Specification on "MD200"

NEXTEC

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1. **Figure and size**

■ **Features**

-Brushless motor, 4-Q(Quadrant) PWM servo controller(with encoder)

-RS485, 0~5V Analog, or Pulse(RC radio) command modes

-Operates from a single power source

-Programmable or volume current limit for protecting controller or limit system load.

-Accurate speed and odometry measurement using hall-sensor data

-Up to 7 digital speed inputs by setting I/O channels as speed step inputs.

-Quadrature encoder inputs(servo control)

-Regerative brake resistance available, when not use a battery as a power source

-Changable for input curve(curve fitting with 2 points setting)

-Open loop or closed loop speed control operation

-Closed loop position control with communication command or MDUI(option)

-Data logging for a oprating time and position

-Auto stop(stall alarm) if no motion is detected

-Short circuit, overvoltage and undervoltage protection

-Diagnostic LED

- -30℃ to +65℃ operating environment

-Easy configuration, tuning and monitory using provided PC utility(MDAS program)

2. Specification

■ In, Out

Items	Contents	Remark
Size/Weight	148x83x32(case including)/290g	
Power	DC12~24V(±10%), Normal 10A	
Signal	Input : pull-up(10K) Output : open-collector type	PLC
Serial comm.(option)	RS485 1ch, 19200bps	PLC
Speed range	50~5,000rpm	
Speed variation ratio	Less than ±1%	

■ LED

LED	Color	Number of blink	Contents
ALARM	RED	0, Hall fail	Hall-sensor fail or motor speed sign inversed.
		1, Over load	**Overload(over than 4s at max. control load)**
		2, Short circuit	Short circuit of motor coil or current more than 150% of max. limit.
		3, Over voltage	System voltage is over than that of normal range.
		4, Low voltage	Input voltage is lower than that of normal range .
		5, Control fail	The motor speed is larger than 30% of reference speed during 15s.
STATUS	GREEN	1, Normal status	Blink at 1hz on the normal CPU condition.

■ DIP Switch

Pin no.	Name	Contents					Remark
1~4	**DIP1~4**	DIP1,2 : Set the number of motor poles DIP3,4 : Max. motor speed setting					Refer to below table
5	**INV**	Invert the motor speed sign (not the standard direction)					
6	**1Q**	OFF : Sinuwave PWM driving(4-Q control) ON : Square wave PWM driving(1-Q control)					Sinuwave Square wave
7	**OPEN**	OFF : Closed-loop control, ON : Open-loop control					Open, Closed loop
8	**CHG**	ON: Change the usage of CTRL signals(DIR and START/STOP)					**At lifter or limited motion mechanic. Use CW/CCW as a limit switch**
		Control status	**CW(DIR)**		**CCW(START/STOP)**		
		Stop	OFF		OFF		
		CW turn	ON		OFF		
		CCW turn	OFF		ON		
		Brake	ON		ON		

Number of motor poles (DIP1, DIP2)						Max. speed(DIP3, DIP4)			
NO	DIP1	DIP 2	Pole	Pulse/rev	Min. rpm	NO	DIP 3	DIP 4	rpm
0	OFF	OFF	4	6	50	0	OFF	OFF	1,800
1	ON	OFF	8	12	50	1	ON	OFF	2,000
2	OFF	ON	10	**30**	50	2	OFF	ON	3,000
3	ON	ON	12	18	50	3	ON	ON	5,000

With GGM motors, DIP switch no. 1~6 are not allowed, just fixed
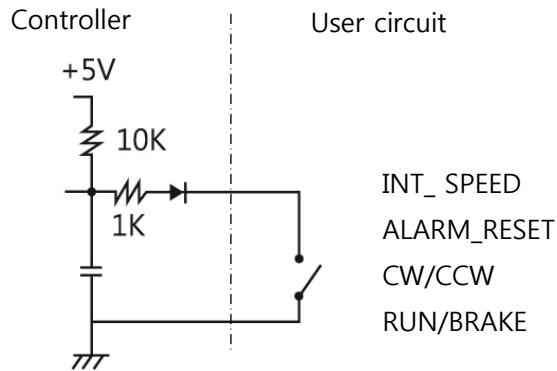**GGM motors : 10poles, 3200rpm, normal, 4Q control**

■ Motor and connectors

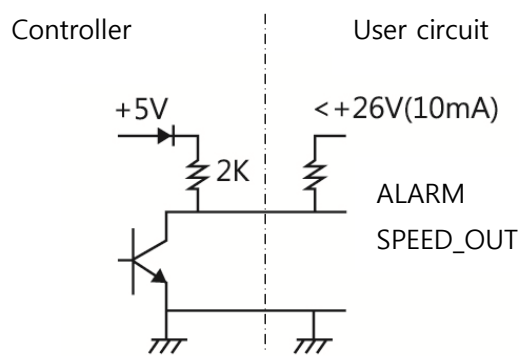| Name	Pin	Pin Name	Contents	Remark(Ext. harness)
HALL_SENOR MOLEX 5268-05	1~3	Hw,Hv, Hu	Hall sensor	MOLEX 5264-05
	4,5	Gnd, 12V	Power for hall sensor	
MOTOR BR508LH-3	1~3	U,V,W	Motor	
PWR BR508LH-2	1	Gnd	Ground	
	2	V+	12~24V(±10%)	
RS485 SMAW250-03	1	GND	RS485 connector	SMH250-03
	2	485+		
	3	485-		
ENC SMAW250-04	1~4	Gnd, B, A, 5V	Encoder(PHASE_B, PHASE_A)	SMH250-04
CTRL, MOLEX 5267-11			Control in/out signals.(refer to the below table)	MOLEX 5264-11

■ In/out signals

Inputs   **Outputs**

Controller   User circuit   Controller   User circuit

+5V   +5V   <+26V(10mA)

10K   2K   2K

1K   INT_ SPEED   ALARM

ALARM_RESET   SPEED_OUT

CW/CCW

RUN/BRAKE

For output circuit : the pull-up resistance must be set not to over 10mA.

Ex) At 24V input, the max. value of pull-up resistor is 24V/0.01A = 2.4kΩ.

■ CTRL connector(Molex, 5267-12)

ON : Connected with GND(Ground) or gournd level(less than 1.3V)

OFF : Disconnected with GND, or high level.

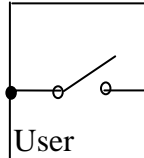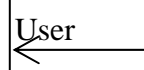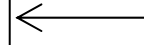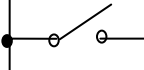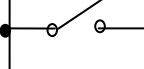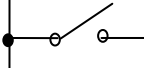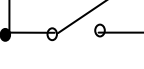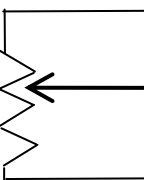To run the motor, connect RUN/BRAKE and START/STOP to GND

To stop the motor(free state), disconnect the signal START/STOP from the ground(GND).

When motor running, and wants to stop quickly. disconnect RUN/BRAKE from GND

Control conditions by the signals, START/STOP and RUN/BRAKE

START/STOP	RUN/BRAKE	Normal driving
ON(L)	ON(L)	Normal driving
ON(L)	OFF(H)	Quick stop(brake)
OFF(H)	ON(L)	Stop naturally

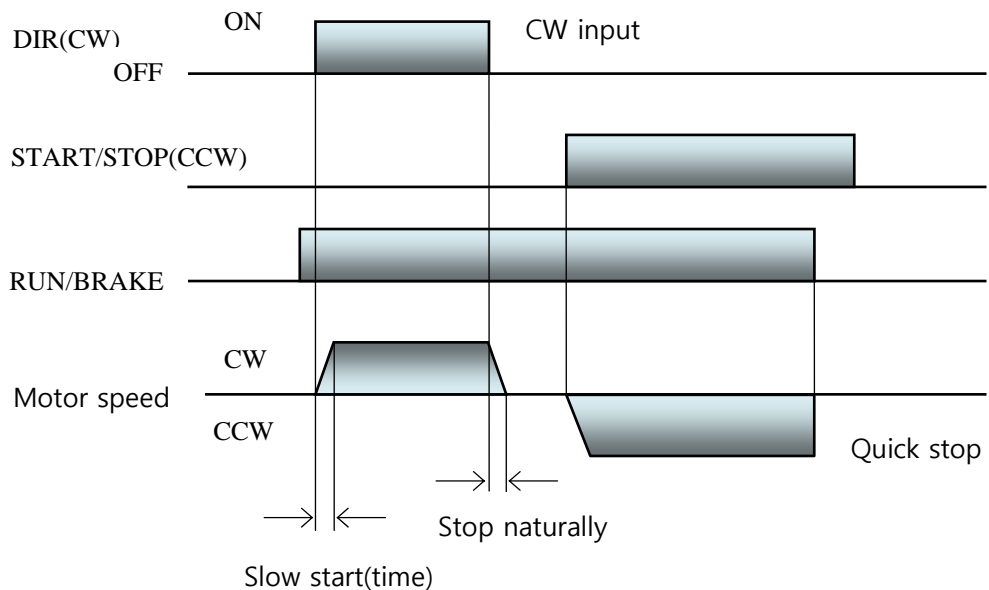| Pin	Signal Explanation	Direction Color	Contents
1	GND	Black	Ground
2	INT_SPEED Select speed input type	IN Green	ON : Set the speed by internal volume(LOAD/SPEED) OFF : Set the current by internal volume and speed by external volume(SPEED_IN)
3	ALARM Alarm output	OUT Purple	When alarm occurs, the signal is OFF(H), and at normal condition, the output is ON(L) If there is any alarm, the alarm LED is blink according to the alarm status.
4	SPEED_ OUT Speed output	OUT Orange	Out pulses proportion to the motor speed. Pulse number per one revolution = (number of poles x3)÷2 10 poles only: 30ppr(number of poles x 3) and pulse width is about 300μs..
5	ALARM_ RESET Reset alarm	IN Grey	If controller stops by any alarm, then user must remove the cause of alarm, and restart controller using ALM_RESET Restart condition : alarm signal change ON to OFF
6	DIR Motor direction	IN Brown	Used to set the motor direction. CW : Connected to the GND(ON) CCW : Disconnected to the GND(OFF) If DIP_SW, CHG is ON and DIR is ON, the motor turns to CW. If controlled by communication, this signal is used as a limit-switch(to run motor, must to connected to GND)
7	RUN/ BRAKE	IN White	ON(L) : Run the motor. OFF : Quick stop of motor(BRAKE ON), and hold stop.
8	START/ STOP Driving/ Stop	IN Magenta	ON : Ready to motor run. OFF : Stop motor naturally If DIP_SW, CHG is ON and START/STOP is ON, the motor turns to CCW direction. If controlled by communication, this signal is used as a limit-switch(to run motor, must to connected to GND)
9	GND	Blue	Ground
10	SPEED_IN Speed input	IN Yellow	Set the motor speed. the range is from 0 to 5VDC
11	5V	OUT Red	Used to supply 5VDC to the external volume. Do not use other usage but speed input.

■ **Motor control on the input signals**

DIP_SW, No.8, CHG is OFF

Driving condition on the signals RUN/BRAKE and STAT/STOP
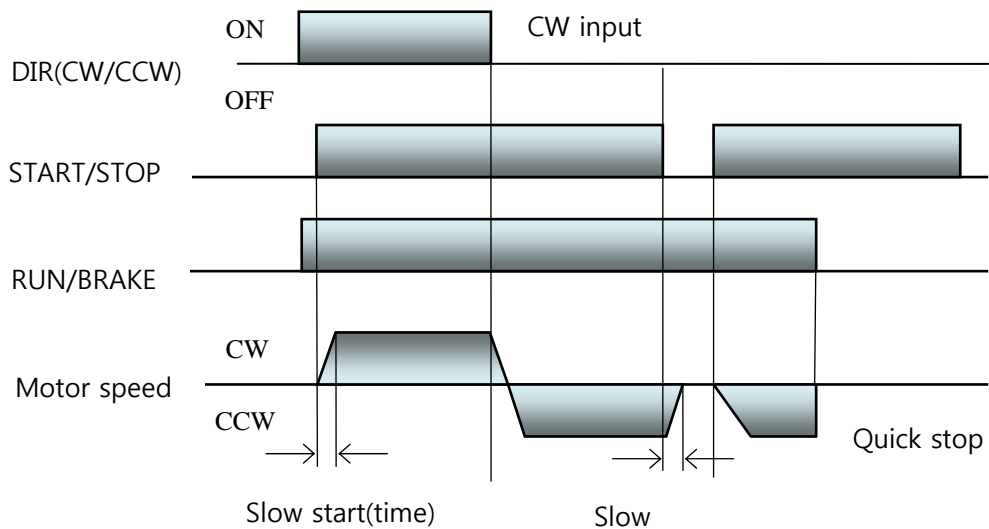
DIP_SW, No. 8, CHG is ON

Motor moves when RUN/BRAKE is ON.

■ Types of control inputs

Mode is set by communication command(refer to the communication protocol)

MODE	Types of input Connector	Range			Remark(range/digital)	Figure
		Input	Speed	Center		
0	Analog or PWM CTRL	0~5V Duty cycle	0~max.	-	Default setting More than 5khz	
1	Joystick CTRL	0~5V	-max.~+max.	2.5V	deadzone:2~3V(±10%)	
5	STEP CTRL	7steps	0~7 steps input	-	DI input(D0, D1, D2=> INT_SPEED,RUN/BRAKE, START/STOP)	
6	RF3KEY CTRL	CW, CCW, STOP	Analog input 0~max.	2.5V or 50% duty	START/STOP:CCW DIR :CW RUN/BRAKE:STOP	

■ RF3KEY input

When use RF3KEY mode, user can connect the RF receiver signals to the START/STOP, DIR, RUN/BRAKE of CTRL connector.

Then, the power to the RF receiver is supplied from 5VDC of controller

ENC : pin no.1(Gnd), no.4(5VDC), or CTRL : pin no.1(Gnd), no.11(5VDC)

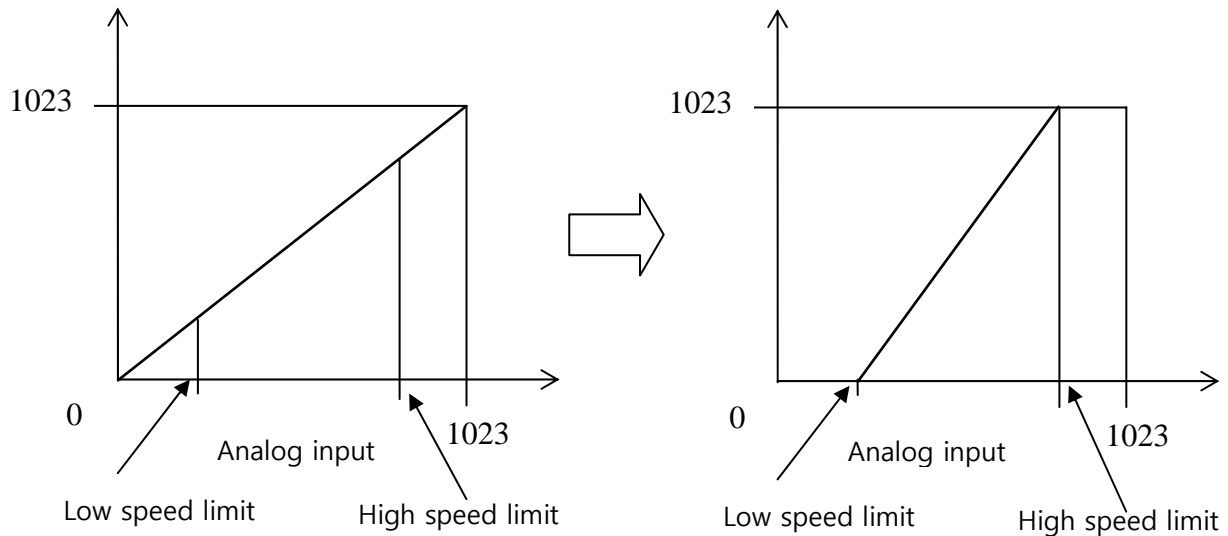The number of button in the transmitter is 3,

BT1(up) : CCW

BT2 (center) : STOP

BT3(down) : CW opration

■ **Alanog input processing.**

The analog input can be converted to fit the user's intention.

How to set the limitation of analog input

1 . Set the every DIP_SW to ON : set mode intro.

2. Input the voltage of lower limitation, ranging 0~2.5V

3. Change RUN/BRAKE signal of CTRL, OFF->ON, then alarm LED turns to ON(set OK)

4. Change RUN/BRAKE signal to OFF.

5. Input the voltage of upper limitation, ranging 2.5~5V.

6. Repeat items 3, 4 samely

7. Set the DIP SW to original vaule(set of motor and speed)

If you use throttle handle, you have to set the input limitations, because it has range about 1~4VDC

■ **Step input**

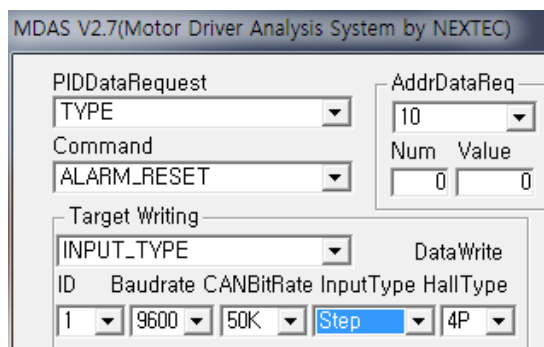 7step digital inputs by user setting

To use spep input, user set the input mode to INPUT_STEP by MDAS or user program.

STEP INPUT(CTRL connector)				Default setting(%) Percentage of max. speed
No.	INT_SPEED	RUN/BRKAKE	START/STOP	
0	OFF	OFF	OFF	0(stop condition)
1	ON	OFF	OFF	14
2	OFF	ON	OFF	28
3	ON	ON	OFF	42
4	OFF	OFF	ON	57
5	ON	OFF	ON	71
6	OFF	ON	ON	85
7	ON	ON	ON	100

-Select Step input in the combo box, InputType

-Select INPUT_TYPE inthe combo box, Target Writing

Then the input type is set with a step input

■ Protections.

Over-voltage protection

If the system voltage is over the defined max. voltage, the overvoltage alarm is generated.

If the appropriate regenerative resistor is not applied, and the energy by regeneration is not absorbed by system, then the system voltage excess the set over-voltage limitation.

This protection is particularly recommended for situation where the controller is powered from a power supply instead of batteries.

Under-voltage protection

In order to ensure the proper system operation, the controller monitors the supply voltage, if this voltage drops below the safety level, the controller's output stage is turned off.

Short circuit protection

The controller includes a circuit that will detect very high current surges that are consistent with short circuits conditions.

When such a condition occurs, the power FETs for the related motor channels are cut off within a few microseconds.

Over load protection

If the system measured current is over the set max. current, during 4s, then the power is cut off and the over load alarm is generated.(blink twice in two second)
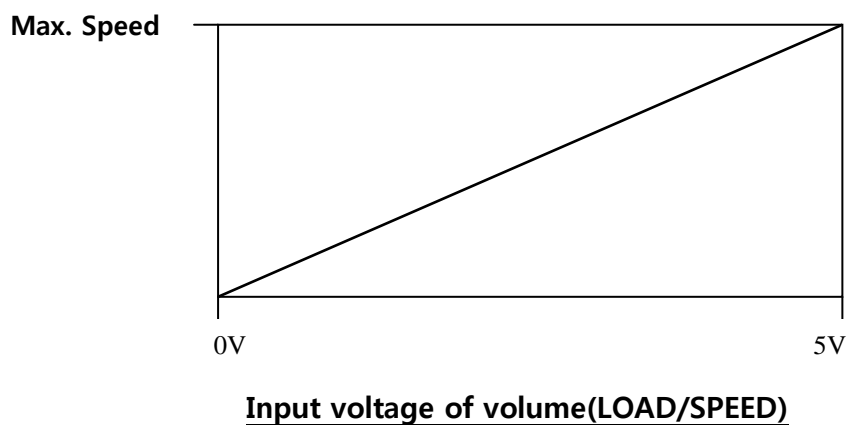
Stall protection

If the output current is over a tenth of max. current during 2s, and the speed is zero, then the power is cut off and the over load alarm is generated.
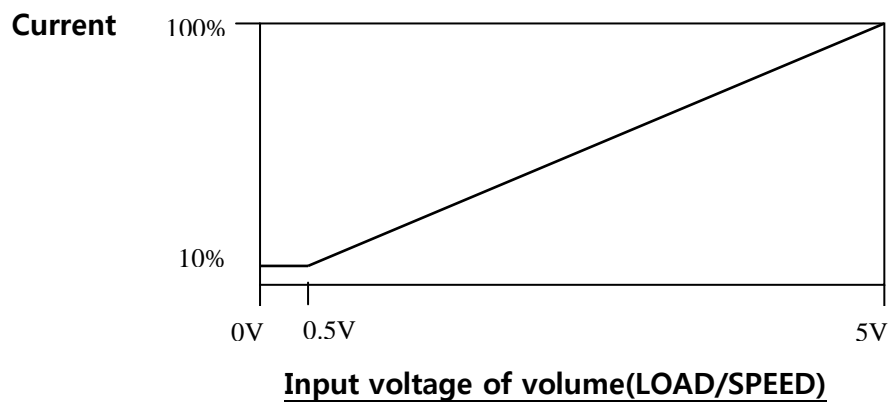
■ **Internal volume**

• **Speed or current limit : SPEED**

When the signal, INT_SPEED of CTRL is ON, the motor speed is controlled by internal volume(LOAD/SPEED).

Input voltage of volume(LOAD/SPEED)

or the **INT_SPEED** is OFF, it is used to limit max. current of motor

Input voltage of volume(LOAD/SPEED)

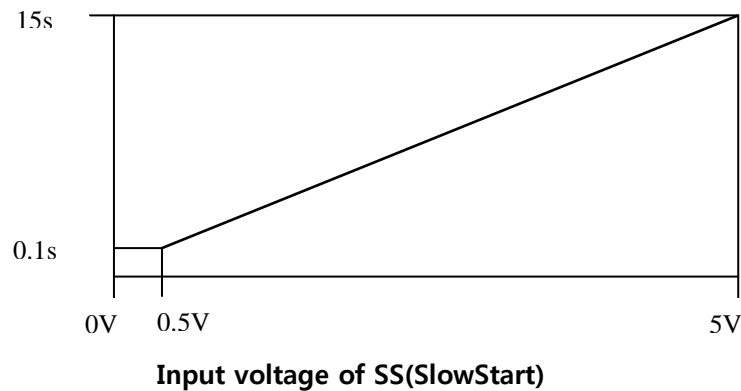**•Deceleration and acceleration : SS(Slow Start) or SD(Slow Down)**

Set acceleration or deceleration of the motor speed.

If there is no SD volume, the deceleration is set by the volume SS also.

Max. value of volume(CW turn) : 15s to the max. speed.

Min. value of volume(CCW turn) : about 0.1s to the max. speed

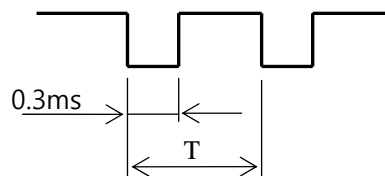**Time to max. reference speed**

Input voltage of SS(SlowStart)

■ SPEED output(SPEED_OUT)

Output signal on the number of poles, 10(GGM motors)

30pulses per one revolution.

Frequency(1/T)
Motor speed(rpm) = 2/T

At the other number of poles, the output pulse is toggled one and half numbers of poles.

Pulse number per one revolution = 1.5 x number of poles.

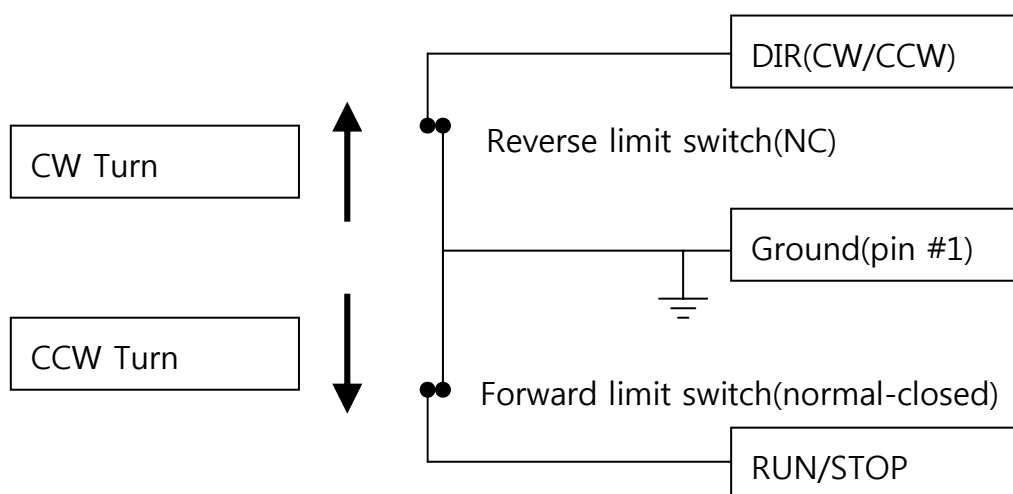■ **Safety switches and driving condition when communition command used**

If you use communication command, then the controller uses the CTRL signals as limit switchs for system safety.

Set the DIR(CW/CCW) and START/STOP signals to ON(connected to GND) to drive motor

The relationship of the moving direction and the signals.

X : don't care

Reference direction	CTRL connector(no. 6 and no. 8 input signal)		Motor status
	DIR(CW/CCW)	**START/STOP**	
CW(Reverse)	**ON**	X	Driving
	OFF	X	Stop
CCW(Forward)	X	**ON**	Driving
	X	OFF	Stop

CW Turn

CCW Turn

DIR(CW/CCW)

Reverse limit switch(NC)

Ground(pin #1)

Forward limit switch(normal-closed)

RUN/STOP

Wiring condition on the moving direction and limit switches

3. Diagnosis

Items	Cause	Solutions
Motor don't move	RUN/BRAKE and START/STOP signals are not ON status.	Set the RUN/BRAKE and START/STOP inputs to ON status
	DIP_SW No.8 CHG is not ON and RUN/BRAKE is not ON or, DIR or START/STOP are not ON.	Set RUN/BRAKE to ON, and wants to move to CW direction, set DIR to ON or CCW direction, START/STOP to ON.
	When using the internal volume, LOAD/SPEED as a speed input, CTRL connector no.2, INT_SPEED is not ON.	Set the INT_SPEED to ON.
	The external volume(speed in) is malfunction.	At the CTRL connector no. 10 , check 0~5V input voltage.
	Alarm LED ON	Check hall sensors of motor
Low power.	Internal volume, LOAD/SPEED is not proper setting.	Turn this volume to CCW direction to increase the limit of max. current.
Wrong direction	DIR signal is not proper	Set the valid status of DIR(CW/CCW) signal.
	Reducer connected.	The direction of axis is depend on the reducer ratio. change the DIR status.
Unstable run	Motor axis has not valid coupling	Use flexible coupling.
	Type of motor is not correct.	Set the correct number of motor poles by DIP_SW no. 1,2
Motor speed increased slowly.	Not valid set of SS(SlowStart), SD.	Set the volume SS, SD to fit the wanted response.(turn CCW->quick response)
Motor run max. speed shortly and stop with the alarm LED, ON	The motor speed sign is not valid.	Set the DIP_SW no. 5, INV to ON. And reboot the controller.
The dynamic response is not good.	The motor is drived by 1Q mode.	Set the DIP_SW no. 6, 1Q to OFF, The motor is drived by sinuwave PWM.

4 History

VERSION	DATE	CONTENTS
V1.0	03/26/2013	First born.
V1.1	10/01/2014	Input mode added.

- The end -