| NO. | Name | Description | Remark |
|---|---|---|---|
| 1 | FORWARD RUN | Motor forward switch input | Input Signal |
| 2 | REVERSE RUN | Motor reverse switch input | Input Signal |
| 3 | REVERSE RUN | Motor's alarm reset switch input | Input Signal |
| 4 | SPEED SELECT 1 | Input internal/ external input select switch Select operation mode with parameter No.7 * Internal Speed: Parameter No.30~No.32 *External Speed: Input external variable resistance | Input Signal |
| 5 | SPEED SELECT 2 | * Internal Torque: Parameter No.33~No.35 *External Torque: Input external variable resistance | |
| 6 | SIGNAL COMMON | Motor switch common input | COMMON |
| 7 | ALARM OUT | Output controller ALARM status * Change output A, B replay according to parameter No.10 | Input Signal |
| 8 | SPEED OUT | Motor operating speed output | Input Signal |
| 9 | OUT COMMON | Output Contact Common | COMMON |

## Functions of CN4 Connector

| NO. | Name | Description | Remark |
|---|---|---|---|
| 1 | VCMD V | External speed command potentiometer + voltage output | 5V Output |
| 2 | VCMD Vref | External speed directive value input | Voltage input |
| 3 | VCMD GND | Connect to external speed directive GND | V GND |

## Functions of CN5 Connector

| NO. | Name | Description | Remark |
|---|---|---|---|
| | | RS 485 | |
| 1 | RS 485 TXD+ MODBUS | Connect RS485 Communication line + | |
| 2 | RS 485 TXD− MODBUS | Connect RS485 Communication line − | |
| 3 | GND | Communication line Common | S GND |
| 4 | +24[VDC] | Control Power+24[VDC] | Input power |
| 5 | GND24V | Control Power GND24V | GND |

## Troubleshooting and Action

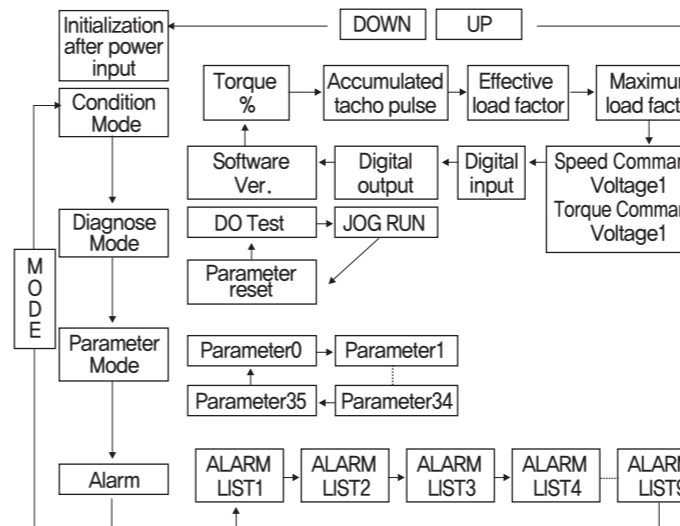| Trouble | Indication Part | Reason | Action |
|---|---|---|---|
| Motor doesn't operate | No display | − Power doesn't be connected to controller − Power doesn't be connected to FG terminal − Disconnected connector | Check a source of electric power supply Re-connect diagram Check the connection Change or fix controller |
| ALARM ON | AL SE | Internal arithmetic error inside of controller | Check alien substance inside Re-start controller |
| | AL CE | bad connection with motor or feedback Sensor | Check the motor connector Check the sensor connector Change or fix controller |
| | AL PE | Parameter alarm In case of failing to store parameter value in the controller memory | Re-start controller Change or fix controller |
| | AL AC | AC input alarm Occur when putting RUN signal without AC power | Check AC input connector Change or fix controller |

## Segment LCD

### 1. Segment LCD operation and transition diagram

After power input, LED display will be status display mode and mode change will be done by MODE button.

| | Default Value |
|---|---|
| Initialization after power input → MODE ↵ | |
| Condition display mode → MODE ↵ | 0 |
| Diagnose display mode → MODE ↵ | do F |
| Customer parameter mode → MODE ↵ | Pr 1 |
| Alarm display mode | AL 1 |
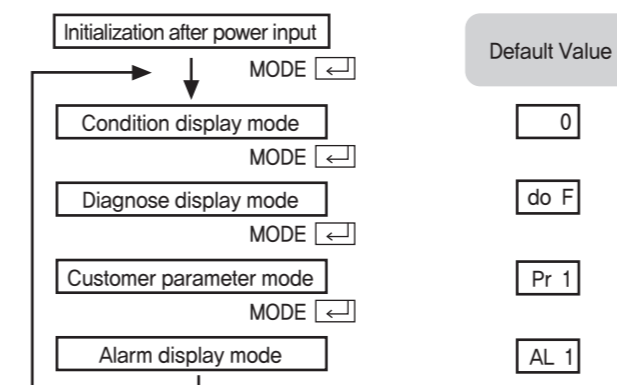
▶ The display shows the PRM screen [ 0 ], which is the default mode if inputting power. (Torque control mode: %)

▶ UP DOWN : Increase/ decrease of data for functions and setting in the same mode SET Button: Setting and Storage of DATA

▶ Set button is only available on conditions that forward/ reverse input signal does not come

▶ In communication mode, only available at stop signal input conditions (0x0005 address/ Bit No. 0 is ON)

▶ Setting is only available in conditions that LED does not blink

### 2. Entire transition diagram

Initialization after power input

DOWN  UP

Condition Mode → Torque % → Accumulated tacho pulse → Effective load factor → Maximum load factor

MODE

Diagnose Mode → Software Ver. → Digital output → Digital input → Speed Command Voltage1 Torque Command Voltage1

DO Test → JOG RUN

Parameter reset

Parameter Mode → Parameter0 → Parameter1

Parameter35 → Parameter34

Alarm → ALARM LIST1 → ALARM LIST2 → ALARM LIST3 → ALARM LIST4 → ALARM LIST9

### 3. Condition display mode

Display the following status on the display during operation

| Title | Symbol | Display Range | Contents |
|---|---|---|---|
| Motor Rotation Speed (Torque Command Value) | − | * Speed Mode : 0~1800[RPM] * Torque Mode : 0 ~ 100[%] | It is changed according the motor rotation speed(torque), and setting value |
| Accumulated Tacho Pulse | t | 0~999[PULSE] | Display amount of motor rotation by counting the tacho sensor value |
| Effective Load | L | 0.0 [A] | Display continuous effective current value with 0.1A unit |
| Max Load | H | 0.0 [A] | Display maximum effective current value with 0.1A unit |
| Speed(Torque) Command Voltage | U1 | 0~5.0 [V] | Display speed( torque) command voltage with 0.1V unit |
| Digital Input | dl. | | Display On/.Off of digital input signal |
| Digital Output | dO. | | Display On/.Off of digital output signal |
| Software Version | Soft. | 1.0~ | Display software version of controller |

### ◎ Details

▶ Digital Input  d I. ☐ ☐ : Display On/ Off on digital input screen

S/S1  REV
S/S2  ALR  FWD
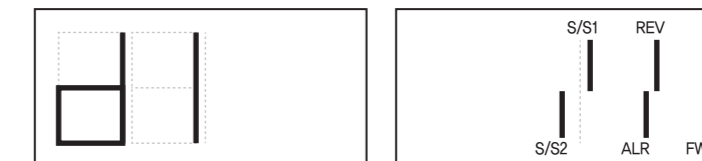
▶ Signal Explanation
※ S/S1,2 : Speed Mode − Internal/External Speed Select
Torque Mode − Internal/External Torque Select
※ A/R : Alarm Reset
※ REV : Reverse Operation Command
※ FWD : Forward Operation Command

▶ Digital Input  d O. ☐ ☐ : Display On/ Off on digital input screen

Alam

SPD
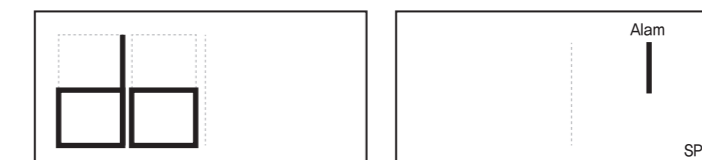
▶ Signal Explanation
※ Alarm : Output motor alarm condition
※ SPD : Output motor RPM

### 4. Diagnose Display Mode

System conditions and system initialization can be checked and set with diagnose display mode.

### 4-1. Digital Out Test

− Output signal of the controller status can be output arbitrarily.
− If SET button is pressed, all output contacts are output.

d o F : ALL OUTPUT STATUS IS OFF

d o n : ALL INPUT STATUS IS ON

▶ How to use

d o F   d o n   d o F

SET ↵ Over a second   SET ↵ Over a second

◇ Speed out, Alarm out can be output.
※ Alarm out port signal is reversed during according to the setting value of parameter No. 10

### 4-2. JOG RUN

◇ JOG operation starts according to set speed command

▶ How to use

J r F

SET ↵

J r n

UP ↵ :Rotate 500 rpm to the forward direction while pressing the UP button
DOWN ↵ :Rotate 500 rpm to the reverse direction while pressing the DOWN button
※ Operation will stop when user hands off UP, DOWN button  SET ↵

J r F

### 4-3. Parameter Reset

◇ Initialize each parameter value stored in controller memory to default value.

▶ How to use

P r F

SET ↵  Over 1 Sec.

☐ ☐ P : Initialization Process

After 1~2Sec.

P r F : Complete Parameter initialization