

CB-016S7 & CB-016BS7 Circuit Board



Features

- Adjustable acceleration and deceleration time (0 to 2.5s)
- Stable speed operation
- Manual or automatic recovery of the thermal overload device
- One (1) DIP switch combined with one (1) rotary switch to select up to 20 different fixed speeds
- Forcibly stops the motor if motor lock or thermal overload error lasts for 4 seconds or more.
- Three (3) LEDs (green, red, & orange) to identify the type of error and number of error occurrences
- Error occurrence indication
 - Displayed only when error condition is present
- Pulse signal output to indicate motor revolution
- Lead free design; RoHS compliant
- Low Voltage Protection reacts when
 - Sustained low voltage (less than 15V DC) for at least 1 second
 - Fluctuating voltage dropping below 15V DC, 5 times within 0.5 second
- Delayed Start-up Over-current response
 - 1 second delay after RUN signal is applied, before over-current indication is active
 - Eliminates false over-current indication during motor start
- External Direction control
 - When external DIR signal is changed while motor is running, the motor stops for 0.5 second, then runs again in opposite direction

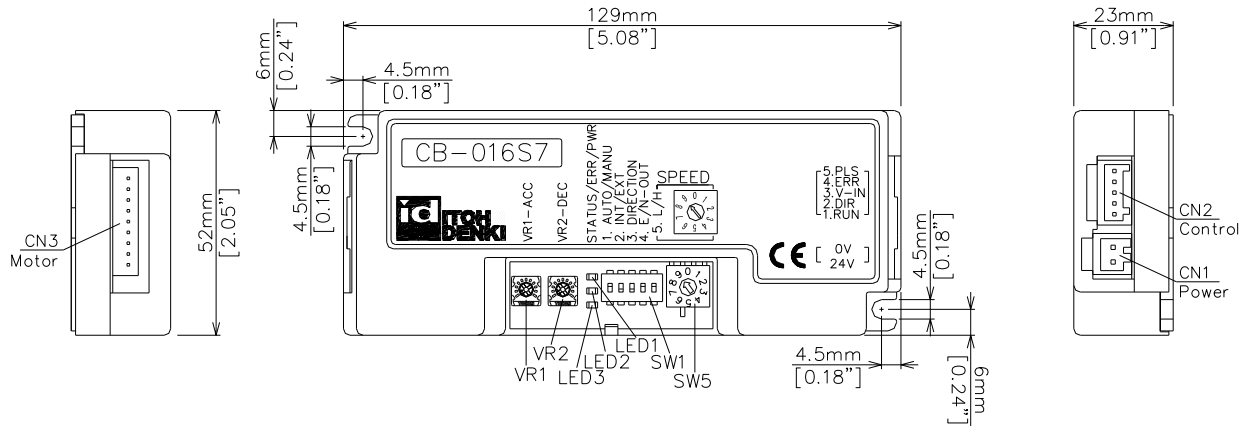
Enhancements over CB-016S4

- Increased Torque
 - More efficient components
- Improved protection against generated voltage due to Power Moller overspeeding
- Snap-on cover makes NPN/PNP switching easier (better visibility),
 - Card does not have to be removed from conveyor frame to remove cover

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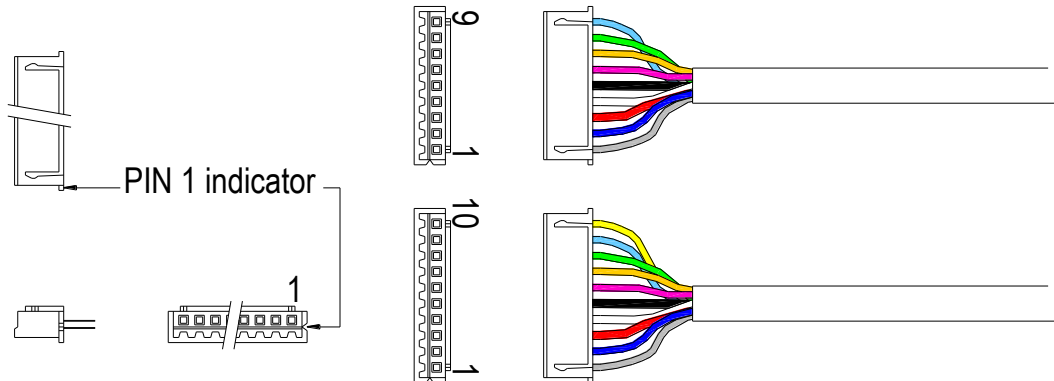
SPECIFICATIONS



Connections

CN1 2 PIN connector POWER		Male Connector on Card WAGO #734-162	Female Connector for Wiring WAGO #734-102
PIN	Description		
1	+24V DC	Wire size 28~14AWG	
2	0V		

CN3 9 or 10 PIN connector MOTOR		Male Connector on Card JST #S?B-XH-A (? = 9 or 10)	Female Connector for Wiring JST #XHP-? (? = 9 or 10)
PIN	Description		
1	GND – Grey	Wire size: 28~22 AWG signal lines & 24~22 AWG phase lines Terminal pins: JST #SXH-001T-P0.6	
2	+12V DC – Blue		
3	Motor phase U – Red		
4	Motor phase V – White		
5	Motor phase W – Black		
6	Hall sensor U - Violet		
7	Hall sensor V – Orange		
8	Hall sensor W – Green		
9	Thermistor – Light Blue		
10	Brake - Yellow		



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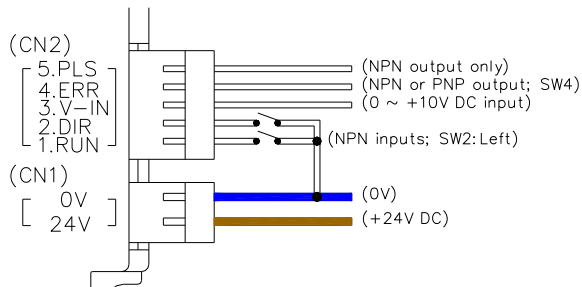
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Connections

CN2 5 PIN connector CONTROL		Male Connector on Card WAGO #733-365	Female Connector for Wiring WAGO #733-105
PIN	Description		
1	+24V DC or 0V input (RUN)		
2	+24V DC or 0V input (DIR)		
3	0 ~ +10V DC input (V-IN)		
4	+24V DC or 0V output (ERR)		
5	0V output (PLS)		
Wire size: 28~20AWG			

Control Wiring

Power to CN1 (24V DC) remains ON, control motor through CN2



CB-016S7 & CB-016BS7

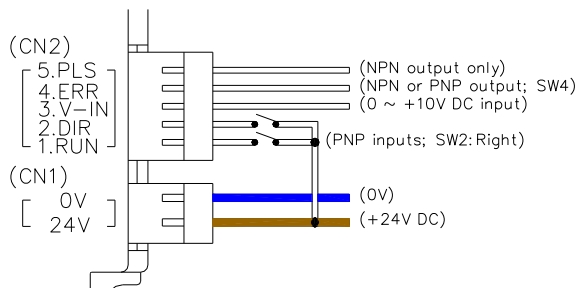
Default settings

SW2: LEFT – NPN inputs (RUN & DIR)
SW4: UP – PNP output (ERR)

CB-016N7 & CB-016BN7

Default settings

SW2: LEFT – NPN inputs (RUN & DIR)
SW4: DOWN – NPN output (ERR)



CB-016P7 & CB-016BP7

Default settings

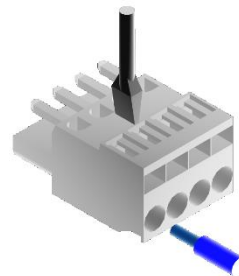
SW2: RIGHT – PNP inputs (RUN & DIR)
SW4: UP – PNP output (ERR)

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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Electrical	24V DC $\pm 10\%$ input <ul style="list-style-type: none">- Battery- Power Supply: fullwave rectified with smoothed current and $<10\%$ Ripple Power ON delay $<1s$ 4A locking current Input signal level for activation <ul style="list-style-type: none">- 0V (3V or less) for NPN- 24V (18V or greater) for PNP Output (Error and Motor Pulse) signals <ul style="list-style-type: none">- Open collector 24V, 25mA or less- NPN- PNP (selectable for Error only) Brake model only <ul style="list-style-type: none">- 0.2s delay between stop signal and mechanical brake reaction- 0.2A brake current @24V ($<0.1s$)- Brake coil is active (disengaging brake) while motor is running
Applicable PM Models	PM486/500FS PM486/500/570/605FE PM486/500FP PM635FS
Brake	Dynamic (Electric – Both models) Mechanical (CB-016BS7 only)
Protection	Thermal protection reaction <ul style="list-style-type: none">- 85° C (185° F) on the PCB- 105° C (221° F) in the motor Built-in 5A fuse for power supply protection Built-in diode for incorrect wiring protection
Applicable Environment	Temperature 0~40° C (32~104° F) $<90\%$ Relative Humidity (No condensation) No corrosive gas Vibration $<0.5G$

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OPERATION

DIP Switches – User Settings

DIP-SW	Function	ON setting	OFF setting	Initial setting
1	Thermal device recovery	Manual	Automatic (Restarts 1min after cool down)	ON
2	Speed change selection	External (0~10V DC applied) Refer to table on page 8	Internal (DIP & Rotary switches)	OFF
3	DIR* (no external DIR signal; viewed from cable side)	FS/FP – CCW FE – CW	FS/FP – CW FE – CCW	OFF
4	Error signal activity	Active during normal status	Active during abnormal status	ON
5	Internal speed selection	High speed	Low speed	ON
Rotary Switch		Refer to table on page 8		9

*If a direction change signal should occur while the motor is running, the motor will first stop for 0.5s. Then, the motor will start in the new direction.

Potentiometers*

VR1 – Acceleration

Adjust acceleration time from 0~2.5s after the RUN signal is applied

VR2 – Deceleration

Adjust deceleration time from 0~2.5s after the RUN signal is removed

* VRs turn 270°

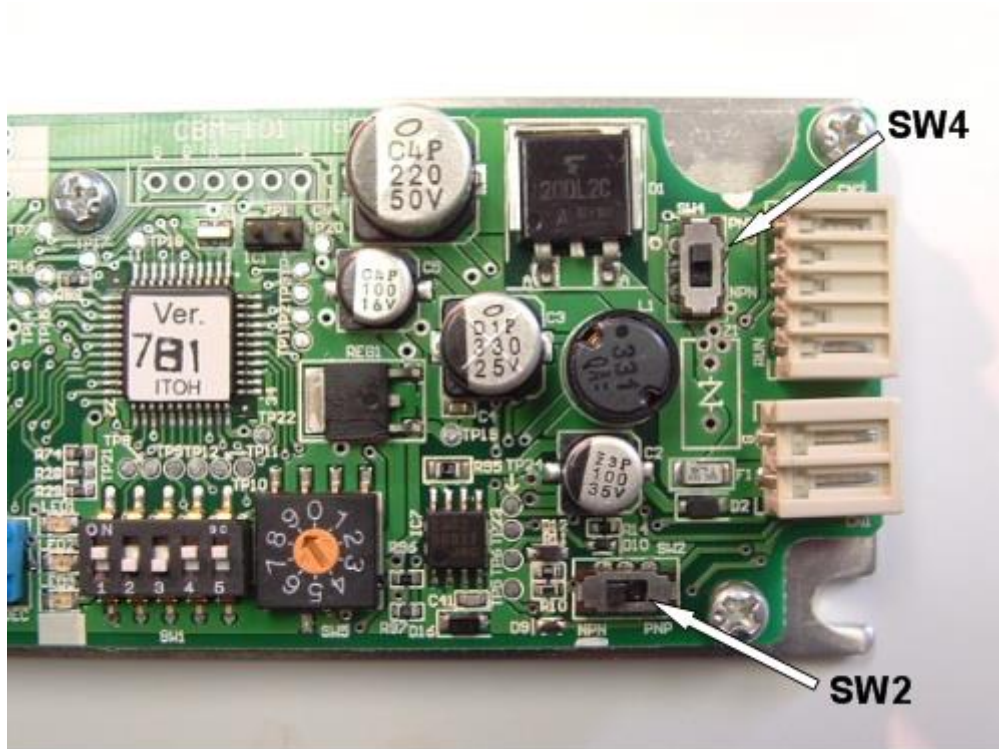
Internal Switches

Switch	Function	Position for Signal Type		Initial Setting
		NPN Setting	PNP Setting	
SW2	RUN & DIR Inputs	LEFT	RIGHT	LEFT
SW4	ERR Output	DOWN	UP	UP

These switches are not visible. They are under the snap-on cover. Access them by inserting a small flat head screw driver in the slot shown below and gently pry out to remove the snap-on cover. Then toggle the switches and replace the cover.

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The following input/output settings are available from the factory, if necessary:

Alternate Model Designation

<p>CB-016N7 – NPN input <u>and</u> output signals CB-016P7 – PNP input <u>and</u> output signals CB-016BN7 or CB-016BP7 – for brake models, respectively</p>
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LED and ERROR Indications

LED 1 – Green (power)

LED 2 – Red (error condition)

LED 3 – Orange (error occurrence)

Green LED, Red LED, and Error Indication

Status	LED 1 (Green)	LED 2 (Red)	ERR Output (DIP-SW4 setting)		Error Condition*	Result
			OFF	ON		
Normal operation	●	○	○	●	-	-
No power	○	○	○	○	-	Supply power (24V DC)
Fuse blown	○	Flashes (6Hz) ●●●●○ ●●●●○	●	○	Current overload	Card must be replaced
Current limit (while running)	●	Flashes (6Hz) ●●●●○ ●●●●○	○	●	Maximum current (Run signal ON >1s)	May indicate overload during operation
Low voltage (<15V)	●	Flashes (6Hz) ●●●●○ ●●●●○	●	○	≤15V DC (>1s or 5x in 0.5s)	Motor does not operate
Thermal protection**	●	●	●	○	Motor or PCB overheated	Motor stops 4s after reaction
Motor lock	●	Flashes (1Hz) ● ○	●	○	Motor does not turn for 4s	Motor stops
Motor not plugged in	●	●	●	○	-	Motor does not operate

*To reset an error condition: Remove input signals; then reapply an input signal to either CN2-1 (RUN) or CN2-2 (DIR)

**If thermal device recovery is set for automatic, the error will reset 1min after the temperature has reached operating range, and as long as no external input has been applied.

Orange LED Indication – Error occurrence

The orange LED indicates the number of **consecutive** occurrences of the **present** error condition indicated by the red LED. If the previous error differs from the present error, a combination status will be displayed. This is only displayed while an error condition is active.

No Error	1	2	≥3	Combination
○	○	Flashes (1Hz) ● ○	●	Flashes (6Hz) ●●●●○ ●●●●○

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“Fuse blown” and “current limit” occurrences are not recorded.

Motor pulse output signal

- NPN (0V) output from CN2-5
- Two (2) pulses per motor revolution

Speed Change Table

Speed Adjustment Control Method Discreet Steps			Surface Speed* ft/min ±3%		
Internal Control Switches		External Control 0~10V DC	PM486FE-17 (3-stage)	PM486FE-60 (2-stage)	PM486FE-100 (1-stage)
DIP sw5	Rotary				
ON	9	9.55~9.95	55.4	196.8	433.6
	8	9.05~9.45	50.5	180.4	433.6
	7	8.55~8.95	48.2	172.2	433.6
	6	8.05~8.45	45.9	164.0	433.6
	5	7.55~7.95	43.6	155.8	433.6
	4	7.05~7.45	41.3	147.6	433.6
	3	6.55~6.95	36.7	131.2	433.6
	2	6.05~6.45	34.4	123.0	433.6
	1	5.55~5.95	32.1	114.8	408.7
	0	5.05~5.45	29.8	106.6	379.5
OFF	9	4.55~4.95	27.6	98.4	350.3
	8	4.05~4.45	25.3	90.2	321.1
	7	3.55~3.95	23.0	82.0	291.9
	6	3.05~3.45	20.7	73.8	262.7
	5	2.55~2.95	18.4	65.6	233.5
	4	2.05~2.45	16.1	57.4	204.3
	3	1.55~1.95	13.8	49.2	175.2
	2	1.05~1.45	11.5	41.0	146.0
	1	0.55~0.95	9.2	32.8	116.8
	0	0.05~0.45	6.9	24.6	87.6

* The listed speed steps are based on our 1.9” (48.6mm) diameter roller tube, FE motors, and 3 different gear stages. Shaded speeds represent no-load speeds. Any speed settings (for the corresponding gear stage) above the model’s maximum speed will have no effect. Also, FS and FP models will operate slightly faster.

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Installation Precautions – *IMPORTANT, PLEASE READ BEFORE INSTALLATION*

Precaution	Action	Reason
Power supply	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"> • If the voltage drops below 15V DC and remains low for 1s, then the low voltage error will appear • If the voltage drops below 15V DC five times in 0.5s, then the low voltage error will appear • 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
Multiple power supplies	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.
Voltage drop across the power bus	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.
Grounding	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.
Electrical	24V DC ±10% 4A maximum current limiter (motor lock is 4A) Diode protection for mis-wiring Sensor power short circuit protection 5A fuse for power supply protection	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.
Environment	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.
Over-speeding	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

<i>Revision Number</i>	<i>Change</i>
09-0812	Initial document
10-0104	Added "Enhancements" to Features section on page 1
19-0108	Updated company address

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