ITOH DENKI

POWER MOLLER® 24
MDR -Motor Driven Roller-

Driver Card for PM570/605KT

CBK-109

Driver

〈 User Manual 〉

Read this manual before use

Thank you for purchasing CBK-109□(F/B)□(N/P)
(hereinafter referred to as “this product”).
＊“This product” is a generic term that includes accessories such as screws.

Applicable MDR models

- CBK-109FN / CBK-109FP ･･･ PM570KT、PM605KT
- CBK-109BN / CBK-109BP … For built-in brake function

※Optional code "-BR" is applied on MDR model number.

Before using this product, carefully read this user manual and fully understand the content.
Keep this document readily accessible for future reference.

For more details of PM570KT and PM605KT, please download the user manual from our web page.

ITOH DENKI Home > Download/Support > User Manual
https://itohdenki.co.jp/english/support/manual.html

ITOH DENKI

Driver card
No.625

1. Introduction

Features

・20 steps variable speed
・Reduces impact on trays by setting acceleration and deceleration.
・Possible to transfer at constant speed, regardless of load variation

Disclaimer

- This product is designed as a general industrial device. Do not use for other applications. We do not take any responsibility for any damage that may result from the disregarding of these warnings.
- In the event that an accident results from the use of this product, we do not compensate for any damage, including abnormalities of equipment, connection devices, and/or software, any damage resulting from malfunctions, and/or any other secondary damage.
- Caution : Installation, operation and usage of ITOH DENKI MDRs in combination with a control card designed by a third party could result in fatal phenomena such as fire, electric shock, injuries etc which are out of the responsibility of ITOH DENKI.

Notes on industrial property rights

There are some examples of parts that need to be prepared by customers, as explained within this manual. However, this does not provide any guarantee against the existence of any rights, such as our industrial property rights, or those of other companies, in advance.

Notes on technical support

We respond to technical inquiries based on the contents described within this manual, and on this product within the range of general items for this product unit.
There are some descriptions in this manual, about parts, equipment, and wiring arranged by customers, as well as the controls and operation under such circumstances. However, these are not included in the guaranteed operating range and/or support.
When in use, please check and perform the aforementioned based on your responsibility according to operation.

Performance level for this system

This product is based on the performance level "C"*2 in ISO-13849-1*1.

＊1：International Organization for Standardization
＊2：This indicates that even though events that would result in serious injury occur infrequently under assumed risk environment, there is a high probability to avoid danger if you observe the safety contents described in this manual.

About installation environment

This product is not equipped with special dust proof/waterproof countermeasures, and is intended to be used in environments of "Pollution Degree 2"*2, as defined in IEC60664 -1*1.

＊1：Insulation coordination for equipment within low-voltage supply systems - Part 1 of the International Standard.
＊2：Non-conductive pollution will occur, but it is assumed that condensation will happen to generate conductive property temporarily.

About description of the product

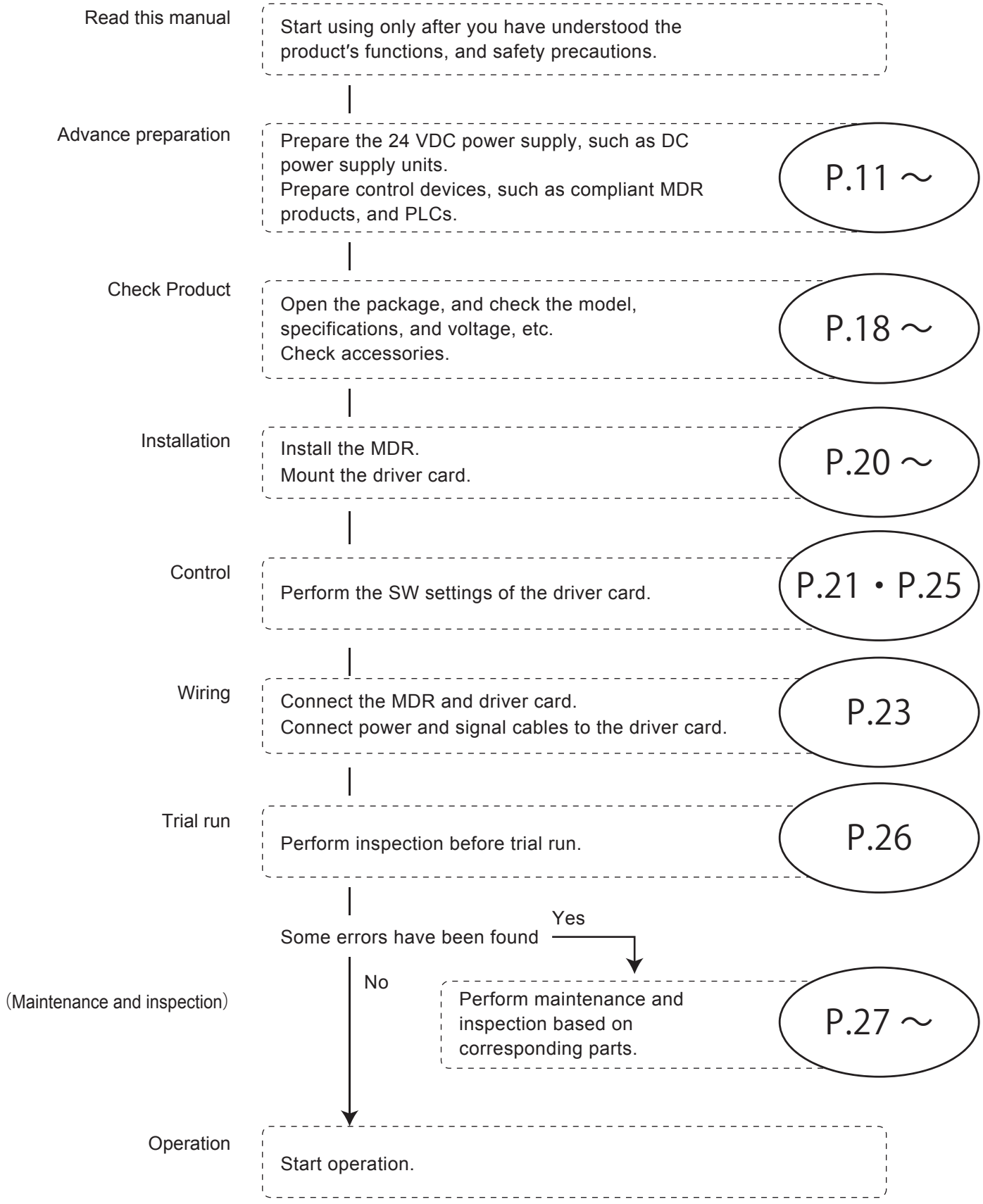
Driver card models vary depending on the signal type (NPN/PNP) and the MDR specifications specified by customers.

MDR specifications \ Signal input/output type	NPN	PNP
Standard	CBK-109FN	CBK-109FP
w/ Brake option	CBK-109BN	CBK-109BP

In this manual, [CBK-109FN] / [CBK-109FP] and [CBK-109BN] / [CBK-109BP] are described as [CBK-109].
[CBK-109FN] / [CBK-109FP] and [CBK-109BN] / [CBK-109BP] are described separately, when needed.

2. Procedures from installation to operation

Procedures from installation to operation



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3. Safety precautions

Refer to 5. Check Product (P.18) for parts name.

3. Safety precautions

Danger level
Niveau de danger

To prevent hazards to users and/or others, and/or damage to property in advance, we explain important precautions to be followed securely as below.

Pour prévenir à l'avance les risques pour les utilisateurs et/ou d'autres personnes, et/ou les dommages matériels, les précautions importantes à suivre sont décrites ci-dessous.

■ We categorize the degree of hazard and/or damage that may result if a user disregards the description, and operates the product improperly, using and explaining the following symbols.

Le degré de danger et/ou de dommage qui peut survenir si un utilisateur ignore la description et utilise le produit de manière inappropriée est désigné par les symboles suivants et expliqué ci-dessous.

⚠ WARNING	This indicates a high possibility that severe injury or even death may result. AVERTISSEMENT Cela indique un risque élevé de blessures graves, voire mortelles.
⚠ CAUTION	This indicates a high possibility that injury, or only property damage may result. MISE EN GARDE Cela indique un risque élevé de blessure ou de dommage matériel.

Symbol explanation
Explication de symbole

■ We categorize the type of those precautions using the following symbols throughout the manual.

Le type de précautions est classé dans les catégories suivantes et expliqué ci-dessous.

	This symbol indicates operations that are prohibited. Ces symboles indiquent des opérations interdites.
	This symbol indicates forced operations that you should always perform. Ces symboles indiquent des opérations forcées que les utilisateurs doivent toujours effectuer.

3. Safety precautions

3-1. General precautions

Précautions générales

⚠ WARNING

Do not use the product near places subject to explosive, flammable gas, and/or corrosive atmosphere, and/or combustible materials.

Failure to follow this could result in explosion, fire, electric shock and/or injury.

Ne pas utiliser le produit près de lieux exposés à des gaz explosifs, inflammables et/ou corrosifs et/ou à des matières combustibles.
Dans le cas contraire, cela pourrait provoquer une explosion, un incendie, un choc électrique et/ou des blessures.

When using the product in places where serious accidents and/or damage may possibly occur, install backup and/or fail-safe functions systematically.

Failure to follow this could result in the inability to control this product due to driver card malfunction, which could lead to serious accidents.

Lors de l'utilisation du produit dans des endroits où des accidents graves et/ou des dommages peuvent éventuellement se produire, installer systématiquement des fonctions de sauvegarde et/ou de sécurité intégrée.
Dans le cas contraire, cela pourrait entraîner une incapacité à contrôler ce produit en raison d'un dysfonctionnement de la platine de commande, ce qui pourrait entraîner des accidents graves.

⚠ CAUTION

Do not forcibly bend and/or pull cables.
Also, do not put heavy materials on cables, or do not get them stuck between cables.

Failure to follow this could result in fire and/or electric shock due to cable damage.

Ne pas forcer et ne pas tirer les câbles.
Aussi, ne pas mettre de matériaux lourds sur les câbles, ou ne pas les coincer entre eux.
Le non-respect de cette consigne peut provoquer un incendie et/ou un choc électrique en raison de l'endommagement du câble.

Never remodel the driver card.

Failure to follow this could result in serious accidents. We assume no responsibility for remodeled products.

Ne jamais modifier les platines de commande.
Le non-respect de cette consigne pourrait entraîner des accidents graves.
Nous n'assumons aucune responsabilité pour les produits modifiés.

Make sure to attach ground wires to the conveyor body and DC power supply unit.

Failure to follow this could result in electric shock if any malfunction or leakage occurs.

S'assurer de connecter les fils de terre au châssis du convoyeur et à l' unité d'alimentation DC.
Dans le cas contraire, cela pourrait entraîner un choc électrique en cas de dysfonctionnement ou de fuite.

3. Safety precautions

3-1. General precautions

Précautions générales

⚠ CAUTION

Do not apply strong impact and/or excessive force to the product, such as hitting it with objects, or dropping it. Also, do not use the equipment if strong impact has been applied, and/or if the appearance has become deformed.

Failure to follow this could result in malfunction due to applied impact.

Ne pas appliquer de force violente et/ou d'impact excessif sur le produit, par exemple en le heurtant avec des objets ou en le laissant tomber. De même, ne pas utiliser l'équipement si un impact important a été appliqué et/ou s'il semble déformé.
Le non-respect de cette consigne pourrait entraîner un dysfonctionnement en raison de l'impact appliqué.

Do not use in a way exceeding the range of the product specifications.

Failure to follow this could result in malfunction, fire, and/or injury.

Ne pas utiliser au-delà des spécifications du produit.
Le non-respect de cette consigne peut entraîner un dysfonctionnement, un incendie et/ou des blessures.

Turn off the power supply to the product before moving and/or installing the product, and performing maintenance and inspection (excluding those during operation).

Working while the power is on could result in accidents due to unexpected operation.

Couper l'alimentation du produit avant de le déplacer et/ou de l'installer, ainsi que pour son entretien et son inspection (à l'exception de celles à réaliser en cours de fonctionnement).
Travailler pendant que l'appareil est sous tension peut provoquer des accidents en raison d'un fonctionnement inattendu.

Observe the safety regulations for installation locations, and/or products in use.

Respecter les consignes de sécurité requises pour les lieux d'installation et/ou les produits utilisés.

Securely wire each connector to the connection parts.

Improper wiring could result in electric shock and/or malfunction.

Brancher correctement chaque câble aux connecteurs.
Un câblage incorrect peut entraîner un choc électrique et/ou un dysfonctionnement.

Do not turn on/off relays and/or contactors near power cables, signal cables, and/or driver cards.

Failure to follow this could result in malfunction due to noise generation.

Ne pas activer / désactiver les relais et/ou les contacteurs à proximité de câbles d'alimentation, de câbles de signaux et/ou de platines de commande.
Le non-respect de cette consigne pourrait entraîner un dysfonctionnement dû à la génération de bruit.

---

3. Safety precautions

3-1. General precautions

Précautions générales

CAUTION

LED or Pull-up/Pull-down circuits implemented in the output circuit of control devices could result in unexpected operation.
Carefully check the output circuit.

L'utilisation d'une résistance pull-up ou pull-down sur la ligne de sortie d'un contrôleur externe peut provoquer un comportement inattendu.
Vérifier le circuit de sortie pour éviter une telle occurrence.

Turn on the power in order of external control devices, and then the product.
Turn off the power in order of the product, and then external control devices.
Turning on/off the power in the wrong order could result in malfunction.

Mettre les alimentations en amont sous tension avant de mettre le produit sous tension.
Mettre le produit hors tension avant de mettre les alimentations hors tension.
Mettre sous/hors tension dans le mauvais ordre peut entraîner un dysfonctionnement.

Do not unplug power and/or signal cables during operation except in an emergency.
Also, do not run/stop the MDR using the power supply. (Use the signal.)
Failure to follow this could result in malfunction.

Ne pas débrancher les câbles d'alimentation et/ou de signal pendant le fonctionnement. En outre, ne pas exécuter/arrêter le MDR avec l'alimentation. (Utiliser le signal.)
Le non-respect de cette consigne pourrait entraîner un dysfonctionnement.

Do not shut off the power during operation unless emergency.
Failure to follow this could result in malfunction.

Ne pas couper le courant pendant le fonctionnement, sauf en cas d'urgence.
Le non-respect de cette consigne pourrait entraîner un dysfonctionnement.

Make sure to perform the start-up inspection, and check that devices are free from any abnormalities, and that safety equipment functions correctly before using the product.

S'assurer d'effectuer l'inspection de démarrage et s'assurez que les périphériques ne présentent aucune anomalie et que l'équipement de sécurité fonctionne correctement avant d'utiliser le produit.

When disposing of the product, make consigning contracts with licensed industrial waste disposers, and consign the disposal to them.

Confier la mise au rebut du produit à une entreprise agrée pour l'élimination de déchets industriels.

3. Safety precautions

3-2. Precautions on installation

Précautions d'installation

⚠ CAUTION

Make sure to use the recommended tightening torque to tighten fixing screws of the driver card.

Failure to follow this could result in screws loosening, and/or malfunction.
⇒ P.21

Veiller a utiliser le couple de serrage recommande pour serrer les boulons et ecrous au chassis du convoyeur.
Le non-respect de cette consigne pourrait entrainer le desserrage des boulons et/ou des vis et/ou un dysfonctionnement. => P.21

3-3. Precautions on wiring

Précautions de cablâge

⚠ CAUTION

Perform wiring when the power is shut off.

Failure to follow this could result in electric shock and/or accidents due to unexpected operation.

Effectuer le câblage lorsque l'alimentation est coupée.
Dans le cas contraire, cela pourrait entraîner un choc électrique et/ou des accidents en raison d'un fonctionnement imprévu.

When attaching or removing connectors, turn off the power first, securely hold connectors, and perform operation. Also, do not apply excessive force to the driver card connection parts, such as obliquely attaching or removing connectors.

Failure to follow this could result in electric shock, malfunction, and/or accidents due to unexpected operation.

Lorsque vous connectez ou retirez des connecteurs, mettre d'abord l'appareil hors tension, le tenir fermement et effectuer les opérations.
De même, ne pas appliquer de force excessive sur les pièces de connexion de la platine de commande, telles que la fixation ou le retrait oblique de connecteurs.
Le non-respect de cette consigne peut entraîner un choc électrique, un dysfonctionnement et/ou des accidents en raison d'un fonctionnement imprévu.

Securely attach each connector.

Improper wiring could result in electric shock and/or malfunction.

Fixer solidement les connecteurs de la platine de commande.
Un câblage incorrect peut entraîner un choc électrique et/ou un dysfonctionnement.

Perform wiring to connectors so that cables make secure contact with connectors.

Barb lines from the cable core could result in heat generation and/or fire due to changes of contact resistance, and/or short circuit with the adjacent contact.

Effectuer le câblage des connecteurs de sorte que les câbles soient en contact sécurisé avec les connecteurs.
Des brins de fils mal connectés pourrait générer un échauffement et/ou un incendie, à cause d' une résistance de contact accrue et/ou d' un court-circuit avec le contact adjacent.

3-4. Precautions related to control

Précautions liées au contrôle

CAUTION

Do not turn the driver card switches using excessive force.
Failure to follow this could result in malfunction.

Ne pas tourner les commutateurs de la platine de commande avec une force excessive.
Le non-respect de cette consigne pourrait entraîner un dysfonctionnement.

3-5. Precautions on maintenance and inspection

Précautions de maintenance et d'inspection

WARNING

If any abnormalities are found, do not use this product until the causes have been eliminated completely .
Using this product with unattended abnormalities could result in not only damage to the devices, but also unexpected accidents.

En cas d'anomalie, ne pas utiliser ce produit avant que les causes en aient été complètement éliminées.
L'utilisation de ce produit avec des anomalies non résolues pourrait non seulement endommager les appareils, mais aussi causer des accidents imprévus.

Have specialists (or people who have sufficiently acquired skills) perform maintenance and inspection under instructions by management supervisors.

Faire appel à des spécialistes (ou à des personnes ayant acquis des compétences suffisantes) pour effectuer la maintenance et l'inspection conformément aux instructions des superviseurs de la direction.

At the time of repair and replacement work, turn off the power to all connecting devices.
To prevent wraparound for the power circuits and/or signals, shut off the power, wait a sufficient amount of time, and discharge electricity inside the DC power supply equipment.

Au moment des travaux de réparation et de remplacement, mettre tous les périphériques connectés hors tension.
Pour éviter que les circuits d'alimentation et/ou les signaux ne soient enveloppés, couper le courant, attendre suffisamment longtemps et décharger l'électricité à l'intérieur de l'équipement d'alimentation en courant continu.

At the time of maintenance and inspection, post warning labels so as to prevent unauthorized persons from turning on the power.
Failure to follow this could result in unexpected accidents.

Au moment de l'entretien et de l'inspection, placer des étiquettes d'avertissement afin d'empêcher les personnes non autorisées de mettre le système sous tension.
Le non-respect de cette consigne pourrait entraîner un dysfonctionnement et/ou des accidents inattendus.

3-5. Precautions on maintenance and inspection

Précautions de maintenance et d'inspection

CAUTION

When repairing/replacing, wear protective equipment, such as gloves.

Failure to follow this could result in hands getting injured by metal parts.

Lors de la réparation/remplacement, porter un équipement de protection, tel que des gants.
Si vous ne suivez pas cela, vous risquez de vous blesser les mains avec des pièces métalliques.

Do not disassemble sections and/or parts other than those specified.

Failure to follow this could result in malfunction and/or unexpected accidents.

Ne pas démonter des sections et/ou des pièces autres que celles spécifiées.
Le non-respect de cette consigne pourrait entraîner un dysfonctionnement et/ou des accidents inattendus.

Make sure to prepare repair/replacement parts designated by ITOH DENKI.

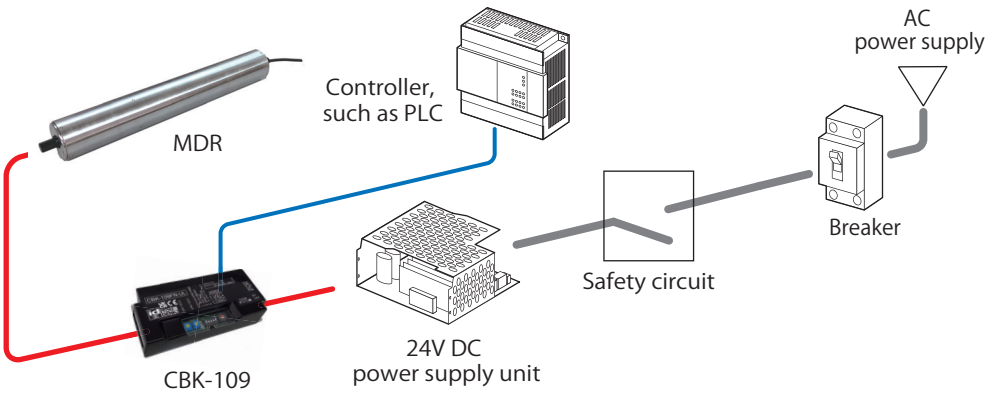
Using parts other than those designated by ITOH DENKI could result in malfunction.

S'assurez de préparer les pièces de réparation/remplacement désignées par ITOH DENKI.
L'utilisation de pièces autres que celles désignées par ITOH DENKI pourrait entraîner un dysfonctionnement.

4. Advance preparation

4. Advance preparation

Configuration example



■ As for the sensor input, and input/output signals of driver cards, adopt the number of inputs/outputs based on operation.

En ce qui concerne l'entrée du capteur et les signaux d'entrée/sortie des platines de commande, définissez le nombre d'entrées/sorties en fonction de l'opération.

■ The safety circuit includes the emergency stop equipment and magnet contactor.

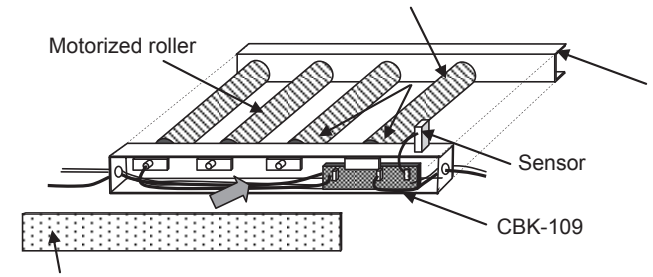
Le circuit de sécurité comprend l'équipement d'arrêt d'urgence et le contacteur.

Following is conditions to comply UL standard

Environment for installation

The described devices in this manual are defined as “Open Type” complying with UL61800-5-1 standard. Therefore, in order to conform to UL on the installation, the devices must be installed in the proper enclosure, which tooling to open must be required to restrict access inside to prevent unintended contact failure.

Reference: Required enclosure structure in general.
As far as general motorized roller conveyor, driver card and its wiring are protected by the enclosure that is composed of conveyor frame and frame cover as drawing below. Due to this enclosure, the worker has to use tooling for intentional opening the frame cover. The protective level of this enclosure must be conformed to UL50 Type 1 or over.



(It is usually made from nonflammable plastic or steel, and removed from conveyor using tool.)

Example of general enclosure’s structure

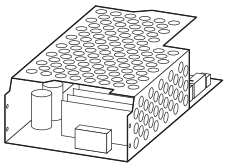
Refer to P.34 Product specifications

Items to be prepared by customers

Before introducing this product, prepare the following devices separately.

① 24V DC power supply

Power supply equipment to supply 24V DC to this product



● Switching power supply (24V DC)

10A 240W per MDR

● 24V DC battery

■ A switching power supply is recommended as the DC power supply (24V DC±10%) for the driver card.
■ Use a stabilized power supply that has an adequate capacity of 24V DC and 10 A or higher and does not fluctuate due to load variation.
■ A transformer type power supply cannot be used.
■ Secure a voltage of 24V DC±10% at the power supply terminal of a driver card.
■ If the power supply capacity is smaller than the rated power of the dedicated driver card multiplied by the number of MDRs to be used, the supply voltage may drop and cause failure or damage of the MDR and driver card. Be sure to use a power supply with a capacity larger than the rated power of this product multiplied by the number of MDRs to be used.
＊When starting multiple MDRs simultaneously, use a power supply with a capacity of 10A multiplied by the number of MDRs to be used.
■ The power supply should not activate protection with peak current 30A, 1 ms or below.
■ For the power supply unit, use an isolation type switching power supply compliant with the safety standard (IEC62368-1). Do not use a non-isolation type power supply for safety reasons, since it may not conform to the radiation noise regulations.

Following is conditions to comply UL standard

Recommended power supply specification
- Stabilized power supply that isolates between output and input.
- Connect driver cards within a capacity of power supply.

	Condition
Input Voltage range	100 to 230V AC (+/- 15%)
Input frequency range	50 to 60 Hz
Output voltage range	24V DC (+/- 10%)
Rated output current	7A or over
Surrounding operating Temperature	0 to 40 deg. C
Humidity	90% RH or less (No condensation)
Safety standard	Conforming to UL62368-1 or IEC62368-1 in the US. CSA C22.2 No. 62368-1 in Canada.
Recommended model	Nipron GPSA-360-24 (Output rated current; 15A, Peak; 25A)

<Cautions>
The installation of over current protection device at primary side in power source might be requested when using a compliant safety standard which is UL62368-1, IEC62368-1 or CSA C22.2 No. 62368-1. In this case, install specified over current protection device.

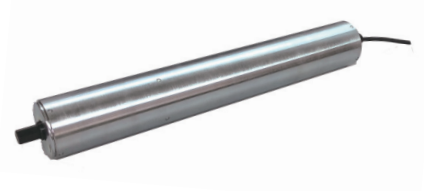
Suitable for use on a circuit capable of delivering not more than 5,000 rms symmetrical amperes, 240 volts maximum, when protected by Circuit Breakers connected with Switching Mode Power supply, R/C (QQGQ2/8), Nipron Co Ltd (E161936), Model GPSA-360-24 (Output rated current; 15A, Peak; 25A).

Driver card specifications ＊UL certified value

		Rated value
1	Rated input voltage	24V DC
2	Rated input current	3.8A
3	Rated output voltage	24(Vp-p)
4	Rated output current	2.6A

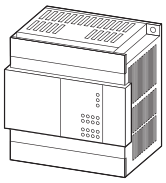
4. Advance preparation

② MDR

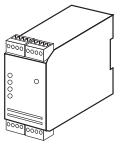


③ Control devices

Devices to control this product, such as PLCs



④ Safety relay



⑤ Wiring materials

Necessary for wiring of power and signal cables, branch connectors, driver cards, controllers, such as sensors or PLCs, and power supply.

〈Available wire diameter for driver card connectors〉

Driver card / Connector	CBK-109
Power connector	0.8～1.5mm² (AWG：18～16)
Control connector	0.08～0.5mm² (AWG：28～20)

■ To select the current capacity of wiring materials, secure a high safety margin based on the current value in the equipment to be used.
Pour sélectionner la section des matériels de câblage, prévoir une marge de sécurité élevée en fonction du courant de l'équipement à utiliser.

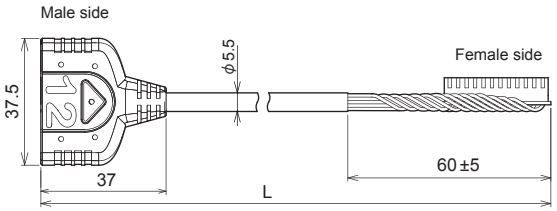
■ Longer wiring between the power supply unit and driver cards/controllers could cause the voltage to decrease, resulting in malfunction and/or damage.
Un câblage plus long entre le bloc d'alimentation et les platines/contrôleurs peut entraîner une baisse de tension, un dysfonctionnement et/ou des dégâts.

⑥ MDR extension cables (Option)

Necessary when the installing location of the MDR is far from that of the driver card.

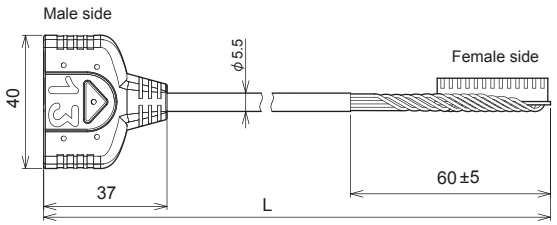
■ CBK-109：12P extension cable

Model	12P extension cable length
ACE-CBM-G0600	L= 600mm
ACE-CBM-G1200	L= 1200mm
ACE-CBM-G2000	L= 2000mm



■ CBK-109：13P extension cable (only for the brake type)

Model	13P extension cable length
ACE-CBK-H1000	L= 1000mm
ACE-CBK-H2000	L= 2000mm



■ Cables can be extended up to 3000 mm, including the MDR cable length.
La longueur totale du câble, incluant le câble du rouleau moteur, ne doit pas dépasser 3000 mm.

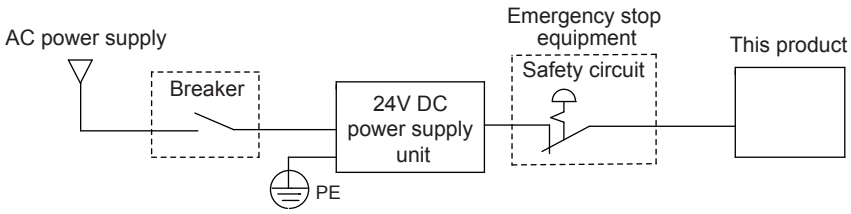
■ Do not extend cables by connecting multiple extension cables.
Ne pas utiliser plusieurs câbles d' extensions par MDR.

4. Advance preparation

⑦ Emergency stop equipment

This product does not include the emergency stop equipment.
Customers must make sure to install it.

Ce produit n'inclut pas l'équipement d'arrêt d'urgence.
Les clients doivent s'assurer de l'installer.



⑦-1 Checking the breaker

Regarding equipment where this product is incorporated, check that a breaker with appropriate capacity for the 24 VDC power supply unit has been installed. If abnormal operation should occur, protection through the breaker could be effective.
Note that when using an earth leakage breaker, select one that is “inverter corresponding”. Some inverter non-corresponding earth leakage breakers could result in malfunction, since they may recognize high-frequency components of the switching power supply as leakage.

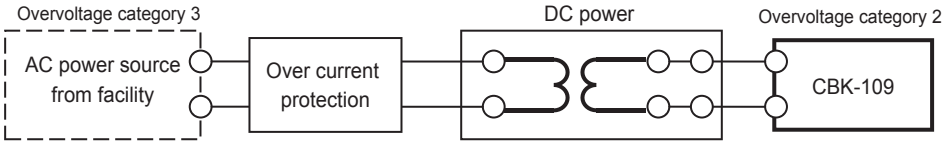
⑦-2 Operation check

When the 24V DC power supply unit has been incorporated, check that the breaker and safety circuit can work properly. Perform operation following the trial operation after checking them.

① Input to the DC power supply unit (AC power) is securely turned ON/OFF when turning ON/OFF the breaker.
② AC power input to the DC Input power supply unit is securely turned OFF/ON when turning ON/OFF the safety circuit.

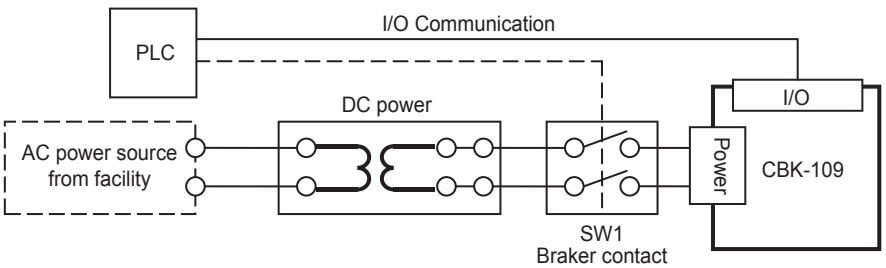
⑧ Wiring for power supply

① Installation of Over-current Protection device on DC power source.
The installation of specific over current protection device in power source might be requested by specification DC power source that would requests safety standard (UL62368-1, etc.). In this case, install specified over current protection device as shown below. If this protection device is not requested by specification of DC power source, it is not necessary to install.



② Installation of over-current protection device.
In case of using power supply device except a limit power supply, install the over-current protection device on the 24V DC line.

③ Adding the circuit breaker on motor power line when abnormal circumstances.
There are not equipped motor overload protection and over-temperature sensing on CBK-109. CBK-109 transmits an abnormal status data to external with I/O network, when abnormal circumstances such as overload or high temperature rising condition but does not block out the power. Therefore, if the power needs to be blocked out, add a circuit breaker on motor power line as shown as SW1 below that is controlled by upper layer device (PLC).
Upper layer device needs to receive an abnormal status data from driver to block out the power with circuit breaker SW1.
Separate overload detector needs to be added on the power line to block out the motor power, when driver does not have communication to upper layer device.

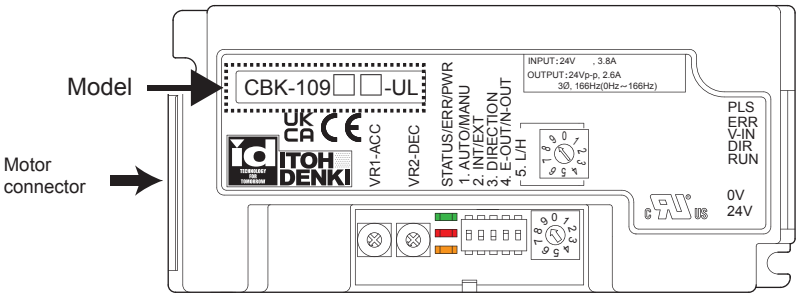


5. Check Product

5. Check Product

Checking the model

Unpack the product, and check that the product model is what you ordered.



Model description sample

CBK-109□□-UL

① Driver card specifications ※
- F ⋯ Standard
- B ⋯ Brake specifications

② Input and output signals
- N ⋯ NPN input/output
- P ⋯ PNP input/output

※12pin motor cable is for standard type, and 13pin motor cable is for brake type.

Checking appearance

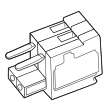
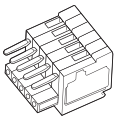
① Check that the main unit is free from any abnormalities, such as traces of scratches, dents, dirt, and/or corrosion (rust).

If any abnormalities are found, contact the supplier immediately.

Checking accessories

Check that all the following items are included.

Power connector WAGO 734-102	Control connector WAGO 733-105	M4 cross-recessed head SW screw x 15 / M4 hex. nut (for securing the driver card)
1	1	2 sets

6. Installation/Wiring

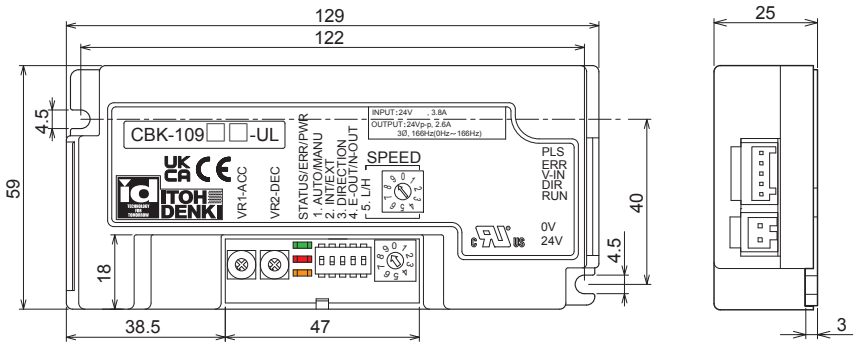
6. Installation/Wiring

6-1. Preparation to install driver cards

Hole processing on frames and control panel

1 Perform mounting processing on the frames and control panel by reference to the mounting holes for driver cards.

- Mount driver cards on a flat surface where heat can be released easily.
  Monter les platines de commande sur une surface plane où la chaleur peut être facilement évacuée.
- Prevent chips generated during processing from entering driver cards.
  Empêcher les copeaux générés lors du perçage d'entrer dans la platine de commande.

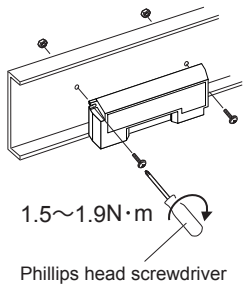


6-2. Mounting driver cards

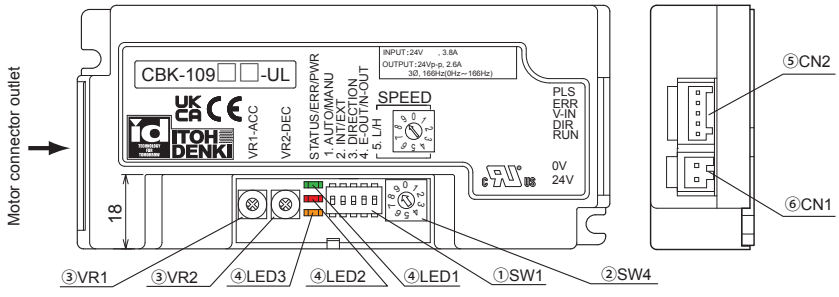
Mounting driver cards

1 Use the included screws and nuts to mount driver cards on the conveyor frames or control panel.

- Recommended tightening torque
  1.5～1.9N·m
  Couple de serrage recommandé 1.5 ～ 1.9N·m
- Since the driver card has the degree of protection of IP20, use a protective case in areas subject to water, or install in other locations.
  Étant donné que le produit a un boîtier classéIP20, utilisez un boîtier de protection ou montez-le dans un endroit protégé au cas ou il serait soumis à des projections d'eau.



6-3. CBK-109 Functions list / Wiring



①SW1 (DIP switch)

No.	Description	Setting when turned ON	Setting when turned OFF	Factory setting	References
1	Switch between automatic/manual recovery if a thermal error/low voltage error/back EMF error occurs	Manual recovery	Automatic recovery	ON	8-1. Error details 8-2. Error history
2	Selection of internal/external speed settings	External	Internal	OFF	Specified speed
3	Selection of the direction of rotation	Refer to 7-1. Transfer direction settings		OFF	7-1. Transfer direction settings
4	Selection of the alarm (error) signal output	Output under the normal condition	Output when an error occurs	OFF	7-2. Error signal
5	Selection of the speed range	High speed range	Low speed range	ON	Specified speed

6. Installation/Wiring

②SW4 (Rotary switch)

10 speeds can be specified. (＊When combined with SW1#5, up to 20 speeds can be specified.)

③VR (Volume)

		Minimum (Full in a counter-clockwise direction)	Maximum (Full in a clockwise direction)	Factory setting	References
1	Acceleration time from RUN signal until specified speed	0 seconds	2.5 seconds	Minimum	—
2	Deceleration time from STOP signal until stop	0 seconds	2.5 seconds	Minimum	

④LED

		Color	Display	References
1	PWR	Green	Indicates the power status.	8-1. Error details
2	ERR	Red	Indicates the type of errors.	
3	STATUS	Orange	Indicates the number of times for thermal error/lock error/low voltage error/back EMF error.	8-2. Error history

⑤CN2 (Control)

		Operation	References
5	PLS	Motor pulse output	7-3. Motor pulse signal
4	ERR	Error signal output	7-2. Error signal
3	V-IN	MDR external speed setting	Specified speed
2	DIR	MDR rotation direction switching	7-1. Transfer direction settings
1	RUN	MDR RUN/STOP	RUN signal for MDR operation

⑥CN1 (Power)

2	0V
1	24V DC

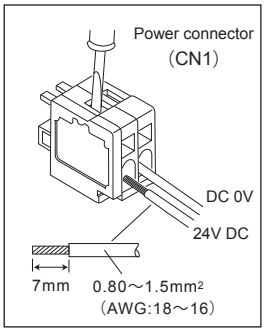
Specified speed

SW setting		PM570KT-15m/min Speed(m/min)	PM570KT-55m/min Speed(m/min)	PM605KT-15m/min Speed(m/min)	PM605KT-55m/min Speed(m/min)	External voltage Input (V)
SW1#5	SW4	No-load	No-load	No-load	No-load	
ON	9	16.2	61.6	17.2	65.4	9.6～9.9
	8	14.9	56.5	15.8	60.0	9.1～9.4
	7	14.2	53.9	15.1	57.2	8.6～8.9
	6	13.5	51.4	14.3	54.5	8.1～8.4
	5	12.8	48.8	13.6	51.8	7.6～7-9
	4	12.2	46.2	12.9	49.1	7.1～7.4
	3	10.8	41.1	11.5	43.6	6.6～6.9
	2	10.1	38.5	10.8	40.9	6.1～6.4
	1	9.5	36.0	10.0	38.2	5,6～5.9
	0	8.8	33.4	9.3	35.4	5.1～5.4
OFF	9	8.1	30.8	8.6	32.7	4.6～4.9
	8	7.4	28.2	7.9	30.0	4.1～4.4
	7	6.8	25.7	7.2	27.2	3.6～3.9
	6	6.1	23.1	6.5	24.5	3.1～3.4
	5	5.4	20.5	5.7	21.8	2.6～2.9
	4	4.7	18.0	5.0	19.1	2.1～2.4
	3	4.1	15.4	4.3	16.3	1.6～1.9
	2	3.4	12.8	3.6	13.6	1.1～1.4
	1	2.7	10.3	2.9	10.9	0.6～0.9
	0	2.0	7.7	2.2	8.2	0.1～0.4

6. Installation/Wiring

Wiring of power connector (CN1)

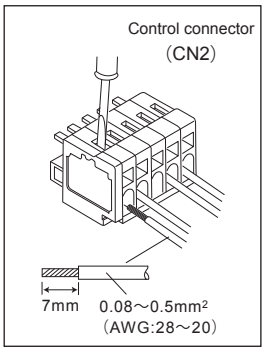
1 Connect the 24 VDC and 0 VDC cables to CN1 (2 contacts).



- Do not connect multiple power cables to one contact. Failure to follow this could result in electric shock, short circuit, and/or damage due to the capacity of connectors being exceeded. (Connector capacity: 10 A)
  Ne connectez pas plusieurs conducteurs à un seul pôle. Le non-respect de cette consigne pourrait produire un dépassement de la capacité du connecteur et entraîner un choc électrique, un court-circuit ou des dommages.
  (Capacité 10A pour le connecteur)
- Connect the 24 VDC and 0 VDC cables correctly.
  Des précautions doivent être prises pour éviter les erreurs de câblage de 24V et 0V.
- Do not connect cables when connectors are plugged in.
  Ne pas câbler le connecteur branché (sous tension)

Wiring of control connector (CN2)

2 Connect each cable to CN2 (5 contacts).



- Refer to P.22 ⑤ CN2 (control), and perform wiring according to operation.
  Voir P.22 ⑤ CN2 (contrôle), et effectuer le câblage selon le fonctionnement.
- Use the same voltage to be input to CN2#1 as the power supply voltage. (Connector capacity: 4 A)
  La tension du connecteur de contrôle doit être commune à la tension d'alimentation.
  (Capacité de connecteur 4A)
- Make sure to check the input signal (NPN/PNP), and input the voltage to CN2.
  Vérifier le signal d'entrée (NPN/PNP) et entrer la tension sur CN2.
- When connecting a relay coil, etc., to the remote output, use surge protector devices, or perform surge protection measures using diodes.
  Using devices without surge protection measures could result in damage to the remote output terminal, if counter electromotive voltage is generated when switching the output signal.
  Dans le cas où une bobine de relais est connectée à la sortie, utilisez un relai doté d'une protection contre les surtensions ou utilisez une diode contre les surtensions potentielles. En cas de non-respect de cette consigne, une contre-force électrique est générée lors de la commutation du signal de sortie, ce qui peut endommager la borne de sortie distante.

Connecting to the driver card

3 Connect the power connector (CN1) and control connector (CN2) to the driver card.

Connecting to the MDR

4 Connect the connector coming from the MDR.

- Connect the extension cable, if necessary. Refer to P.16
  Utilisez un câble d'extension si nécessaire. Voir P.16

- Cables can be extended up to 3000 mm, including the MDR cable length.
  La longueur totale du câble, incluant le câble du rouleau moteur, ne doit pas dépasser 3000 mm.
- Do not extend cables by connecting multiple extension cables.
  Ne pas utiliser plusieurs câbles d'extensions par MDR.

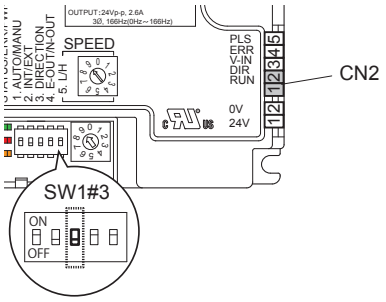
7. Control/Operation

7. Control/Operation

7-1. Transfer direction settings

The MDR's direction of rotation is determined by a combination of SW1#3 and CN2#2.

MDR transfer direction settings using SW1#3 and CN2

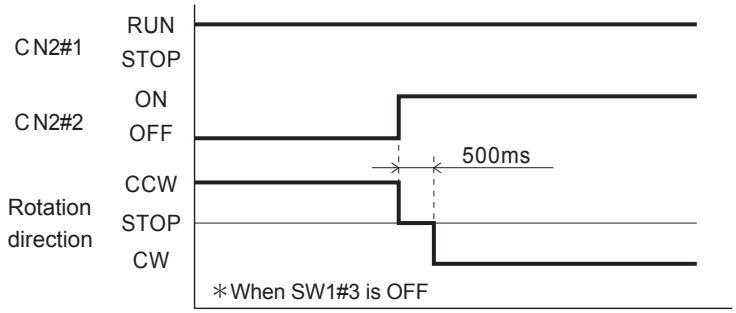


	SW1#3 ON	SW1#3 OFF
CN2# 1 2 3 ← IN	CW	CCW
CN2# 1 2 3 ← IN	CCW	CW

■ The transfer direction cannot be changed using SW1#3 during transfer (while the MDR is running).
Change the direction when the MDR stops.

Le sens de rotation ne peut pas être modifié à l'aide de SW1#3 pendant le transfert (pendant que le MDR est en cours d'exécution).
Changer le sens de rotation lorsque le MDR s'arrête.

Switching the direction of rotation while the MDR is rotating by operating CN2#2

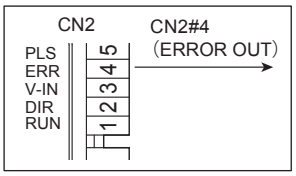


7-2. Error signal

The error signal is output from CN2#4.

CBK-109FN / CBK-109BN	CBK-109FP / CBK-109BP
NPN open collector output	PNP open collector output

SW1#4 OFF	SW1#4 ON
Output the signal when an error occurs	Output under the normal condition
Open under the normal condition (The transistors inside driver cards are turned ON when an error occurs.)	Open when an error occurs (The transistors inside driver cards are turned OFF when an error occurs.)



＊Protection resistance of 100 Ω is included inside driver cards.

■ When connecting a pull-up (pull-down) resistor, set the value to 25 mA or less.
Failure to follow this could result in damage to parts/components inside the driver card.
Lors de la connexion d'une résistance pull-up (pull-down), réglez la valeur sur 25 mA ou moins.
Le non-respect de cette consigne pourrait endommager les pièces/composants de la platine de commande.

■ When using multiple driver cards, extract the STATUS signal respectively.
Lors de l'utilisation de plusieurs platines de commande, extraire respectivement le signal STATUS.

■ The error signal is output when turning the power ON/OFF. Disregard the error signal sent from the driver card for 0.5 seconds when turning the power ON, and for two seconds when turning the power OFF.
Lors de la mise sous tension et hors tension, le signal d' erreur est envoyé.
Il ne faut pas tenir compte de ce signal pendant 0,5s à la mise sous tension, et 2s à la mise hors tension.

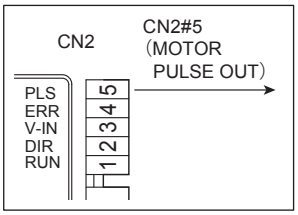
7. Control/Operation

7-3. Motor pulse signal

- The motor pulse signal for the MDR is output from CN2#5.
- Output is the NPN open collector output of 2-pulse signal per rotation of the internal motor.

Accuracy: ±3%

Internal speed settings		Frequency (Hz)	Motor speed (r/min)	External speed setting (V)
SW1#5	SW4			
ON	9	155	4638	9.6～9.9
	8	152	4556	9.1～9.4
	7	145	4349	8.6～8.9
	6	138	4141	8.1～8.4
	5	131	3934	7.6～7.9
	4	124	3727	7.1～7.4
	3	110	3313	6.6～6.9
	2	104	3106	6.1～6.4
	1	97	2899	5.6～5.9
	0	90	2692	5.1～5.4
OFF	9	83	2485	4.6～4.9
	8	76	2278	4.1～4.4
	7	69	2071	3.6～3.9
	6	62	1864	3.1～3.4
	5	55	1657	2.6～2.9
	4	48	1450	2.1～2.4
	3	41	1242	1.6～1.9
	2	35	1035	1.1～1.4
	1	28	828	0.6～0.9
	0	21	621	0.1～0.4



■ Attach protection resistance so that the output is 25 mA or less. Using the product with an output of over 25 mA could result in damage to the transistors inside driver cards.

Régler une résistance de protection de sorte que la sortie soit de 25 mA ou moins. L'utilisation du produit avec une sortie supérieure à 25 mA peut endommager les transistors des platines de commande.

■ In the motor pulse signal output section, protection resistance of 100Ω is included inside driver cards.

Dans la section de sortie du signal d'impulsion du moteur, une résistance de protection de 100Ω est incluse à l'intérieur des platines de commande.

7-4. Trial run

- Prevent other devices around the product from operating.
  Other devices incorporated in the system, such as conveyor lines, could create dangerous situations, since trays may start to flow from upstream when the trial run is driven.
  Check carefully that other elements in the system will not operate when the product starts running.
- Make sure to check that wiring, driver card settings, and PLC settings have been carried out correctly before the trial run.

8. Maintenance/Inspection

8. Maintenance/Inspection

8-1. Error details

Error details on CBK-109

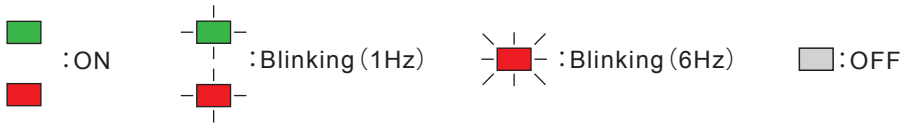
Errors can be checked by PWR (green), ERR (red), and signals from CN2#4.

■ When error signals have been released using CN2#1 (RUN / STOP), the MDR instantly starts up when RUN is input.
Lorsque des signaux d'erreur ont été émis à l'aide de CN2#1 (MARCHE/ARRET), le MDR démarre instantanément lorsque le signal MARCHE est entré.

■ When the power supply voltage has experienced an extreme decrease, an unexpected operation may occur.
Lorsque la tension d'alimentation a subi une baisse importante, un fonctionnement inattendu peut se produire.

■ When releasing an error, switch ON→OFF→ON signals on CN2#1, and ON→OFF→ON / OFF→ON→OFF signals on CN2#2, at intervals of 100 ms or more.
Lors du déclenchement d'une erreur, commuter les signaux ON→OFF→ON sur CN2#1, et les signaux ON→OFF→ ON / OF→ON→OFF sur CN2#2, à des intervalles de 100 ms ou plus.

LED display explanation



Error details

PWR (green) ERR (red)	CN2#4 ERR signal	Type of error	Occurrence conditions	Error release conditions	How to release error	
					Automatic recovery	Manual recovery
	Output	(Normal operation)	—			
	Open	**Fuse blown**	Fuse meltdown (Failure is detected after 1.0 sec has elapsed)	None (Replace the driver card.)		
	Open	**Insufficient voltage**	The driver card supply voltage has been 15 V or less for 1.0 sec, or decreases to 15 V or less five times within 500 msec.	The driver card supply voltage is 18 V or more	The unit starts up instantly	• Input the signal of ON→OFF→ON to CN2#1 (RUN/STOP) • Switch ON→OFF→ON or OFF→ON→OFF on CN2#2 ＊Only the error signal will be released by switching the signal on CN2#2. After the error has been released, turn CN2#1 OFF and ON to run and recover the MDR.
	Open	**Motor connector unconnected**	• Motor cable connector unconnected • Motor cable connector disconnected • Incorrect connection between the MDR and driver card	Correct connection of the motor cable	—	
	Open	**Motor lock**	Failure is detected if the MDR does not rotate for 0.5 sec	Rotates MDR after elapsing 4sec or more when an error occurs.	—	
	Open	**Driver card/MDR thermal error**	• The driver card (FET) temperature has been 95°C or higher for 1.0 seconds • The MDR temperature is 110°C	• The driver card (FET) temperature is 85°C or lower • The MDR internal temperature is 80°C or lower	＊1 When one minute has elapsed after decreasing to the recovery temperature, the unit starts up	
	Open	**Back EMF error**	The MDR voltage has been 40 V or more for 2.0 sec, or it is 50 V or more	The motor voltage has been 30 V or less for 1.0 sec	The unit starts up instantly	
	Open	**Motor cable disconnected**	MDR disconnected	None (Replace the MDR.)		

＊1 As for the method to release the thermal error, when you want to start up the unit within one minute after decreasing to the recovery temperature using the automatic recovery setting, take the same procedure as for the manual recovery to release the error and start the MDR.
En ce qui concerne la méthode pour éliminer l'erreur thermique, pour redémarrer l'appareil dans la minute qui suit la baisse de la température de récupération avec le redémarrage automatique, suivez la même procédure que pour le redémarrage manuel pour éliminer l'erreur et démarrer le MDR.

■ Errors will be also released when the power is OFF (for 2.0 seconds or more).
L'erreur peut également être remise à zéro en coupant l'alimentation plus de 2 secondes.

■ Error details are described as an example when the SW1#4 ERR signal is ON (output under the normal condition).
Les détails de l'erreur sont décrits à titre d'exemple lorsque le signal ERR SW1#4 est envoyé (sortie dans des conditions normales).

8. Maintenance/Inspection

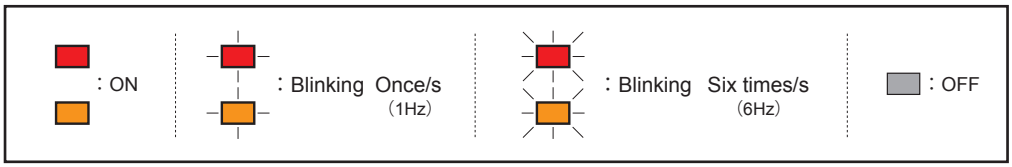
8-2. Error history

CBK-109 Error history

When the thermal error/lock error/low voltage error/back EMF error occurs during operation, the error type and the number of occurrences are indicated using LEDs [ERR (red), STATUS (orange)].

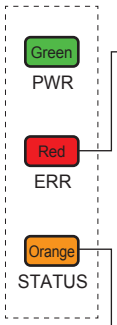
- The error history [STATUS (orange)] is indicated on LEDs only when an error occurs. It will not be indicated during normal operation.
  L'historique des erreurs [STATUTS (orange)] est indiqué sur les LED uniquement lorsqu'une erreur se produit. Il ne sera pas indiqué pendant le fonctionnement normal.
- Other error histories will not be saved.
  Les autres historiques d'erreurs ne seront pas enregistrés.
- When the fourth or following errors occur, the error history for the last three error occurrences will be indicated.
  Lorsque la quatrième erreur ou les erreurs suivantes se produisent, seul l'historique des erreurs pour les trois dernières occurrences d'erreur sera indiqué.
- The error history will be reset when turning the power OFF.
  L'historique des erreurs sera réinitialisé lors de la mise hors tension.

LED display explanation



Error history details

Indicates the lock error/low voltage error/thermal error/back EMF error.



	Lock error
	Low voltage error
	Thermal error
×2 ⇔ 1.5s	Back EMF error

Indicates the number of error occurrences after the power is turned ON.

	First error.
	Second error. (Indicates that the same error as the previous one occurs.)
	Second or third error. (Indicates that the type of errors are mixed.)
	Third error. (Indicates that the same error occurs three times continuously.)

8. Maintenance/Inspection

8-3. Error time chart

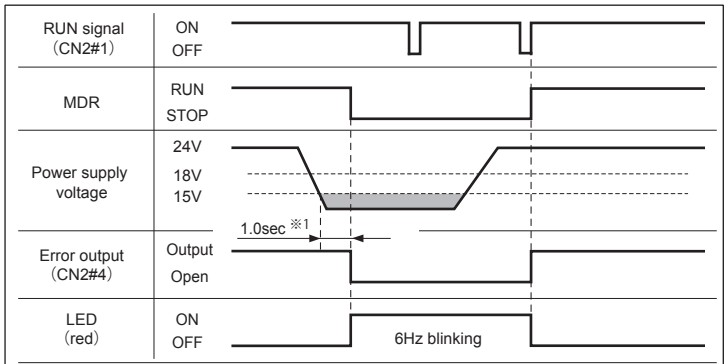
CBK-109 Error time chart

For details on error conditions, recovery conditions, and LED indication, refer to each section.

＊The error time chart is described as an example when the SW1#4 is ON (output under the normal condition).

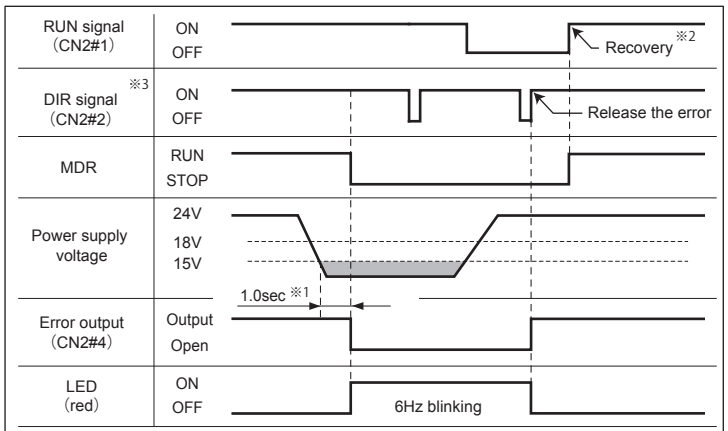
Low voltage error

Release the error	RUN signal
Recovery	



※1 An error occurs when a power supply voltage has been at 15 V or less for 1.0 seconds, or decreases to 15 V or less five times within 500 msec.

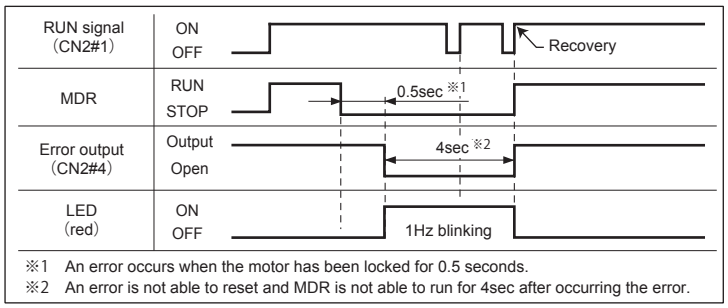
Release the error	DIR signal
Recovery	RUN signal



※1 An error occurs when a power supply voltage has been at 15 V or less for 1.0 seconds, or decreases to 15 V or less five times within 500 msec.
※2 The error will be released using the DIR signal, and recovered using the RUN signal.
※3 Error release using the DIR signal can also be performed using OFF→ON→OFF.

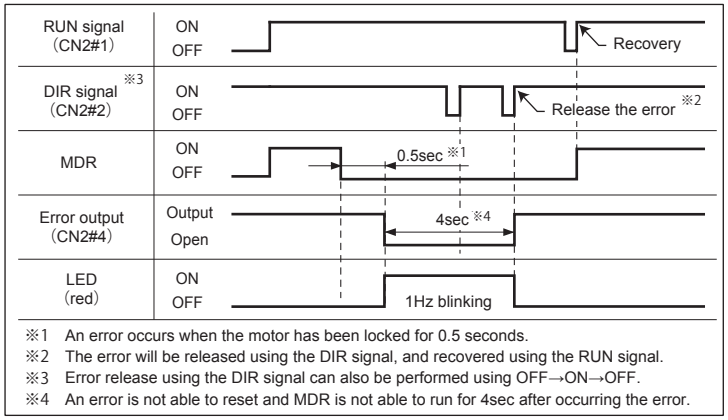
Lock error

Release the error	RUN signal
Recovery	



※1 An error occurs when the motor has been locked for 0.5 seconds.
※2 An error is not able to reset and MDR is not able to run for 4sec after occurring the error.

Release the error	DIR signal
Recovery	RUN signal

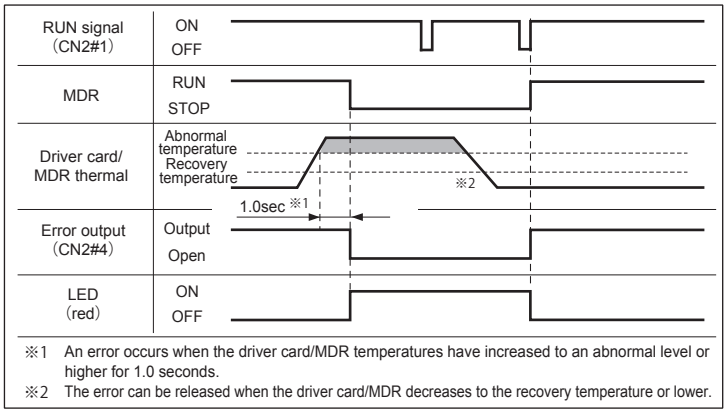


※1 An error occurs when the motor has been locked for 0.5 seconds.
※2 The error will be released using the DIR signal, and recovered using the RUN signal.
※3 Error release using the DIR signal can also be performed using OFF→ON→OFF.
※4 An error is not able to reset and MDR is not able to run for 4sec after occurring the error.

8. Maintenance/Inspection

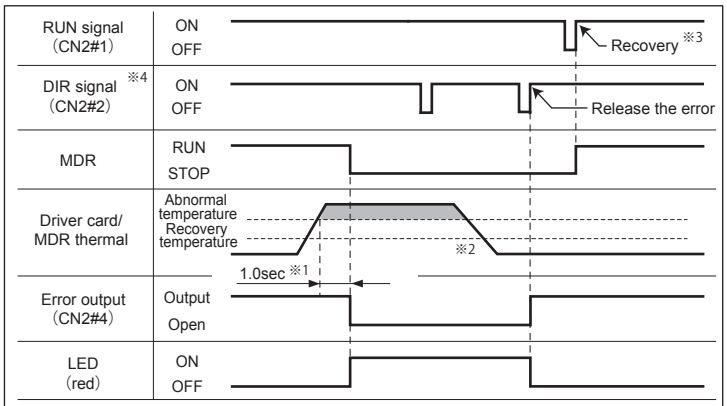
Driver card/MDR thermal error

Release the error	RUN signal
Recovery	



※1 An error occurs when the driver card/MDR temperatures have increased to an abnormal level or higher for 1.0 seconds.
※2 The error can be released when the driver card/MDR decreases to the recovery temperature or lower.

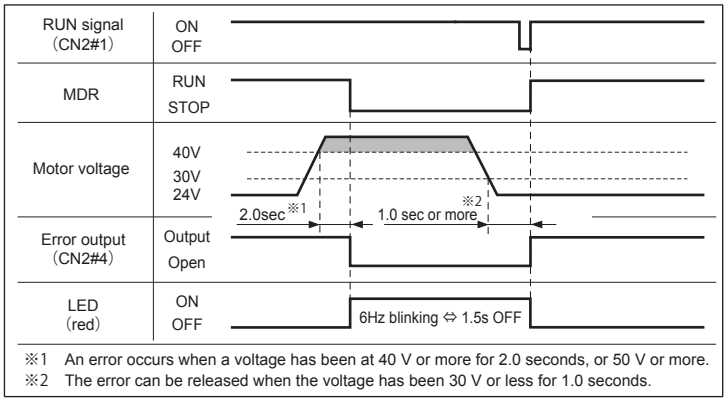
Release the error	DIR signal
Recovery	RUN signal



※1 An error occurs when the driver card/MDR temperatures have increased to an abnormal level or higher for 1.0 seconds.
※2 The error can be released when the driver card/MDR decreases to the recovery temperature or lower.
※3 The error will be released using the DIR signal, and recovered using the RUN signal.
※4 Error release using the DIR signal can also be performed using OFF→ON→OFF.

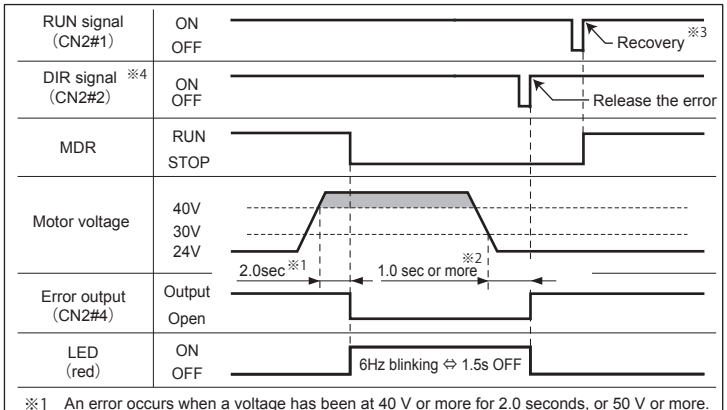
Back EMF error

Release the error	RUN signal
Recovery	



※1 An error occurs when a voltage has been at 40 V or more for 2.0 seconds, or 50 V or more.
※2 The error can be released when the voltage has been 30 V or less for 1.0 seconds.

Release the error	DIR signal
Recovery	RUN signal



※1 An error occurs when a voltage has been at 40 V or more for 2.0 seconds, or 50 V or more.
※2 The error can be released when the voltage has been 30 V or less for 1.0 seconds.
※3 The error will be released using the DIR signal, and recovered using the RUN signal.
※4 Error release using the DIR signal can also be performed using OFF→ON→OFF.

8. Maintenance/Inspection

8-4. Troubleshooting

■ Check the following items without removing the cover or remodeling.
Vérifiez les éléments suivants sans retirer le couvercle ni modifier le produit.

(Symptom 1)
MDR does not rotate.

Power	・Check if only PWR (green) illuminates. ・Check if the stable 24 VDC is adequately supplied from the power supply. ・Check if wiring to the CN1 connector has been done correctly. ・Check if the 24 VDC cable is adequately wired to the CN1 connector.
RUN signal	・Check if 0 V is input to CN2#1. ・Check if the input signal to CN2#1 is correct. (NPN-0V / PNP-24V) Also, check if the connector is connected securely. ・Check if the 0 V input to CN2#1 is common to the 0 V input to CN1#2.
Error	・Check if ERR (red) is illuminating or blinking. ⇒ Refer to 8-1. Error details, remove the cause of error.
MDR	・Check if the MDR is adequately installed, and its shafts are adequately fixed with the supplied mounting brackets or accessories. ・Check that the MDR end housing does NOT come into contact with the conveyor frame. ・Check if the MDR's connector is properly connected to the driver card. ・Check that the o-ring or belt tension is not too strong. Check if the number of slaved idler rollers is adequate.

(Symptom 2)
The speed cannot be changed.
The speed cannot be increased.

MDR	・Check if the nominal speed of MDR is selected correctly. ⇒ The adjustable speed range is depending on nominal speed.
SW1#2	・Check if SW1#2 is set properly: ON for external speed variation and OFF for internal speed variation.
Power (During external speed variation)	・Check if the external voltage 0 V is common to the 0 V input to CN1#2. ・Check if the stable 24 VDC is adequately supplied.
CN2#3 (During external speed variation)	・Check if the cable is adequately wired to the CN2#3 connector. ・Check if the analog voltage input is set between 0 V and 10 V.

(Symptom 3)
The rotation direction cannot be switched.

CW/CCW	・Check if 0 V is input to CN2#2, and it is common to the 0 V input to CN1#2. ・Check if the input signal to CN2#2 is correct. (NPN-0V / PNP-24V) Also, check if the connector is connected securely.
SW1#3	・Check that DIP-SW1#3 has not been changed during MDR rotation. ⇒ The rotating direction during MDR rotation cannot be changed using DIP-SW1#3. Stop MDR rotation and change the direction using DIP-SW1#3, or change the direction during MDR rotation using CN2#2.

(Symptom 4)
Error cannot be output.

SW1#4	・Check that the setting is done properly for signal output under the normal and abnormal condition.
Voltage	・Open collector output is set. Check if the external voltage is 24V DC or less, and the 0 V input is common to the 0 V input to CN1#2. ・Check if the resistor of 1 kΩ or larger is mounted. （The resistor type depends on the unit used by customers.）
CN2#4	・Check if the cable is adequately wired to the CN2#4 connector. ・Check that wiring for NPN or PNP signal output is done correctly.

(Symptom 5)
Error is output immediately.

ERR （red）	・Check if ERR (red) is illuminating or blinking. ⇒ One of the thermal error, lock error, back EMF error, and low voltage error occurs. Refer to 8-1. Error details. ・Check that an appropriate power supply with enough capacity is being used. ⇒ Refer to 24V DC power supply on P.16. ・Check that the wire diameter to be used for the power supply is appropriate.（0.8 to 1.5mm²） ・Also, check that there is no failure in wiring and/or no looseness at connectors. ⇒ Check the wire diameter and wirings. ・Check that CBK-109 is not too far from the power supply. (Check if the voltage has not dropped.)
Environment	・Check if the product is being used in the ambient temperature range between 0 and 40ºC. ・Check if the driver card back plate is affixed to the metallic plate face where heat can be released easily. ・Check that the MDR has not been locked when stopping transferred products using a stopper.
MDR	・Check that the MDR end housing does NOT come into contact with the conveyor frame. ・Check that the MDR's connector is properly connected to the driver card. ・Check that the MDR power cable has not been damaged.

Specifications

Specifications

Product specifications

Model		CBK-109□(F/B) □(N/P)
Power supply voltage		24V DC±10%
Rated voltage		24V DC
Static current		0.06A
Peak current		30A, 1 msec or less
Starting current		7.0A
Time from Run (when CN2#1 is powered) input to motor rotation		15 msec or less
Error output		NPN (PNP) transistor open collector output (Set the maximum output current to 25mA or less)
LED indication		Power indication (green)
		Error indication (red)
		Indication of the number of error occurrences (red)(orange)
Thermal protection		Driver card: 95ºC MDR: 110ºC
Brake release current		Maximum 0.3A (Only for brake option)
Cable connector	Power	WAGO 734-102 (Max：10A)
	Control	WAGO 733-105 (Max：4A)
Weight		0.2kg

	Available condition	Remark
Surrounding Temperature	0 to 40 deg.C	No freezing
Humidity	90 % RH ro less	No condensation
Installation	Indoor	
Atmosphere	No corresive gas	
Vibration	0.5 G or less	
Pollution level	2	Conforming to IEC60640-1 and UL840
Overvoltage category	2	

■Brake type

	When power OFF	When power ON (MDR stops)	When error arises
Standard	—	Servo lock brake ※1	Dynamic brake
w/ Brake option	Mechanical brake※2	Servo lock brake ※1	Mechanical brake※2

※1 ・Servo lock brake activates after activating dynamic brake for 200msec.
・Maximum 1A current flows.
・Servo lock brake torque

Nominal speed(m/min)	Torque (Nm)
15	22.04
55	5.51

※2 ・Mechanical brake activates instantly when power off.
・In case of error condition, mechanical brake activates after 400msec.
・Mechanical brake torque

Nominal speed(m/min)	Torque (Nm)
15	25.40
55	6.35

Term

Servo lock brake

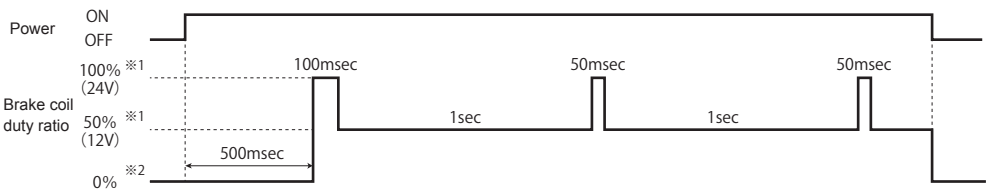
- Dynamic brake activates to retain MDR stop position when stopping MDR.
- While the brake activates, MDR will return to the retained position even when rotating it forcibly.
- This can be used in places subject to external force when the MDR stops, such as ascending or descending slope line.

Term

Mechanical brake

- Mechanical brake is a dedicated electromagnetic brake that is released when power on.
- Mechanical brake activates to retain stop position as holding effect.

Mechanical brake operation chart



※1 Mechanical brake deactivates.
※2 Mechanical brake activates.

Technology for tomorrow

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