

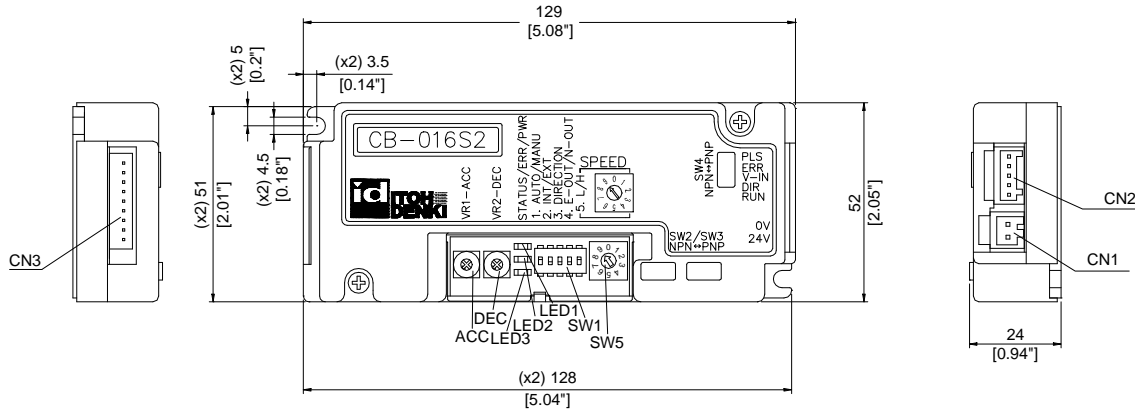
## CB-016S2 & CB-016BS2 Circuit Board



- Adjustable acceleration and deceleration time (0 to 2.5s)
- Stable speed operation
- Switch for 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
- DIP switch to select the condition of error signal activity; during normal status or abnormal status
- 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
- Pulse signal output to indicate motor revolution

### **SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE**

# SPECIFICATIONS



## Electrical

24V DC  $\pm 10\%$  input

- Battery
- Power Supply: fullwave rectified with smoothed current and  $< 10\%$  Ripple

Power ON delay  $< 1s$

4A locking current

Input signal level for activation

- 0V (3V or less) for NPN
- 24V (18V or greater) for PNP

Output (Error and Motor Pulse) signals

- Open collector 24V, 25mA or less
- NPN
- PNP (selectable for Error only)

Brake model only

- 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  
PM486/500/570FE  
PM486/500FP

## Brake

Dynamic (Electric – Both models)  
Mechanical (CB-016BS2 only)

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Page 2 of 10

# SPECIFICATIONS

|                               |   |
|-------------------------------|---|
| <b>Protection</b>             | Thermal protection reaction <ul style="list-style-type: none"><li>- 85°C (185°F) on the PCB</li><li>- 105°C (221°F) in the motor</li></ul> Built-in 5A fuse for power supply protection<br>Built-in diode for incorrect wiring protection   |
| <b>Terminal</b>               | 2-Pole WAGO (CN1) <ul style="list-style-type: none"><li>- (M) 734-162</li><li>- (F) 734-102</li></ul> 5-Pole WAGO (CN2) <ul style="list-style-type: none"><li>- (M) 733-365</li><li>- (F) 733-105</li></ul>   |
| <b>Motor Connector</b>        | 9-Pole JST (CB-016) <ul style="list-style-type: none"><li>- (M) S9B-XH-A</li><li>- (F) XHP-9 (socket terminal SXH-001P-P0.6)</li></ul> 10-Pole JST (CB-016B) <ul style="list-style-type: none"><li>- (M) S10B-XH-A</li><li>- (F) XHP-10 (socket terminal SXH-001P-P0.6)</li></ul> |
| <b>Applicable Environment</b> | Temperature 0~40°C (32~104°F)<br><90% Relative Humidity (No condensation)<br>No corrosive gas<br>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<br>(Restarts 1min<br>after cool down) | ON              |
| 2             | Speed change selection                                     | External<br>(0~10V DC applied)<br><br>See Speed Change Tables | Internal<br>(DIP & Rotary<br>switches)          | OFF             |
| 3             | DIR<br>(no external DIR signal;<br>viewed from cable side) | FS/FP – CCW<br>FE – CW  | FS/FP – CW<br>FE – CCW                          | OFF             |
| 4             | Error signal activity                                      | Active during normal<br>status                                | Active during<br>abnormal status                | ON              |
| 5             | Internal speed change                                      | High speed<br>Refer to table on page 7                        | Low speed                                       | ON              |
| <b>Rotary</b> | Internal speed change                                      | Refer to table on page 7                                      |   | 9               |

### 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 Input  | LEFT                     | RIGHT       | LEFT            |
| SW3    | DIR Input  | LEFT                     | RIGHT       | LEFT            |
| SW4    | ERR Output | DOWN                     | UP          | UP              |

\* These switches are not readily visible. They are under the cover, protected by grommets on the cover. Access them by removing the grommets. Then, toggle the switches, and replace the grommets.

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

#### Alternate Model Designation

|   |
|---|
| CB-016N2 – NPN input <u>and</u> output signals<br>CB-016P2 – PNP input <u>and</u> output signals<br>CB-016BN2 or CB-016BP2 – for brake models, respectively |
|---|

### LED and ERROR Indications

LED 1 – Green (power)

LED 2 – Red (error condition)

LED 3 – Orange (error occurrence)

#### LED Error Indication

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

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

\*\*If thermal device recover is set for automatic, the error will reset 1 min after the temperature has reached operating range.

### Red LED Indication – Error condition

The red LED indicates the **current** error condition in conjunction with the green LED.

| No Error | Motor Lock          | Low Voltage (<15V)                         | Fuse Blown*                                | Current Limit*                             | Thermal Protection |
|----------|---------------------|--|--|--|--------------------|
| ○        | Blinks (1Hz)<br>● ○ | Blinks (6Hz)<br>● ○ ● ● ○ ○<br>● ○ ● ○ ● ○ | Blinks (6Hz)<br>● ○ ● ● ○ ○<br>● ○ ● ○ ● ○ | Blinks (6Hz)<br>● ○ ● ● ○ ○<br>● ○ ● ○ ● ○ | ●                  |

### Orange LED Indication – Error occurrence

The orange LED indicates the number of **consecutive** occurrences of the **current** error condition indicated by the red LED. If the previous error differs from the current error, a combination status will be displayed.

| No Error | 1 | 2                   | ≥3 | Combination                                |
|----------|---|---------------------|----|--|
| ○        | ○ | Blinks (1Hz)<br>● ○ | ●  | Blinks (6Hz)<br>● ○ ● ● ○ ○<br>● ○ ● ○ ● ○ |

\* The occurrences of “fuse blown” and “current limit” errors are not recorded.

### Motor pulse output signal

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

### Speed Change Table

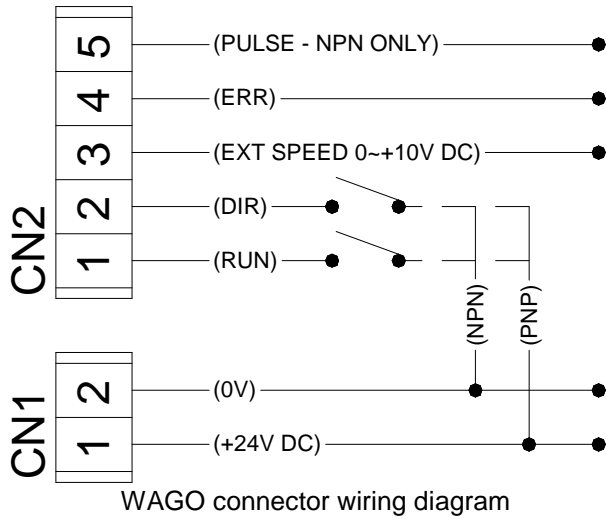
| Speed Adjustment Control Method<br>Discreet Steps |        |                                 | Surface Speed*<br>ft/min $\pm 3\%$ |                         |                          |
|---|--------|---------------------------------|------------------------------------|-------------------------|--------------------------|
| Internal Control<br>Switches                      |        | External<br>Control<br>0~10V DC | PM486FE-17<br>(3-stage)            | PM486FE-60<br>(2-stage) | PM486FE-100<br>(1-stage) |
| DIP sw5   | Rotary |                                 |                                    |                         |                          |
| ON  | 9      | 9.55~9.95                       | 55.4                               | 196.8                   | 408.0                    |
|   | 8      | 9.05~9.45                       | 50.5                               | 180.4                   | 408.0                    |
|   | 7      | 8.55~8.95                       | 48.2                               | 172.2                   | 408.0                    |
|   | 6      | 8.05~8.45                       | 45.9                               | 164.0                   | 408.0                    |
|   | 5      | 7.55~7.95                       | 43.6                               | 155.8                   | 408.0                    |
|   | 4      | 7.05~7.45                       | 41.3                               | 147.6                   | 408.0                    |
|   | 3      | 6.55~6.95                       | 36.7                               | 131.2                   | 408.0                    |
|   | 2      | 6.05~6.45                       | 34.4                               | 123.0                   | 408.0                    |
|   | 1      | 5.55~5.95                       | 32.1                               | 114.8                   | 408.0                    |
|   | 0      | 5.05~5.45                       | 29.8                               | 106.6                   | 378.8                    |
| OFF   | 9      | 4.55~4.95                       | 27.6                               | 98.4                    | 349.6                    |
|   | 8      | 4.05~4.45                       | 25.3                               | 90.2                    | 319.5                    |
|   | 7      | 3.55~3.95                       | 23.0                               | 82.0                    | 291.3                    |
|   | 6      | 3.05~3.45                       | 20.7                               | 73.8                    | 262.1                    |
|   | 5      | 2.55~2.95                       | 18.4                               | 65.6                    | 233.2                    |
|   | 4      | 2.05~2.45                       | 16.1                               | 57.4                    | 204.0                    |
|   | 3      | 1.55~1.95                       | 13.8                               | 49.2                    | 174.8                    |
|   | 2      | 1.05~1.45                       | 11.5                               | 41.0                    | 145.6                    |
|   | 1      | 0.55~0.95                       | 9.2                                | 32.8                    | 116.4                    |
|   | 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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Page 7 of 10

# WIRING



### CN2 – Control Signals

External Speed Signal\*  
(0 ~ +10V DC)

NPN – 0V signal to operate  
PNP – +24V DC signal to operate

CB-016S2 is set for **NPN** inputs and **PNP** ERR output

CB-016N2 is set for **NPN** inputs and **NPN** ERR output

CB-016P2 is set for **PNP** inputs and **PNP** ERR output

\*Terminal CN2-3 is used only when PM speed is to be controlled by an external DC voltage

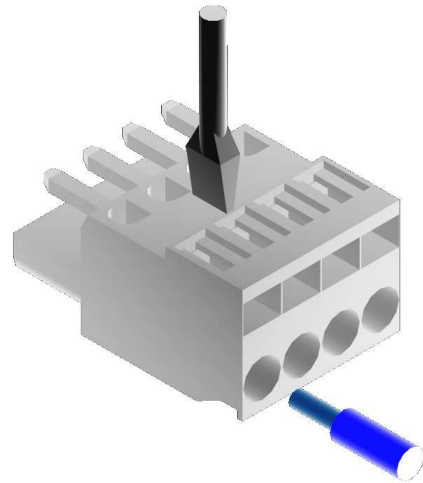
|  |   |
|--|---|
| <p><b>CN1 – POWER CONNECTOR</b><br/>WAGO connector # 734-102<br/>Minimum wire gauge – 28 AWG<br/>Maximum wire gauge – 16 AWG</p> | <p><b>CN2 – CONTROLS CONNECTOR</b><br/>WAGO connector # 733-105<br/>Minimum wire gauge – 28 AWG<br/>Maximum wire gauge – 20 AWG</p> |
|--|---|

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

| Precaution                               | Action  | Reason   |
|--|---|--|
| <b>Multiple power supplies</b>           | 0V line of all power supplies on the same conveyor line (powering the card/rollers, & controls) need to be physically linked together.  | This completes the signal path from one section of the conveyor (powered by a power supply) to the adjacent section of conveyor (powered by another power supply) and allows for proper communication through the cable and external interfaces.   |
| <b>Voltage drop across the power bus</b> | Use suitable gauge wire in relation to distance and current draw to prevent voltage drop.<br><br><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%<br>4A maximum current limiter (motor lock is 4A)<br>Diode protection for miswiring<br>Sensor power short circuit protection<br>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.  |
| <b>Environment</b>                       | Ambient temperature is 32~104°F<br>Ambient humidity is < 90%RH<br>Atmosphere has no corrosive gas<br>Vibration is < 0.5G<br>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

| Revision Number | Change  |
|-----------------|---|
| 06-1107         | Initial document  |
| 07-0517         | Updated "Fuse Blown" LED indication in the tables on pages 5 & 6  |
| 08-0109         | Added "Revision History" table to document<br>Removed GS/GE/GP models from page 2 & 4<br>Updated 5A fuse protection for power supply on page 3<br>Updated data for "Speed Change" table on page 7 |
| 09-0423         | Added precautions   |
|                 |   |

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