



Tilt Right Angle Diverting Unit

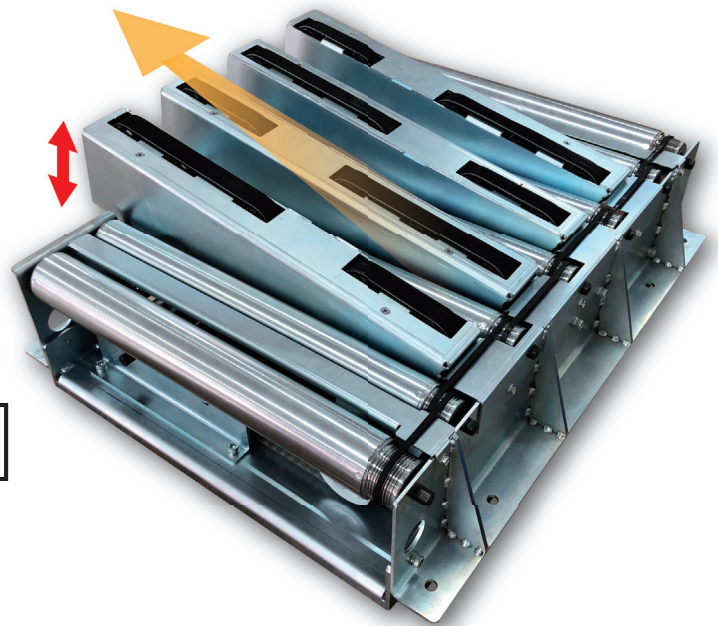
T-RAT-S

Tilt-Right Angle Transfer

〈 User Manual 〉

Read this manual before use

Thank you for purchasing the Tilt-Right Angle Transfer Module
(hereinafter referred to as "this product").



Make sure to read this manual carefully before using, and start using only after you have understood all the product's functions, safety information and precautions.

After reading the manual, make sure to keep it safe in a specified place for future use, whenever necessary.

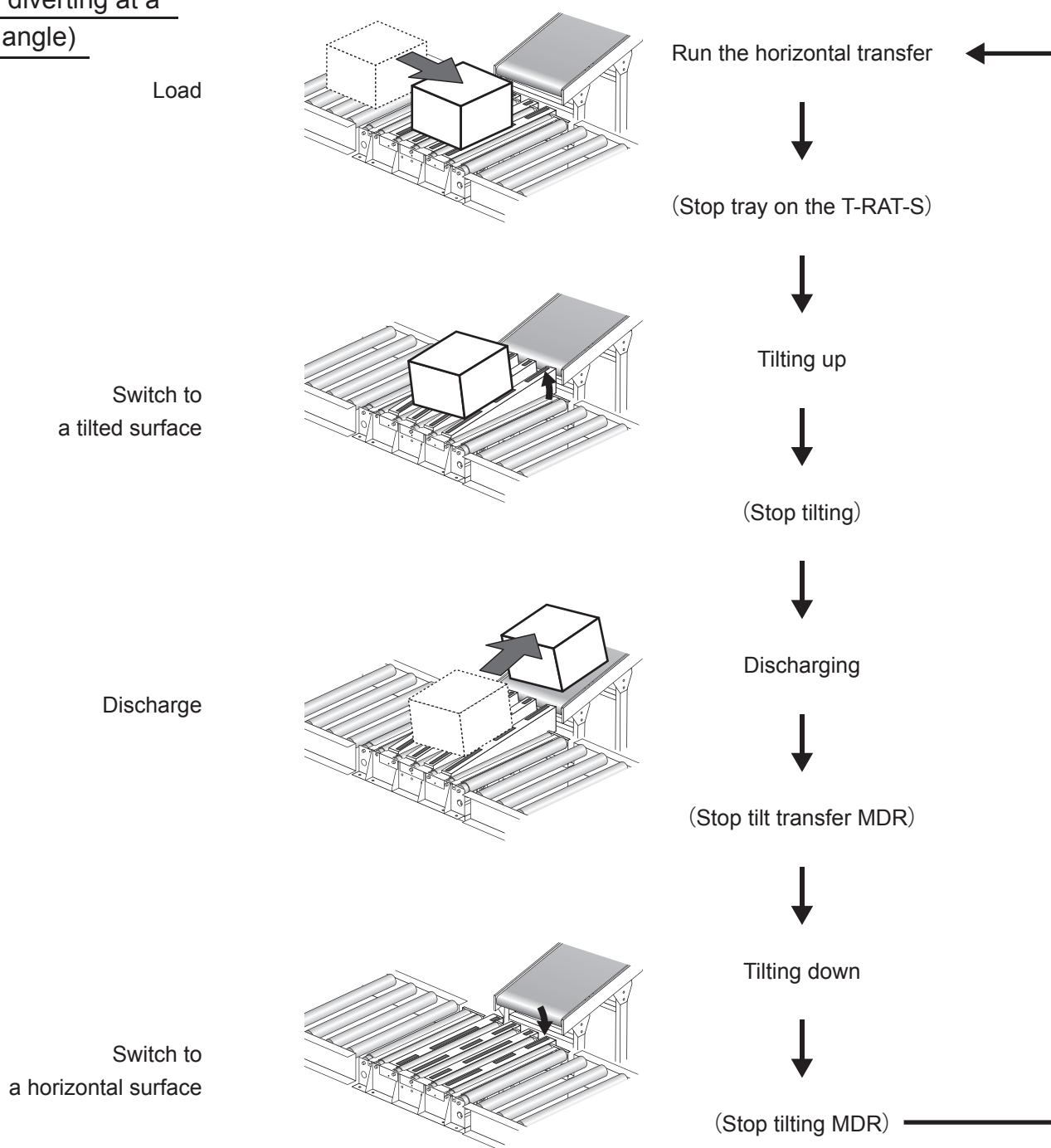
1. Introduction

Features

Features of the Tilt-Right Angle Transfer Module (hereinafter referred to as "this product").

- This product is a module to transfer trays to incline/decline or spiral conveyors by diverting at a right angle.
- Since it lifts trays at a tilt, and diverts at a right angle, the trays avoid being impacted.
- All-electric control. No pneumatics.

Operation description (when diverting at a right angle)



1. Introduction

Limited warranty

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.

Also, 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.

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 with standard specifications, and for the options prepared by us.

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.

About the risk category of this system

This product is intended to comply with the risk category 2^{*2} or lower as defined in EN 954-1^{*1}. It does not comply with purposes beyond risk category 3 or higher.

^{*1}: European machinery safety standards.

^{*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", as defined in IEC60664-1.

For this reason, if you install this product in an environment that requires dust proof/waterproof treatments, you need to add necessary countermeasures, and check the performance based on your responsibility.

About description of the product

• In this manual, T-RAT-S is described as T-RAT, and T-RAT-S and T-RAT are described separately, when needed.

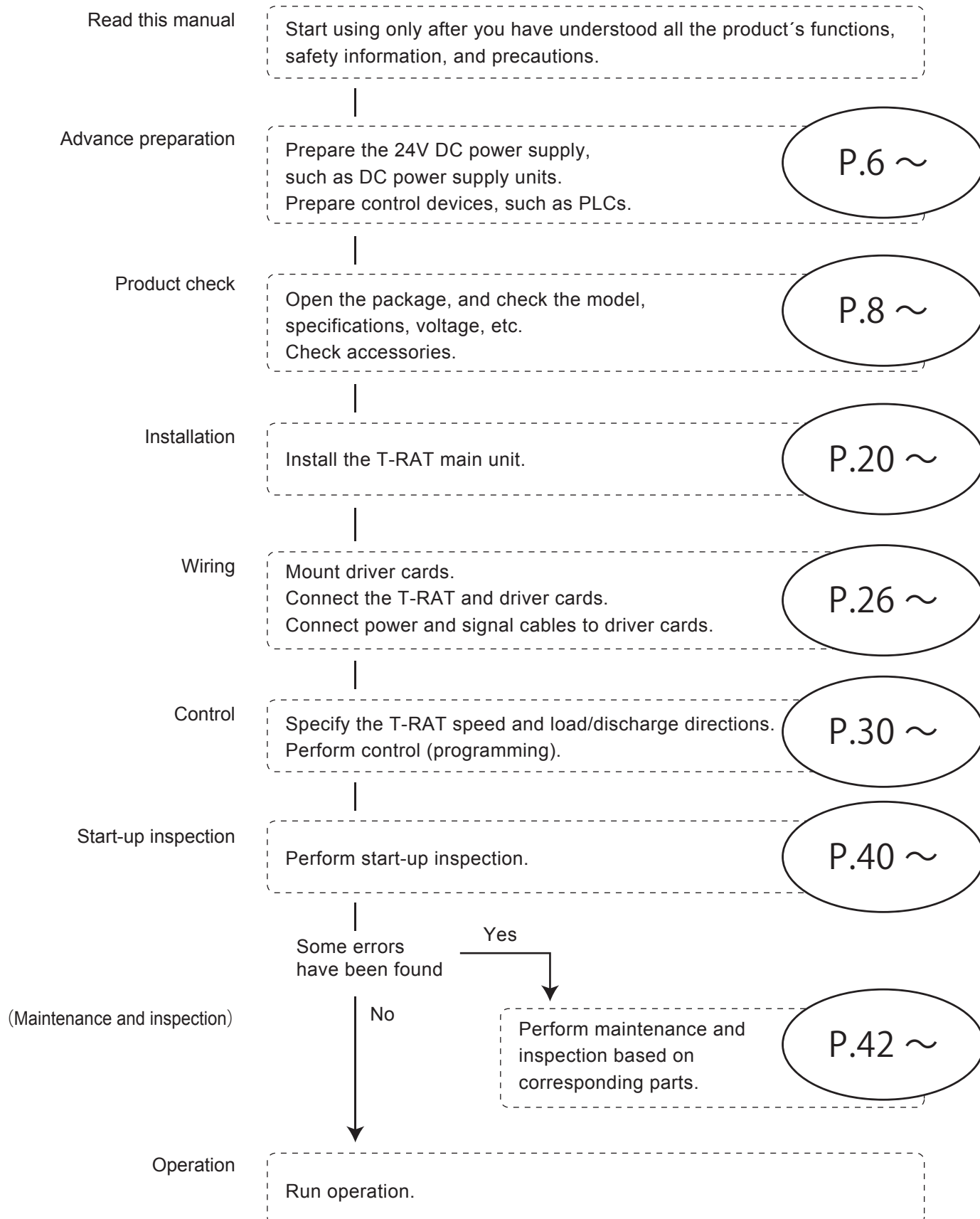
• Depending on the signal type (NPN/PNP) specified by customers, different models of control driver cards are supplied as being the standard for this product.

Signal input/output type	NPN	PNP
Included driver card model	CB-016N6 (2) HBM-201FN (1)	CB-016P6 (2) HBM-201FP (1)

In this manual, CB-016N6 and CB-016P6 are described as CB-016, and HBM-201FN and HBM-201FP as HBM-201. Also, CB-016N6 and CB-016P6, as well as HBM-201FN and HBM-201FP are described separately, when needed.

2. Procedures from installation to operation

Procedures from installation to operation



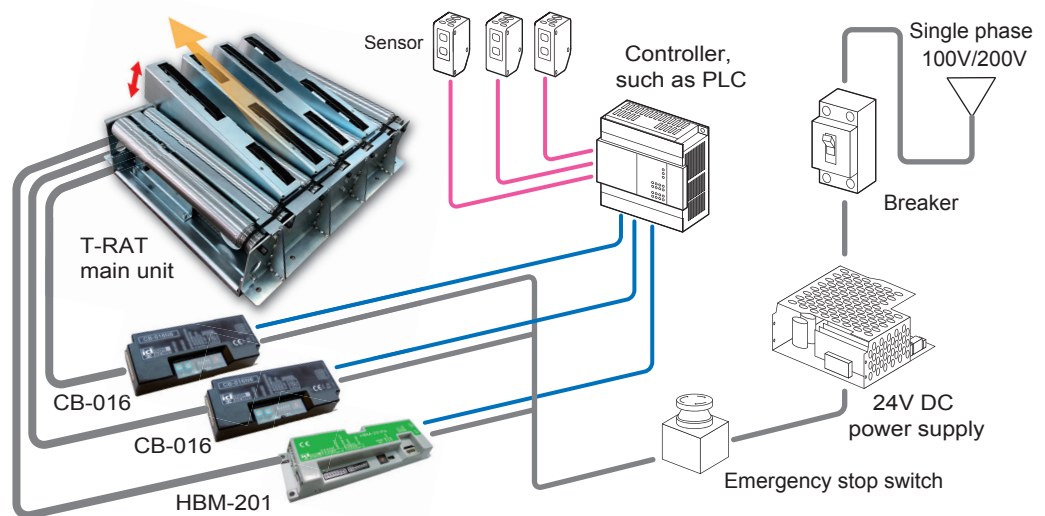
2. Procedures from installation to operation

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3. Advance preparation

Wiring image



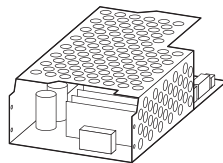
[Important] • As for the sensor input, and input/output signals of driver cards, adopt the number of inputs/outputs based on operation.

Items to be prepared by customers

Before introducing this product, prepare the following devices separately.

24V DC power supply

Power supply equipment to supply 24V DC to this product



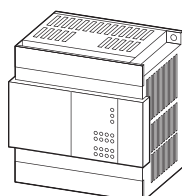
- Switching power supply (24VDC · 5A 120W)
- Rectified power
(With a rectifying capacitor, ripple rate 10% or below)
- 24VDC Battery

[Important]

- A switching power supply is recommended as the DC power supply (24VDC $\pm 10\%$) for drivers. Use a stabilized power supply that has an adequate capacity of 24VDC and 5A or higher and does not fluctuate due to load variation.
- The power supply shall have a capacity larger than the total of the MDR rated values.
- A transformer type power supply cannot be used.
- Secure a voltage of 24VDC $\pm 10\%$ at the power source terminal of a driver card.
- If the power supply capacity is the rated power of MDR the number of MDRs or smaller, the supply voltage may drop to cause failure or damage of MDRs and drivers. Be sure to use a power supply with a capacity larger than the rated power of MDR the number of MDRs.
- In addition, the power supply should not activate protection with peak current 20A, 1ms or below.
- For the power supply unit, use an insulation type switching power supply compliant with the safety standard (IEC60950-1 or UL60950-1). Do not use a non-isolation type power supply for safety reasons, since it may not conform to the radiation noise regulations.

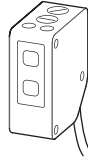
Control devices

Devices to control this product, such as PLCs



3. Advance preparation

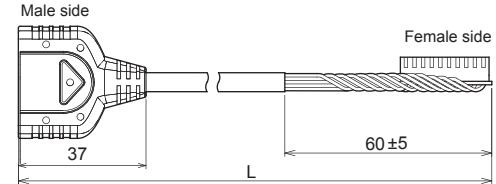
Sensors Zone sensors to check the tray, and area sensors to check loading and discharging, etc.



MDR extension cables

Necessary when the installing location of the T-RAT main unit is far from that of the driver cards

Model	Cable specifications
ACE-CBM-B0600	9P extension cable length L= 600mm
ACE-CBM-B0850	// L= 850mm
ACE-CBM-B1200	// L=1200mm
ACE-CBM-B2700	// L=2700mm



[Important] • Cables can be extended up to 3000mm including the product cable length 300mm.

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〉

- Power connector...0.5 to 1.5mm² (AWG: 20 to 14)
- Control connector...0.08 to 0.5mm² (AWG: 28 to 20)

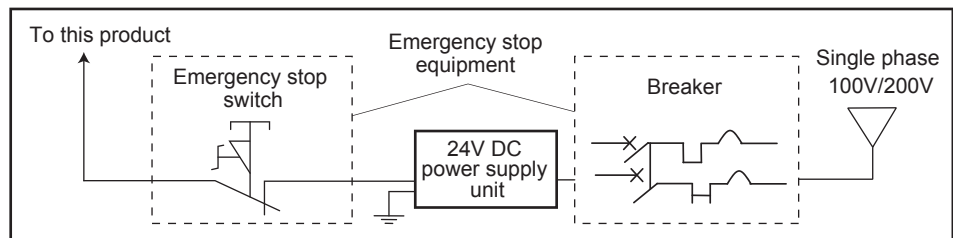
[Important] • For the current capacity of wiring materials, secure a high safety margin based on the current value in specifications.
• Longer wiring between the power supply unit and driver cards / controllers could cause the voltage to decrease, resulting in malfunction and/or damage.

Emergency stop equipment



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

Install the emergency stop equipment on the side of the DC power supply unit to which the power is supplied.



Checking the breaker

Regarding facilities where this product is incorporated, check that a breaker with appropriate capacity for the 24V DC 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.

Operation check

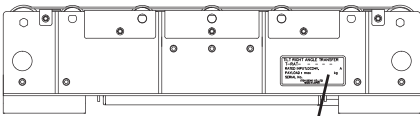
When the 24V DC power supply unit has been incorporated, check that the breaker and emergency stop switch can work properly. Perform operation following the trial operation after checking them.

- (1) Input to the DC power supply unit (single phase 100V / 200V) is securely turned ON / OFF when turning ON/OFF the breaker.
- (2) Input to this product (24V DC) is securely turned ON / OFF when turning ON / OFF the emergency stop switch.

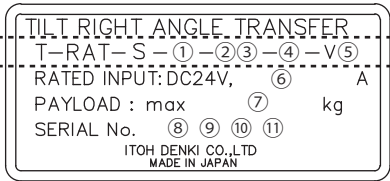
4. Product check

Checking the model

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



< Product label details >



Product model

- ① Tilt angle ② Speed type
③ Input / output signal type ④ Size ⑤ Version

Transfer capacity

- ⑥ Rated current value for the transfer MDR
⑦ Available load weight

Serial No. (YY / MM / DD Lot No.)

- ⑧ Year (last two digits) ⑨ Month ⑩ Day
⑪ Lot No. (three digits)

Model description sample

T-RAT-S-085-60N-A-V1

① Tilt angle

- 070 ... 7.0 °
- 085 ... 8.5 °
- 100 ... 10.0 °

② Speed type

- 60 ... Nominal speed of 60m/min type ※

③ Input / output signal type

- N ... NPN (driver card only for input and output)
- P ... PNP (driver card only for input and output)

⑤ Version
1

④ Size

- A ... L599mm×W499mm
(415 mm wide between frames)
- B ... L599mm×W599mm
(515 mm wide between frames)
- C ... L599mm×W699mm
(615 mm wide between frames)

※ For details, refer to Transfer speed settings (P.33), 8. Control / Operation.

Checking appearance

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

- ② Check that there is no omission and/or looseness of screws, etc.

※ If any abnormalities are found, contact the supplier immediately.

4. Product check

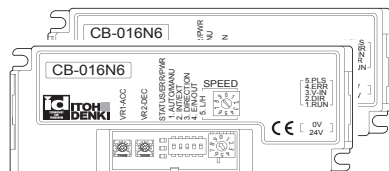
Checking accessories

Check that all the following items are included.

Driver cards

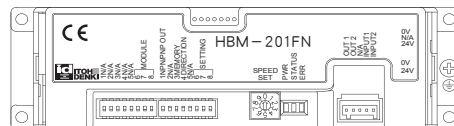
Depending on the T-RAT input and output signal type, driver cards with the NPN (N) or PNP (P) signal input are included.

For T-RAT-S-□□□-60N-□-V1



Driver card CB-016N6

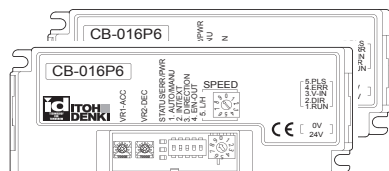
2



Driver card (for switching the transfer surface)
HBM-201FN

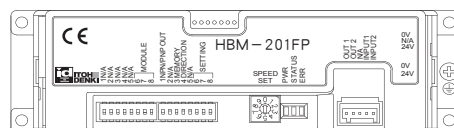
1

For T-RAT-S-□□□-60P-□-V1



Driver card CB-016P6

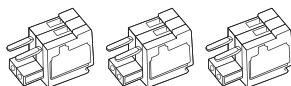
2



Driver card (for switching the transfer surface)
HBM-201FP

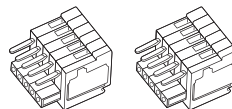
1

Common accessories



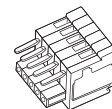
Power connector
(for CB-016 / HBM-201)
EAHB05

3



Control connector
(for CB-016)
PACB16

2



Control connector
(for HBM-201)

1



Hex. bolt with spring lock and plain washers
M8 x 20 / Hex. nut M8
(for installing the T-RAT main unit)

8 sets



Cross-recessed head SW screw
M4 x 15 / Hex. nut M4
(for securing CB-016 / HBM-201)

8 sets

5. Safety precautions

For parts names in sentences, refer to 6. Structures (P.19).

5. Safety precautions

Danger level

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.

- We explain hazardous contents that may result from existence and/or operation (including situations before and after operation) of target devices and/or facilities, using the following symbol.

 DANGER	This indicates an imminent hazardous situation that may result in severe injury or even death.
---	--

- 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.

 WARNING	This indicates a high possibility that severe injury or even death may result.
 CAUTION	This indicates a high possibility that injury, or only property damage may result.

Symbol explanation

- The type of precautions we would like you to observe is categorized using the following symbols, and explanations are added.

	This symbol indicates a reminder you should pay attention to.
	This symbol indicates operations that are prohibited.
	This symbol indicates forced operations that you should always perform.

5. Safety precautions

5-1.

General precautions



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.



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.



CAUTION



Do not apply heavy loads to this product, such as stepping on it.

Failure to follow this could result in people falling and/or malfunction.



Do not put fingers, hands, and/or clothes close to the moving parts, such as belts, rollers, or lifting sections.

Failure to follow this could result in them getting caught and/or stuck.



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.



Never remodel the product and/or driver cards.

Failure to follow this could result in serious accidents.



Make sure to attach ground wires to this product and the DC power supply unit.

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



Do not touch the product when it has just stopped operation.

Failure to follow this could result in burns.



Do not put water and/or oil on the product, and do not transfer wet and/or oily trays.

Failure to follow this could result in electric shock, and/or malfunction.



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.

5. Safety precautions

5-1.

General precautions

CAUTION



Stop operation when abnormal sound is heard during operation.

Failure to follow this could result in unexpected accidents.



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.



Turn off the power 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.



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



Securely wire each cable to connection parts.

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



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.



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.



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.



Do not unplug power and/or signal cables during operation. Also, do not run/stop this product using the power supply. (Use the signal.)

Failure to follow this could result in malfunction.



Do not forcibly rotate the MDR at times other than maintenance and inspection.

Failure to follow this could result in damage to driver cards, and/or their lifetime to be significantly shortened.



Do not turn off the power during transfer (during MDR rotation).

Failure to follow this could result in malfunction.



Do not step on this product.

Failure to follow this could result in injury, accidents, and/or damage if the MDR rotates just after the power is turned on.

5. Safety precautions

5-1.

General precautions

CAUTION



Do not turn on the power when trays are unstable.

Failure to follow this could result in injury, accidents, and/or damage due to load collapse.



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.



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

5-2.

Precautions on installation

WARNING



In principle, have two or more persons work when carrying and/or installing the product as it is a heavy load.



When hoisting this product, never enter the area under the suspended load.

When hoisting, use appropriate hoisting equipment, and pay special attention to prevent the balance of the suspended load from being lost and/or falling. Also, have only qualified workers conduct the operation. Improper hoisting could result in serious accidents.



Do not hoist this product with goods loaded.

Failure to follow this could result in objects falling.

CAUTION



When handling, wear protective equipment, such as gloves.

Since this product consists in large part of metal, careless handling could result in hands getting injured.



Make sure to use the recommended tightening torque to tighten bolts for installing the T-RAT main unit and/or fastening screws of driver cards.

Failure to follow this could result in bolts and/or screws loosening, and/or malfunction.



Check the corresponding installation direction to the loading/discharging sides before installing.

Failure to follow this could result in objects/body parts getting caught and/or stuck.

5. Safety precautions

5-2. Precautions on installation

CAUTION



Surround this product using safety fences.

Getting close to it carelessly could result in objects/body parts getting caught and/or stuck, if workers put fingers and/or clothes close to the moving parts, such as belts, rollers, or lifting sections. It could also result in them getting injured by trays popping out of conveyors.



If necessary warning/caution labels become hidden after installing fences, affix again on places where they can be seen.

5-3. Precautions on wiring

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.



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.



Securely attach connectors to the driver card connection parts.

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



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.

5-4. Precautions related to control

CAUTION



Do not change DIP switch settings for HBM-201.

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



Do not change the VR1 and VR2 values on CB-016.
(Minimum (leftmost): Factory setting)



Do not turn the driver card DIP switches using excessive force.

Failure to follow this could result in malfunction.

5. Safety precautions

5-5.

Precautions

related to operation

CAUTION



Do not forcibly move trays when they are placed on the tilt transfer belt.

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



Make sure to perform the start-up inspection before starting operation.



At the start-up inspection, wear protective equipment, such as gloves.

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



At the start-up inspection, shut off the power, and perform inspection. (excluding inspection to be performed when operating this product.)

Failure to follow this could result in injury due to unexpected operation, such as getting caught and/or stuck.



When operating this product at the start-up inspection, take appropriate measures to prevent fingers from getting stuck and/or caught in rollers.

Also, get ready to shut off the power in the event that something should happen.

Failure to follow this could result in accidents/injury by getting caught and/or stuck.



If any abnormalities are found at the start-up inspection, make sure to take countermeasures before the trial run.

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

5-6.

Precautions

on maintenance and 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.



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



At the time of maintenance and inspection, turn off the power of all connecting devices.

(excluding when adjusting the tension for tilt transfer belts)

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.



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.

5. Safety precautions

5-6.

Precautions on maintenance and inspection

CAUTION



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

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



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

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



Depending on sections and/or parts to be repaired and/or replaced, they need to be rotated and/or lifted by hand.

Pay attention not to get caught and/or stuck. Failure to follow this could result in injury.



Before the trial operation after repair/replacement, check groove positions of roller drive belts. Also, check that there are no parts you have forgotten to mount.

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



After replacing tilt transfer belts, make sure to adjust the tension.

When the belt tension is too strong, the MDR becomes overloaded, which could result in malfunction.

When the belt tension is weak, belt slipping and/or winding could result in inability to transfer.



When tilt transfer belts are running, do not touch belts and/or idlers.

Failure to follow this could result in body parts getting caught.



When tilt transfer belts are running, turn on the power only for M1: Tilt (belt) transfer.

Also, at times other than when running, make sure to turn off the power.

Failure to follow this could result in injury due to unexpected operation.



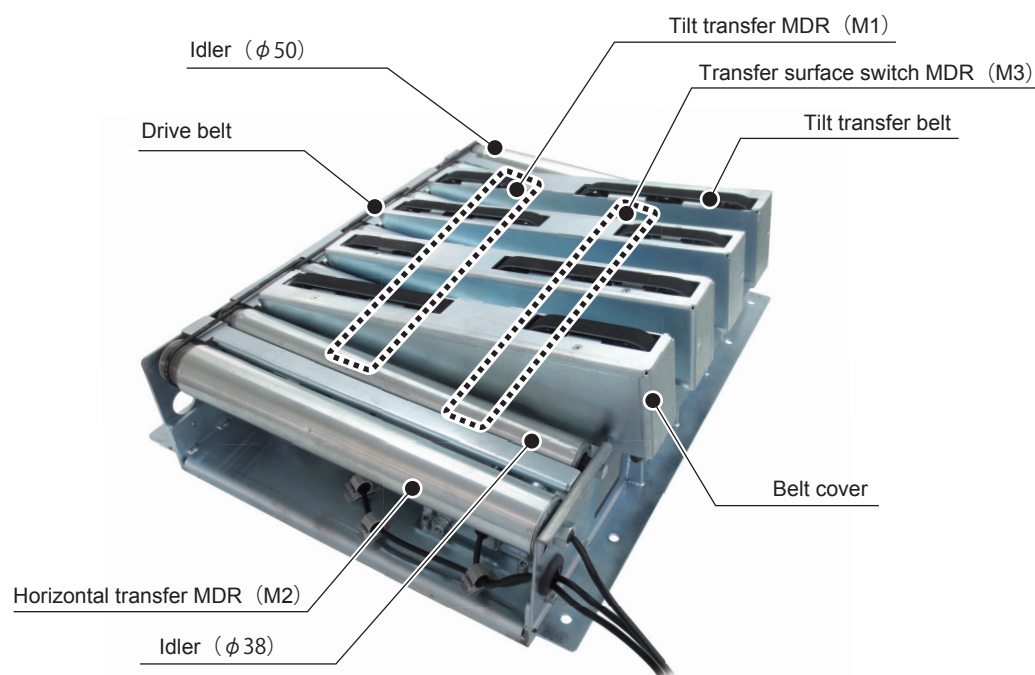
Make sure to prepare parts designated by us.

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

6. Structures

6. Structures

Structures



Product designation

Model: **T-RAT-S** - ① - ② ③ - ④ -V ⑤

① Tilt angle

070 ... 7.0°
085 ... 8.5°
100 ... 10.0°

② Speed type

60 ... Nominal speed of 60m/min type

③ Input/output signal type

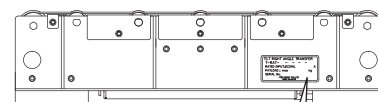
N ... NPN (driver card only for input and output)
P ... PNP (driver card only for input and output)

④ Size

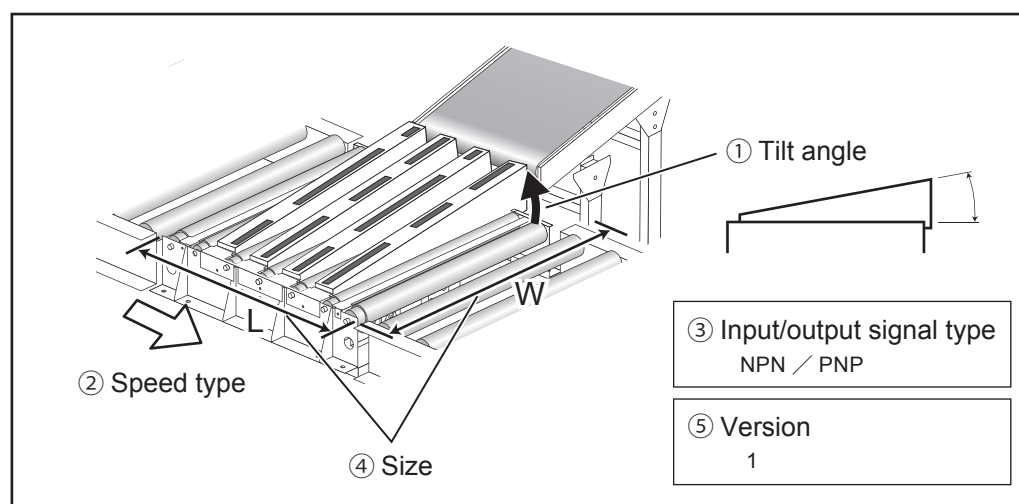
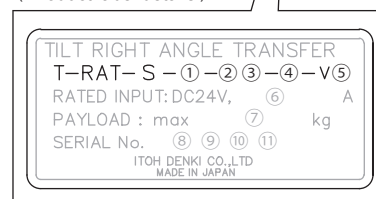
A ... L599mm×W499mm (415mm wide between frames)
B ... L599mm×W599mm (515mm wide between frames)
C ... L599mm×W699mm (615mm wide between frames)

⑤ Version

1



〈 Product label details 〉



7. Installation / Wiring

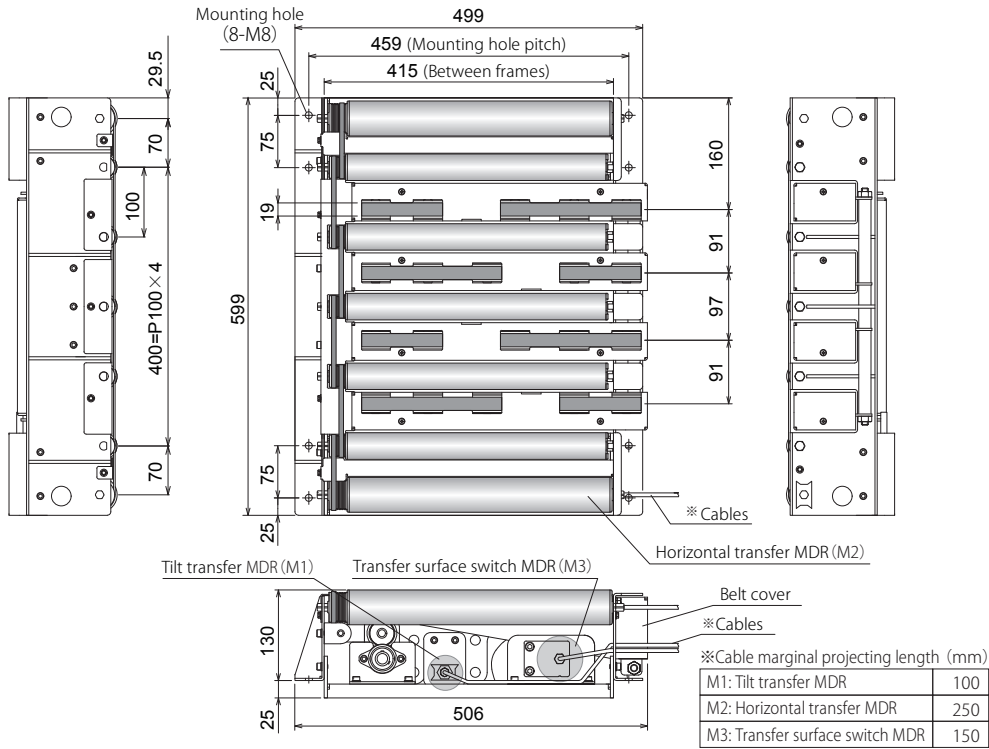
7. Installation / Wiring

7-1. Before installation

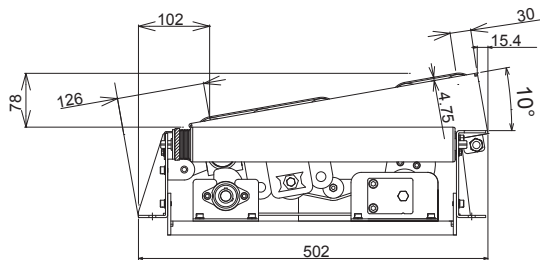
- Prepare stands, and perform frame processing in advance by reference to the mounting holes in dimensions.
 - Determine the mounting location for zone sensors to check the existence of trays, and area sensors to check loading and discharging. Then, prepare for them to be mounted.
- [Important]** Secure sufficient space to prevent the belt cover from making contact with adjacent conveyors, etc. when switching the transfer surface.

Mounting preparation for the T-RAT main unit

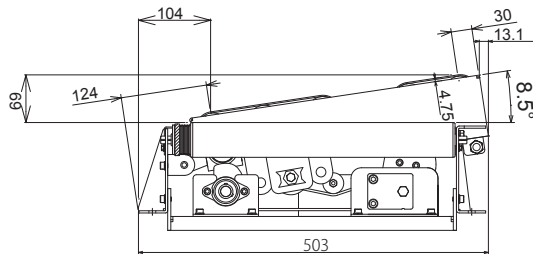
Size A
L599mm×W499mm



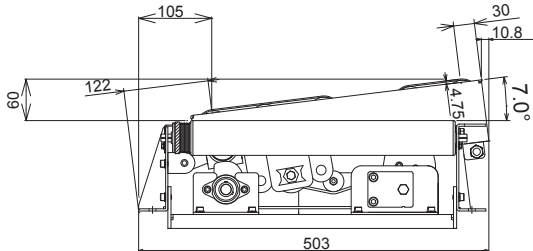
(When tilting)
(Type of tilt angle 10°)



(Type of tilt angle 8.5°)



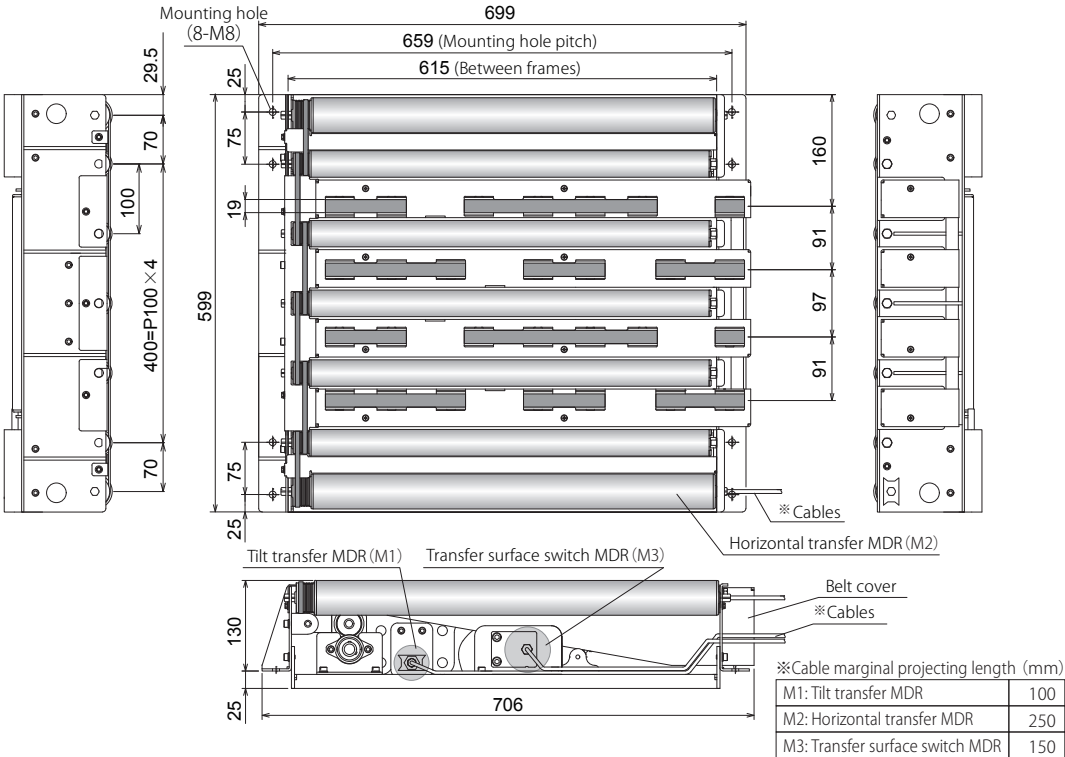
(Type of tilt angle 7°)



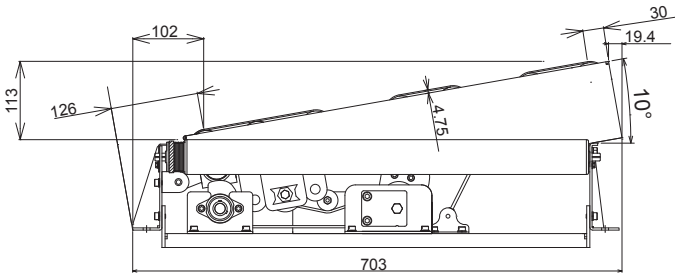
7. Installation / Wiring

Mounting preparation
for the T-RAT main unit

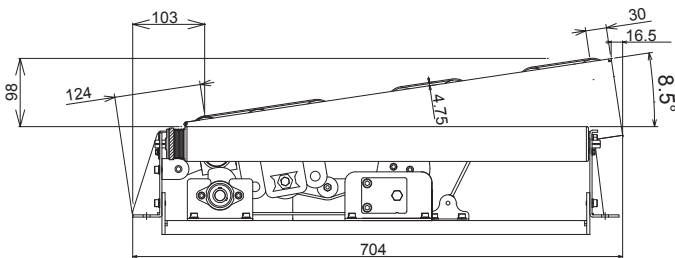
Size C
L599mm×W699mm



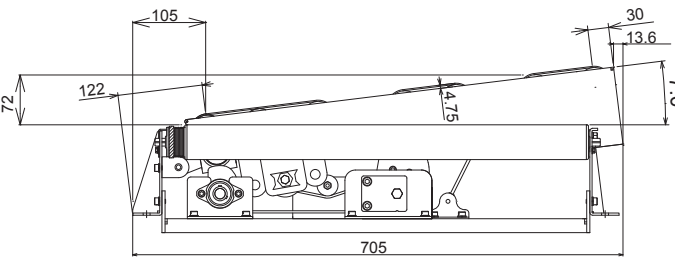
(When tilting)
(Type of tilt angle 10°)



(Type of tilt angle 8.5°)



(Type of tilt angle 7°)

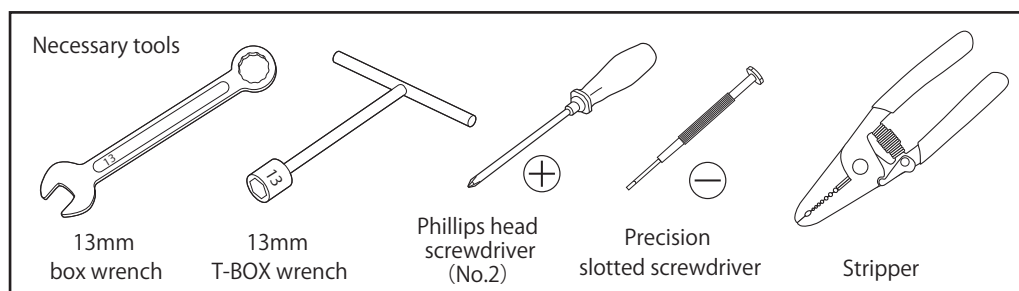


7. Installation / Wiring

7-2.

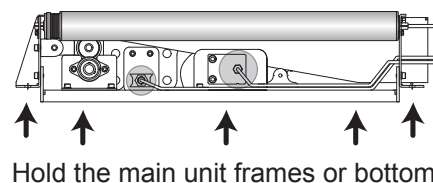
Installation

Installing the T-RAT main unit

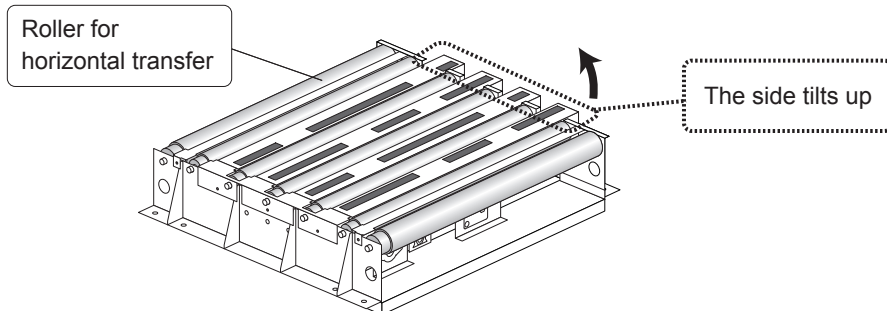


① Carry this product to the installing location.

When lifting, hold the main unit frames, and/or the bottom of this product.
Do not hold the moving parts, such as rollers, belt transfer parts, or lifting sections.



② Check the installing direction for the loading/discharging sides.



③ Use the included bolts and nuts to secure the unit on stands or frames using mounting holes.

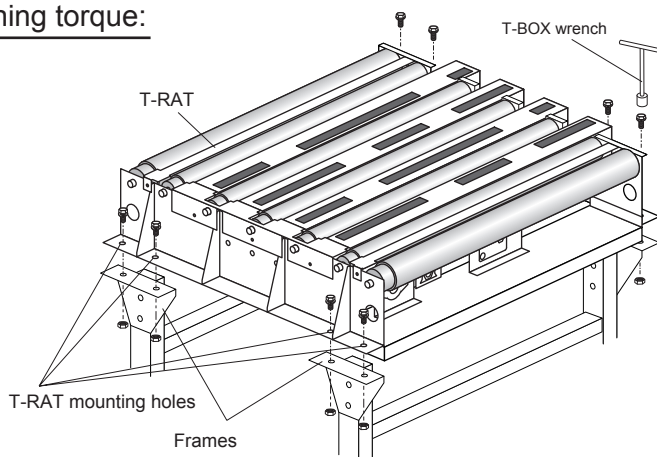
※When installing, be careful not to get fingers caught.

【Important】 Install this product in places with a mounting surface tilt (inclination) of 0.5% or less.

- Install in locations where the weight of this product and trays can be sufficiently supported.
(For the main unit weight, refer to P.53)
- The vibration level in the installation environment for this product should be 0.5G or less.
- Secure the working space for maintenance around this product.
- Observe safety regulations required for installation locations or equipment in use.

Recommended tightening torque:

12 to 15N·m



④ Adjust the roller surface level of adjacent conveyors and this product.

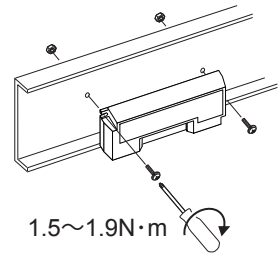
7. Installation / Wiring

Mounting driver cards

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

Recommended tightening torque:

1.5 to 1.9N·m



Mounting sensors, control devices, and power supply units

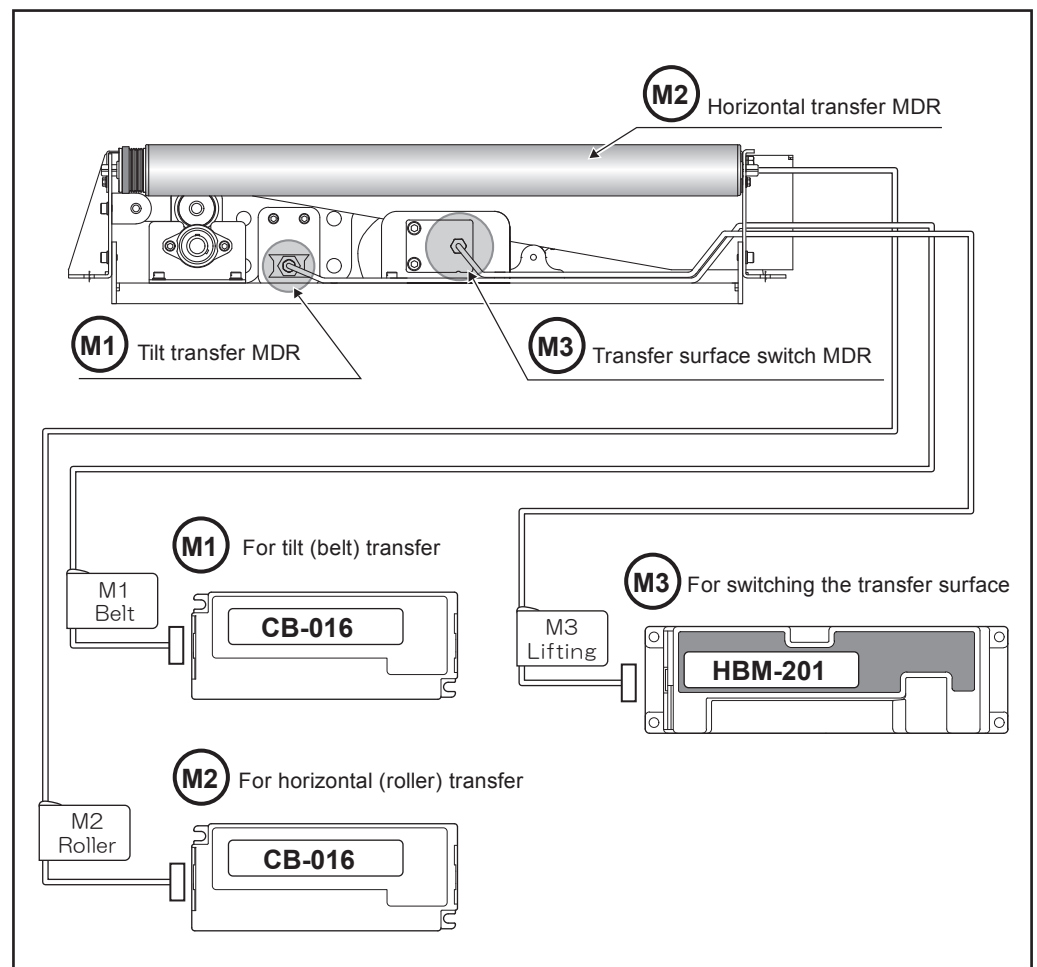
Mount customer-prepared zone sensor and area sensor for loading and discharging, as well as power supply units, and PLCs.

7-3.

Wiring

Connection between the T-RAT main unit and driver cards

- Refer to the labels for cables coming from the T-RAT main unit, and securely connect the MDR connectors and driver cards.
- When using extension cables, check the labels of the original cables, and securely connect the MDR connectors and driver cards.



7. Installation / Wiring

Wiring for
control connectors
and power connectors
[CB-016]

CB-016 (M1: for tilt transfer / M2: for horizontal transfer)

5.PLS
4.ERR
3.V-IN
2.DIR
1.RUN

0V
24V

CN2

CN1

OUT (CB-016N6 : 0V
CB-016P6 : 24V)

0-10V IN

IN (CB-016N6 : 0V
CB-016P6 : 24V)

■ Connector descriptions

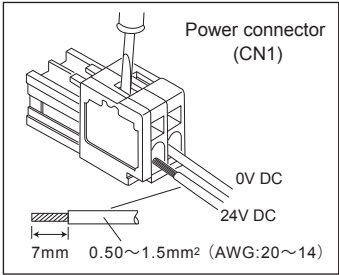
CN1 (Power)	#2	0V
	#1	24V DC

Functions			Detailed descriptions	
CN2 (Control)	#5	Output	Motor pulse output	- Outputs 2-pulse signal per rotation of the internal motor. - NPN open collector output. - Attach protection resistance so that the output is 25mA or less. - Protection resistance of 100Ω is included inside driver cards.
	#4	Output	Error signal output	- Detects MDR errors, and outputs. - Settings for normal output and error output can be specified using ON/OFF of DIP-SW1#4 - Open collector output. - Attach protection resistance so that the output is 25mA or less. - Protection resistance of 100Ω is included inside driver cards.
	#3	Analog input	MDR external speed setting	The transfer speed can be set using the voltage input of 0-10V.
	#2	Input	MDR rotation direction switching	The transfer direction can be switched.
	#1	Input	MDR RUN/STOP	Required for RUN/STOP signals.

Power connector (CN1) Connect the 24V DC and 0V DC cables to CN1 (2 pins).

[Important]

- 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: 10A)
- Do not connect the 24V DC and 0V DC cables incorrectly.
- Do not connect cables when connectors are plugged in.

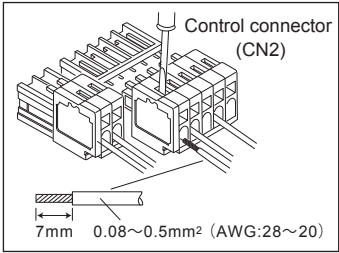


Control connector (CN2) Connect each cable to CN2 (5 pins).

※For CB-016, refer to the above, and perform wiring according to operation.

[Important]

- Use the same voltage to be input to CN2#1 (MDR RUN/STOP) and CN2#2 (MDR rotation) as the power supply voltage. (Connector capacity: 4A)



Connecting to driver cards Connect the power connector (CN1) and control connector (CN2) to driver cards.



For more details on CB-016, please download the driver card user manual from our web page.

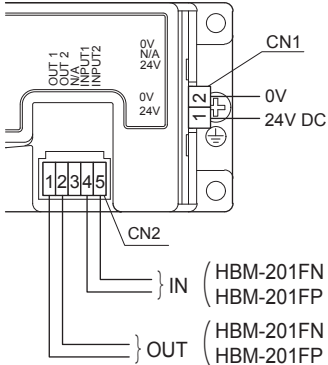
ITOH DENKI Home > Download/Support > User Manual
<http://itohdenki.co.jp/english/support/manual.html>



7. Installation / Wiring

Wiring for
control connectors
and power connectors
[HBM-201]

HBM-201 (M3: for switching the transfer surface)



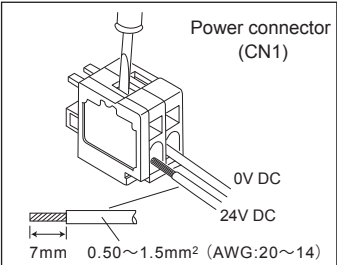
■ Connector descriptions

CN1 (Power)	#2	0V
	#1	24V DC

		Functions	Detailed descriptions	
CN2 (Control)	#5	Output	Tilt run input	• Tilt and horizontal transfer surfaces are switched using signal input • Teaching settings can be performed when both #4 and #5 are ON
	#4	Output	Horizontal run input	
	#3	—	Unused	
	#2	Input	Tilt standby output	• Teaching has not completed when both #1 and #2 are ON (when the power is turned on) • Transfer surfaces are being switched, and teaching is in operation when both #1 and #2 are OFF • Open collector output
	#1	Input	Horizontal standby output	

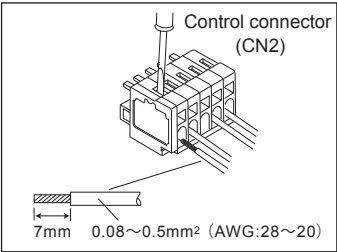
Power connector (CN1) Connect the 24V DC and 0V DC cables to CN1 (2 contacts).

- [Important]**
- 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: 10A)
 - Do not connect the 24V DC and 0V DC cables incorrectly.
 - Do not connect cables when connectors are plugged in.



Control connector (CN2) Connect the above four cables.

- [Important]**
- Use the same voltage to be input to CN2#1 as the power supply voltage. (Connector capacity: 4A)



Connecting to driver cards Connect the power connector (CN1) and control connector (CN2) to driver cards.



Teaching

Teaching is the operation to perform the initial settings of transfer surface (horizontal/tilt) positions by making the tilt transfer surface move upward and downward using the signal input from driver cards, after the power is turned on.

7. Installation / Wiring

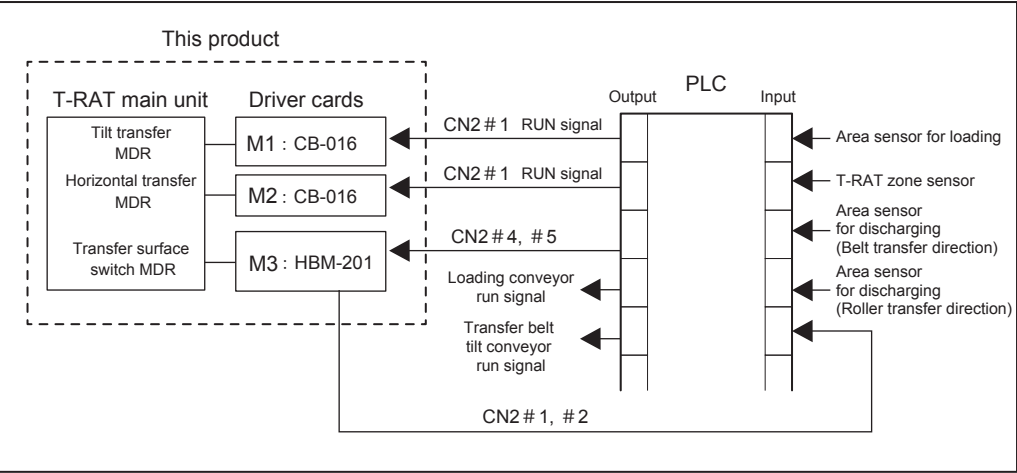
Connecting to
power supply units

The power is supplied to driver cards from the power connector (CN1).
Connect customer-prepared power cables of zone and area sensors for loading and discharging.

Connecting
signal cables of
driver cards/sensors
to PLCs

Connect signal cables of driver cards to controllers, such as PLCs.
Connect customer-prepared signal cables of zone and area sensors for loading and discharging.

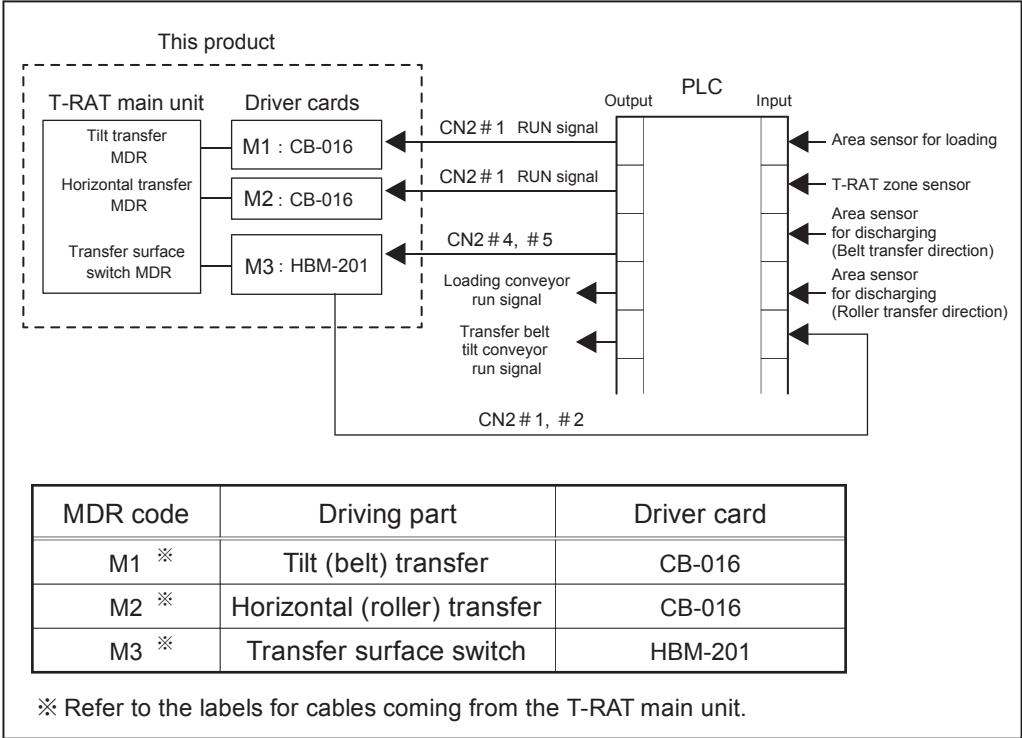
[Important] The following is an example. For input and output of each signal, perform wiring according to your operation.



8. Control / Operation

8. Control / Operation

Device configuration
image



8. Control / Operation

8-1. Setting driver cards

Setting driver cards for tilt (belt) transfer / horizontal (roller) transfer [CB-016]

Setting the transfer direction

Check the T-RAT main unit installation direction and the transfer direction, and set SW1#3 on CB-016.

〈 T-RAT transfer direction 〉

V-ribbed pulley

SW1

#	1	2	3	4	5
	ON	OFF	OFF	OFF	ON

		SW1 # 3	
		ON	OFF
		1 2 3 4 5	1 2 3 4 5
CN2#	1 2 3 4 5	CW	CCW
CN2#	1 2 3 4 5	CCW	CW

Set driver cards for tilt transfer (M1) and horizontal transfer (M2), respectively.

Transport setting example

Roller transfer (horizontal transfer)

Tilt (diverting) conveyor

Belt discharging (Tilt transfer)

V-ribbed pulley

Tilt transfer MDR cable side (M1)

Horizontal transfer MDR cable side (M2)

Rotation direction		CCW	→	CCW
SW1#3		OFF		OFF
CN2 #2		OFF		OFF
CN2 #1		ON		ON

Roller loading	Belt discharging
Horizontal transfer MDR M2	Tilt transfer MDR M1

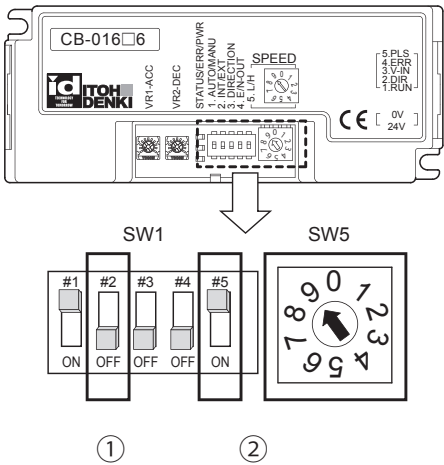
8. Control / Operation

Setting the transfer speed

There are two types of speed settings: the internal speed setting to change the speed using switches on the driver card, and the external speed setting to change the speed by inputting the analog voltage to CN2#3.

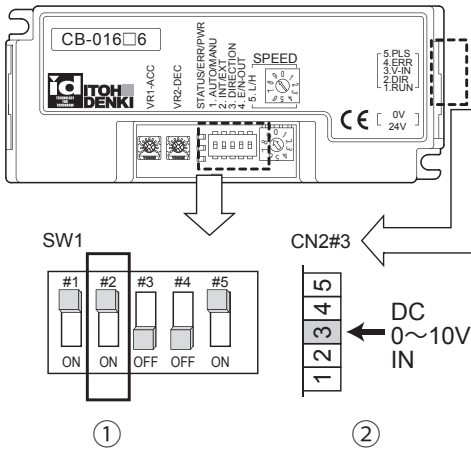
Internal speed setting

- ① Turn OFF SW1#2 on the driver card CB-016 for tilt transfer and horizontal transfer.
- ② Set SW1#5 and SW5 on the driver card CB-016 for tilt transfer and horizontal transfer.



External speed setting

- ① Turn ON SW1#2 on the driver card CB-016 for tilt transfer and horizontal transfer.
- ② Input the voltage to CN2#3 on the driver card CB-016 for tilt transfer and horizontal transfer.



- Set driver cards for tilt transfer (M1) and horizontal transfer (M2), respectively.
- The speed can be changed even during horizontal transfer/tilt transfer (when RUN signal is being input).
- For the setting speed, refer to the table below.

(m/min)		Speed accuracy: ±3%																			
		SW1#5 : ON										SW1#5 : OFF									
SW5		9	8	7	6	5	4	3	2	1	0	9	8	7	6	5	4	3	2	1	0
M1 For tilt transfer (belt) 〔Nominal speed of 17m/min type〕	Setting	17.4	15.9	15.2	14.5	13.7	13.0	11.6	10.9	10.1	9.4	8.7	8.0	7.2	6.5	5.8	5.1	4.3	3.6	2.9	2.2
	Rating	15.0	15.0	15.0	14.5	13.7	13.0	11.6	10.9	10.1	9.4	8.7	8.0	7.2	6.5	5.8	5.1	4.3	3.6	2.9	2.2
M2 For horizontal transfer (roller) 〔Nominal speed of 60m/min type〕	Setting	61.7	56.6	54.0	51.4	48.9	46.3	41.2	38.6	36.0	33.4	30.9	28.3	25.7	23.1	20.6	18.0	15.4	12.9	10.3	7.7
	Rating	53.5	53.5	53.5	51.4	48.9	46.3	41.2	38.6	36.0	33.4	30.9	28.3	25.7	23.1	20.6	18.0	15.4	12.9	10.3	7.7

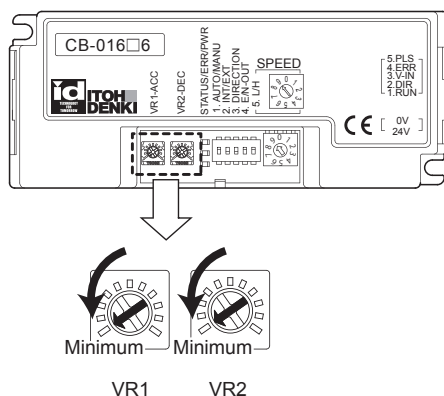
- Values in “Setting” indicate the speed when trays are not placed on belts and rollers.

- [Important]**
- During operation, the transfer speed may not reach the specified value depending on ambient temperature. Perform running operation thoroughly.
 - Values described above may differ from the actual transfer speed depending on the weight, material, and/or shape of trays.

8. Control / Operation

Setting VR1 / VR2

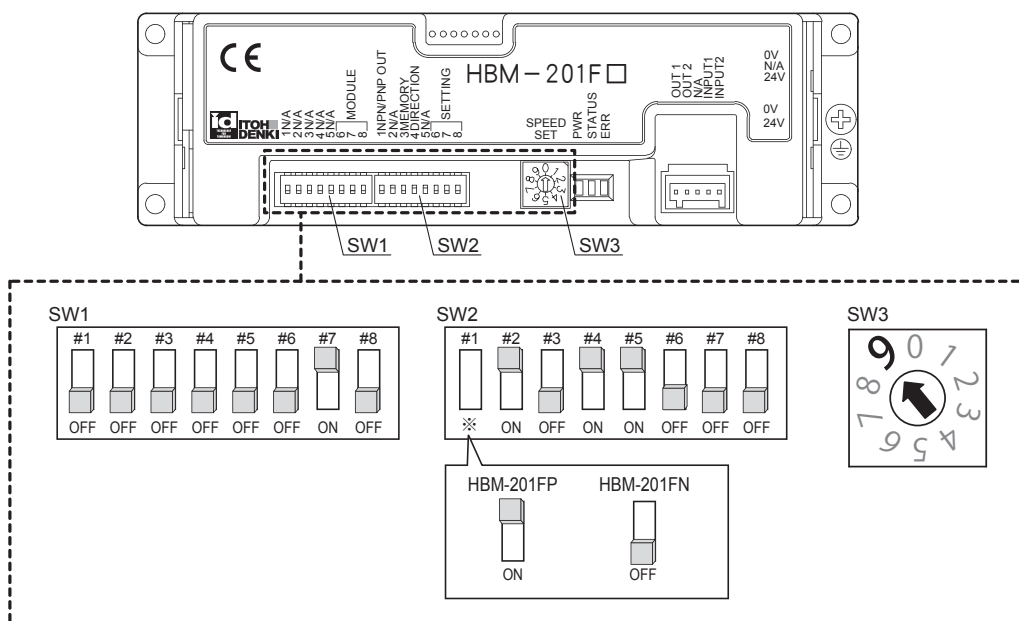
Check that both values on VR1 / VR2 have been set to the minimum.
(The minimum value is set under the factory setting.)



Setting driver cards for switching the transfer surface [HBM-201]

Check that the DIP-SW settings have been set as follows.

(For HBM-201, they have been already set at the factory setting.)



⚠ CAUTION

- Do not change the DIP-SW settings on HBM-201.
Failure to follow this could result in malfunction, and/or accidents due to unexpected operation.

8. Control / Operation

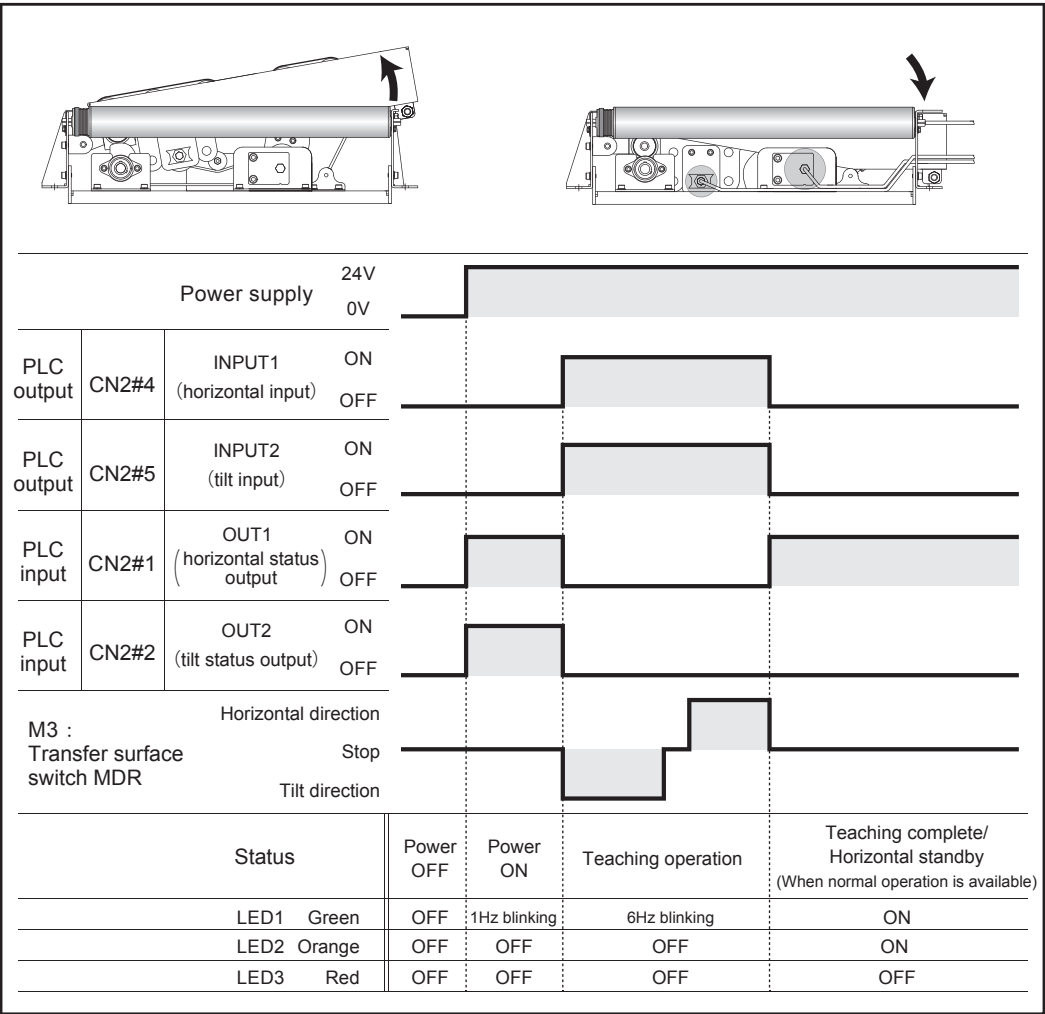
8-2.
Control (program)

Initial setting
(teaching setting)
[M3 : HBM-201]

Perform the teaching setting to specify the transfer surface (horizontal/tilt) positions after the power is turned on.

- [Important]**
- If teaching has not been set, the transfer surface cannot be switched.
 - During teaching operation, do not load trays on the T-RAT.

Teaching operation



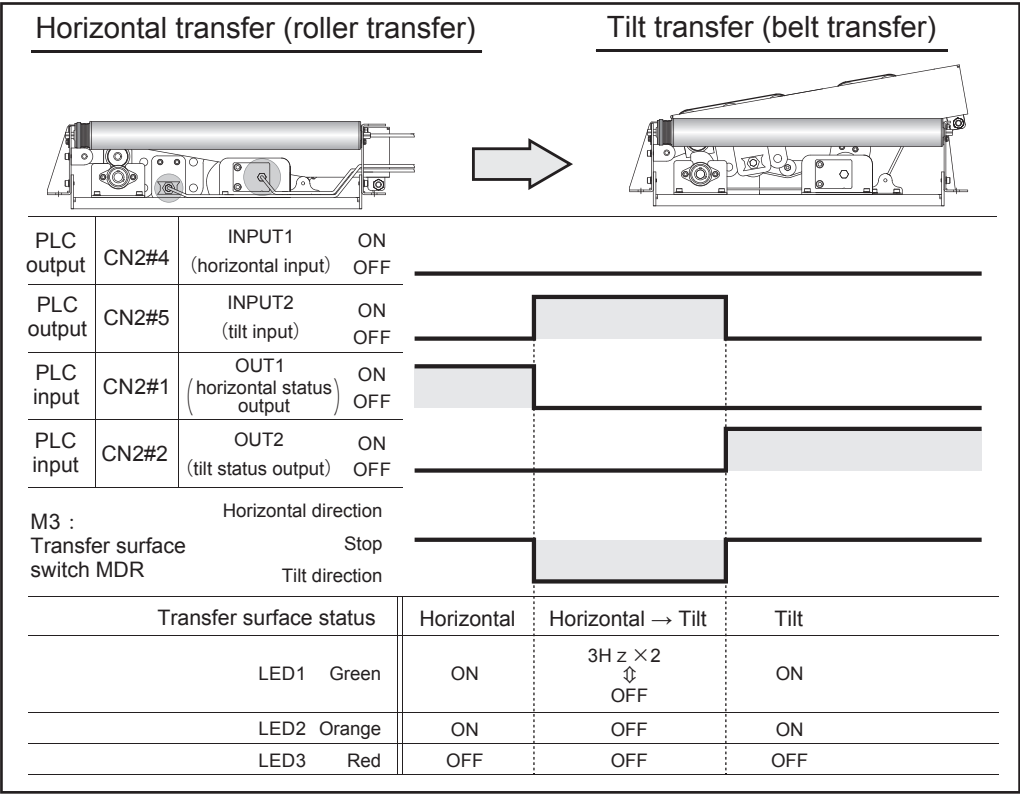
※When teaching fails, both CN2#1 (OUT1) (horizontal status output) and CN2#2 (OUT2) (tilt status output) are turned ON, which is the same status as when the power is turned on.
In such cases, perform teaching operation again.

8. Control / Operation

Switching the transfer surface
[M3 : HBM-201]

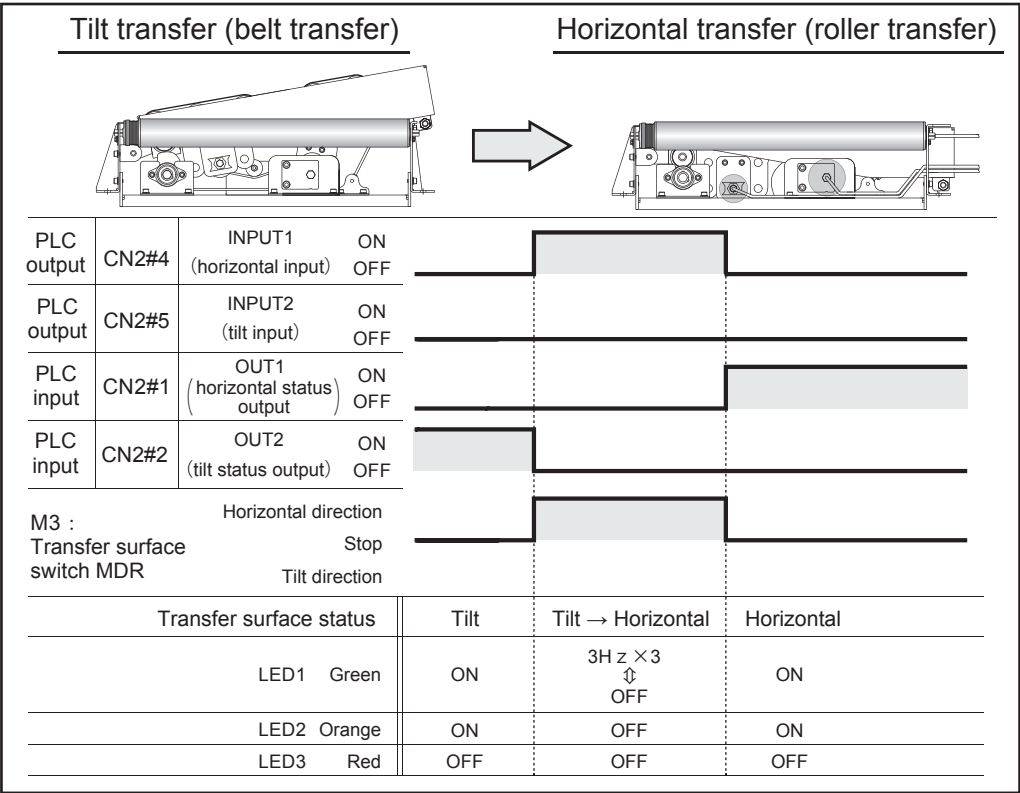
Horizontal transfer
→ Tilt transfer

When teaching is complete, the transfer surface can be switched by inputting the signal to CN2#4 and CN2#5.



※If the signal input stops when the transfer surface is being switched, operation will be interrupted, and the signal output from both CN2#1 and #2 will stop. When inputting the signal again, operation restarts.

Tilt transfer
→ Horizontal transfer

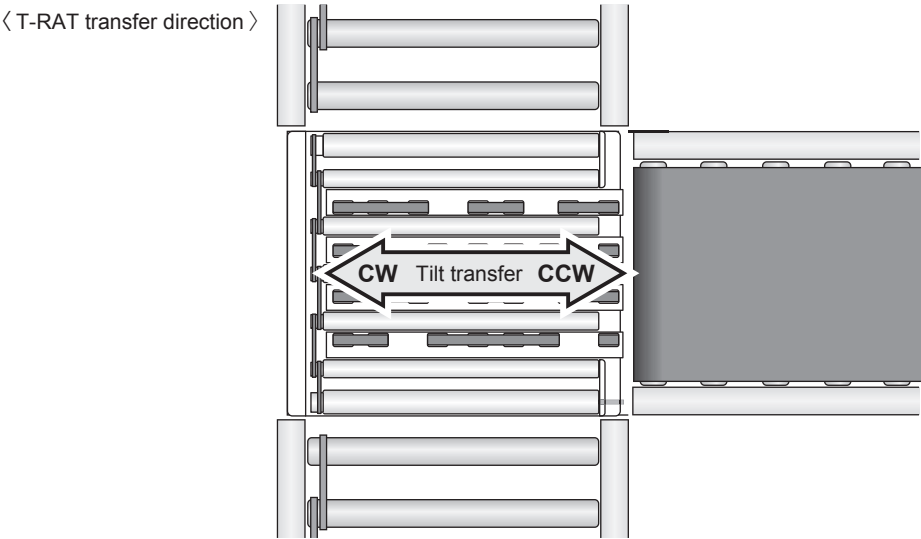


※If the signal input stops when the transfer surface is being switched, operation will be interrupted, and the signal output from both CN2#1 and #2 will stop. Operation restarts by re-input signal.

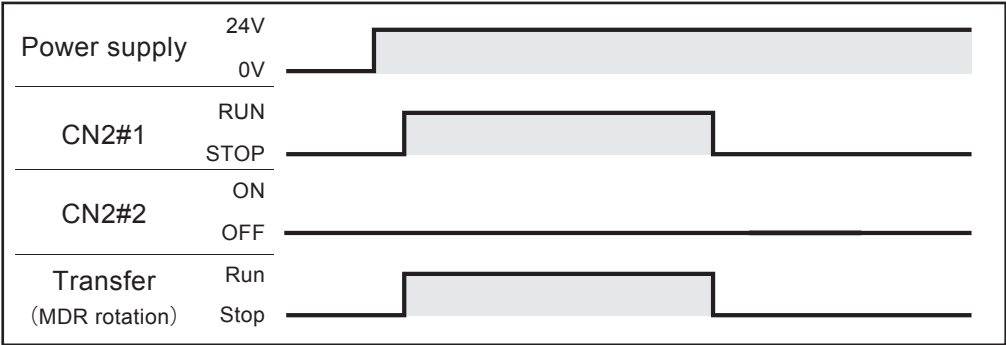
8. Control / Operation

Tilt transfer
[M1 : CB-016]

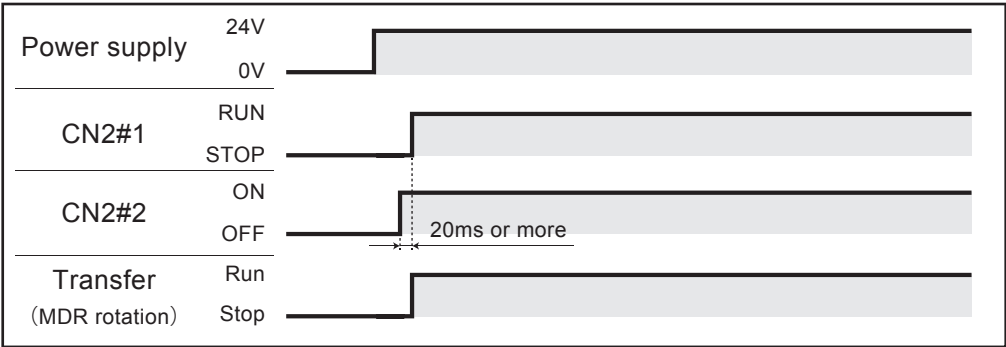
Transfer (Run) / Stop operation for the tilt transfer can be performed using the signal input to CN2 on [M1: CB-016].



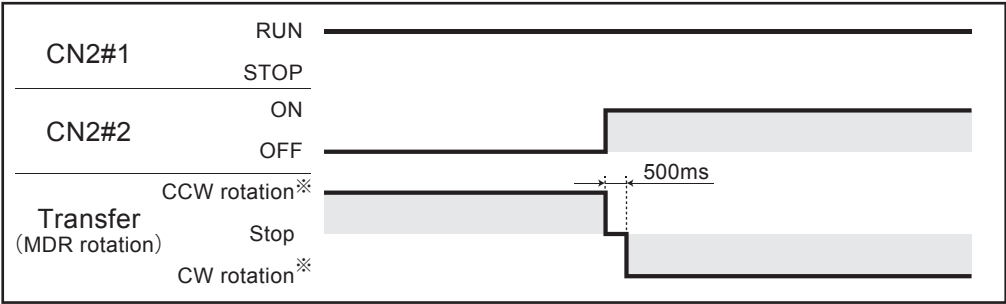
Transfer/Stop
in the CCW direction※



Transfer/Stop
in the CW direction※



When switching the
transfer direction
during transfer

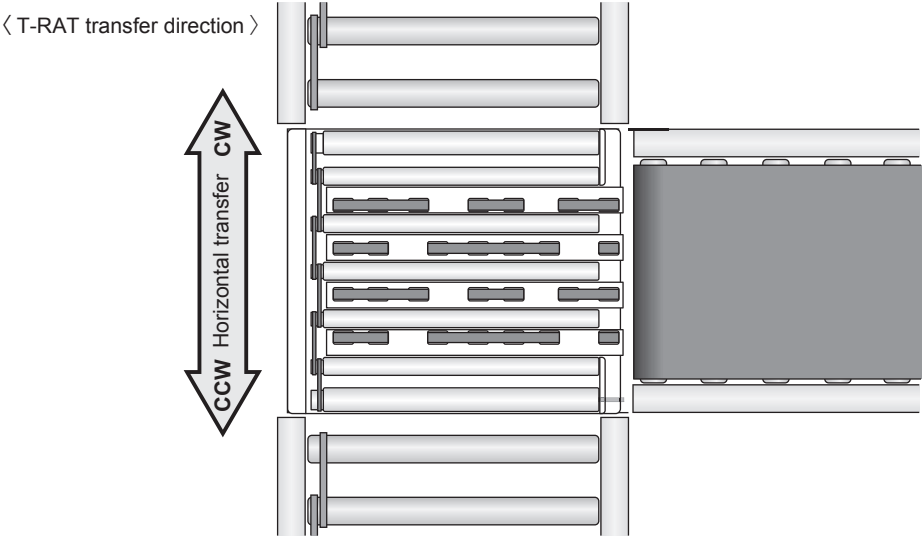


※ When SW1#3 is OFF (factory setting). When it is ON, transfer reversely.

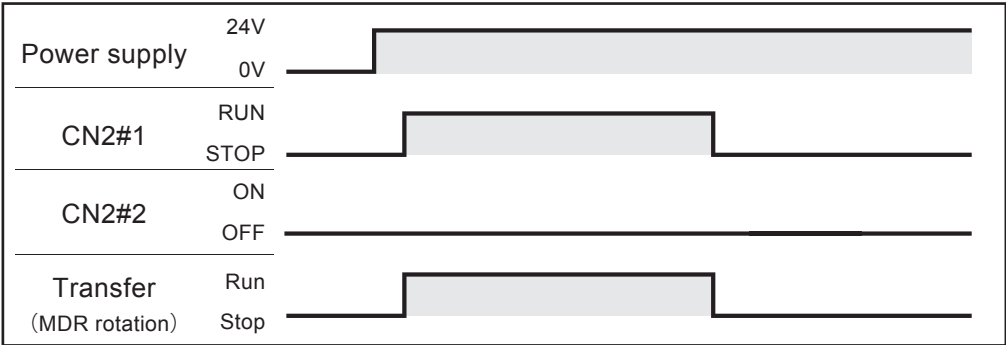
8. Control / Operation

Horizontal transfer
[M2 : CB-016]

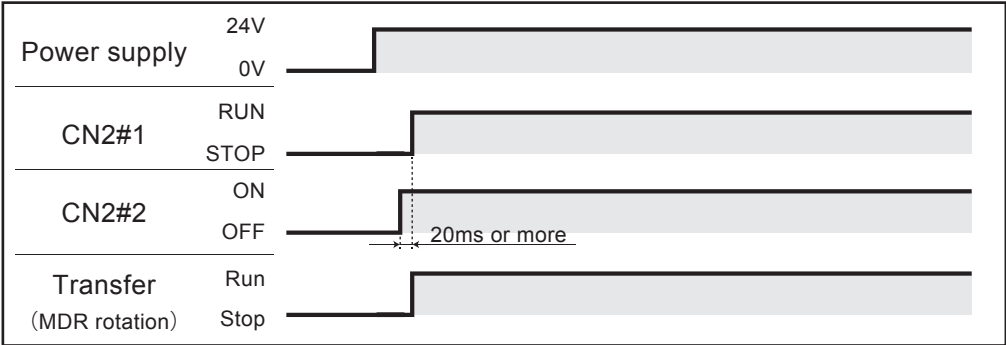
Transfer (Run)/Stop operation for the Horizontal transfer can be performed using the signal input to CN2 on [M2: CB-016].



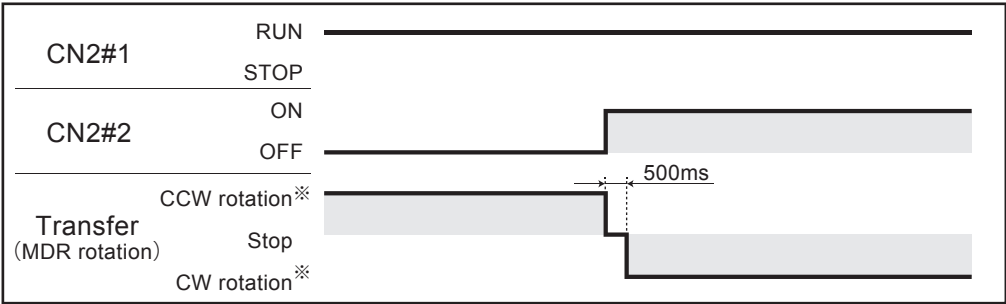
Transfer/Stop
in the CCW direction※



Transfer/Stop
in the CW direction※



When switching the
transfer direction
during transfer



※ When SW1#3 is OFF (factory setting). When it is ON, transfer reversely.

8. Control / Operation

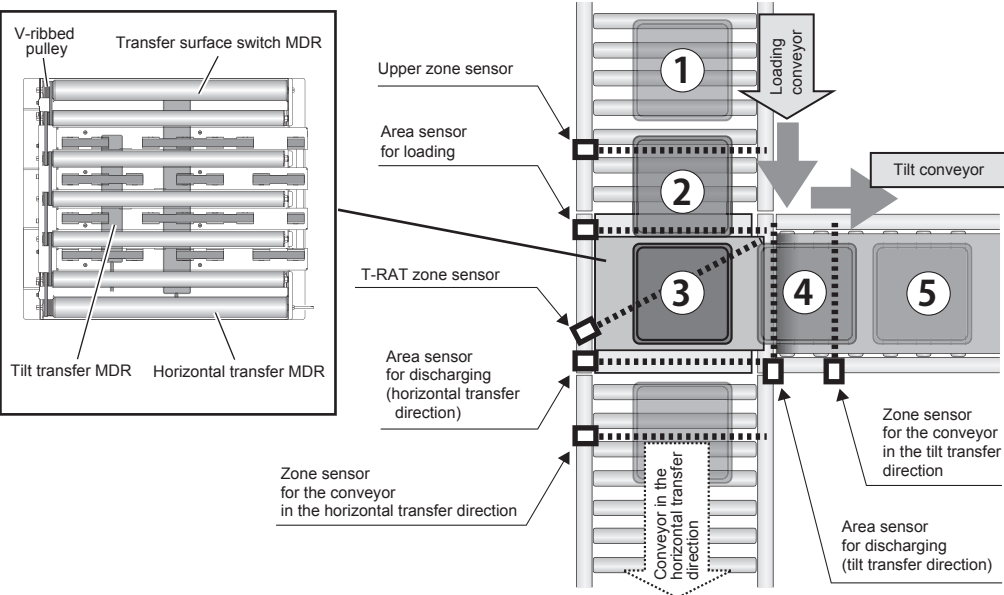
Workflow from horizontal transfer load to tilt transfer discharge (program example)

Basic operation (example)

【Important】 Do not carry in by horizontal transfer MDR while the signal from CN2#2 on HBM-201 is output.
Failure to follow this could result in damage to trays, and malfunction.

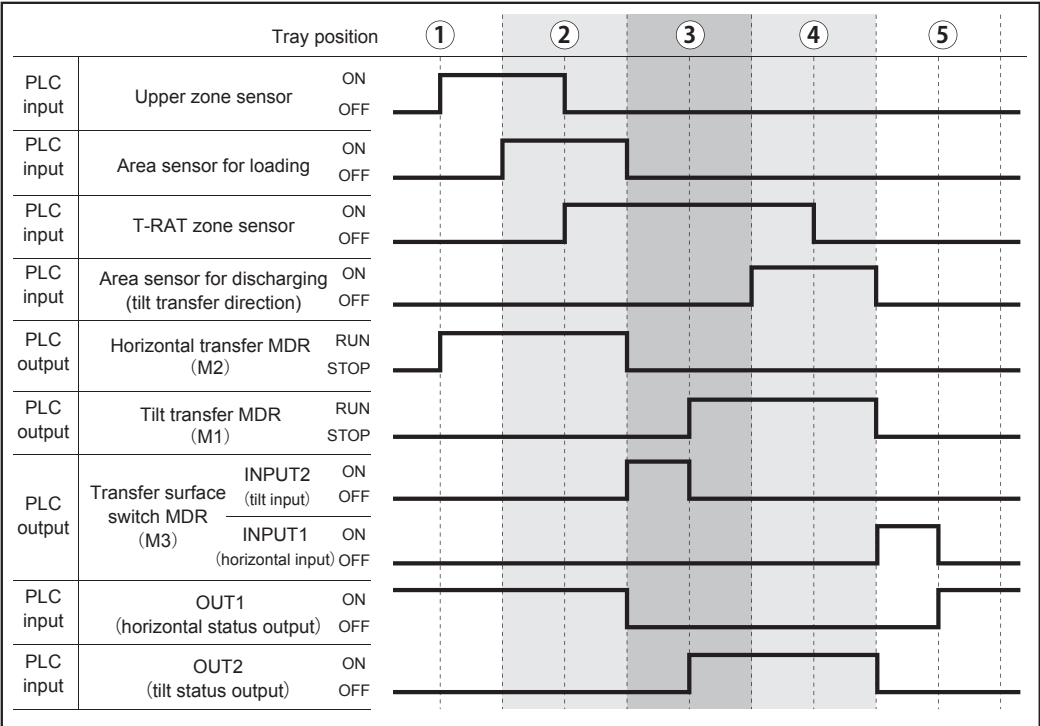
The following time chart is an example.
When in use, control the number of sensors, and/or determine how to place/control sensors depending on operation.

When loading by the horizontal transfer, discharging by the tilt transfer, and standing by in the horizontal transfer status



Time chart example

〈 About area sensors for loading / discharging 〉
These sensors have been installed in order to precisely judge the loading and discharging of trays. Loading is judged as complete at the falling edge of the area sensor for loading, and discharging is judged as complete at the falling edge of the area sensor for discharging.



※ It is assumed that driver switches are used based on the initial settings.

8. Control / Operation

8-3. Before operation

Start-up inspection

Items to check
before turning on the power

To prevent accidents and/or damage to devices during operation, refer in advance and before operation to the below, and check the safety.

Turn off the power of all connected devices, and perform the following inspection, taking necessary measures.

- 【Important】**
- Turn off the power, wait a sufficient amount of time, and discharge electricity inside the DC power supply equipment.
 - Post warning labels so as to prevent unauthorized persons from turning on the power.

Parts to be inspected	Inspection items	Description of measures
Secured positions of the T-RAT main unit	Screw looseness	Re-tighten screws
Dedicated driver cards	Damage, deformation	Contact the supplier
	Screw looseness on secured positions	Re-tighten screws
	Mounting failure for driver cards and connectors	Correctly mount connectors
	Damage to cables/Wiring failure	Perform wiring correctly
Idlers for horizontal transfer	External abnormalities, such as scratches or breakage	Refer to P.45 9-2. Before replacement work
MDR for horizontal transfer	External abnormalities, such as scratches, dents, or breakage	
Roller drive belts for horizontal transfer	Cracks, looseness, wear on the surface	
Tilt transfer belt	Cracks, looseness, wear on the surface	
Others	Parts deformation, damage	Contact the supplier
	Cable damage	

Items to check
after turning on the power

After completing measures to prevent any signal of controllers, such as PLCs, from entering driver cards, perform inspection, and take measures as below. Manually input the signal according to inspection contents.

- 【Important】**
- After completing measures to prevent fingers from getting stuck and/or caught in rollers during transfer switching, and/or transfer operation, perform inspection.
 - Take safety measures, such as getting ready to shut off the power in the event that something should happen.

Parts to be inspected	Inspection items	Description of measures
Dedicated driver cards	Abnormal temperature rise	Contact the supplier
	Error check with LED display <Normal LED display after the power is turned on> Judged as errors if the LED display is other than that below.	Check error contents, and eliminate the causes.
	CB-016 HBM-201 LED1 (green) ON LED2 (red) OFF LED1 (green) ON LED3 (red) OFF	※For driver card LED display and error countermeasures, refer to 9-1. Driver card LED display and error countermeasures (P.43).
Idlers for horizontal transfer	Abnormal sound Rotation failure	Refer to P.45 9-2. Before replacement work
MDR for horizontal transfer	Abnormal sound	
	Decrease from the specified speed Abnormal temperature rise	
MDR for tilt transfer	Abnormal sound	Contact the supplier
	Decrease from the specified speed Abnormal temperature rise	
Transfer surface switch MDR	Abnormal sound	
	Abnormal temperature rise	
Others	Leakage from equipment	Check grounding on equipment, perform grounding

8. Control / Operation

8-4.
Trial run

Points to be checked
after maintenance
and inspection

- Check below before the trial run.
- When the MDR for horizontal transfer and/or idlers have been replaced, check that the drive belts have been mounted in the correct groove positions.
 - Check all parts are installed.

Performing the trial run

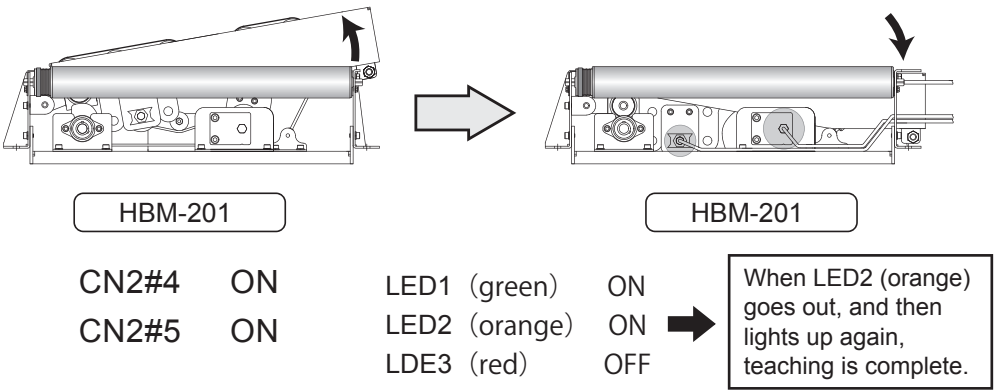
When the start-up inspection has finished, perform the trial run with careful attention to the following points, and check that operation is correctly performed.

- 【Important】**
- Check that other devices around the product will not operate. 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.

- ① Turn on the power to each driver card.
- After the power is turned on, the LED display are indicated as below.

CB-016		HBM-201	
LED1 (green)	ON	LED1 (green)	ON
LED2 (red)	OFF	LED2 (orange)	OFF
		LDE3 (red)	OFF

- ② Input the signal to CN2#4 and #5 on HBM-201, and perform teaching.



※When teaching fails, LED2 (orange) will not light up again.
In this case, perform teaching operation again.

- ③ After teaching is complete, operate several times without using trays, and check that there is no abnormal operation.

【Important】 During operation, the transfer speed may not reach the specified value depending on ambient temperature.
Perform running operation thoroughly.

9. Maintenance and inspection

9. Maintenance and inspection

9-1. Driver card LED display and error countermeasures

Checking the driver card status

If errors occur with this product, identify the cause of errors, and perform recovery work.

LED display explanation

Identify the cause of errors by checking LEDs, and error signal output on driver cards, and restore the product.

 : ON

 : Blinking (1Hz)

 : Blinking (6Hz)

 : OFF

[CB-016] for horizontal transfer / tilt transfer

Errors can be checked by LED1 (green), LED2 (red), and signals from CN2#4.

- [Important]**
- When error signals have been released using CN2#1 (RUN / STOP), the T-RAT instantly starts up when inputting RUN.
 - When the power supply voltage is dropped to 8.5 V or less, an operation when the power is shutdown or an unexpected operation may be occurred.
 - To restart the T-RAT, switch the ON→OFF→ON / OFF→ON →OFF / RUN→STOP→RUN signals at intervals of 100ms or more.

Error details

[A] : Automatic recovery setting (SW1#4 OFF <factory setting>) / **[M]** : Manual recovery setting (SW1#4 ON)

LED1 (Green) LED2 (Green)	CN2#4 (Error signal)		Causes	How to release error signals	Recovery operation
	[A]	[M]			
 	Output	Open	(Normal operation)	—	
 	Open	Open	No power supply	Supply 24V DC	Refer to P.27 Wiring for control connectors and power connectors
	Open	Output	Damage to driver cards	Turn off the power, and replace the driver card	Refer to P.26 Mounting driver cards
 	Open	Output	Thermal error Thermal protection has started operation due to a temperature rise of driver cards or MDR	When one minute has elapsed after decreasing to the recovery temperature, the error signal is released, and the unit starts up instantly	
				[A] After decreasing to the recovery temperature, the error signal is released using ON→OFF→ON or OFF→ON→OFF on CN2#2	The unit starts up using RUN→STOP→RUN on CN2#1 The unit starts up within one minute
				After decreasing to the recovery temperature, release the error signal, and start up the unit using RUN→STOP→RUN on CN2#1	
				[M] After decreasing to the recovery temperature, release the error signal using ON→OFF→ON or OFF→ON→OFF on CN2#2	Start up the unit using RUN→STOP→RUN on CN2#1
 	Open	Output	Connector disconnected	Turn off the power, and connect the connector	Refer to P.26 7-3. Wiring
 	Open	Output	MDR disconnection	Turn off the power, and replace the MDR	Refer to P.45 9-2. Before replacement work
	Open	Output	Lock error MDR has been locked, and four seconds have elapsed	Release the error signal, and start up the unit using RUN→STOP→RUN on CN2#1	
	Open	Output	Low voltage error Power supply voltage is 15V or less	A power supply voltage of 18V or more is secured	
				After securing the power supply voltage of 18V or more, release the error signal, and start up the unit using RUN→STOP→RUN on CN2#1	
				[M] After securing the power supply voltage of 18V or more, start up the unit using ON→OFF→ON or OFF→ON→OFF on CN2#2	Start up the unit by RUN→STOP→RUN on CN2#1

Errors will be also released when the power is OFF (for two seconds or more).

9. Maintenance and inspection

[HBM-201] for switching the transfer surface

Even if inputting the signal to CN2#4 and #5, but the signal output from CN2#1 and #2 does not change, the following errors have been assumed to occur. Errors can be distinguished by the LED display.

Error details

LED1 (green)	LED3 (Red)	Description	Causes	Recovery conditions	Recovery operation
		Stop (signals not input)	(Normal operation)	—	—
3Hz blinking×3 ⇕ OFF for 480ms		When operating on a tilted surface			
3Hz blinking×2 ⇕ OFF for 480ms		When operating on a horizontal surface			
		During teaching operation			
		No teaching setting	Teaching setting incomplete	Teaching setting complete	Refer to P.35 Initial setting (teaching setting) [HBM-201]
		Thermal error	Driver card temperature is 85°C or more, or MDR temperature is 110°C or more	Driver card temperature is 75°C or less, and MDR temperature is 95°C or less	Take one of among the following measures : • Turn CN2#4 (INPUT1) OFF and ON
		MDR not connected	MDR connectors removed	Connect the MDR connectors	• Turn CN2#5 (INPUT2) OFF and ON
		Lock error	MDR has been locked during the transfer surface switching	Eliminate the cause of lock	• Turn CN2#4 (INPUT1) and CN2#5 (INPUT2) OFF and ON
		Low voltage error	The voltage has been 17V or less for one second, or the power connector is connected improperly	Supply a voltage of 17V or more, or properly connect the power connector again	
		Fuse blown	Driver card fuse blown	Replace the driver card	Refer to P.26 Mounting driver cards

LED2 (orange) details

LED2 (orange)	Description
	No teaching setting/During teaching operation/When the transfer surface is being switched
	Horizontal surface standby/Tilted surface standby

9. Maintenance and inspection

9-2. Before replacement work

- Prepare parts to be replaced with in advance.
- For repair/replacement of parts other than those mentioned below, contact us.

If any abnormalities are found, such as damaged parts, immediately take actions, including replacement with new parts.

Repair/replacement parts list

Replacement parts		Model of replacement parts
Roller for horizontal transfer	Horizontal transfer (roller) MDR	PM500FE-60-377-D-024-JW-VG
	Idler (ϕ 38)	ARI-38-374-JX-VG-OS for T-RAT
	Idler (ϕ 50)	ARI-50-377-JH-VG
Roller drive belt	drive belt (ϕ 38- ϕ 38)	2PJ302
	drive belt (ϕ 50- ϕ 38)	2PJ256
Tilt transfer belt	Tilt transfer belt	TF-10 L1142 W19

Replacement procedure

- ① Turn off the power of all connecting devices.

- 【Important】**
- Shut off the power switch, leave for three minutes or more, and discharge electricity inside the DC power supply equipment.
 - Post warning labels so as to prevent unauthorized persons from turning on the power.

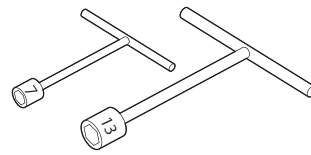
- ② Wear protective equipment, such as gloves.

- 【Important】** Depending on sections and/or parts to be repaired/replaced, you need to rotate rotation positions by hand, or touch them, or get hands close to them. Therefore, take appropriate measures to prevent from hands getting caught and/or stuck.

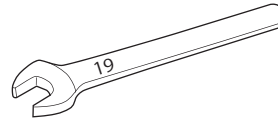
9. Maintenance and inspection

9-3. Replacement of horizontal transfer rollers/roller drive belts

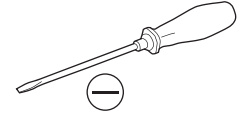
Necessary tools



7mm / 13mm T-BOX wrench



19mm wrench

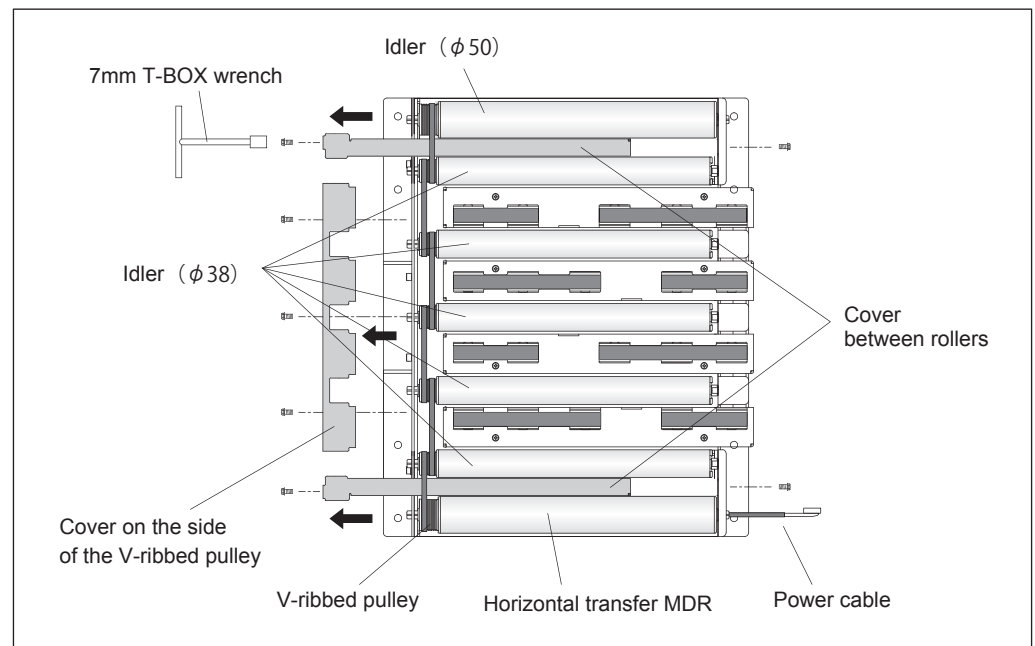


Slotted screwdriver

① Removing covers

When lifting, hold the frames with mounting holes attached, or the bottom of this product.

Do not hold the moving parts, such as rollers, belt transfer parts, or lifting sections.



1. Remove the covers between rollers.

Pull the covers between rollers to the side of the V-ribbed pulley.

※One side of the cover between rollers does not need to be removed depending on roller/roller drive belts.

2. Remove the cover on the side of the V-ribbed pulley.

9. Maintenance and inspection

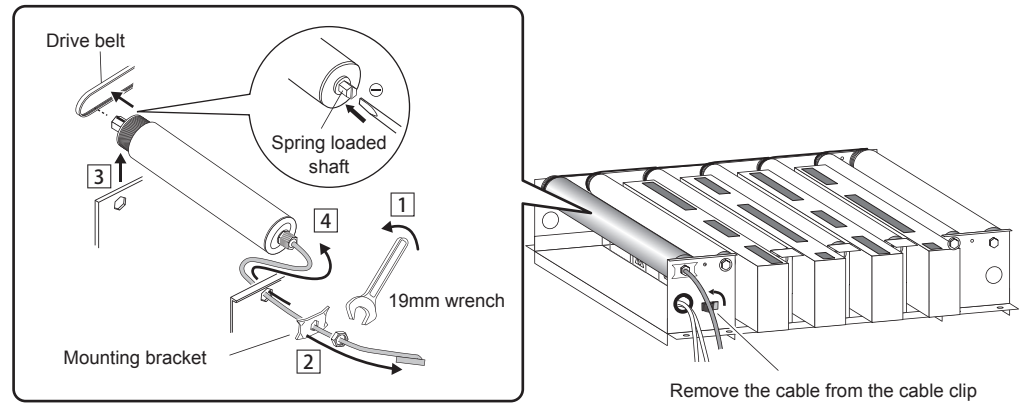
② Removing horizontal transfer MDR/idlers/drive belts

Remove the horizontal transfer MDR → idler ($\phi 38$) or the idler ($\phi 50$) → idler ($\phi 38$) from the edge of the module, to the position where the roller or drive belt to be replaced can be removed.

※All parts do not need to be removed depending on the horizontal transfer MDR/idler/drive belts to be replaced.

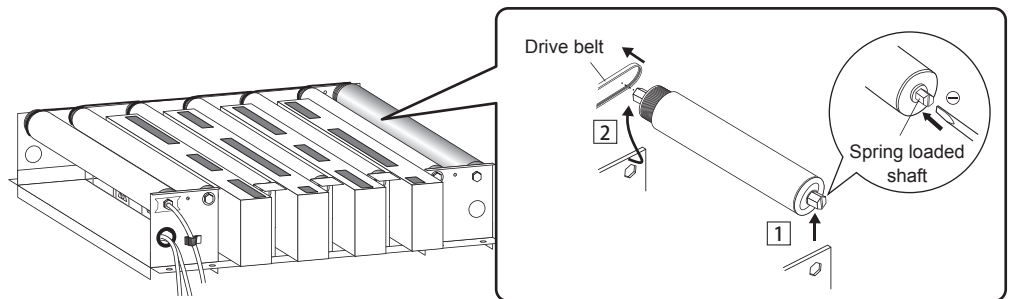
Removing the horizontal transfer MDR

Loosen the mounting bracket on the side of the power cable, and remove the cable from the cable clip first.



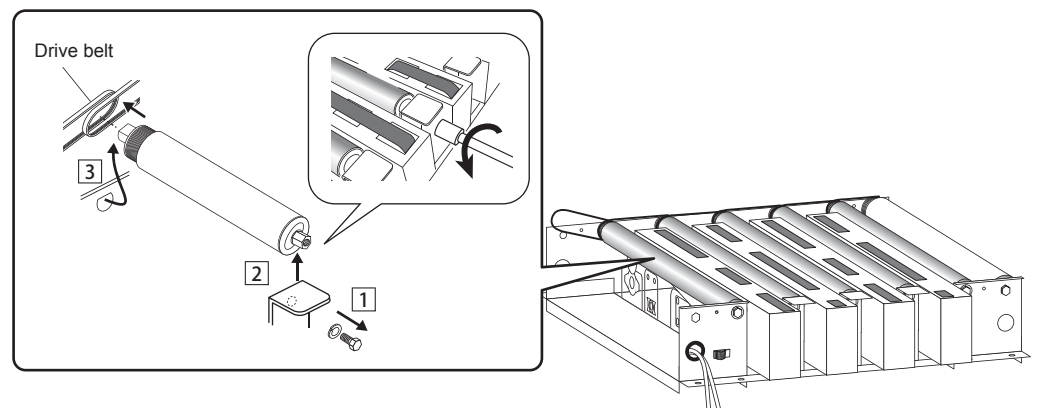
Removing the idler ($\phi 50$)

Rollers without power cables are idlers.



Removing the idler ($\phi 38$)

Remove using the 13mm T-BOX wrench.



9. Maintenance and inspection

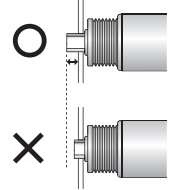
③ Replacing/mounting horizontal transfer MDR/idlers/drive belts

Mount in the reverse order of removal, while passing drive belts through rollers.
※For the mounting groove position for drive belts, refer to P.48.

⚠ CAUTION

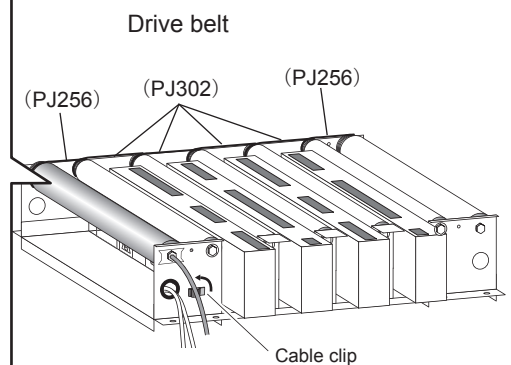
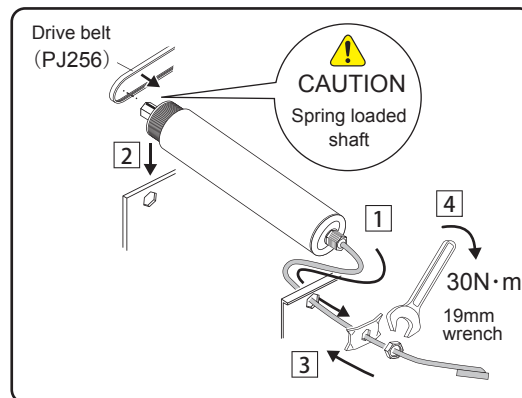
Check that the spring loaded shafts of the horizontal transfer MDR/idler have not been pressed down after mounting. Failure to follow this could result in malfunction.

Spring loaded shaft

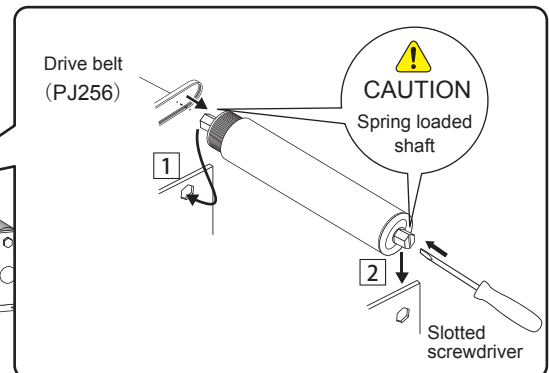
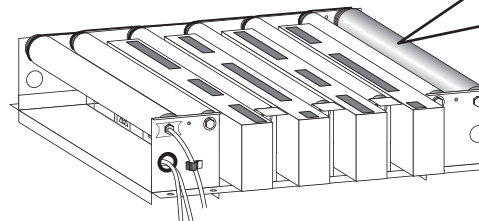


Mounting the horizontal transfer MDR

After mounting, secure the roller MDR power cable to the cable clip.



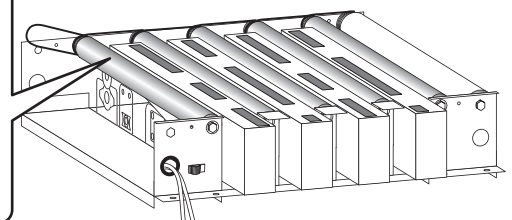
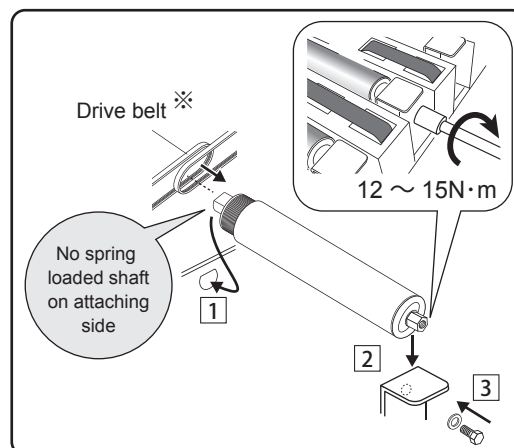
Mounting the idler (φ 50)



Mounting the idler (φ 38)

Mount using the 13mm T-BOX wrench.

※ Drive belts of PJ256 (2PJ256) are used for the horizontal transfer MDR, and those of PJ302 (2PJ302) are for idler(φ 38) .

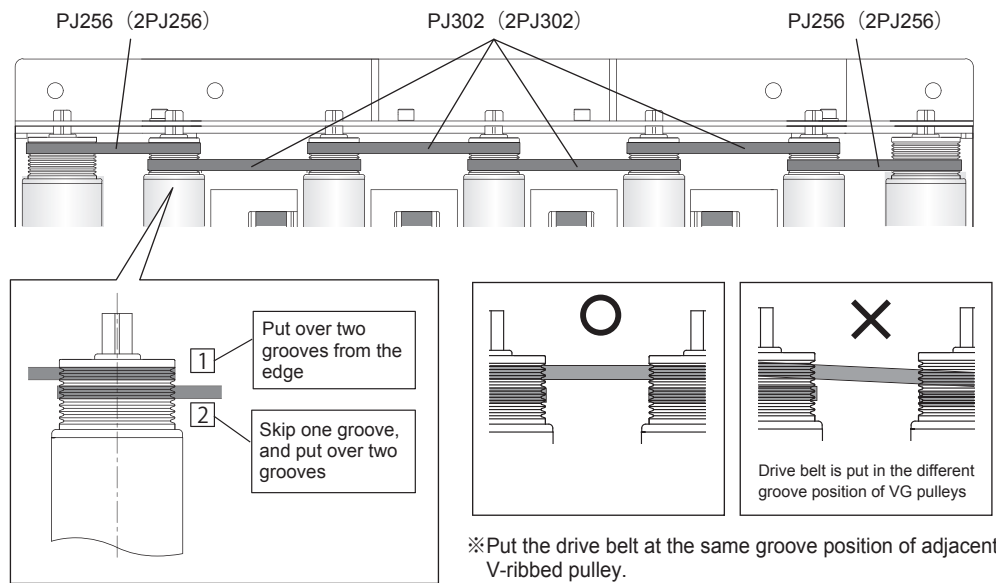


9. Maintenance and inspection

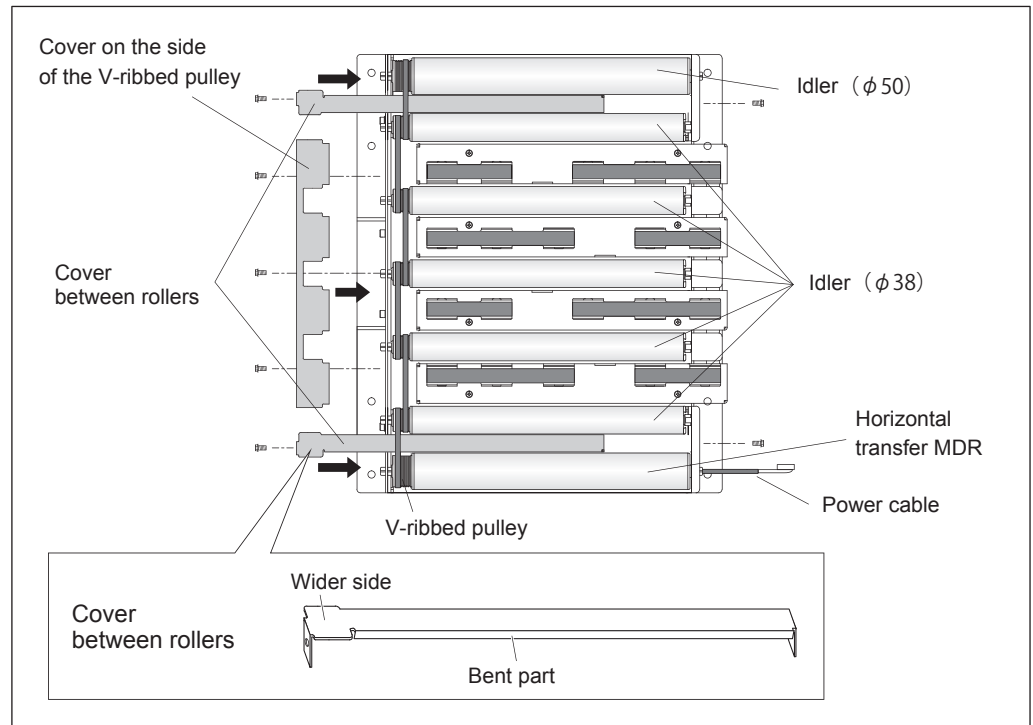
④ Adjusting mounting groove positions for drive belts

For mounting groove positions for drive belts, refer to the figure below, and adjust them by turning rollers by hand.

- Coordinating the horizontal transfer MDR with idlers ($\phi 38$) PJ256 (2PJ256)
- Coordinating the idler ($\phi 50$) on the edge of the module with idlers ($\phi 38$) . . PJ256 (2PJ256)
- Coordinating the idlers ($\phi 38$) with each other PJ302 (2PJ302)



⑤ Mounting covers



1. Mount the cover on the side of the V-ribbed pulley

2. Mount the covers between rollers.

※Put them under drive belts from the side of the V-ribbed pulley.

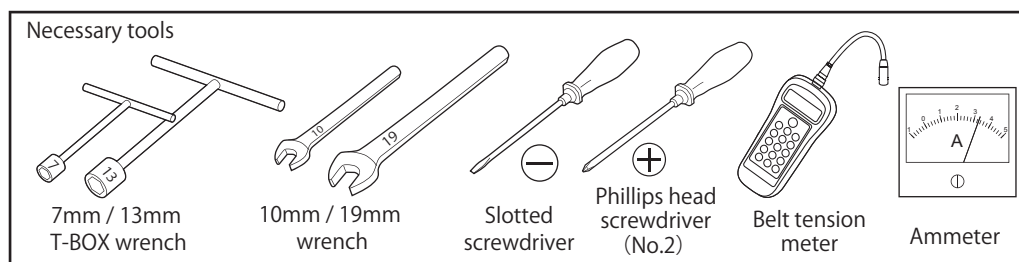
※Align the wider side of covers between rollers with the side of the V-ribbed pulley.

Mount so that the bent part faces the MDR roller or idler ($\phi 50$).

※Mount the covers between rollers horizontally to rollers.

9. Maintenance and inspection

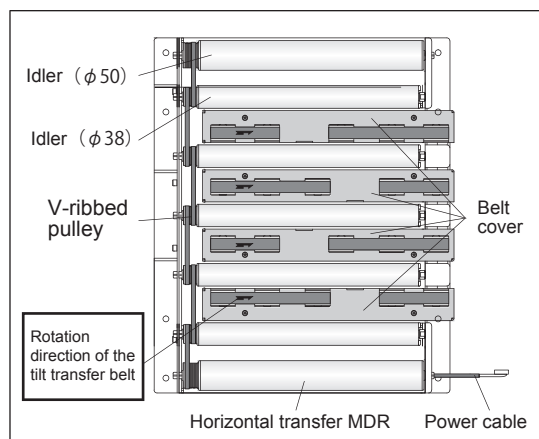
9-4. Replacement of tilt transfer belts



- Loosen nuts used to secure idlers before replacing the tilt transfer belt, and adjusting the belt tension.

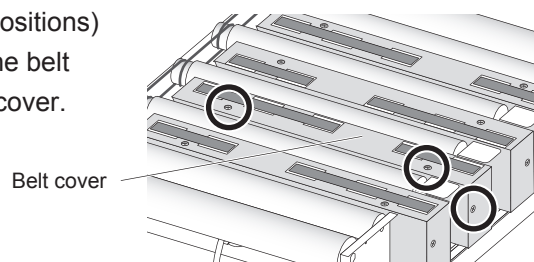
- Remove the horizontal transfer MDR, or idlers from the edge of the module to the side of nuts.

※All covers between rollers, as well as all rollers do not need to be removed depending on tilt transfer belts to be replaced.



① Removing belt covers

Loosen countersunk screws (at three positions) of the belt cover on the thread where the belt is to be replaced, and remove the belt cover.

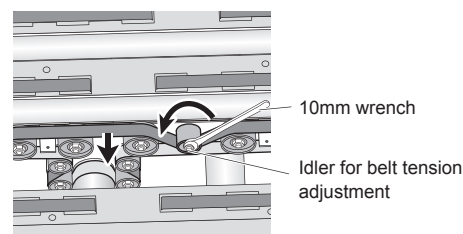


② Removing horizontal transfer rollers/roller belts (refer to P.46, P.47)

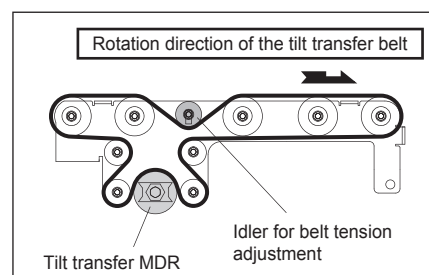
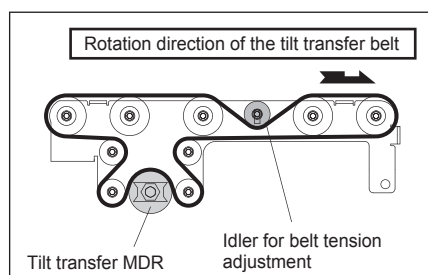
Refer to (1) and (2) in “9-3. Replacement of horizontal transfer rollers/roller drive belts”, and remove the horizontal transfer MDR/idler/drive belt to the position where the tilt transfer belt to be replaced can be removed.

③ Replacing tilt transfer belts

1. Loosen nuts of the idler for belt tension adjustment, and remove the tilt transfer belt.



2. Mount a new tilt transfer belt, paying careful attention to the arrow direction in the figures below.
※Mount the tilt transfer belt so as not to interfere with the plates, etc. on which idlers have been mounted.



9. Maintenance and inspection

④ Adjusting the tension of tilt transfer belts

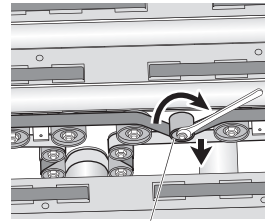
CAUTION

After replacing tilt transfer belts, make sure to adjust the tension.

Adjust the belt tension using the idler for belt tension adjustment, and check it using the belt MDR current value. When the belt tension is too strong, the MDR becomes overloaded, which could result in malfunction. When the belt tension is weak, belt slipping and/or winding could result in inability to transfer.

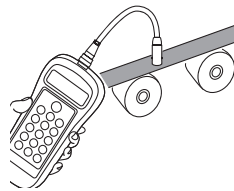
1. After replacing the tilt transfer belt, check that the tilt transfer belt has not interfered with the plates, etc. on which idlers have been mounted. Then, tighten idler nuts by applying the tension to temporarily secure.

Nut tightening torque for the
idler for belt tension adjustment : $5.4\text{N}\cdot\text{m}$



Idler for belt tension adjustment

2. Run M1: MDR for tilt (belt) transfer, and perform running so as to have the tilt transfer belt settle in place. Check the reference tension value below when the tilt transfer belt has been settled, and adjust the tension using the idler for belt tension adjustment.

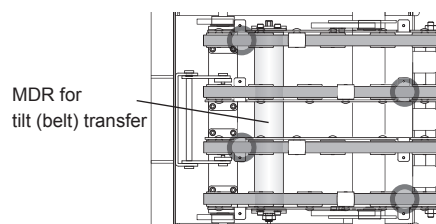


Reference tension : 40 to $50\text{N}\cdot\text{m}$

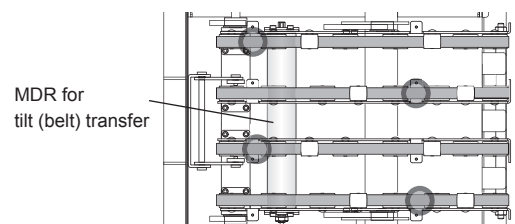
※For details on how to use belt tension meters, refer to the user manuals provided by each belt tension manufacturer.

《Tension confirmation positions using belt tension meters》

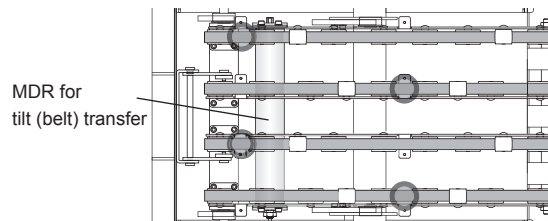
Size A



Size B



Size C



3. Measure the current value when the MDR for tilt (belt) transfer operates without load, and confirm that it meets the following value.

※Measure the current value on the side of the power input on M1: driver card for tilt (belt) transfer.

Current value of MDR for tilt (belt) transfer : 0.65 to 1.15A

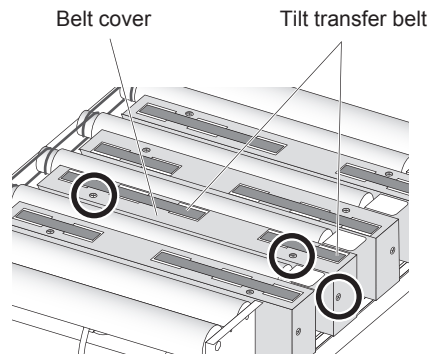
9. Maintenance and inspection

- ⑤ Mounting rollers for horizontal transfer and roller belts
(Refer to P.48, P.49)

Refer to (3) and (4) in “9-3. Replacement of horizontal transfer rollers/roller drive belts”, and mount the horizontal transfer MDR/idler/drive belt.

- ⑥ Mounting belt covers

Mount the belt cover using countersunk screws at three positions. (Tightening torque: 1.7N·m)
※Make sure to pass the belt through on the belt cover in places where the tilt transfer belt is exposed.



- ⑦ Mounting covers between rollers, and on the side of the VG pulley
(refer to P.49)

Refer to (5) in “9-3. Replacement of horizontal transfer rollers/roller drive belts”, and mount the covers between rollers, and on the side of the VG pulley.

9-5.

Confirmation

after repair/replacement

After repair/replacement are complete, confirm the following points before starting the trial run.

1. Check that roller drive belts have been mounted in correct groove positions.
2. Check that there is no friction between the moving parts, or between the moving and fixed parts.
3. Check that screws/covers removed once have been securely mounted again.
Also, check that there are no parts you have forgotten to mount.

Appendix

Appendix

Appendix 1.
Product specificationsT-RAT main unit
specifications

■ Tray

Maximum weight			30kg (20kg for W615)
Material			Tray, cardboard, etc.
Size	A	415mm ※	W300×L300 ~ W400×L600mm
	B	515mm ※	W300×L300 ~ W500×L600mm
	C	615mm ※	W300×L300 ~ W600×L600mm

※Between frames

● Values of the tray size and weight are reference only, since they may change depending on tray conditions.

● Depending on the bottom shape of trays, they may not be transferred normally, even if they are within the above size range.

■ Speed

Transfer speed ※	Roller	61.7 m/min (Nominal speed of: 60m/min type)
	Belt	17.4 m/min (Nominal speed of: 17m/min type)

※The above shows the transfer speed when trays are not placed on belts and rollers with SW1#5 ON / SW5: 9 specified on CB-016.

■ Power supply

Voltage specifications	24V DC±10%
Rated current	2.7A

■ Installation environment

Transfer conditions

Ambient temperature	0 to 40°C (no freezing)
Ambient humidity	90%RH or less (no condensation)
Altitude	1,000m or less
Atmosphere	No corrosive gas
Vibration	0.5G or less
Installation location	Indoor
Mounting surface tilt (inclination)	0.5% or less
Degree of contamination	2 (according to the definition of IEC60640-1, UL840)

■ Product weight

Size	Weight
A	43kg
B	46kg
C	49kg

■ Throughput

800 cases/hour

〈 Transfer conditions 〉

- Case weight: 30kg
- Case size: 370×470mm
- T-RAT size: A
- Transfer speed setting: Tilt transfer 17.4m/min / Horizontal transfer 61.7m/min
- Load: Horizontal transfer / Discharge: Tilt transfer
- Load from the point when cases stopped

※Values are only references based on our measurement and are not guaranteed.

※The throughput depends on the size, material, bottom status of trays, and/or transfer speed.

Driver card
specifications

1. For transfer run (For horizontal transfer: 1 unit, for tilt transfer: 1 unit)

Model		CB-016□6 (□=N : NPN, P : PNP)
Power supply voltage		24V DC±10%
Rated voltage		24V DC
Static current		0.03A
Starting current		4.0A
Peak current		20A (1ms or less)
Wire diameter	Power connector (CN1)	0.50 ~ 1.5mm ² (Note) (AWG : 20 ~ 14)
	Control connector (CN2)	0.08 ~ 0.5mm ² (Note) (AWG : 28 ~ 20)
Time from RUN signal input to motor starting		15msec or less
Protective function		Incorrect wiring protection Built-in 6.3A fuse
Thermal protection		Driver card 95°C Motor 105°C
Current limitation		4.0A
Operating environment	Ambient temperature	0 to 40°C (no freezing)
	Ambient humidity	90%RH or less (no condensation)
	Atmosphere	No corrosive gas
	Vibration	0.5G or less
Installation location		Indoor

Note) Applicable wires to connectors included as standard

2. For switching the transfer surface x 1 unit

Model		HBM-201F□ (□=N : NPN, P : PNP)
Power supply voltage		24V DC±10%
Rated voltage		24V DC
Static current		0.06A
Starting current		3.7A ~ 4.4A
Peak current		20A (1ms or less)
Wire diameter	Power connector (CN1)	0.50 ~ 1.5mm ² (Note) (AWG : 20 ~ 14)
	Control connector (CN2)	0.08 ~ 0.5mm ² (Note) (AWG : 28 ~ 20)
Protective function		Incorrect wiring protection Built-in 7A fuse
Thermal protection		Driver card 85°C Motor 110°C
Current limitation		4.0A
Operating environment	Ambient temperature	0 to 40°C (no freezing)
	Ambient humidity	90%RH or less (no condensation)
	Atmosphere	No corrosive gas
	Vibration	0.5G or less
Installation location		Indoor

Note) Applicable wires to connectors included as standard

Appendix

Appendix 2.
Residual risk list/MAP

Residual risk list

No.	Operation stage	Work	Qualifications /education required for work	Locations on machine	Seriousness of harm	Remaining risk factors	Examples of assumed measures
1	Installation	Unpack /Carry	Having carefully read the user manual, and having full knowledge of all the contents	Metal parts on the product	CAUTION	Hands may get injured by metal parts of the product	When working, wear protective equipment, such as gloves
2	Installation	Carry		No particular location	CAUTION	Carrying the heavy load alone may result in damage to the main machine unit, and/or injury to the body	When carrying, have more than one person hold and support the bottom
3	Installation	Carry /Install		No particular location	CAUTION	Dropping the product or letting it fall when carrying and/or installing may result in damage to the main machine unit, and/or injury to the body	Check safety of installation location in advance, and wear protective equipment, such as protective glasses, footwear, and/or gloves, when working
4	Operation	Trial run		No particular location	CAUTION	At the trial run by the single unit, trays may flow to this product	Stop the surrounding conveyor operation before starting operation
5	Operation	All during operation		Gaps between the moving parts, or moving and fixed parts	WARNING	Workers' fingers and/or hands may get stuck in gaps between the moving parts, or moving and fixed parts of the main unit	- Surround the product using safety fences or covers to prevent workers from approaching during operation - Put additional covers over gaps in this product, and eliminate unsafe gaps.
6	Operation	All during operation		Top panel of the product	CAUTION	Workers may step on the main unit and lose their footing Or fall down due to movement of the unit	Keep workers informed thoroughly about the prohibition of stepping on the machine
7	Operation	All during operation		No particular location	CAUTION	If problems occur, trays may collide with each other, and pop out of the equipment	Surround the product using safety fences, or covers, to prevent trays from popping out
8	During maintenance /inspection	All during maintenance /inspection		No particular location	WARNING	During parts replacement, the tilt transfer section that stops under the tilt transfer status may fall, and workers' fingers and/or hands may get stuck	Lower the tilt transfer section completely, or remove it from the main unit, and replace parts under safe conditions
9	During maintenance /inspection	All during maintenance /inspection		Power supply part to the product (driver card)	WARNING	Persons turning on the power without notice may result in unexpected operation of the product, and/or injury of workers	When more than one person is working together with the product, determine the person who turns on the power
10	During maintenance /inspection	All during maintenance /inspection		No particular location	WARNING	Workers' fingers and/or hands may get stuck in the product	Wear protective equipment, such as protective glasses, footwear, and/or gloves, when working

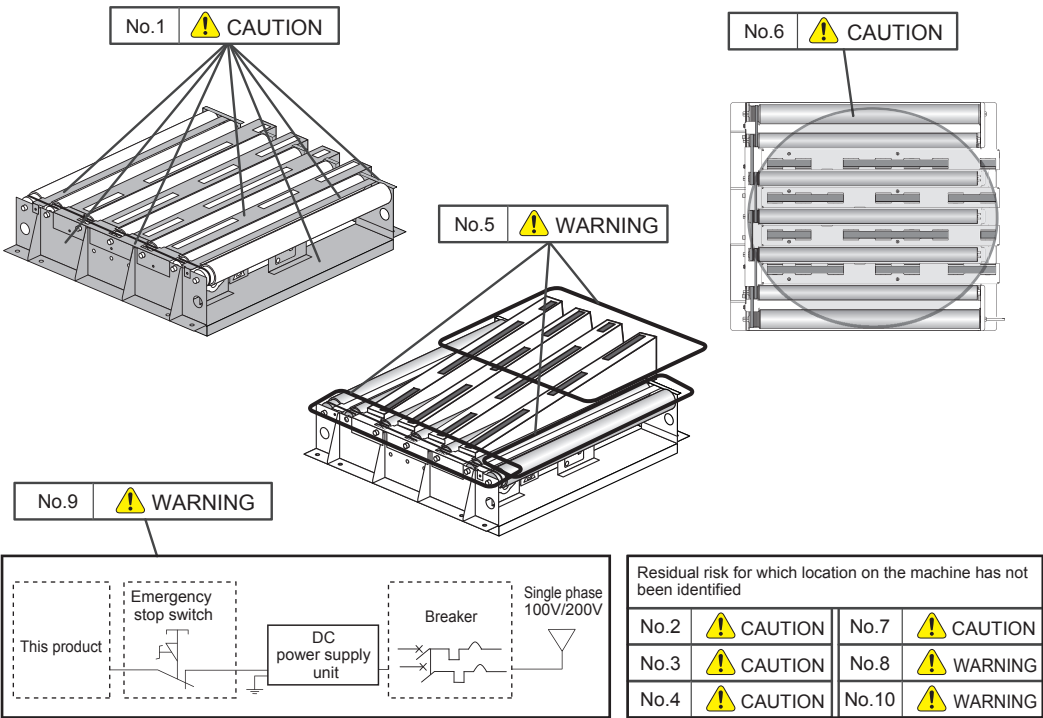
[Seriousness of harm]

DANGER: Indicates that there is a high possibility that severe injury or even death may result if protective measures have not been taken

WARNING: Indicates that there is a possibility that severe injury or even death may result if protective measures have not been taken

CAUTION: Indicates that there is a possibility that minor injury may result if protective measures have not been taken

Residual risk MAP



Technology for tomorrow



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Specifications are subject to change without prior notice.

2-00K-2004