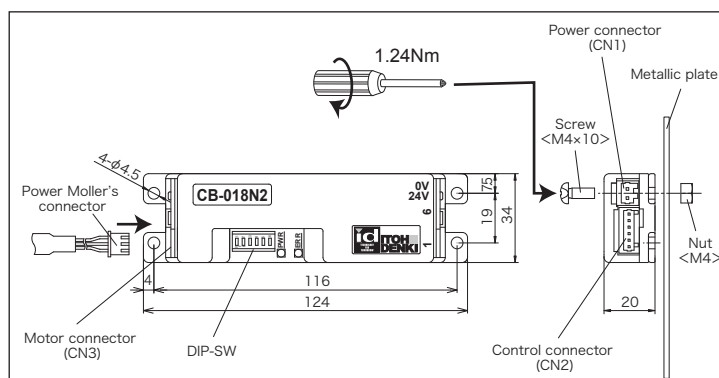
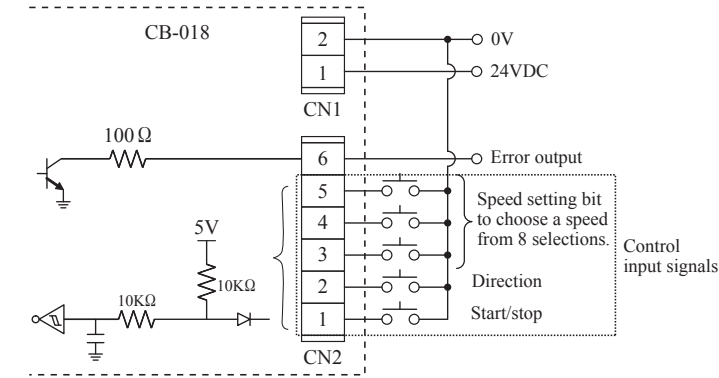




4. Connector wiring

Caution

- Never fail to switch off the power before wiring to prevent any accident and injury.
- Wiring to the connector should be done before inserting into the Driver card.
- Do not insert or pull the connector to and from the Driver card too strongly.
- Make sure the application environment is free from static or electric noise.



< CN1 >

Caution

- Do not wire in daisy chain manner. Electric shock, short circuit or damage may happen by excessive current draw more than capacity of connector (10A)
- Make sure the wiring is done with correct polarity.
- Do not wire while the connector is inserted to the Driver card.

< CN2 >

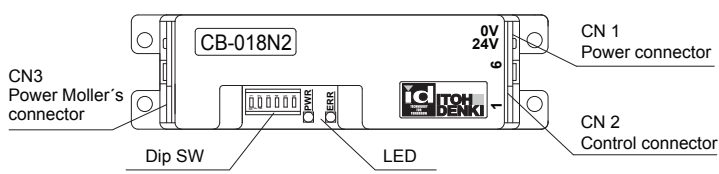
Caution

- 0V input to CN2 #1 (RUN/STOP) and to CN2 #2 (CW/CCW) should be common to power voltage. (4A connector capacity)
- Error signal output from CN2 #6 is NPN open collector.
- Connecting with external device such as Relay Coil requires apply coil surge absorption type or add protective devices to protect from surge otherwise remote OUTPUT in CB-108 may be damaged by back EMF when output signal is changed.

Caution

Power Moller's turning direction is determined by SW3 and 0V signal input to CN2 #2. Make sure the status of Dip SW3 and input signal status to CN2 #2.
(See 7. Reversing)

5. Control signals and functions



Terminal sign	Name	Function
CN1#1, CN1#2	Power input (24VDC)	Wire 24V to CN1 #1, and 0V to CN1 #2.
Input signal	CN2#1	Start Power Moller runs with ON
		Stop Power Moller stops with OFF
	CN2#2	Direction (When SW3 OFF) ON makes right turn (CW viewed from lead-wire side) OFF makes left turn (CCW viewed from lead-wire side)
	CN2#3~5	External speed change (When SW2 ON) 8 different speeds by combination of 3 signals
	* Switch is not standard accessory (not inclusive) as illustrated. * Relay contact, PLC output (NPN – sinking only) can be connected instead of switch. (current draw to the switch is 0.5mA) * Defined motor direction is viewed from Power Moller's cable side.	
Output signal	CN2#6	Error signal output Signal output to indicate the Driver card's protector reacted, to reduce or stop the motor output. NPN open collector output, 35VDC, ≤25mA
	* Error signal output is reset when start signal to CN2 #1 becomes OFF. However, this won't reset fuse blow error.	
Dip switches	SW1	Acceleration / deceleration Invalidated with OFF Validated with ON (for 1 second with default setting)
	SW2	Speed setting Internal speed setting with OFF External speed setting with ON
	SW3	Direction Switching of CW and CCW (default OFF setting) See 7. Reversing
	SW4~6	Speed variation (When SW2 OFF) 8 different speeds by the combination of 3 signals
LED	PWR (Green)	○ : Powered -○- : RUN ● : Power shortage
	ERR (Red)	● : Normal -○- : Error with over current (overload) -○- : Motor stall error, Motor unplugged error, Low voltage error, fuse blow error ○ : Thermal error

*LED indication ○ : Illuminates -○- : Slow blink (1Hz) -○- : Fast blink (7.6Hz) ● : OFF

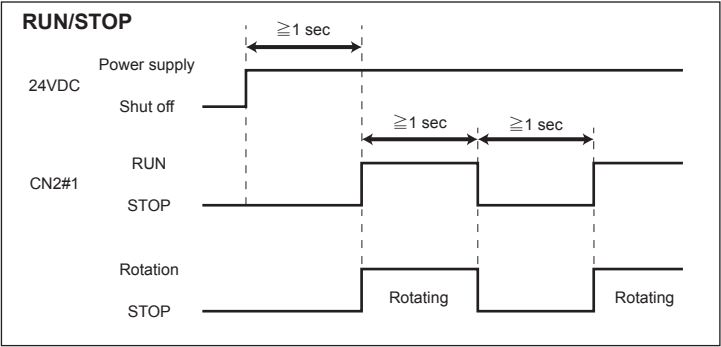
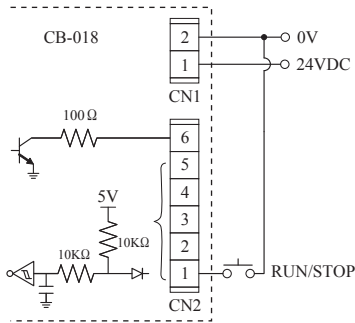
Note: 0V signal line to CN2 should be common to 0V of 24V power.

6. Start / Stop

- 1. Input 24VDC to CN 1 and PWR (green LED) illuminates.
- 2. Power Moller starts running with CN2 #1 ON
- 3. Power Moller stops with CN 2 #1 OFF

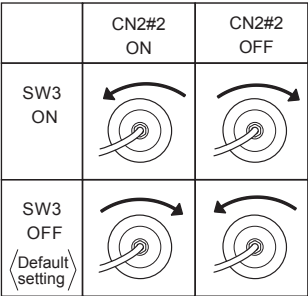
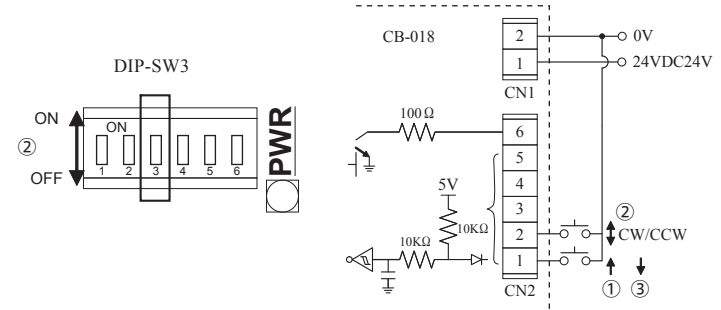
Caution

- 0V should be common to the power voltage.
- CN2 #1 draws 0.5mA current.
- Motor start signal is validated 1 second after the Driver card is powered.
- Do not switch on or off the Power Moller at the power supply.
- Power Moller coasts with no dynamic brake if the power to the unit is shut off at the power supply.



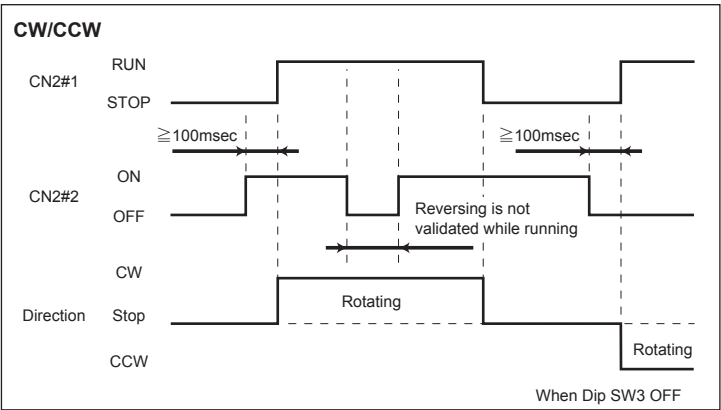
7. Reversing

- Direction is determined by the combination of CN2 #2 ON/OFF and SW 3 ON/OFF.
- 1. Stop the Power Moller with CN2 #1 OFF
 - 2. Reverse the Power Moller rotation by switching CN2 #2 ON or OFF, or switching Dip SW 3 ON or OFF. (See schematic below)
 - 3. Start the Power Moller with CN2 #1 ON.



Caution

- 0V should be common to the power voltage.
- CN2 #1 draws 0.5mA current.
- Power Moller won't be reversed regardless of CN2 #2 or Dip SW 3 status, unless the unit is once stopped before reversing signal is injected.
- RUN and Reversing signals are validated simultaneously. First effect the reversing, then effect RUN signal.



8. Speed variation

Speed can be varied internally or externally by the Dip SW 2 setting.

Caution

CN2 #3-5 draws 0.5mA

DIP-SW2

External variation

Internal variation

PWR

Power Moller speed can be varied by injecting signals to Dip SW4 thru 6 internally, or to CN2 #3 thru 5 externally.

< Internal variation >

DIP-SW 4~6

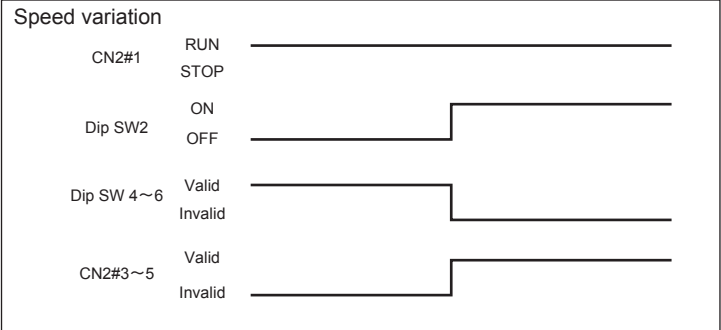
Speed control

< External variation >

CN2#3~5

Speed control

Nominal Speed (m/min)	Peripheral Velocity			SW2 OFF (Default)			SW2 ON		
	No load	Rated		SW4	SW5	SW6	CN2#3	CN2#4	CN2#5
30	28.0	25.8		↑ ON (Default)	↑ ON (Default)	↑ ON (Default)	ON	ON	ON
25	24.7	24.7		↑ ON	↑ ON	↓ OFF	ON	ON	OFF
22	22.0	22.0		↑ ON	↓ OFF	↑ ON	ON	OFF	ON
19	18.8	18.8		↑ ON	↓ OFF	↓ OFF	ON	OFF	OFF
16	15.9	15.9		↓ OFF	↑ ON	↑ ON	OFF	ON	ON
13	13.0	13.0		↓ OFF	↑ ON	↓ OFF	OFF	ON	OFF
10	9.9	9.9		↓ OFF	↓ OFF	↑ ON	OFF	OFF	ON
6	5.8	5.8		↓ OFF	↓ OFF	↓ OFF	OFF	OFF	OFF



9. Acceleration / deceleration

Acceleration and deceleration can be adjusted by the Dip SW1.

Caution

Check the actual acceleration/deceleration time as the setting time through control may not match the actual value.

DIP-SW1

Valid

Invalid

PWR

Turning SW1 ON validates acceleration and deceleration for approximately 1 second.

Turning SW1 OFF invalidates this function.

SW1 ON

Speed setting

abst 1 sec

abst 1 sec

RUN signal input

STOP signal input

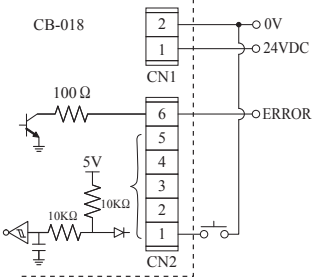
10. Error signal output

When abnormality is detected during operation, protective device reacts and stop the Power Moller.

Error signal is discharged from CN2 #6 (NPN open collector output) depending on the type of error. Type of error can be identified by the status of LEDs on the Driver card.

Caution

- Use with 35V, 25mA or less
- Driver card has integral 100Ω protective resistor.



LED behavior : Illuminates : Slow blink (1Hz) : Fast blink (7.6Hz) : OFF

LED		Status / Type of error	Motor	Error signal	Descriptions
PWR	ERR				
		Normal	RUN	Nil	Normal operation
		Motor run	RUN	Nil	Motor is running normally
		Over current	RUN	Nil	1-1.5A over current. Red LED blinks at 7.6Hz for 2 second, then off for 2 second
		Overload	OFF	Discharged	≥1A over current continues for over 12 seconds or ≥1.5A over current continues for over 4 seconds
		Motor stall Motor unplugged	OFF	Discharged	Power Moller is stalled with ≤1.5m/min speed for a second. Or motor is unplugged to the Driver card.
		Thermal error	OFF	Discharged	Temperature in the Driver card reached 75°C or over thereby protector reacted.
		Low voltage	OFF	Discharged	Power voltage is dropped down to 17V or less
		Fuse blow	OFF	Discharged	Integral fuse on the Driver card blew
		Overload / low Voltage	OFF	Discharged	Overload and low voltage situation occurred at the same time. Red LED blinks at 7.6Hz for 0.4 second then on for 0.6 second.

Error reset

Follow the procedure below to reset the error (extinguish red LED)

Caution

- Failure to comply with this procedure may bring unexpected accident or damage.
- Red LED won't be extinguished while error signal is discharged.

1. Switch OFF the RUN signal to CN2 #1, or switch ON CN2 #3, and error signal output (CN2 #6) is reset.

2. Remove the causes of the error.

3. Switch ON the RUN signal to CN2 #1.

ERR

ERR

ERR

ERR

Motor runs with red LED extinguished.

Error time chart

Thermal error

Thermal

75°C

Input CN2#1

RUN
STOP

Motor

RUN
STOP

Input CN2#3

ON
OFF

Error output CN2#6

Abnormal
Normal

LED ERR (red)

ON
OFF

• Error signal is discharged 1 second after thermal error is detected, with red LED (ERR) illuminated.

• Error is reset by switching power off then on, but error signal is discharged 1 second later unless the temperature reaches to the reset level.

• Error signal won't be discharged once the thermal temperature went down to 75°C or less, and STOP signal is injected or ON signal input to CN2 #3.

• Red LED (ERR) will be extinguished by switching the power OFF first then switching ON.

Stall error

• Error is detected, discharging error signal when motor speed becomes 1.5m/min or less continuously for a second, with red LED blinking at 1Hz.

• Error signal is stopped by effecting STOP signal or switching ON to CN2 #3.

• Red LED will be extinguished by switching the power OFF, then ON.

Overload error

• Error signal is discharged when current over 1A lasts for 12 seconds, or current over 1.5A lasts for 4 seconds consecutively. Then, ERR LED (red) blinks at 7.6Hz.

• Error signal is stopped by effecting STOP signal or switching ON to CN2 #3.

• Red LED will be extinguished by switching the power OFF, then ON.

Low voltage error

• The error is detected discharging error signal with red LED (ERR) blinking at 1Hz and green LED (PWR) being extinguished, when power voltage becomes continuously 17V or less.

• Error is reset with red LED extinguished and green LED illuminated, when the power voltage recover to 17V or over.

• When error arises, switching RUN signal ON makes coast brake applied and switching RUN signal off makes dynamic brake applied.

11. Troubleshooting

* Check the followings without removing the enclosure or modification.

Symptom 1: Power Moller does not run	
Power	· Does green LED (PWR) illuminate? · Is 24VDC properly supplied to the Driver card? · Is power wiring (24V and 0V) correct? · Is the power connector properly inserted into the Driver card?
RUN signal	· Is 0V injected to CN2 #1? · Is 0V injected to CN2 #1 common to 0V to CN2 #2? · Is the connector properly inserted to the Driver card?
Error	· Does red LED (ERR) illuminate or blink? (See 10. Error signal output)
Power Moller	· Is Power Moller properly mounted in the conveyor frame without its end-cap contacting conveyor frame inner face? · Is the motor connected properly inserted to the Driver card?

Symptom 2: Power Moller does not run at expected speed	
Dip SW2	· Is SW2 set to ON in case of internal setting, or is SW2 set to OFF in case of external setting?
Power	· Is 0V common to the 0V input to CN1 #2, in case of external setting? · Is 24VDC properly supplied from power supply?
CN2 #3~5	· Is cable properly wired to connector? · Is 0V supplied to CN2 #3-5 common to 0V supplied to CN2 #1?

Symptom 3: Power Moller cannot be reversed	
CW/CCW	· Is 0V supplied to CN2 #2 common to the 0V supplied to CN1 #2? · Is the cable properly wired to connector?
Dip SW3	· Is Dip SW3 used?
Operation	· Aren't RUN signal and reversing signal injected at the same time? · Isn't the reversing tried to be done while Power Moller is turning?

Symptom 4: Error signal is not discharged	
Voltage	· Error signal is NPN open collector output. Is external voltage 24V or less and is 0V common to the 0V supplied to CN1 #2?
CN2 #6	· Is cable properly wired to connector?

Symptom 5: Error signal is frequently discharged	
Red LED (ERR)	· Does red LED (ERR) blink faster at 7.6Hz? If so, Power Moller is overloaded. Reduce the load or increase the number of Power Moller.
Environment	· Is operating ambient temperature between 0 and 40℃? · Is the Driver card affixed to metallic plate ensuring heat dissipation? · Isn't Power Moller stalled if mechanical stopped is used to accumulate loads.
Power Moller Driver card	· Is Power Moller's connector properly inserted to the Driver card? · Is 24VDC supplied to CN1 of the Driver card? · Is 24VDC properly supplied from power supply?

12. Technical Specifications

Operating characteristics

Speed (m/min)	Peripheral velocity (m/min)		Tangential force (N)		Current (A)			CB 018N setting		
	No load	Nominal	Nominal	Starting	No load	Nominal	Starting	SW4 CN2#3	SW5 CN2#4	SW6 CN2#5
30	28.0	25.8	24.4	37.2	0.32	0.90	2.2	ON	ON	ON
25	24.7	24.7	24.5		0.26	0.89		ON	ON	OFF
22	22.0	22.0	24.9		0.21	0.83		ON	OFF	ON
19	18.8	18.8	25.3		0.20	0.74		ON	OFF	OFF
16	15.9	15.9	25.8		0.16	0.67		OFF	ON	ON
13	13.0	13.0	26.2		0.13	0.61		OFF	ON	OFF
10	9.9	9.9	26.6		0.10	0.53		OFF	OFF	ON
6	5.8	5.8	27.2		0.06	0.44		OFF	OFF	OFF

Default setting

Specifications

<Power Moller>		<Driver card>		
External	Body	Stainless steel	Enclosure	Fire resistant polycarbonate ULV0 black
	Oil seal	NBR	Power voltage	24VDC ±10%
	Motor connector	66 Nylon (JST XHP-3)	Rated voltage	24VDC
	Motor cable	Heat resistant vinyl	Static current	0.04A
Motor	Mounting bracket	Stainless steel for output shaft, SPCC for cable side	Peak current	5.0A
	Motor	Brushless dc motor	Starting current	2.2A
	Insulation	Class E equivalent	Delay time	≤1 second (initial reset)
	Operation	Continuous duty	Motor activation time	≤150msec
	Protection	IP 65	Error signal output	NPN open collector output (used with 35VDC ≤ 25mA)
<Common>		LED indication	Red – Error Green – Powered	
Environment	Thermal protection	75℃ inside Driver card		
	Ambient temperature	0 to 40℃ (no freezing)		
	Relative humidity	≤90RH (no condensation)		
	Atmosphere	No corrosive gas		
	Vibration	≤ 0.5G		
	Brake	Dynamic brake (≤10msec brake activation time)		
	Power connector	WAGO 734-102 (EAHB 05)		
	Control connector	WAGO 733-106 (PACB 18)		
	Power Moller connector	JST XHP-3		
	Protections	Diode against miss wiring (wrong polarity) 5A fuse		

Technology for tomorrow



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