Circuit Board CB016BP-7

Doc/FC/1168-01

F U N C T I O N

The electronic Circuit Board CB016BP-7 is used to control Power Moller® 24 ***brushless*** DC motors with a built-in electromechanical brake. It is compatible with series PM500FS-B, PM500FS-B, PM500FE-B, PM570FE-B, PM605FE-B. It can only be used in conjunction with single motors. It performs the following functions:

- Motor Run/Stop
- Selection of the direction of rotation of the motor, depending on the installation requirements
- Variable speed ***at constant starting torque*** using an external analogue voltage (0 to 10V)
- ***Stable speed*** range in relation to the load
- Dynamic brake and mechanical brake
- Overload protection via built-in thermistor and current limiter
- Error signal in case of motor overload
- PNP or NPN inputs (depending on PLC used) - Factory setting: PNP
- PNP or NPN outputs (depending on PLC used) - Factory setting: PNP
- Acceleration and deceleration regulated using 2 potentiometers (0 – 2sec)
- Motor speed pulse signal output
- Speed selection via rotary switch (20 fixed speeds)
- Automatic or manual restart after overload activation

The Circuit Board delivers a PWM (Pulse Width Modulation) controlled by a magnetic pulse sensor built into the motor

C O N D I T I O N S O F U S E

Power supply	TBTS 24V DC ± 10% - ripple < 10% - A regulated power supply is recommended 5A built-in fuse - Input current: cf associated Power Moller® 24 specs. built-in diode for protection against + and - wiring error
Environment	Temperature range 0 / +40 °C / Relative Humidity < 90% - no condensation (prevent thermal shocks) Non corrosive - non explosive / vibration < 0.5G CE in accordance with Directive CEM 89/336/CEE
Level of protection	The Circuit Board must be protected from severe shocks and the ingress of water/dust in accordance with European and local regulations relevant to the installation (UTE C 15-103 :97 ou HD 384.3S2 :95 et 384.5-51S2 :96)

UK Branch
Suite 1 Trinity Space Centre
Waldorf Way, Wakefield WF2 8DH – UNITED KINGDOM
Tel: +44 (0)1924 366 539 - Fax : +33 (0)4 50 03 07 60
Web : www.itohdenki.co.uk - E-mail : sales@itohdenki.co.uk

ITOH DENKI EUROPE S.A.S.
490 av. des Jourdies – Z.A.E. les Jourdies
BP 323 – 74807 – ST PIERRE EN FAUCIGNY Cedex – France
Tel. : +33 (0)4 50 03 09 99 - Fax : +33 (0)4 50 03 07 60
Web : www.itoh-denki.com - E-mail : info@itoh-denki.com

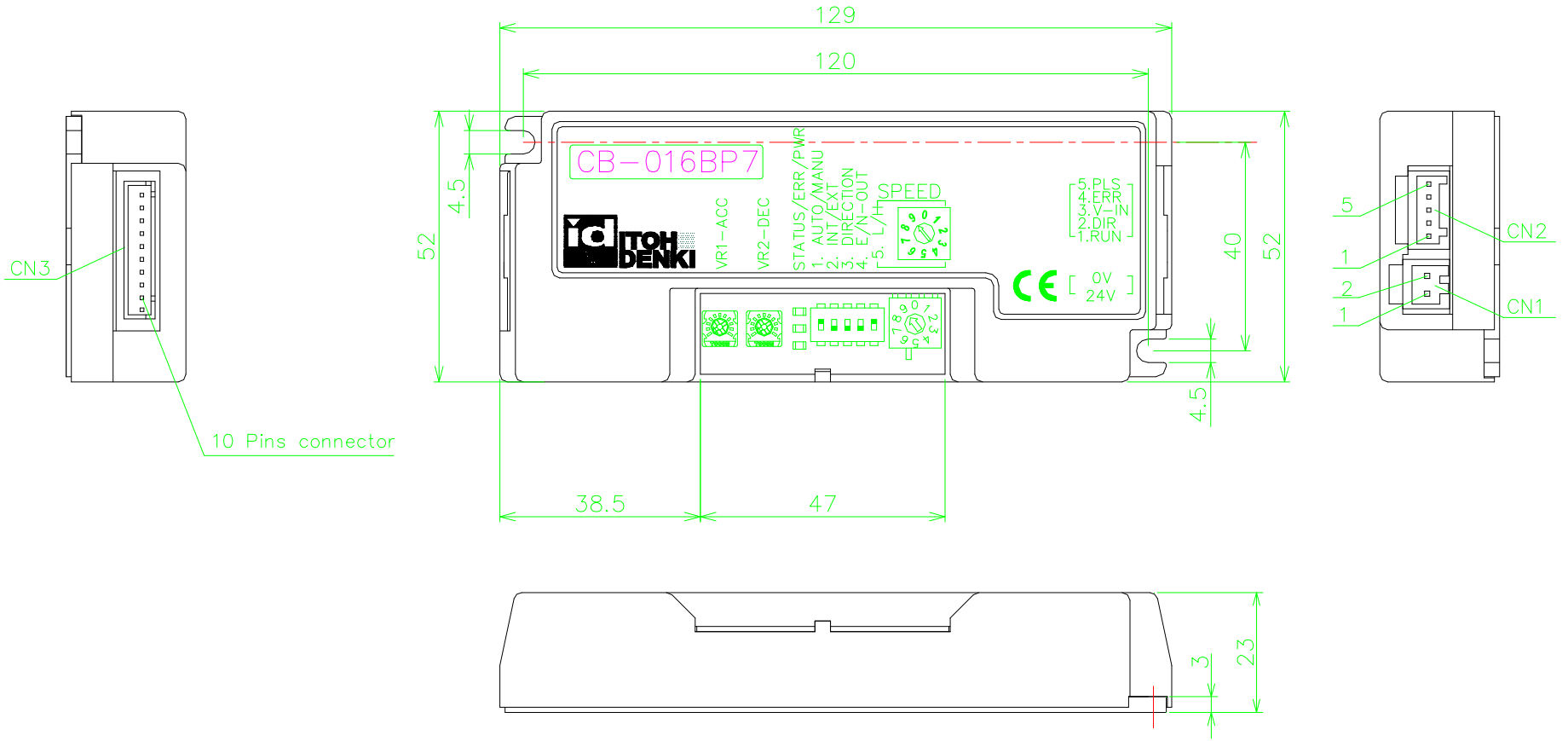
Zweigniederlassung Deutschland
Neumeyerstraße 48
90411 NÜRNBERG - DEUTSCHLAND
Tel: +49 911 25 26 200 – Fax : +49 911 25 26 201
Web : www.itoh-denki.de - E-mail : info@itoh-denki.de

SAS au capital de 460 000 Euros - SIRET 343 034 344 000 30 - Code APE 4669B - RCS BONNEVILLE 87 B 413 - N°TVA : FR 71 343034344

CIRCUIT BOARD CHARACTERISTICS

Voltage	➢ 24V DC
Current absorbed without motorised roller	➢ 0.06A
Power absorbed without motorised roller	➢ 1.5W
Starting current limit	➢ 4A
Time taken to start up	➢ <15ms
Protection Index	➢ IP20
Protection	➢ 5A integrated fuse ➢ Against the inversion of the polarity + and – ➢ Thermal protection (85°C for the circuit board & 105°C for the motorised roller)
Input voltage for the CN2 connector ***If different from 0V or 24V***	➢ < 3V for NPN ➢ > 18V for PNP

DIMENSIONS AND LEGENDS



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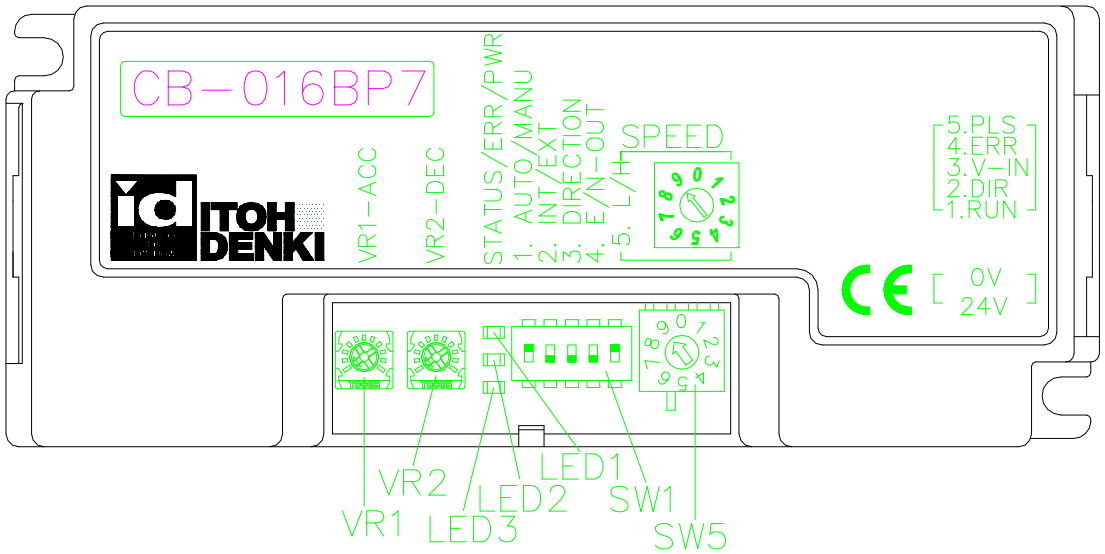

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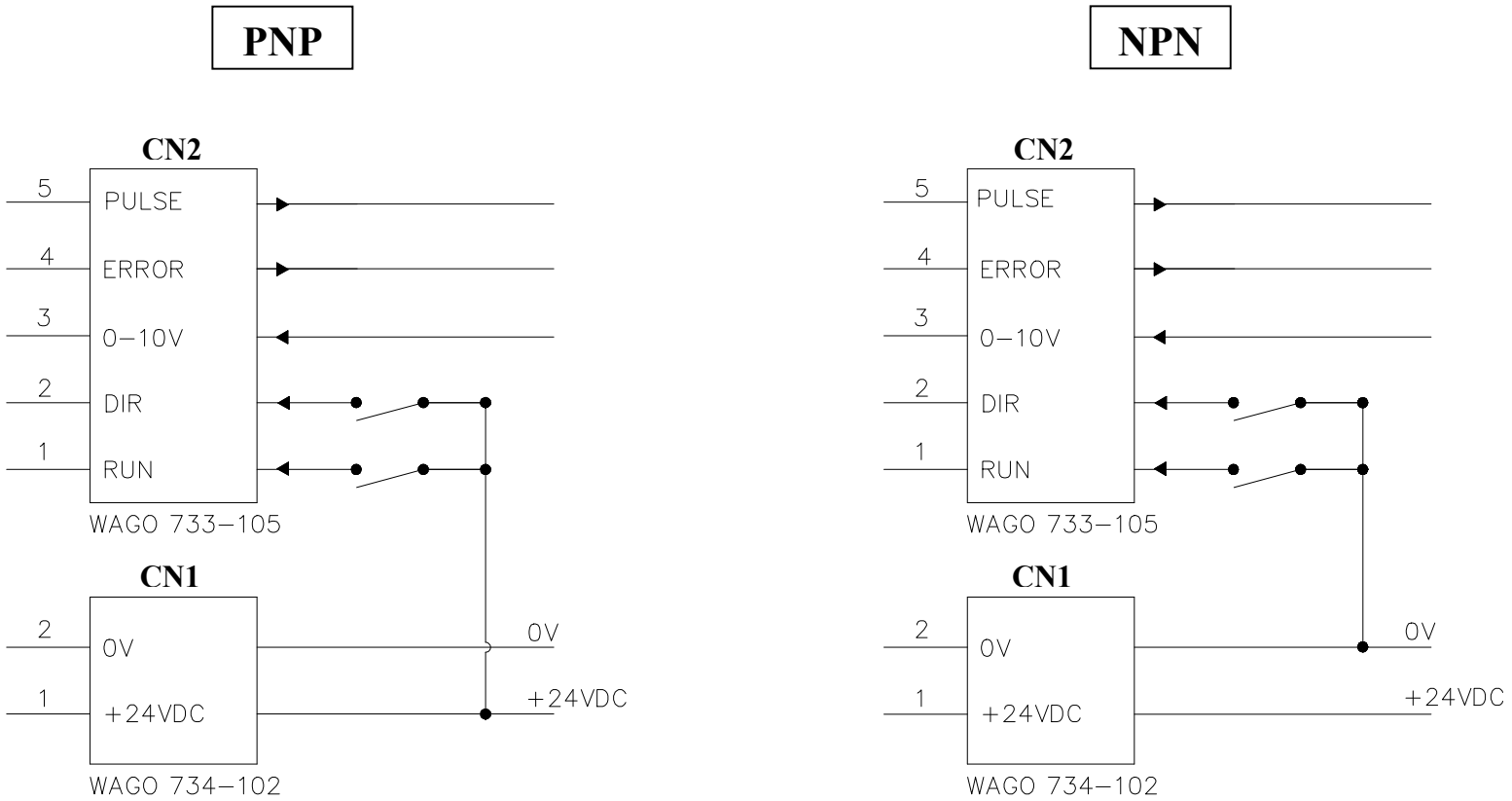
WIRING DIAGRAMS



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TECHNICAL SPECIFICATIONS

Motor On/Off	***RUN/STOP***	Starts and stops the Power Moller® 24 Terminal 1 on CN2 connector Input current 1.6mA at 24V	**PNP** Run: contact closed (24V DC) Stop: contact open	**NPN** Run: contact closed (0V DC) Stop: contact open
Direction of rotation CW/CCW	***DIR***	Changes direction of Power Moller® 24 Terminal 2 on CN2 connector Input current 1.6mA at 24V	See table n°3 (Direction of rotation)	
Speed variation	***0-10V***	Speed variation using an external analogue voltage 0-10V. Terminal 3 on CN2 connector. Input current 1mA at 10V	See table n°2 (Speed variation via an external analogue voltage)	
Motor Overload	***ERROR***	Error signal output (open collector) Terminal 4 on CN2 connector Output 24V, max 25mA (to adjust according to your control using a resistor - not provided)	Indicates motor overload. Logic NPN or PNP selection for error signal output (SW4)	
Pulse	***PULSE***	Pulse output signal Terminal 5 on CN2 connector NPN open collector Output 24V, 25mA (using a resistor - not provided) Protection using a Ω100 resistor.	2 pulses / each rotation of the rotor (see table n.1) 5µs tolerance with a Hall effect sensor	

Table n.1: Number of pulses per rotation on the motorised roller

	Gearbox ratio		**N. of pulses per rotation on the motor/roller**	
	Series 50EB -57EB-60EB	***Series 50B***	***Series 50EB -57EB-60EB***	***Series 50B***
Code 15 m/min	44.9	43.81	89.8 pulses	87.62 pulses
Code 55 m/min	12.6	11.62	25.2 pulses	23.24 pulses

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CONFIGURATIONS : DIP-SWICHES (SW)

 **: OFF**

 **: ON**

SW1:

Dip switches	Function	ON	OFF	Factory Settings
1	Restart mode after overload activation	Manual (Restart after instruction on Run/Stop or Dir)	Automatic (the circuit board restarts after 1 minute without external intervention)	
2	Speed selection	Speed variation via external voltage (0-10V) (Table n°2)	Internal speed selection via dipswitch 5 & rotary pot SW5	
3	Direction of rotation	Change direction of rotation CW and CCW in relation to the input to terminal 2 on CN2 (Table n°3)		
4	Error mode	Sends a signal via terminal 4 on CN2 when there is **NO ERROR**	Sends a signal via terminal 4 on CN2 when there **IS AN ERROR**	
5	Speed selection	Selection of 1 of 20 available fixed speeds. (Table n°4)		

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Table n°2: Speed variation via an external analogue voltage (Figures with series 50EB)

Voltage (V)	No load speed in m/min (± 3%) for speed code 15	No load speed in m/min (± 3%) for speed code 55	Voltage (V)	No load speed in m/min (± 3%) for speed code 15	No load speed in m/min (± 3%) for speed code 55
0.05-0.45	2.2	7.7	5.05-5.45	9.4	33.4
0.55-0.95	2.9	10.3	5.55-5.95	10.1	36.0
1.05-1.45	3.6	12.9	6.05-6.45	10.8	38.6
1.55-1.95	4.3	15.4	6.55-6.95	11.6	41.1
2.05-2.45	5.1	18.0	7.05-7.45	13.0	46.3
2.55-2.95	5.8	20.6	7.55-7.95	13.7	48.9
3.05-3.45	6.5	23.1	8.05-8.45	14.4	51.4
3.55-3.95	7.2	25.7	8.55-8.95	15.2	54.0
4.05-4.45	7.9	28.3	9.05-9.45	15.9	56.6
4.55-4.95	8.7	30.9	9.55-9.95	17.3	61.7

Table n°3: Direction of rotation (Figures with series 50EB)

	Dip switch 3 on SW1	
	ON	OFF
Terminal 2, CN2 ON (contact closed)		
Terminal 2, CN2 OFF (contact open)		

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Table n°4: Speed selection (Figures with series 50EB)

SW1 – 5 ON ■ □			SW1 – 5 OFF □ ■		
Rotary Switch Position	No load speed in m/min (± 3%) For speed code 15 (2.2 to 17.3 m/min)	No load speed in m/min (± 3%) For speed code 55 (7.7 to 61.7 m/min)	Rotary Switch Position	No load speed in m/min (± 3%) For speed code 15 (2.2 to 17.3 m/min)	No load speed in m/min (± 3%) For speed code 55 (7.7 to 61.7 m/min)
9	17.3	61.7	9	8.7	30.9
8	15.9	56.6	8	7.9	28.3
7	15.2	54.0	7	7.2	25.7
6	14.4	51.4	6	6.5	23.1
5	13.7	48.9	5	5.8	20.6
4	13.0	46.3	4	5.1	18.0
3	11.6	41.1	3	4.3	15.4
2	10.8	38.6	2	3.6	12.9
1	10.1	36.0	1	2.9	10.3
0	9.4	33.4	0	2.2	7.7

SW2 and SW3 (Logic selection of input signal)**:**

SW2 (Run/Stop)	Left	NPN
SW3 (Dir)	Right	PNP

SW4 (Logic selection of output signal)**:**

SW4	Bottom	NPN
	Top	PNP

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Potentiometer settings VR1-ACC and VR2-DEC

VR1-ACC: the setting must be between 0 to 2sec (0sec when the potentiometer is turned CCW entirely to the left and 2sec when the potentiometer is turned CW 60° to the right) – **Default factory settings 0sec**
VR2-DEC: the setting must be between 0 to 2sec (when the potentiometer is turned CCW entirely to the left and 2sec when the potentiometer is turned CW 60° to the right) - **Default factory settings 0sec**

3 connectors: Motor, Voltage and I/O (control)

CN1 – Voltage connector: wago type 734-102: 1 conductor 1.5mm^2 max. per terminal
CN2 – I/O Connector (control) : wago type 733-105: 1 conductor 0.5mm^2 max. per terminal
CN3 - Motor connector: JST #XHP-10 with 10 pins

3 LEDs: Power and Error mode

LED 1 (green) : ON when the circuit board CB016BP-7 is under voltage
LED 2 (red): Identification of the error type
There are several status: LED off
LED flashing slowly
LED flashing rapidly
LED on
LED 3 (orange): Identification of the number of errors
There are several status: LED off
LED flashing slowly
LED flashing rapidly
LED on

When restarting the motorised roller after thermal protection activation, terminal 1 (Run/Stop) or 2 (Direction) on the CN2 connector must only be signalled after eliminating the cause of the fault (freeing the blockages, allowing the cooling of the thermal protection)
The voltage supply to the circuit board must be switched off in order to initialize the fault history shown by LED 3 (orange)

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Error Identification

□ : LED switched on

 : LED flashing slowly (1 flash/sec)

 : LED flashing rapidly (6 flashes/s)

■ : LED switched off

Type of fault	Green LED status	Red LED status
Normal (No fault)	□	■
No power (voltage)	■	■
HS Fuse	■	
Motor connector not plugged in or thermal overload activated	□	□
Overload activated	□	

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Type of fault (Green LED switched on)	Red LED status	Orange LED status
Repetitive blockages (Rotation of motorised roller not possible)		1st fault ■ 2nd fault  > 3rd fault 
Repetitive activations of thermal protection (overloading of motorised roller triggering the thermal protection)	□	1st fault ■ 2nd fault  > 3rd fault 
Thermal protection activated following several blockages (indicating problems on the conveying line)	Blockage  Blockage  Thermal □	1st fault ■ 2nd fault  > 3rd fault 
Blockage following several activations of thermal protection (overload problems, or duty cycle…)	Thermal □ Thermal □ Blockage 	1st fault ■ 2nd fault  > 3rd fault 

Not all possibilities are represented; please consult us for more information

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Operational characteristics of Errors

If the motorised roller is blocked by a load that has jammed in the frame for example, it will attempt to free the load. After 4 seconds, if the motorised roller is still blocked, it will stop and the circuit board will switch to default.
The combination of LED 2 – red and LED 3 – orange provides diagnostic detail of the type and the number of errors.
See table under title: **Error Identification**
When restarting the motorised roller after thermal protection activation, terminal 1 (Run/Stop) or 2 (Direction) on the CN2 connector must only be signalled after eliminating the cause of the fault (freeing the blockages, allowing the cooling of the thermal protection.
The voltage supply to the circuit board must be switched off in order to initialize the fault history shown by LED 3 (orange)

Precautions to ensure best performance

- Do not exceed 10V to vary the speed by analogue voltage
- Mount the entirety of the circuit board's aluminium back plate onto a metal surface in order to guarantee good thermal dissipation.
- A regulated power supply is essential
- Use a sufficiently sized/rated power supply according to the number and type of motorised rollers. The absorbed current depends on the model and the speed code of the motorised roller.
- Do not to unplug the motor connector while the motor is running.
- Eliminate the cause of thermal protection activation for frequent error signals
- Do not stop the Power Moller® 24 by interrupting the power supply to the circuit board. It is imperative that terminal 1 (Run/Stop) on the CN2 connector is used.
- Do not change the direction of rotation while the motorised rollers are running. First stop the motorised roller and then change the direction of rotation.
- Make sure that the power supply is switch off before connecting or disconnecting the motorised roller
- Leave a minimum of 1s after the circuit board is powered before starting the motorised roller for the first time.
- Link the 0V together when varying the speed by an external analogue voltage 0-10V
- Wire all other electrical connections in accordance with best codes of practice.

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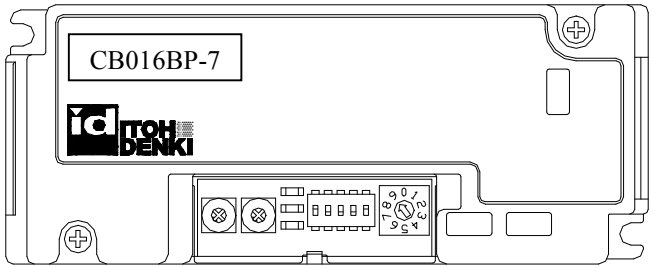
Accessories provided with each circuit board

CB016BP-7 circuit board	
2 - M4x15 screws 2 - M4 washers 2 - M4 nuts	
WAGO Connector – 2 terminals	
WAGO Connector – 5 terminals	

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490 av. des Jourdies – Z.A.E. les Jourdies
BP 323 – 74807 – ST PIERRE EN FAUCIGNY Cedex – France
Tel. : +33 (0)4 50 03 09 99 - Fax : +33 (0)4 50 03 07 60
Web : www.itoh-denki.com - E-mail : info@itoh-denki.com

Zweigniederlassung Deutschland
Neumeyerstraße 48
90411 NÜRNBERG - DEUTSCHLAND
Tel: +49 911 25 26 200 – Fax : +49 911 25 26 201
Web : www.itoh-denki.de - E-mail : info@itoh-denki.de

SAS au capital de 460 000 Euros - SIRET 343 034 344 000 30 - Code APE 4669B - RCS BONNEVILLE 87 B 413 - N°TVA : FR 71 343034344