

## CBM-103FN/FP Circuit Board



### Features

- Specifically designed for the KE series Power Moller® family
- Adjustable acceleration and deceleration time (0 to 2.5s)
- Stable speed operation
- Manual or automatic recovery from thermal overload and low voltage
- One (1) rotary switch to select up to 10 different fixed speeds
- Two (2) LEDs (green & red) to identify error type
- Pulse signal output to indicate motor revolution (2 pulses/motor revolution)
- RoHS and EMC conformity
- Low Voltage Protection
- External Direction control

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# SPECIFICATIONS

**Electrical**

- 24V DC  $\pm 10\%$  input
  - Battery
  - Power Supply: fullwave rectified, smooth current  $< 10\%$  Ripple
- Power ON delay  $< 1s$
- 10A locking current
- Input signals (minimum 2.2mA, maximum 7.3mA)
  - NPN (0V)
  - PNP (+24V DC)
- Output signals (open collector 24V, 25mA or less)
  - NPN (0V)
  - PNP (+24V DC; selectable for Error only)

**Applicable PM Models**

PM635KE

**Brake**

Dynamic (electric)

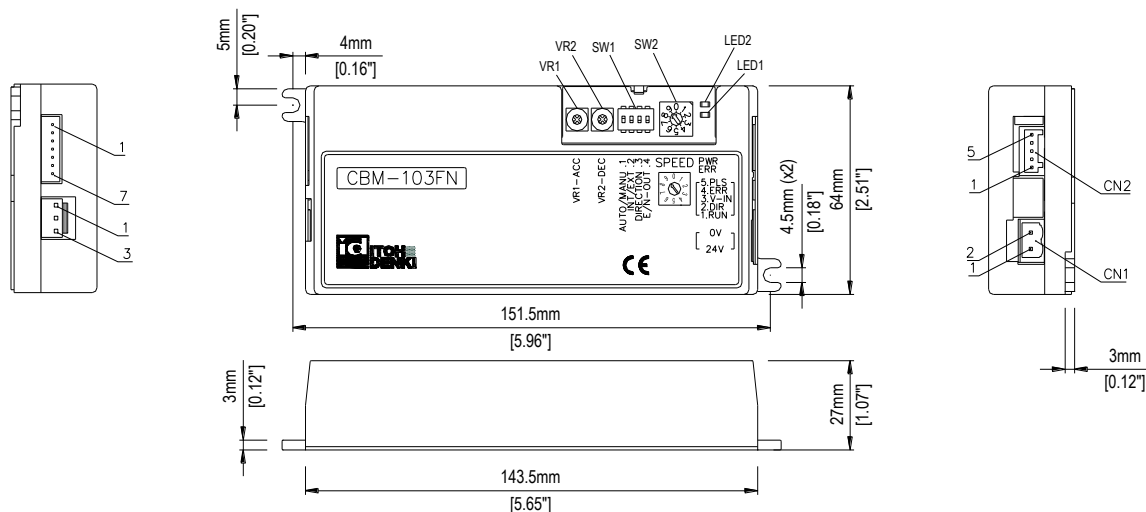
**Protection**

- Motor control thermal protection
  - 95°C (203°F) on the PCB
  - 105°C (221°F) in the motor
- Built-in diode for incorrect wiring protection
- Built-in 18A in-line fuse for supply protection
- Built-in thermal fuse to prevent overheating
  - 139°C (282°F)

**Applicable Environment**

- Temperature 0~40° C (32~104° F)
- $< 90\%$  Relative Humidity (No condensation)
- No corrosive gas
- Vibration  $< 0.5G$

## Dimensions



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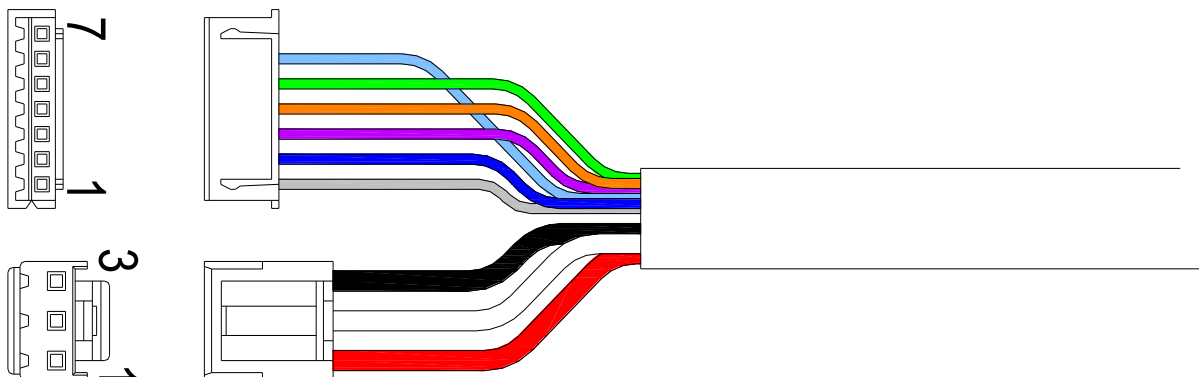
## Connections

<b>CN1</b>	2 PIN connector <b>POWER</b>	<b>Connector on Card</b> WAGO #231-432/001-000	<b>Connector for Wiring</b> WAGO #231-102/026-000
PIN	Description		
1	+24V DC	Wire size 28~14 AWG	
2	0V		

<b>CN3</b>	7 PIN connector <b>MOTOR</b>	<b>Connector on Card</b> JST #S7B-XH-A	<b>Connector for Wiring</b> JST #XHP-7
PIN	Description		
1	GND – Grey	Wire size: 28~22 AWG  Terminal pins: JST #SXH-001T-P0.6	
2	+12V DC – Blue		
3	Hall sensor U - Violet		
4	Hall sensor V – Orange		
5	Hall sensor W – Green		
6	Thermistor – Light Blue		
7	Not used		

<b>CN4</b>	3 PIN connector <b>MOTOR</b>	<b>Connector on Card</b> JST #S3P-VH	<b>Connector for Wiring</b> JST #VHR-3N
PIN	Description		
1	Motor phase U – Red	Wire size: 20~16 AWG  Terminal pins: JST SVH-41T-P1.1	
2	Motor phase V – White		
3	Motor phase W – Black		

**KE Motor Cable**



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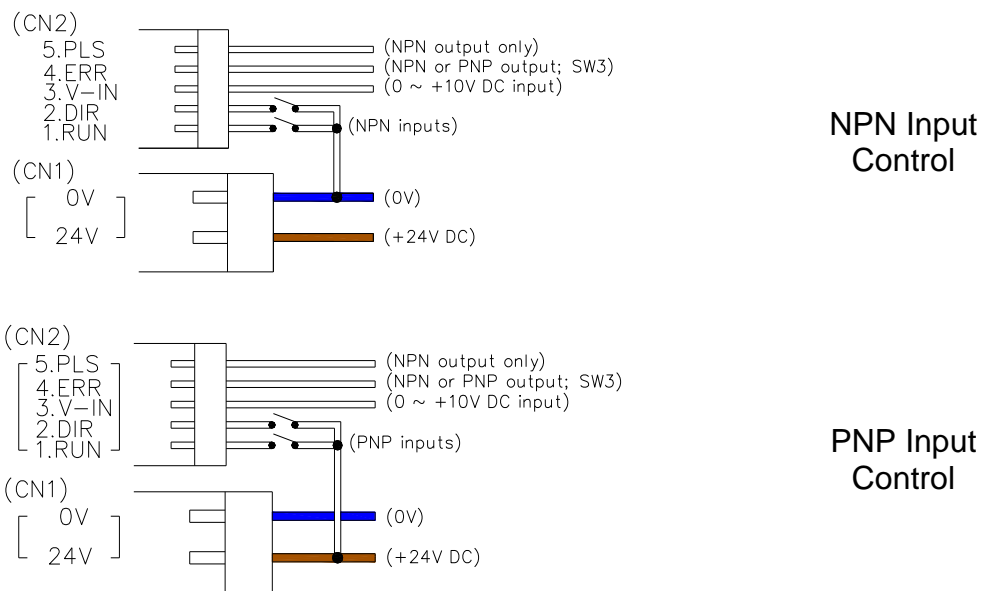
# OPERATION

## Control Connection

<b>CN2</b> 5 PIN connector <b>CONTROL</b>		<b>Connector on Card</b> WAGO #733-365	<b>Connector for Wiring</b> WAGO #733-105
PIN	Description		
1	+24V DC (PNP) or 0V (NPN) input – RUN		
2	+24V DC (PNP) or 0V (NPN) input – DIR		
3	0 ~ +10V DC input – V-IN (speed variation)		
4	+24V DC or 0V output – ERR		
5	0V (NPN) output – PLS (pulse)		
Wire size: 28~20 AWG			

## Control Wiring

**Power to CN1 (24V DC) remains ON, control motor Run/Stop through CN2**

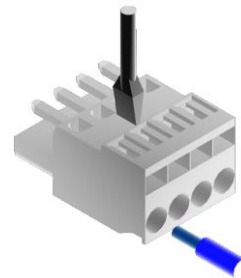


Press down spring clamp in connector with a small screwdriver.

Insert leads in proper order.

Lead should be stripped approx:  
0.31~0.35"

WAGO connector (included) must be inserted and/or pulled out carefully, so as not to damage other parts.

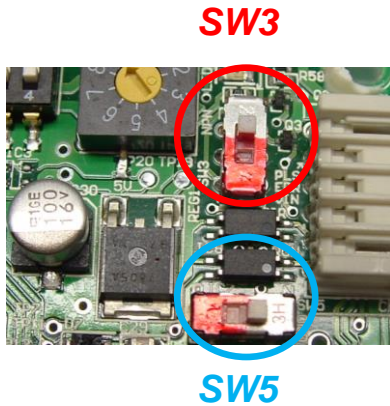


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# OPERATION

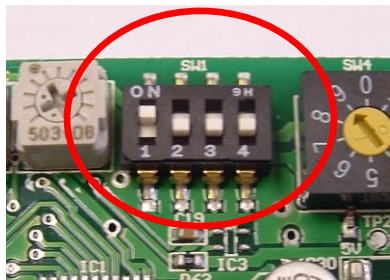
## Switches



Switch	Function	Position		Initial Setting
		Up	Down	
SW3	Error Output	NPN	PNP	NPN: CBM-103FN PNP: CBM-103FP

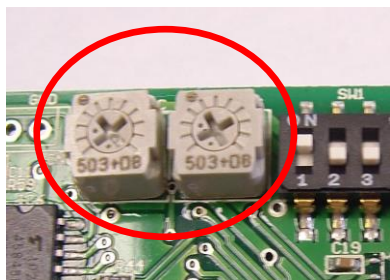
Switch	Function	Position		Initial Setting
		Right	Left	
SW5	Input Type	NPN	PNP	NPN: CBM-103FN PNP: CBM-103FP

## DIP Switches – User Settings



DIP Switch	Function	ON	OFF	Initial Setting
1	Error recovery: Thermal; Low voltage; Induced voltage	Manual Reset	Auto-matic Reset	ON
2	Speed change selection	External Voltage Input	Internal Rotary Switch	OFF
3	Motor Direction (no external DIR signal; viewed from cable side)	CW	CCW	OFF
4	ERR output	Normal, ON	Error, ON	OFF

## Potentiometers



Potentiometer	Function	Description
VR1	Acceleration	RUN signal ON 0~2.5s until set speed
VR2	Deceleration	RUN signal OFF 0~2.5s until stop

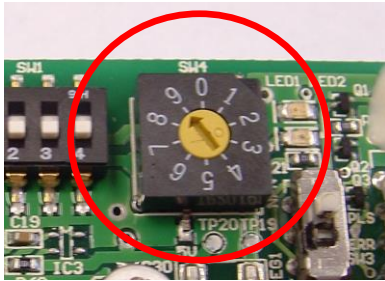
VRs turn 270°

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# OPERATION

## Speed Change Table



10 speed steps available through on-board rotary switch

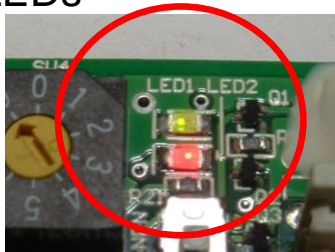
16 speed steps available through external voltage input (V-IN)

Rotary Switch	V-IN (V)	Speed (ft/min) $\pm 5\%$		
		1-stage	2-stage	3-stage
9	9.69 $\pm$ 0.25	758.0	199.5	52.5
8	9.06 $\pm$ 0.25	710.6	187.0	49.2
7	8.44 $\pm$ 0.25	663.3	174.5	45.9
n/a	7.81 $\pm$ 0.25	615.9	162.1	42.7
6	7.19 $\pm$ 0.25	568.5	149.6	39.4
n/a	6.56 $\pm$ 0.25	521.1	137.1	36.1
5	5.94 $\pm$ 0.25	473.8	124.7	32.8
n/a	5.31 $\pm$ 0.25	426.4	112.2	29.5
4	4.69 $\pm$ 0.25	379.0	99.7	26.2
n/a	4.06 $\pm$ 0.25	331.6	87.3	23.0
3	3.44 $\pm$ 0.25	284.3	74.8	19.7
n/a	2.81 $\pm$ 0.25	236.9	62.3	16.4
2	2.19 $\pm$ 0.25	189.5	49.9	13.1
1	1.56 $\pm$ 0.25	142.1	37.4	9.8
0	0.94 $\pm$ 0.25	94.8	24.9	6.6
n/a	0.31 $\pm$ 0.25	47.4	12.5	3.3

## Motor Pulse Output Signal

- 0V (NPN) output from CN2-5
- Two (2) pulses per motor revolution
- Maximum speed pulse frequency approximately 147Hz

## LEDs



**LED 1 – Green (power)**

**LED 2 – Red (error condition)**

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# OPERATION

## NPN or PNP inputs/outputs

The card(s) are ordered with the inputs/outputs preset from the factory – ALL NPN or ALL PNP. The model designation will show the factory preset.

- **CBM-103FN – NPN input/output type**
- **CBM-103FP – PNP input/output type**

If it is necessary to change the input or output type, the internal dip switch(es) will need to be changed as shown below:

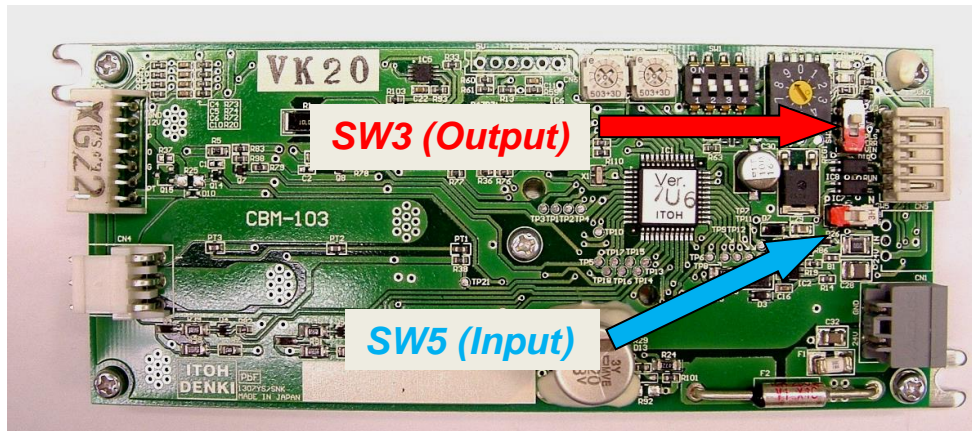
1. Pry open the plastic cover at screwdriver slots on back of card



2. Change internal dip switch(es) to appropriate setting and replace cover

Position for Input Signal Type (SW5)		Initial Setting
NPN Setting	PNP Setting	
Right	Left	Right: CBM-103FN Left: CBM-103FP

Position for Output Signal Type (SW3)		Initial Setting
NPN Setting	PNP Setting	
Up	Down	Up: CBM-103FN Down: CBM-103FP



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# OPERATION

## LED and ERROR Indications

LED 1 (Green)	LED 2 (Red)	ERR Output (DIP-SW4 setting)		Condition	Result
		OFF	ON		
○	○	○	○	No power	Supply power (24V DC)
○	●● Flashes two times with a 1.5s pause	●	○	Fuse or temperature fuse, blown	Card must be replaced
●	○	○	●	Normal	-
●	●● Flashes Slowly	●	○	Stalled motor	Motor shuts off
●	●● Flashes Slowly	●	○	Motor is disconnected at CN4	Motor does not run
●	●●●● Flashes Quickly	○	●	Current limit, active	May indicate overload during operation
●	●	●	○	Thermal error in motor or on PCB	Motor stops after 4s
●	●	●	○	Motor is disconnected at CN3	Motor does not run
●	●● Flashes two times with a 1.5s pause	●	○	Induced voltage	Motor shuts off
●	●●● Flashes three times with a 1.5s pause	●	○	Low voltage	Motor shuts off

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# OPERATION

## Error List

<i>Error</i>	<i>Description</i>	<i>Solution</i>	
Fuse or temperature fuse, blown	> 18A through circuit or > 139°C (282°F)	Replace card	
Motor disconnected (CN3 or CN4)	Motor connector(s) unplugged	Plug in appropriate connectors	
Stalled motor	RUN signal turns ON, but motor does not turn for 1s	After motor shuts off	Turn OFF RUN signal, then turn back ON
Thermal error (PCB or motor)	Motor control circuit has reached 95°C (203°F) on the PCB or 105°C (221°F) in the motor	After operating temperature is restored	
Low voltage	Supply voltage has dropped < 15V for at least 1s or dropped < 15V five times within 0.5s	After supply voltage rises > 18V	
Induced voltage (overspeeding)	Voltage from motor rises > 40V	After induced voltage drops < 30V	

## Automatic Recovery

DIP switch 1 – OFF

- Toggling the run signal (OFF/ON) is not necessary

Thermal error resets 60s AFTER operating temperature is restored

Low voltage error resets as soon as the supply voltage rises above 18V

Induced voltage error resets 1s AFTER induced voltage drops and stays below 30V

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**Installation Precautions – IMPORTANT, PLEASE READ BEFORE INSTALLATION**

<b>Precaution</b>	<b>Action</b>	<b>Reason</b>
<b>Power supply</b>	If the power supply is not sized appropriately for the number of cards/rollers it provides power to, then a low voltage condition may occur.	<ul style="list-style-type: none"> <li>• If the voltage drops below 15V DC and remains low for 1s, then the low voltage error will appear</li> <li>• If the voltage drops below 15V DC five times in 0.5s, then the low voltage error will appear</li> <li>• If the voltage drops below 15V DC less than five times in 0.5s or does not remain low for 1s, the roller may stutter – quickly turning off then on</li> </ul>
<b>Multiple power supplies</b>	0V line of the power supply for the card must be common to the 0V line of the power supply for the controls (RUN, DIR, etc.).	This completes the signal path from the controller (PLC, etc.) to the motor driver card.
<b>Voltage drop across the power bus</b>	Use suitable gauge wire in relation to distance and current draw to prevent voltage drop.  <u>Operating</u> DC voltage is 24V ±10%	When running long distances from a DC power supply, the voltage drop during motor operation across the power bus may be significant (may drop below 15V!). If there is a large enough drop in voltage, the roller(s) may behave in a strange manner. In order to prevent this, a larger gauge wire must be used.
<b>Grounding</b>	Ensure the control card is securely grounded to the conveyor frame. The conveyor frame should also be at the same potential reference as earth ground. Standard grounding practices should be followed.	Static discharge may interfere and damage internal components.
<b>Electrical</b>	24V DC ±10% 10A maximum current limiter (motor lock is 10A) Diode protection for mis-wiring Sensor power short circuit protection 18A fuse for power supply protection Auto-sensing inputs for PNP or NPN	Improper power will damage the card. The motor/card should not be subject to locked conditions repeatedly. Internal fuse is not replaceable. If the fuse has blown, more serious damage has occurred within the card/motor. If inputs are subjected to a low potential the card may see this as a signal, use of a diode inline is recommended to prevent this.
<b>Environment</b>	Ambient temperature is 32~104°F Ambient humidity is < 90%RH Atmosphere has no corrosive gas Vibration is < 0.5G Indoor use only	Extreme environmental variables may cause poor or no performance and damage the card.
<b>Over-speeding</b>	Over-speeding of the roller's no-load speed by more than 50% may cause damage.	Back EMF will be generated.

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## Revision History

<b>Revision Number</b>	<b>Change</b>	<b>Changed by</b>	<b>Checked by</b>
11-0914	<i>Initial document</i>		
12-1226	Added autosensing inputs and precautions for electrical potential		
13-0314	Added diode recommendation and wiring diagram		
13-0514	Removed auto-sensing feature		
14-1219	Added internal input type switch		
15-0409	Added internal output type switch and mirrored induced & low voltage errors	JC and BB	
19-0108	Updated company address		

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