





Read this manual before use

Thank you for purchasing the 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.

ITOH DENKI

Module Original notice - A1.28



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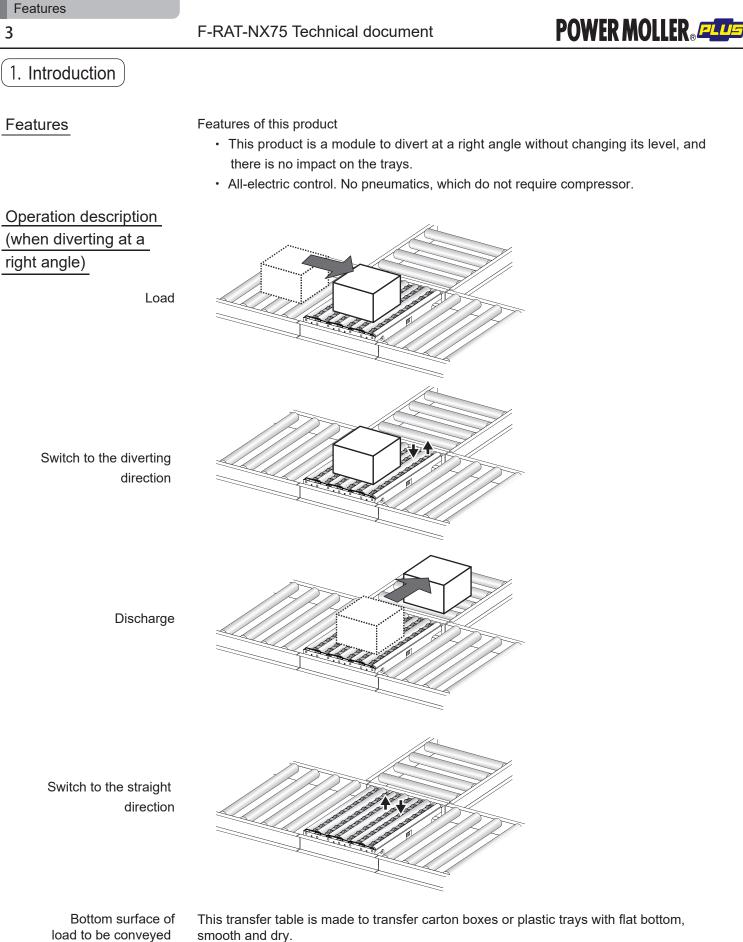
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It is not designed to transfer trays with ribbed bottom, in plastic or metal. For tote with not flat bottom, please consult us.





| 1. Introduction | |
|--|--|
| 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. 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. |
| <u>About the risk category</u> of this system | This product is intended to comply with the risk category 2 ^{*2} or lower as defined in NF EN13849-1 ^{*1} . Its an incomplete machine and it have to be integrated on the complete machine to have CE certification. Nevertheless the module respect the point : 1.1.2 / 1.1.3/ 1.1.4 / 1.1.5 / 1.3.2 / 1.3.4 / 1.3.8.1 / 1.3.8.2 / 1.4.1 / 1.4.2.1 / 1.5.1 / 1.6.1 / 1.7.1 / 1.7.3 / 1.7.4 / 1.7.4.1 / 1.7.4.2 of the European machinery safety standard. 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 reasons, if users install this product in an environment that requires dust proof/waterproof treatments, they need to add necessary countermeasures, and check the performance based on their responsibility. |
| About description of the product | In this manual, F-RAT-NX75 is described as F-RAT, and F-RAT-NX75 and F-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 | CBK-109FN(1) CB-016BN7(1) HBM-201BN(1) | CBK-109FP (1) CB-016BP7 (1) HBM-201BP (1) |

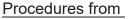
In this manual, CBK-109FN and CBK-109FP are described as CBK-109, CB-016BN7 and CB-016BP7 as CB-016, and HBM-201BN and HBK-201BP as HBM-201. Also, CBK-109FN and CBK-109FP, CB-016BN7 and CB-016BP7, as well as HBM-201BN and HBM-201BP are described separately, when needed.

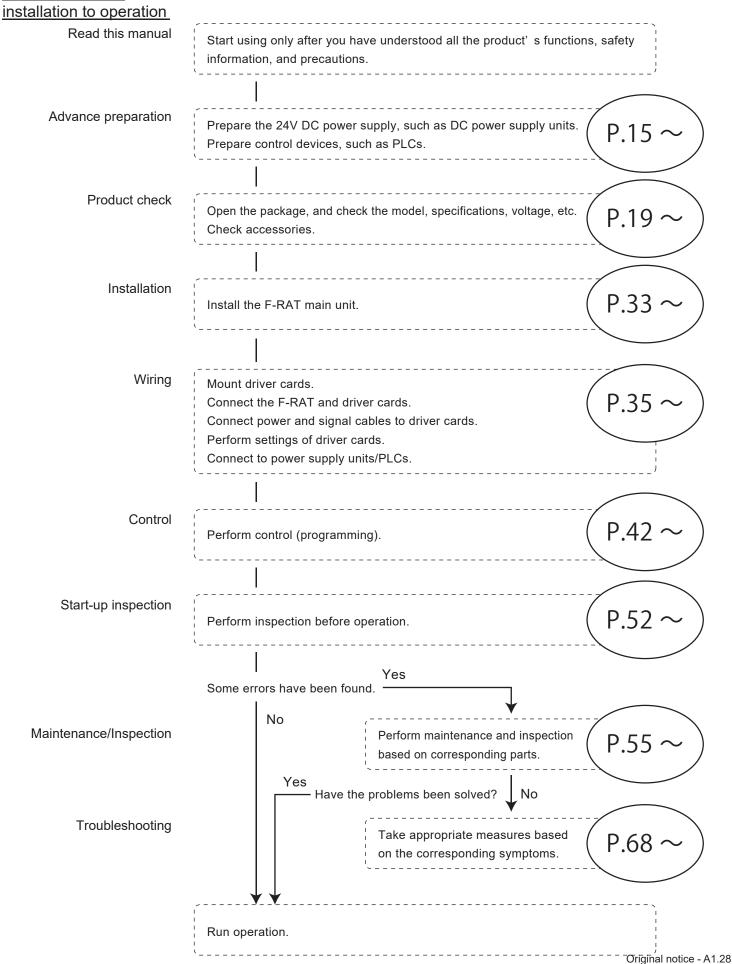
| Signal input/output type | NPN | PNP |
|----------------------------|---------------------------------|--|
| Included driver card model | IB-E04F-N-FT(1) HBM-201BN(1) | IB-P02F-P-FT (or IB-E04F-P-FT) (1) HBM-201BP (1) |

In this manual, IB-E04F-N-FT and IB-E04F-P-FT are described as IB-E04F-FT, and HBM-201BN and HBM-201BP as HBM-201. Also, IB-E04F-N-FT and IB-P02F-P-FT (or IB-E04F-P-FT), as well as HBM-201BN and HBM-201BP are described separately, when needed. Original notice - A1.28



2. Procedures from installation to operation







3. Safety precautions

For parts names in sentences, refer to 6. Structures (P.21).

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3. Safety precautions

Danger level

To prevent hazards to users and/or others, and/or damage to property in advance, the important precautions to be followed securely is described below.

The degree of hazard and/or damage that may result if a user disregards the description and operates the product improperly is caregorized as the following symbols and explained below.

| | This indicates a high possibility that severe injury or even death may result. | | |
|---------------|--|--|--|
| AUTION | This indicates a high possibility that injury, or only property damage may result. | | |

Symbol explanation

The type of precautions is categorized as the following symbols and explained below.

| This symbol indicates a reminder which users should pay attention to. |
|---|
| This symbol indicates operations that are prohibited. |
| This symbol indicates forced operations that users should always perform. |

3. Safety precautions

3-1. General precautions



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

WARNING

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 come into contact with the moving parts, such as the carrier wheels, rollers, or lifting sections, and/or allow clothes to get close to them.

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.



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

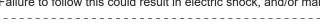


Do not touch the product when it has just stopped operation. Failure to follow this could result in burns.

Make sure to attach ground wires to this product and the DC



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.



The side and lower parts of the module are not protected against mechanical hazards. Protection complying with local safety standards must be provided.

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3. Safety precautions

3-1. General precautions



Safety precautions

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3. Safety precautions

3-1. General precautions





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.



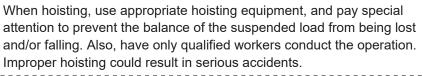
When disposing of the product, make consigning contracts with licensed industrial waste disposers, and consign the disposal to them.

3-2. Precautions on installation



In principle, have two or more persons work when carrying and/or installing the product as it is a heavy load. To carry the module with Block and tackle please see page 74 for more information.

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





Do not hoist this product with goods loaded.

Failure to follow this could result in objects falling.





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 F-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 installing direction to the loading/discharging sides before installing.

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

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3. Safety precautions

3-2. Precautions on installation





Take appropriate measures to prevent trays from popping out of the equipment.

For example, mount guide rails on the conveyor frames. Failure to follow this could result in workers getting injured by trays popping out of the equipment.



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

3-3. Precautions on wiring



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,

CAUTION



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.

Make sure that connectors are tightly and correctly connected to avoid over-heating or short circuits.

3-4. Precautions related to control





Do not change 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 CBK-109 and CB-016. (Minimum (leftmost): Factory setting)



Do not turn the driver card switches with excessive force.

Failure to follow this could result in malfunction.

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Product check

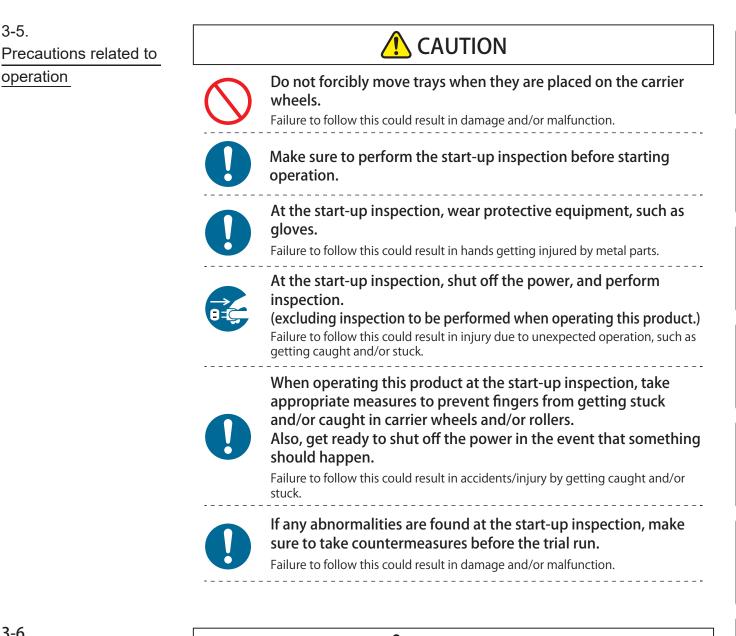
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3-6. Precautions on maintenance and inspection





If any abnormalities are found, do not use this product until the causes have been eliminated completely .

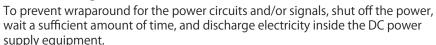
Using this product with unattended abnormalities could result in not only damage to the devices, but also unexpected accidents.



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



At the time of repair and replacement work, turn off the power to all connecting devices.





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 malfunction and/or unexpected accidents.

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3. Safety precautions

3-6. Precautions on maintenance and inspection

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| 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. | | |
| 0 | Before the trial operation after repair/replacement, Check that the roller drive belts have been mounted properly. Check that there is no friction between the moving parts, or between the moving and fixed parts. Check that screws/covers previously removed have been securely mounted again. Check that all parts are installed. Failure to follow this could result in malfunction and/or unexpected accidents. | | |
| | Make sure to prepare repair/replacement parts designated by ITOH DENKI. Using parts other than those designated by ITOH DENKI could result in malfunction. | | |



4. Advance preparation

Product check Advance preparation Safety precautions

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Product check

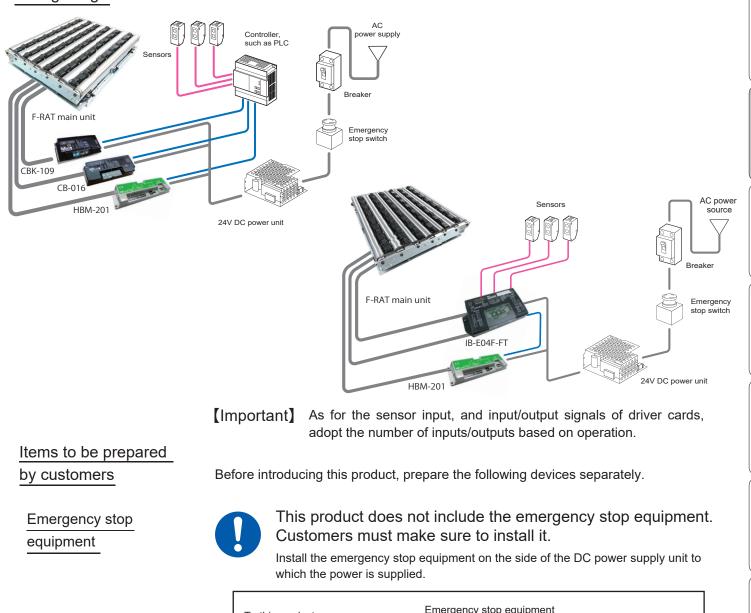
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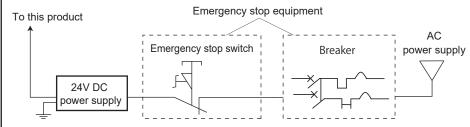
Troubleshooting || Maintenance/Inspection || Control/Operation || Installation/Wiring

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4. Advance preparation

Wiring image





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 (single phase 230V) is securely turned ON/OFF when turning ON/OFF the breaker.

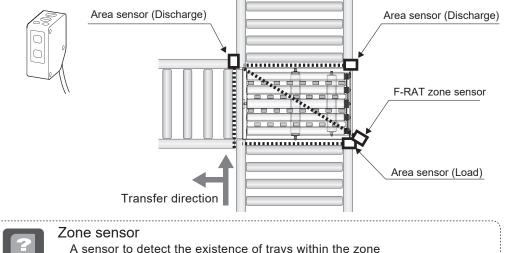
② Input to this product (24V DC) is securely turned ON/OFF when turning ON/OFF the emergency stop switch.
Original notice - A1.28

4. Advance preparation

24V DC power supply Power supply equipment to supply 24V DC to this product • Switching power supply (24V DC/10A, 240W or more) • Rectified power (With a rectifying capacitor, ripple rate 10% or below) 24V DC Battery Operation ф Since F-RAT uses MDR for each of carrier wheel transfer, roller transfer, and drive switching (3 MDRs in total), it is not recommeded to use multiple MDRs at the same time. A switching power supply is recommended as the DC power supply (24V DC±10%) for drivers. Use a stabilized power supply that has an adequate capacity of 24V DC and 10A or higher and does not fluctuate due to load variation. The power supply shall have a capacity larger than the rated value of this product. 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 capacity of the power supply is less than the rated power of this product, it may cause the supply voltage leading malfunction or damage. Be sure to use the power supply with a capacity larger than the rated power of this product. In addition, the power supply should not activate protection with peak current 30A for 1ms or below. For the power supply unit, use an isolation 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



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





Zone sensor A sensor to detect the existence of trays within the zone Area sensor A sensor to detect load and discharge of trays Safety precautions

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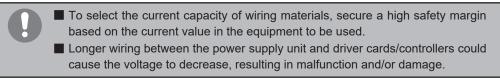
4. Advance preparation

Wiring materials

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

 \langle Available wire diameter for driver card connectors \rangle

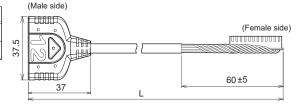
| Driver card Connector | CBK-109 | CB-016 / HBM-201 | | |
|--------------------------|-------------------------|-------------------------------------|--|--|
| Power connector | 0.8~1.5mm² (AWG: 18~14) | 0.5~1.5mm ² (AWG: 20~14) | | |
| Control connector | 0.08~0.5mm ^² | ổ (AWG∶28~20) | | |



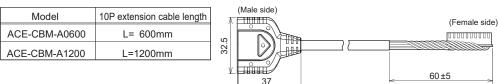
MDR extension cable (option) Necessary when the installing location of the F-RAT main unit is far from that of the driver cards.

CBK-109 : 12P extension cable

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



CB-016 / HBM-201 : 10P extension cable





Use extension cables of 1200 mm or less.

Do not extend cables by connecting multiple extension cables.

Stay (option)

| Size | L | Х | (mm) | | |
|------------------------------|------------------|-----|------|---|-----------|
| 6040 / 7540 / 9040 | 370 | 400 | | | |
| 6050 / 7550 / 9050 | 470 | 500 | | | |
| 6060 / 7560 / 9060 | 570 | 600 | | | |
| 6070 / 7570 / 9070 | 670 | 700 | | | |
| 6080 / 7580 / 9080 | 770 | 800 | | | |
| ki | X (Between frame | es) | | | 35 |
| 2-Ø9 For hex. bolt M8/usi | L | | | 2-M8 For hex. bolt M8 Using plain water/ spring washer - \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ | 21.3 • |

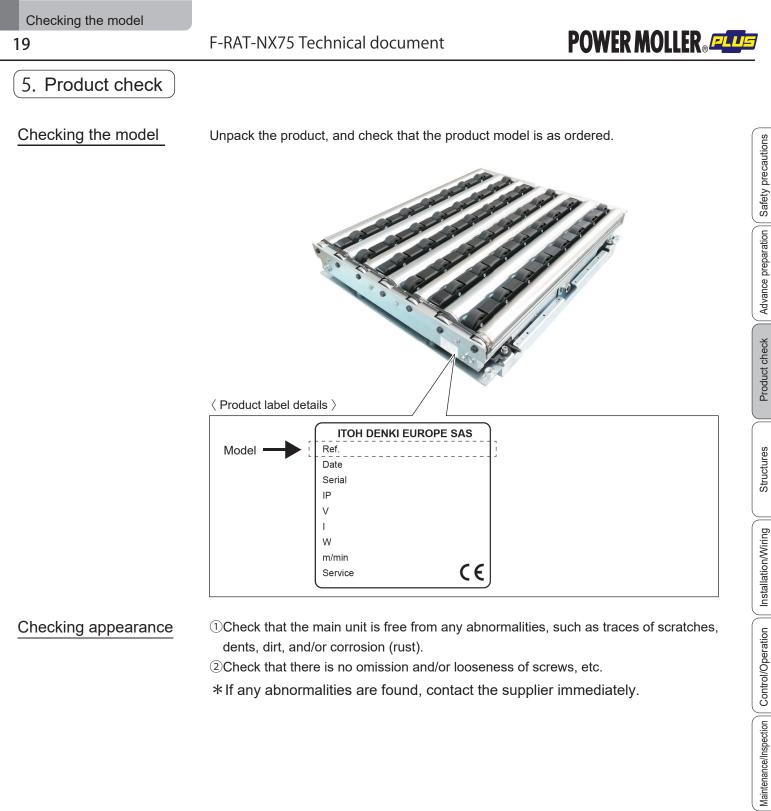
* For X dimensions (between frames) other than those mentioned above, contact us.

Safety precautions Advance preparation



5. Product check

Advance preparation Safety precautions



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

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

Troubleshooting

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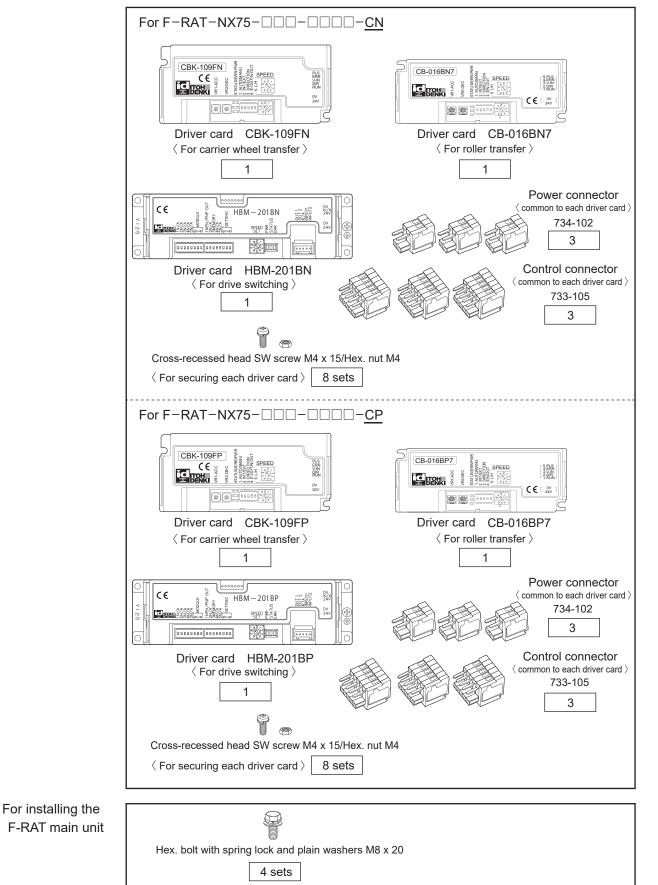
5. Product check

Checking accessories

Driver cards

Check that all the following items are included.

Depending on the F-RAT input and output signal type, driver cards with the NPN (N) or PNP (P) signal input are included. (Not included when no driver card type is specified.)



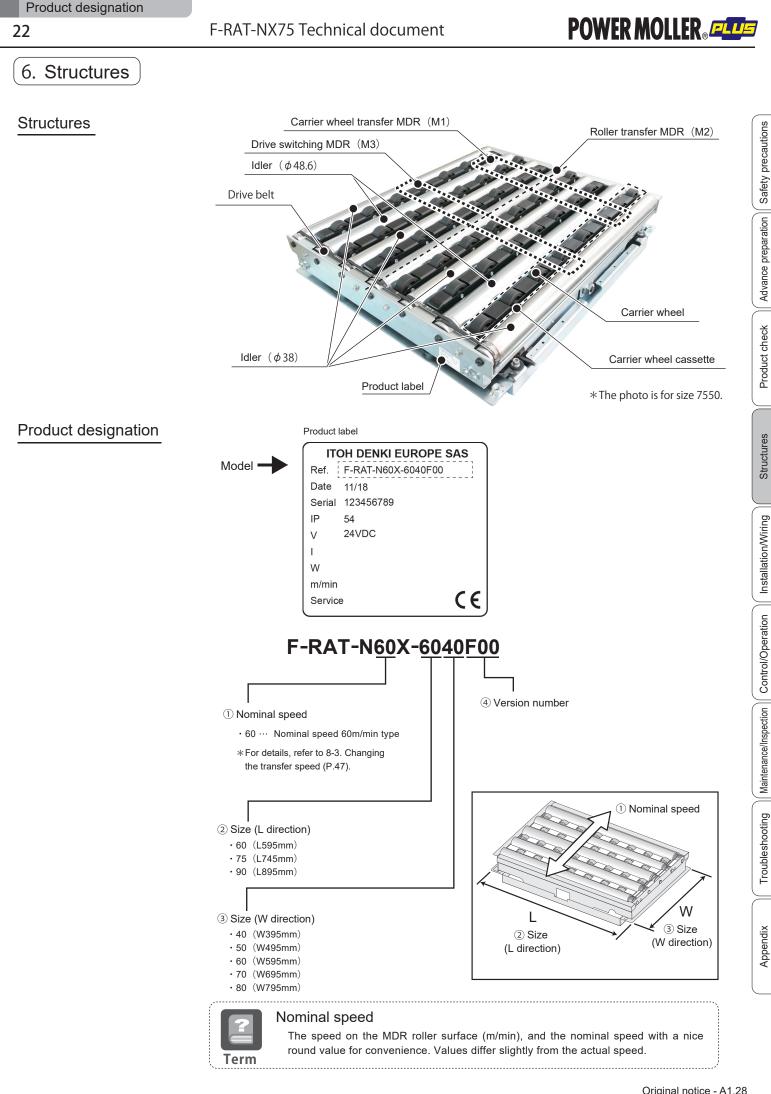


6. Structures

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Appendix

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.
- Minimum load size : 225 x 225mm
- Maximum load size : -100mm from the length and the width of F-RAT-NX75.

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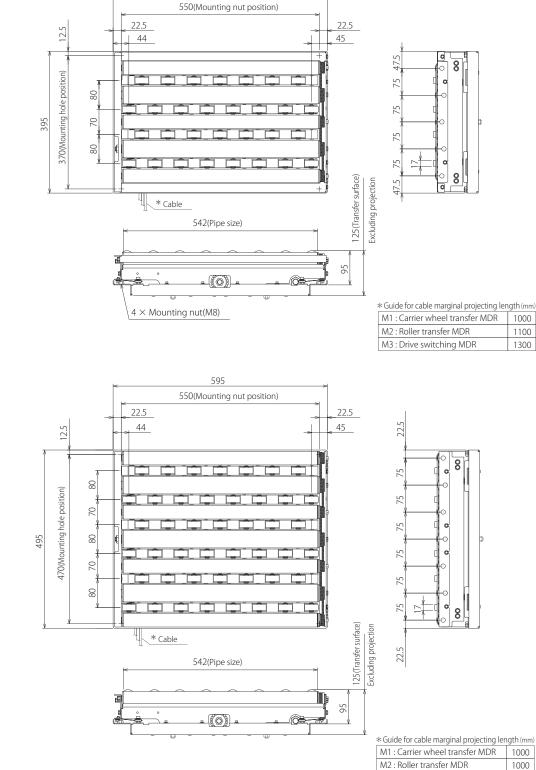
Mounting preparation for the F-RAT main unit

Min and max size load

Size 6040 L595mm×W395mm

Size 6050

L595mm×W495mm



1000 1000 M3 : Drive switching MDR 1300



7. Installation/Wiring



1300

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Product check

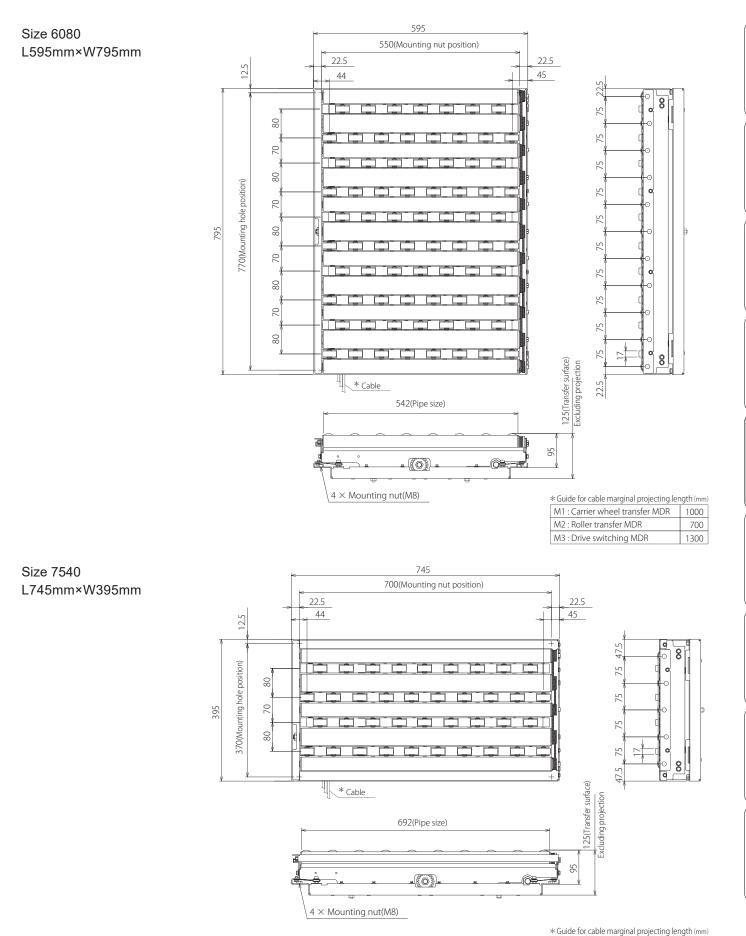
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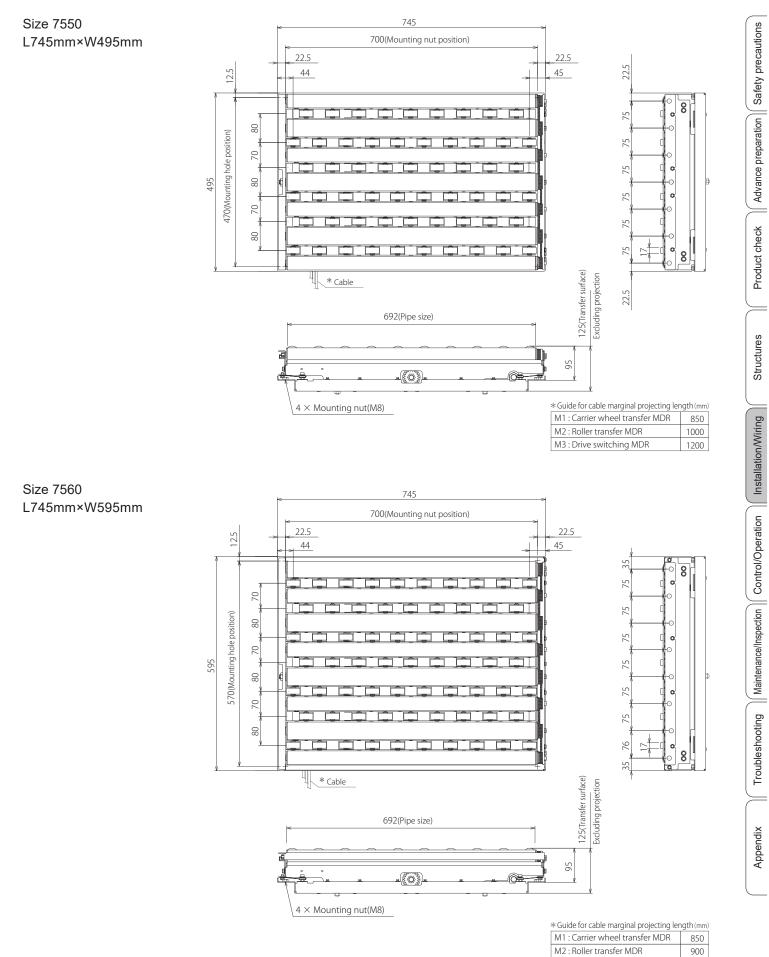
Appendix



| M1 : Carrier wheel transfer MDR | 1200 |
|---------------------------------|------|
| M2 : Roller transfer MDR | 1100 |
| M3 : Drive switching MDR | 1200 |



7. Installation/Wiring



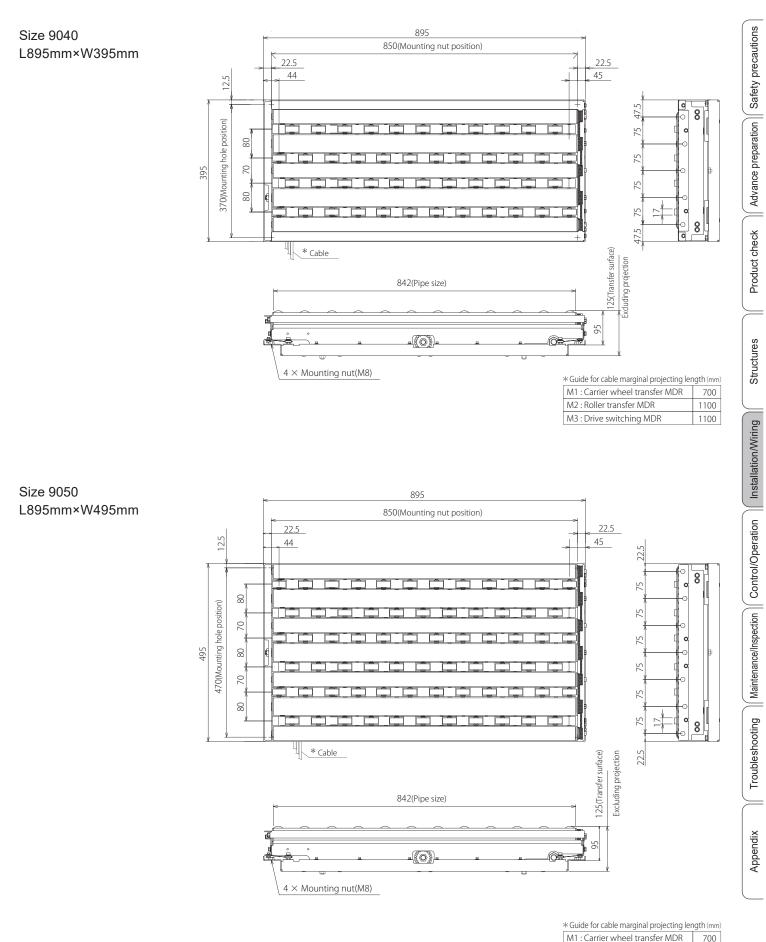
| LIANSIEL WIDK | 900 | |
|---------------|------|--|
| switching MDR | 1200 | |
| | | |

M3 : Drive



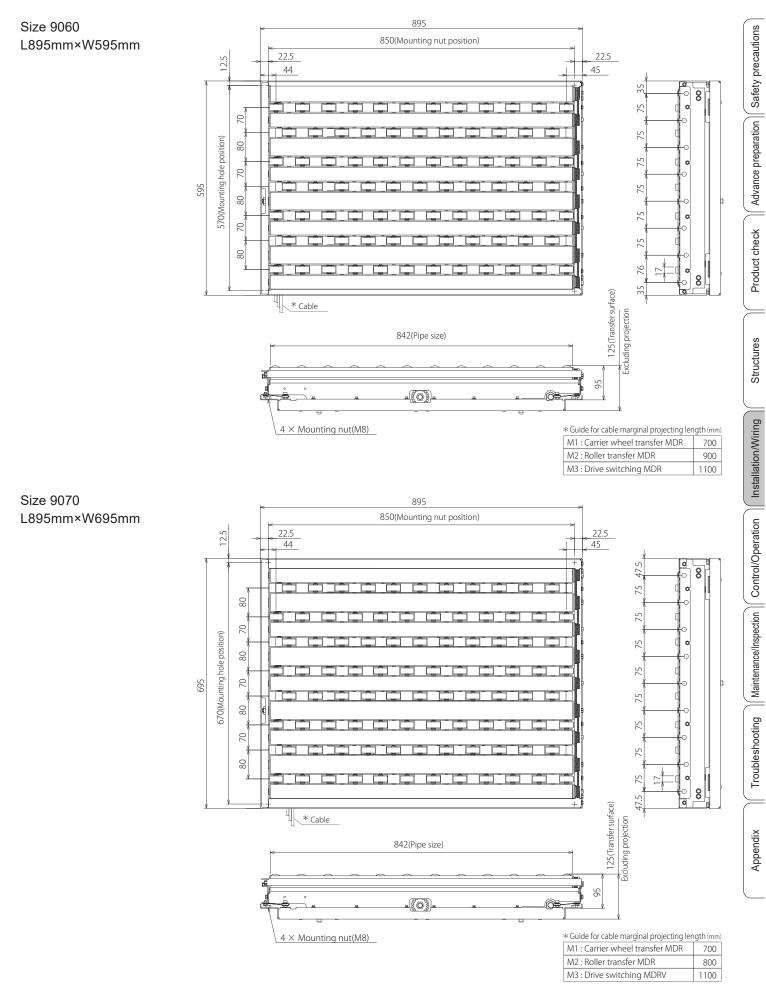






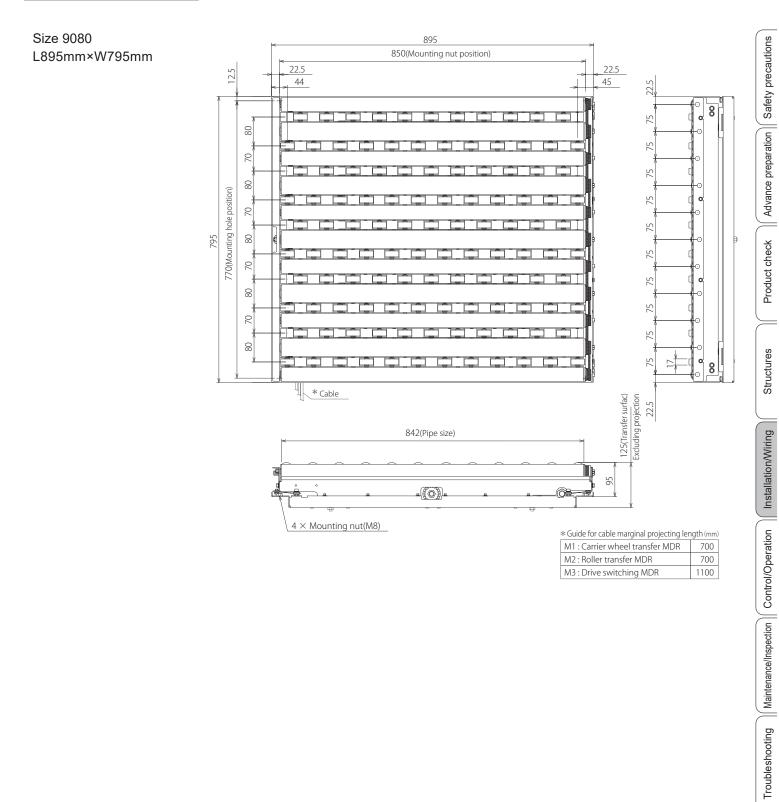
| MT: Carrier wheel transfer MDR | /00 | |
|--------------------------------|------|--|
| M2 : Roller transfer MDR | 1000 | |
| M3 : Drive switching MDR | 1100 | |
| | | |







7. Installation/Wiring



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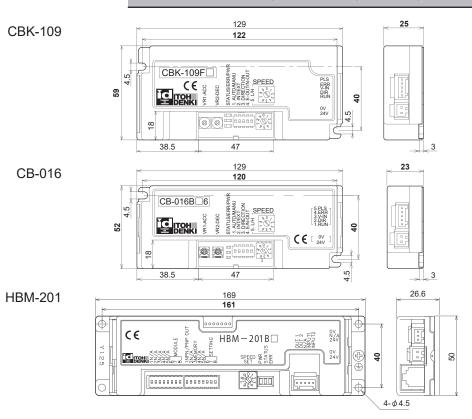
7. Installation/Wiring

Mounting preparation

for driver cards

Hole processing on frames and control panel

- Perform mounting processing on the frames and control panel by reference to the mounting holes for driver cards.
 - For cable opening and projection from the F-RAT main unit, refer to Mounting preparation for the F-RAT main unit (P.24).
 - Mount driver cards on a flat surface where heat can be released easily.
 Prevent chips generated during processing from entering driver cards.



If the mounting location of the F-RAT main unit is far from that of driver cards, prepare the MDR extension cables separately.

- For CBK-109(12P extension cable)
- : ACE-CBM-GOOOO
- For CB-016 / HBM-201 (10P extension cable) : ACE-CBM-A○○○○

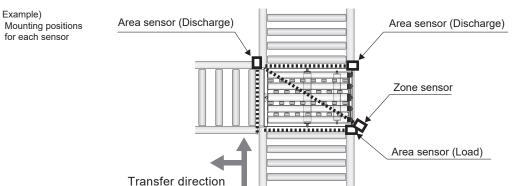
Use extension cables of 1200 mm or less.
 Do not extend cables by connecting multiple extension cables.

Mounting preparation for sensors

Preparation of MDR

extension cables

Determine the mounting location for zone sensors, and area sensors for loading and discharging, and prepare for them to be mounted.



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POWER MOLLER.

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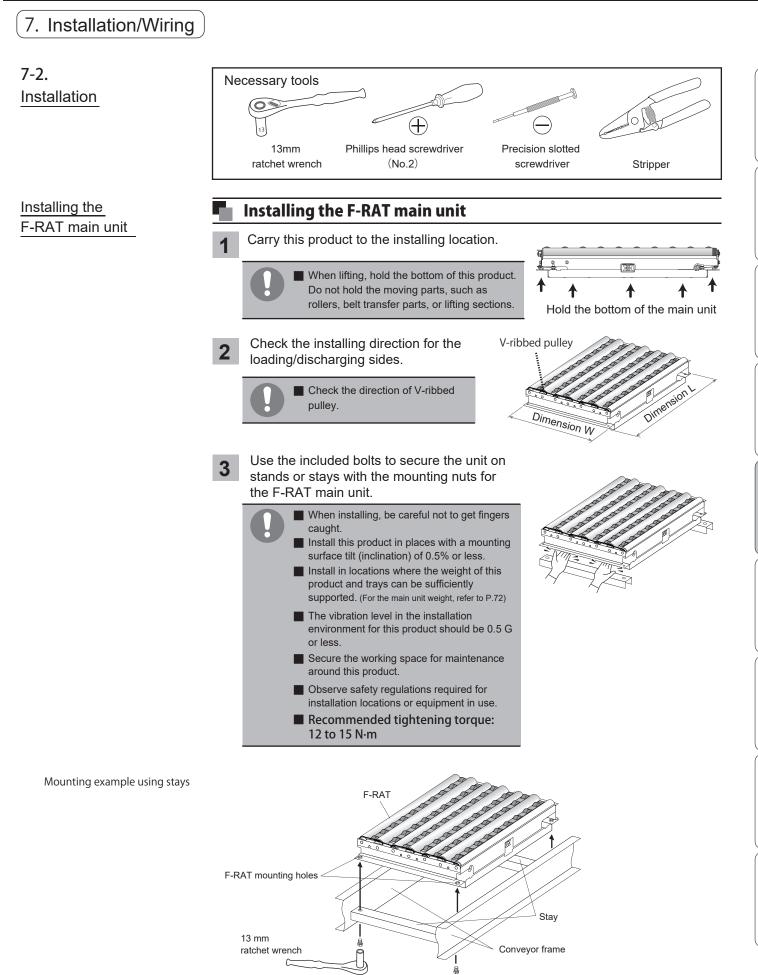
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Adjust the conveyor frame legs on which the F-RAT main unit has been mounted, and align levels of the F-RAT main unit and the adjacent conveyor.



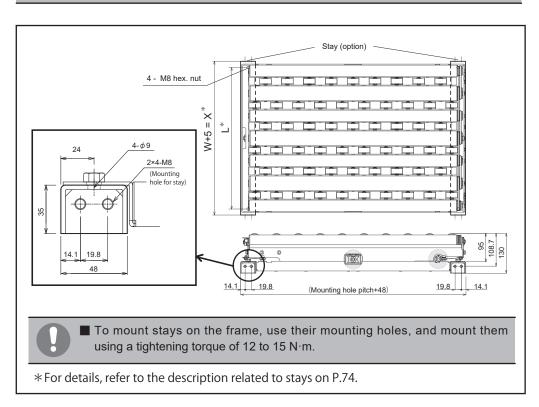
7. Installation/Wiring

About stays (option)

Dedicated stay (optional) is prepared for F-RAT installation.

If users do not use the stays, be sure to use the mounting holes on the F-RAT main unit to secure the F-RAT. In addition, comply with the mounting dimensions for stays, as well as mount

In addition, comply with the mounting dimensions for stays, as well as mount them by taking into consideration the weight of this product and trays.



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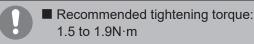
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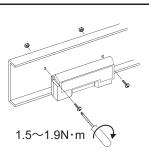
7. Installation/Wiring

Mounting driver cards

Mounting driver cards

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





Mounting sensors, control devices, and power supply units

7-3. Wiring

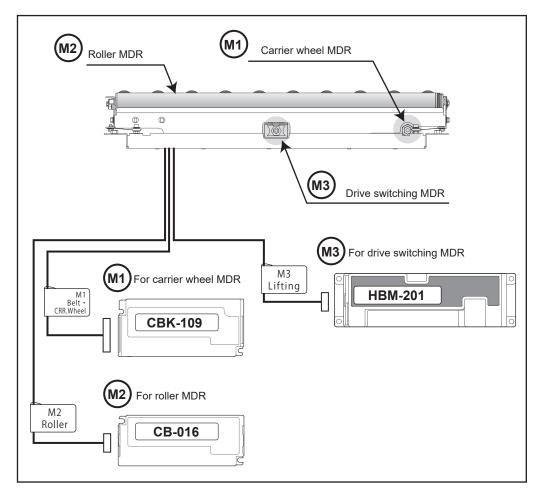
Connection between the F-RAT main unit and driver cards

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.

Connection between the F-RAT main unit and driver cards

- Refer to the labels for cables coming from the F-RAT main unit, and securely connect the MDR connectors and driver cards.
- When using extension cables, securely connect them to the MDR connectors, as well as to the driver card connectors.



POWER MOLLER.

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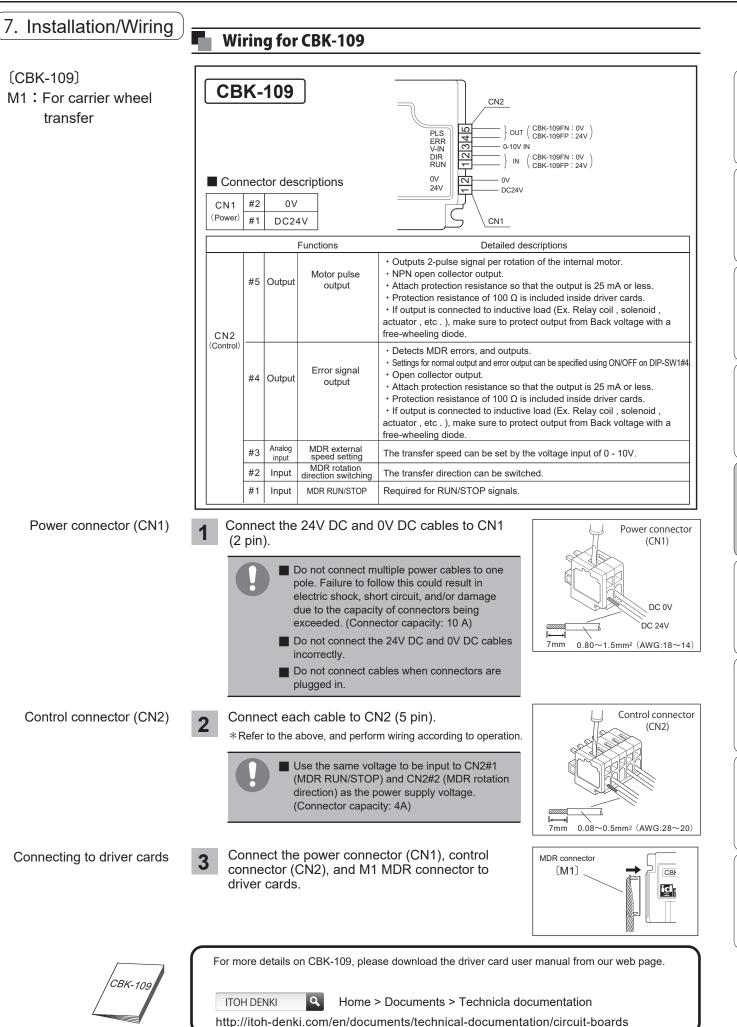
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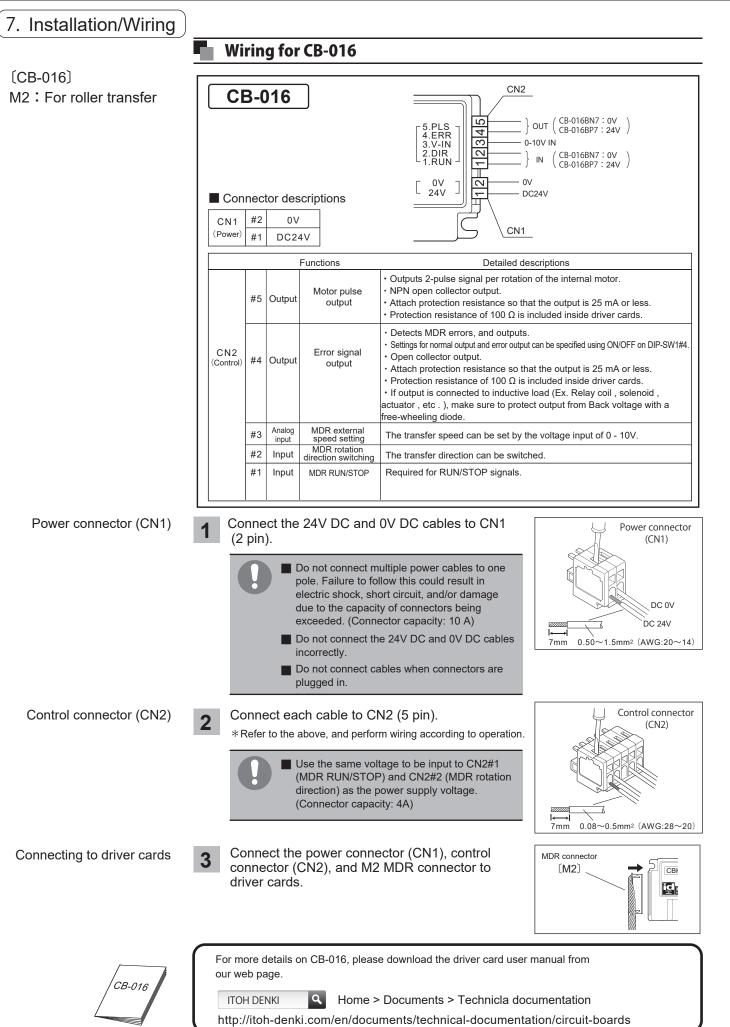
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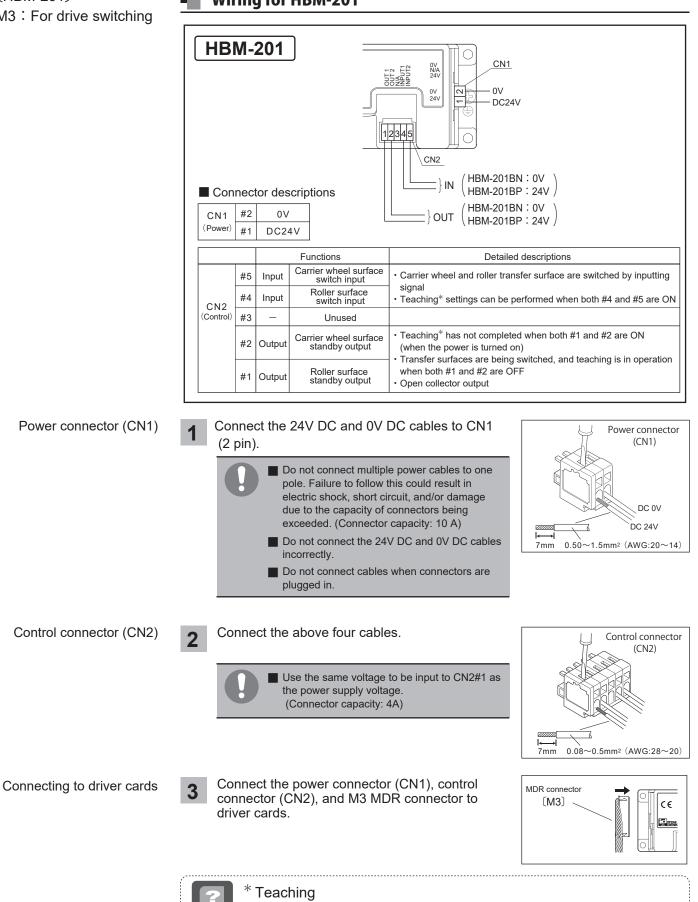
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7. Installation/Wiring

(HBM-201) M3 : For drive switching





Operation to perform the initial setting of the transfer surface position.

Teaching must be performed after the power is turned on.

Term

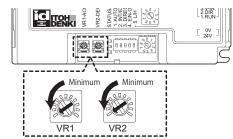


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Setting driver cards

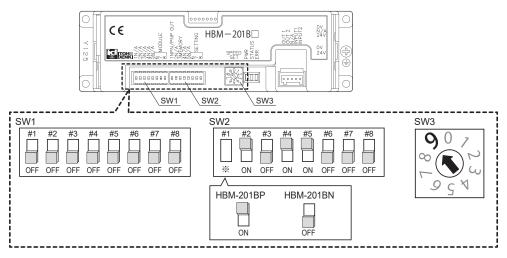
Settings for M1: CBK-109 / M2: CB-016

Turn the driver card volume to the following (factory setting).



Settings for M3: HBM-201

Turn the driver card DIP switch and rotary switch to the following (factory setting).



Connecting to power supply units

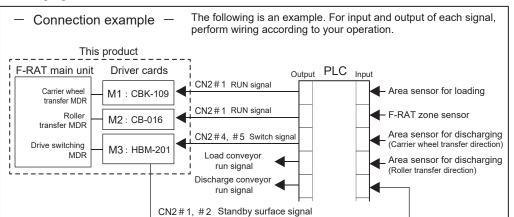
Connecting to power supply units

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

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.





8. Control/Operation

| 8-1. | Basic operation | ••••• | 42 |
|------|---|-------|----|
| 8-2. | Switching the transfer direction | | 46 |
| 8-3. | Changing the speed | | 47 |
| 8-4. | Switching the transfer surface | | 49 |
| 8-5. | About the initial position setting (teaching) of the transfer surface | | 50 |
| 8-6. | Program example | | 51 |
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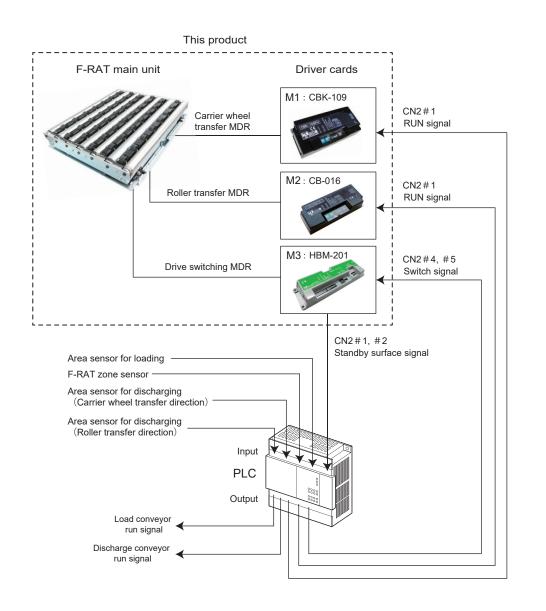
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8. Control/Operation

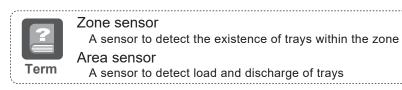
Device configuration

image



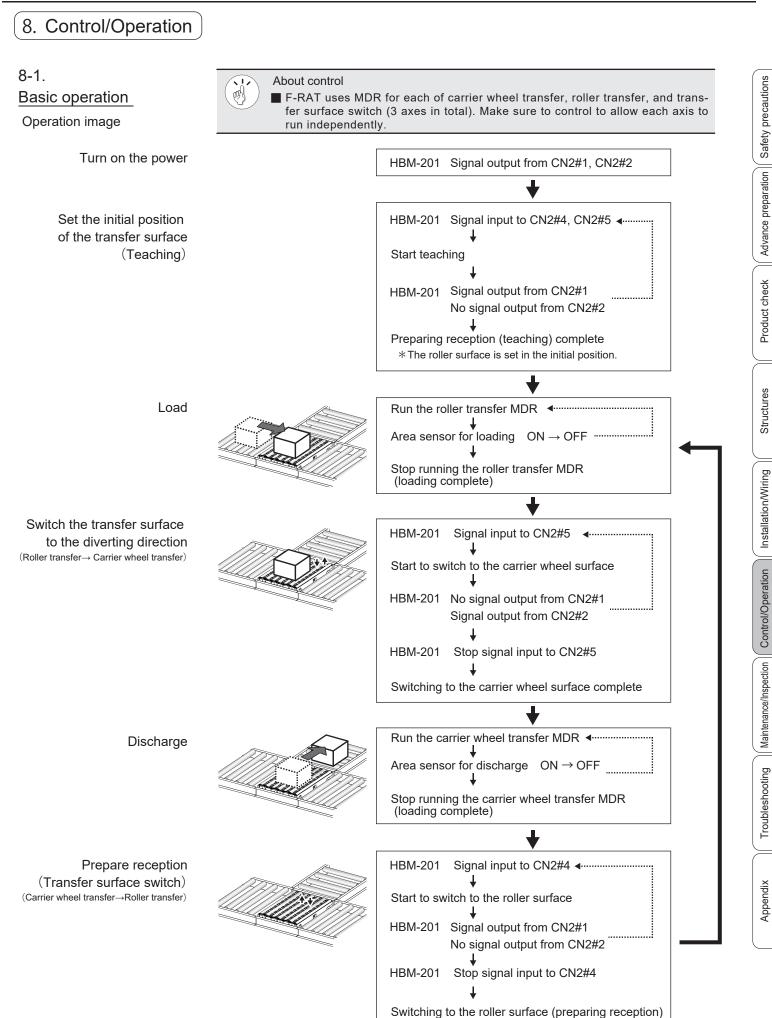
| Label description | MDR code | Driver card |
|-------------------|----------------------------|-------------|
| M1 * | Carrier wheel transfer MDR | CBK-109 |
| M2 * | Roller transfer MDR | CB-016 |
| M3 * | Drive switching MDR | HBM-201 |

* Refer to the labels for cables coming from the F-RAT main unit.



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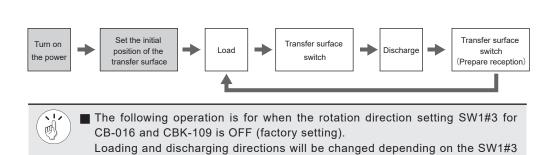
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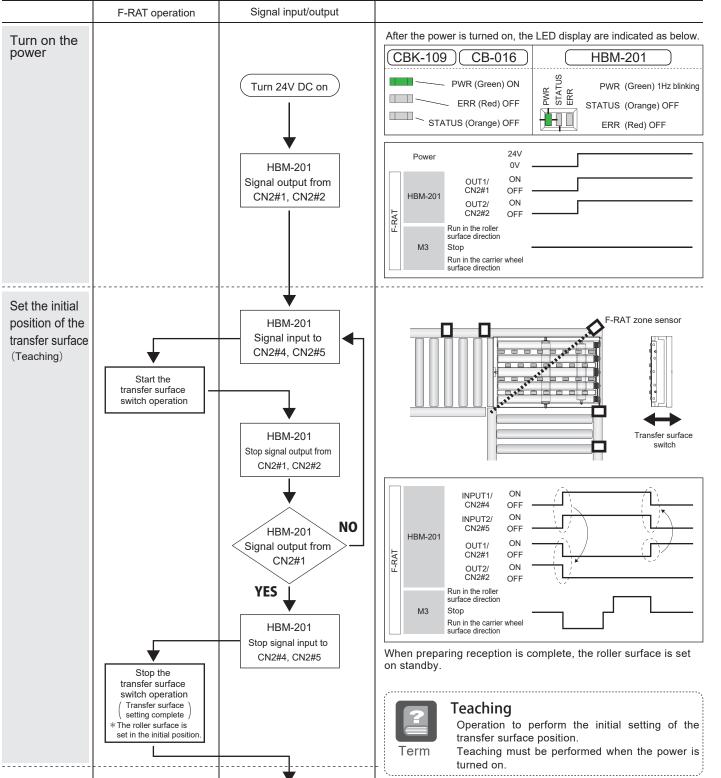
8-1. Basic operation



[Refer to 8-2. Switching the transfer direction on P.46.]

Transfer flow chart (when using the roller for loading, and carrier wheel for discharging)

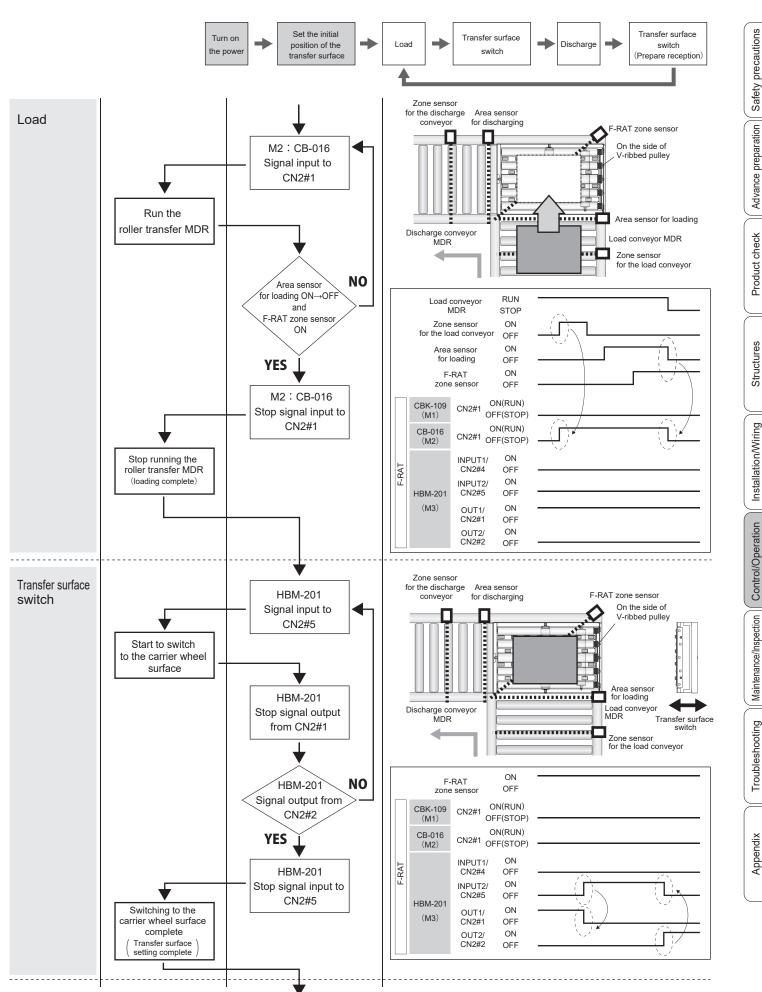
setting and signal input to CN2.



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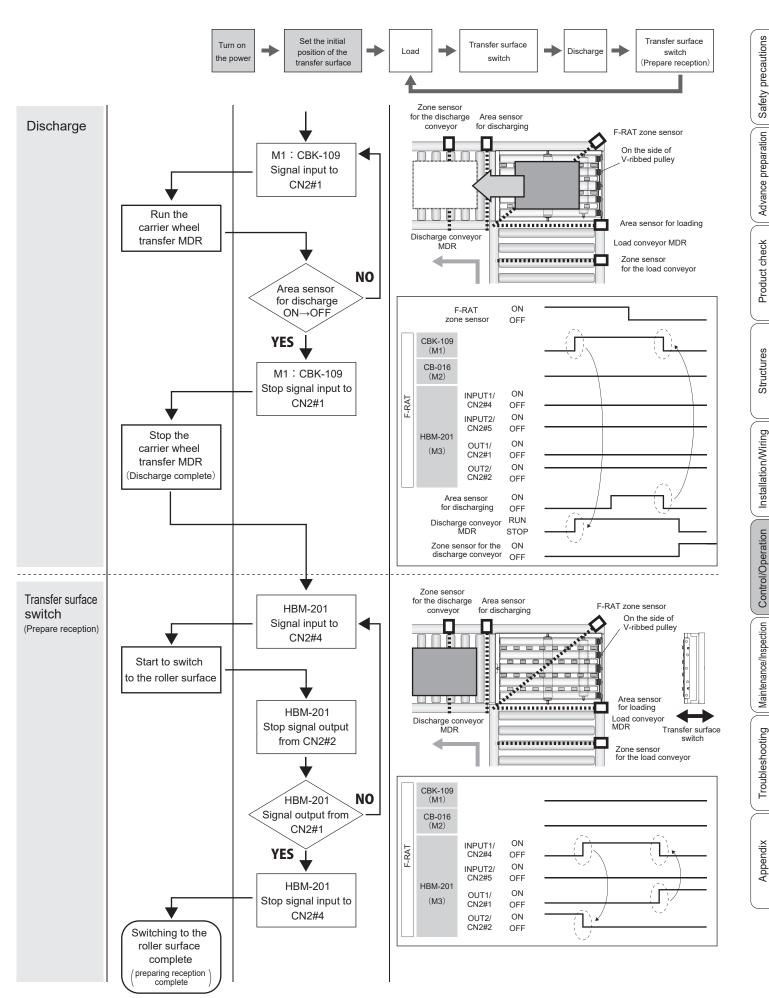


8. Control/Operation









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8. Control/Operation

8-2.

Switching the

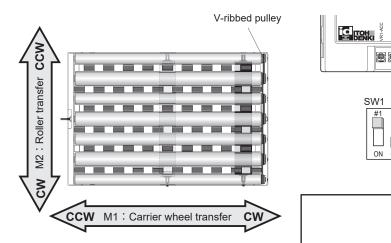
transfer direction

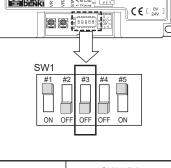
(M1:CBK-109 / M2:CB-016)

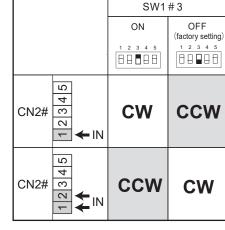
Switching the transfer direction

The transfer direction can be set by DIP-SW on the driver card, and signal input.

- - When changing the direction, check the F-RAT main unit installation direction.
 The transfer direction cannot be changed by SW1#3 during transfer (while MDR is running). Change the direction when MDR stops.

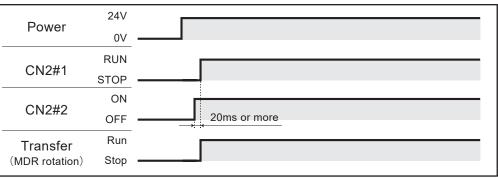






Transfer/Stop in the CW direction * by inputting signal

*When DIP-SW1#3 is OFF



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8-3.

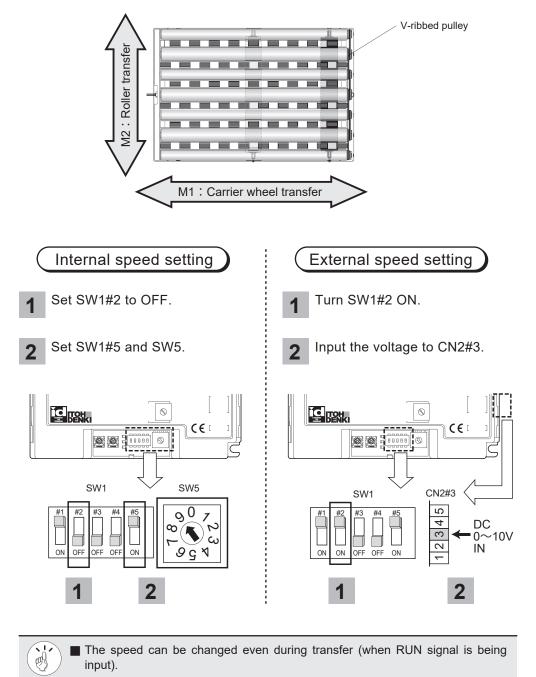
Changing the

transfer speed

. (M1:CBK-109 / M2:CB-016)

Changing the transfer speed

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



Troubleshooting



8. Control/Operation

8-3.

Changing the speed

[M1:CBK-109 / M2:CB-016]

Speed chart

(m/min)

| [M1 | : | Carrier | wheel | speed] |
|-----|---|---------|-------|--------|
|-----|---|---------|-------|--------|

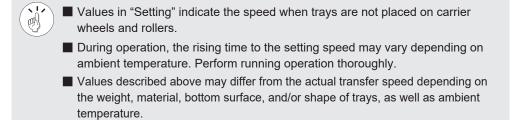
| | SW1#5 : ON | | | | | | SW1#5 : OFF | | | | | | | | | | | | | |
|----------------------------------|------------------|-----------------|------------------|------------------|-----------------|------------------|------------------|------------------|-----------------|-----------------|------------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|------------------|------------------|------------------|
| SW5 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Setting | 61.5 | 56.4 | 53.9 | 51.3 | 48.7 | 46.2 | 41.1 | 38.4 | 35.9 | 33.4 | 30.8 | 28.2 | 25.6 | 23.1 | 20.5 | 18.0 | 15.5 | 12.8 | 10.3 | 7.7 |
| Rated | 59.8 | 56.4 | 53.9 | 51.3 | 48.7 | 46.2 | 41.1 | 38.4 | 35.9 | 33.4 | 30.8 | 28.2 | 25.6 | 23.1 | 20.5 | 18.0 | 15.5 | 12.8 | 10.3 | 7.7 |
| External voltage Input (V) | 9.6 \$ 9.9 | 9.1 〈 9.4 | 8.6 \$ 8.9 | 8.1 \$ 8.4 | 7.6 { 7.9 | 7.1 \$ 7.4 | 6.6 \$ 6.9 | 6.1 \$ 6.4 | 5.6 〈 5.9 | 5.1 〈 5.4 | 4.6 \$ 4.9 | 4.1 5 4.4 | 3.6 〈 3.9 | 3.1 〈 3.4 | 2.6 \$ 2.9 | 2.1 \$ 2.4 | 1.6 \$ 1.9 | 1.1 \$ 1.4 | 0.6 \$ 0.9 | 0.1 \$ 0.4 |

Factory setting

[M2 : Roller speed]

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 Nominal speed Setting 56.6 54.0 51.4 46.3 41.2 38.6 36.0 33.4 30.9 28.3 25.7 23.1 20.6 18.0 61.7 48.9 15.4 12.9 10.3 7.7 60 m/min type 53.5 53.5 46.3 41.2 38.6 36.0 33.4 30.9 28.3 25.7 23.1 20.6 18.0 10.3 7.7 Rated 53.5 51.4 48.9 15.4 12.9 External voltage 9.6 9.1 8.6 8.1 7.6 7.1 6.6 6.1 5.6 5.1 4.6 4.1 3.6 3.1 2.6 2.1 1.6 1.1 0.6 0.1 Input S S S S S S S S S S S S S S S S S S 9.9 9.4 8.9 8.4 7.9 7.4 6.9 6.4 5.9 5.4 4.9 4.4 3.9 3.4 2.9 2.4 1.9 1.4 0.9 0.4 (V)

:Factory setting



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8-4.

Switching the

[M3:HBM-201]

transfer surface

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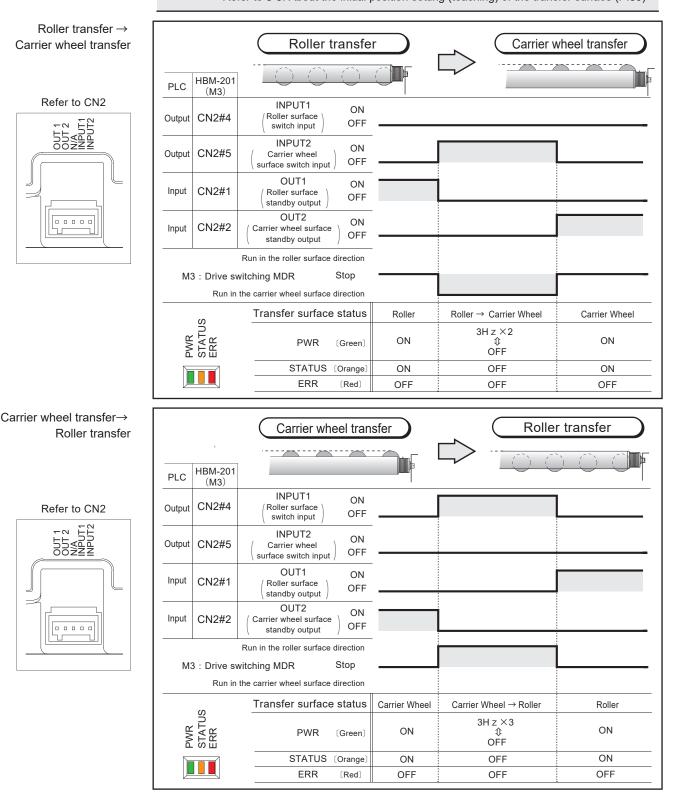
Switching the transfer surface

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The transfer surface can be switched by inputting the signal to CN2#4 and CN2#5.

After the initial position setting (teaching) of the transfer surface, the roller surface is H put on standby. To put the carrier wheel surface on standby (use it for reception), the transfer surface needs to be changed using the signal input.

Refer to 8-5. About the initial position setting (teaching) of the transfer surface (P.50)





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.

8. Control/Operation

8-5.

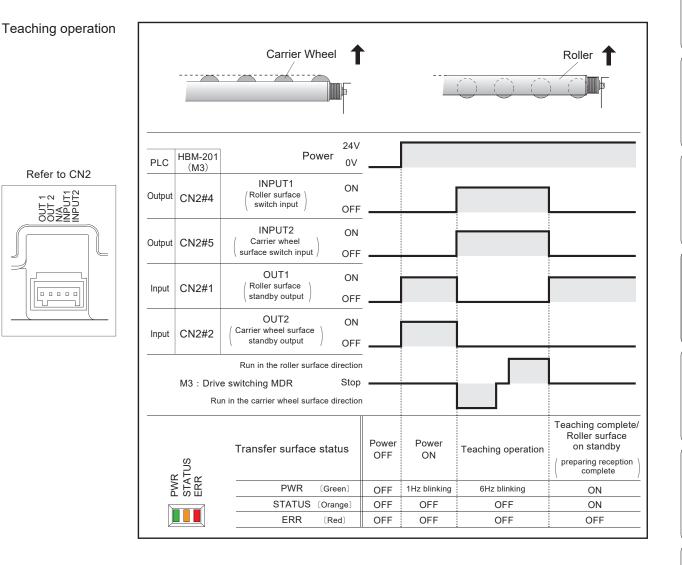
About the initial position setting (teaching) of the transfer surface (M3:HBM-201)

About the initial position setting (teaching) of the transfer surface

The initial position setting (teaching) of the transfer surface is necessary to set the transfer surface after the power is turned on.

- If teaching has not been set, the transfer surface cannot be switched.
- When teaching fails, both CN2#1(OUT1)(roller surface status output) and CN2#2(OUT2)(carrier wheel status output) are turned ON, which is the same status as when the power is turned on.

In such case, check that no foreign object is blocking the lifting mechanism, and perform teaching operation again.





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Teaching

Operation to perform the initial setting of the transfer surface position. After the power is turned on, perform teaching by inputting signal from the driver card.

8. Control/Operation

8-6. Program example

Operation by loading through roller transfer and discharging through carrier wheel transfer

Program example

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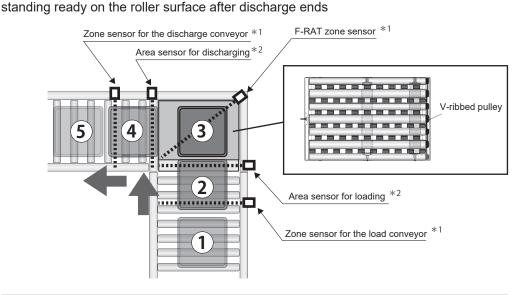


Do not load trays from the roller transfer MDR direction while the carrier wheel status (signal from CN2#2 on HBM-201) is output. Failure to follow this could result in damage to trays, and malfunction.

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 your operation.

When loading through roller transfer, discharging through carrier wheel transfer, and

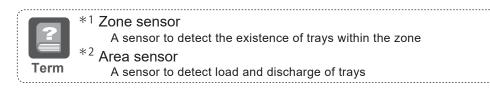
Basic operation (example)



Time chart example

| PLC | | Tray posi | ition | 1 | 2 | 3 | 4 | 5 |
|--------|---|---|------------------------|---|---|---|---|---|
| Input | Zone sensor for th | e load conveyor | ON OFF | | | | | |
| Input | Area sensor | for loading | ON OFF | | | 1 | | |
| Input | F-RAT zon | e sensor | ON OFF | | | | | |
| Input | Area sensor fo (Carrier wheel disc | ON OFF | | | | | | |
| Output | Roller trans (M2 | RUN STOP | | | 1 | | | |
| Output | Carrier wheel tr (M1 | | RUN STOP | | | | | |
| Output | Drive switching MDR (M3) | INPUT2 Carrier wheel surface switch input INPUT1 Roller surface switch input | ON OFF ON OFF | | | | | |
| Input | OUT1 (Roller surface standby output) | | | | | | | |
| Input | OU (Carrier wheel surfa | | ON OFF | | | | | |

It is assumed that switches on CBK-109 and CB-016 are used based on the initial settings.



8. Control/Operation

8-7. What to do before operation

Start-up inspection

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

Items to check before turning on the power

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



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 F-RAT main unit | Screw looseness | Re-tighten screws | | |
| | Damage, deformation | Contact the supplier | | |
| Driver card | Screw looseness on secured positions | Re-tighten screws | | |
| Divercald | Mounting failure for driver cards and connectors | Correctly mount connectors | | |
| | Damage to cables/Wiring failure | Perform wiring correctly | | |
| Idler for roller transfer | External abnormalities, such as scratches or breakage | | | |
| Roller transfer MDR | External abnormalities, such as scratches, dents, or breakage | Refer to P.58 | | |
| Roller drive belt for roller transfer | Cracks, looseness, wear on the surface | 9-2. Before replacement work | | |
| Carrier wheel | Cracks, wear on the surface | | | |
| 0.1 | Parts deformation, damage | Contact the supplier | | |
| Others | Cable damage | | | |

Items to check after turning on the power

Manually input the signal to driver cards according to inspection contents.

Perform inspection after completing measures to prevent fingers from getting stuck and/or caught in rollers during trasnfer switching, and/or transfer operation. 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 | | |
|-------------------------------|--|--|--|--|
| | Abnormal temperature rise | Contact the supplier | | |
| Driver card | Error check with LED display <normal after="" display="" is="" led="" on="" power="" the="" turned=""> Judged as errors if the LED display is other than that below.</normal> | Check error contents, and eliminate the causes. * For driver card LED display and error countermeasures, refer to <u>9-1. Driver card LED display and</u> error countermeasures (P.55). | | |
| Idler for roller transfer | Abnormal sound Rotation failure | Refer to P.58 | | |
| Roller transfer MDR | Abnormal sound Decrease from the specified speed Abnormal temperature rise | 9-2. Before replacement work | | |
| Carrier wheel transfer MDR | Abnormal sound Decrease from the specified speed Abnormal temperature rise (Check ERR LED on driver cards) | Contact the supplier | | |
| Drive switching MDR | Abnormal sound Abnormal temperature rise (Check ERR LED on driver cards) | | | |
| Others | Leakage from equipment | Check grounding on equipment, perform grounding | | |

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8. Control/Operation

Trial run

Items to check before the trial run

Check below before the trial run.

- · When the roller transfer MDR 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.

| 9 | 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. | |
|---|---|--|
| I | Make sure to check that wiring, driver card settings, and PLC settings have been carried out correctly before the trial run. | |
| I | During operation, the transfer speed may not reach the specified value depending on ambient temperature. When the carrier wheel cassette has been replaced, perform running operation thoroughly to eliminate any bends from belts. | |

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| 9-1. | Driver card LED display and error countermeasures | 55 |
|------|--|----|
| 9-2. | Before replacement work | 58 |
| 9-3. | Replacement of MDR for roller transfer/idlers/roller drive belts | 60 |
| 9-4. | Replacement of the carrier wheel cassette | 65 |



9. Maintenance/Inspection

9-1.

Driver card LED display

and error countermeasures

Checking the driver card status

[CBK-109]

For carrier wheel transfer LED display explanation If errors occur with this product, identify the cause of errors, and perform recovery work.

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



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

→ RUN signals at intervals of 100 ms or more.

| ■ When error signals have been released by CN2#1 (RUN / STOP), the F-RAT instantly starts up when RUN is input. |
|---|
| When the power supply voltage becomes insufficient, operation may be disabled, or an |

- ts up when RUN is input. en the power supply voltage becomes insufficient, operation may be disabled, or an unexpected operation may occur. To restart the F-RAT, switch the ON \rightarrow OFF \rightarrow ON / OFF \rightarrow ON \rightarrow OFF / RUN \rightarrow STOP
- Error details

M : Manual recovery setting (SW1#1 ON) / A : Automatic recovery setting (SW1#1 OFF <factory setting>)

| PWR (Green) ERR (Red) | CN2#4 (Error signal) SW1#4 OFF ON | | Causes | | How to release error signals | Recovery operation | | |
|------------------------------------|--|---|--|--|---|--|--|--|
| | Output | Open | (Normal operation) | | _ | | | |
| | Open | Open | No power supply | Su | pply 24V DC | Refer to P.35 7-3. Wiring | | |
| | Open | Output | Damage to driver cards | | rn off the power, and replace driver card | Refer to P.33, 35 7-2. Installation 7-3. Wiring | | |
| | | | | | When one minute has elapsed after decreasing the error signal is released, and the unit starts is | | | |
| | | | | | After decreasing to the recovery temperature, r and start up the unit by RUN→STOP→RUN or | | | |
| | E E | put | Thermal error Thermal protection has worked due to a | A | After decreasing to the recovery temperature, switch $ON \rightarrow OFF \rightarrow ON$ or $OFF \rightarrow ON \rightarrow OFF$ on $CN2#2$ | Start up the unit by RUN \rightarrow STOP \rightarrow RUN on CN2#1 | | |
| | ð | Image: Second | | | After decreasing to the recovery temperature, r and start up the unit by RUN→STOP→RUN or | | | |
| | | | | M | After decreasing to the recovery temperature, switch $ON \rightarrow OFF \rightarrow ON$ or $OFF \rightarrow ON \rightarrow OFF$ on $CN2#2$ | Start up the unit by RUN \rightarrow STOP \rightarrow RUN on CN2#1 | | |
| | Open | Output | Connector disconnected | Tur | n off the power, and connect the connector | Refer to P.35 7-3. Wiring | | |
| | Open | Output | MDR disconnection | Tur | n off the power, and replace the MDR | Refer to P.58 9-2. Before replacement work | | |
| | _ | t | Lock error | | n 4sec or more have elapsed after an error occu start up the unit by RUN→STOP→RUN on CN2≉ | | | |
| | Open | Output | MDR has been locked, and 0.5sec have elapsed | occu | n 4sec or more have elapsed after an error rs, switch ON→OFF→ON or OFF→ON→OFF N2#2 | Start up the unit by RUN \rightarrow STOP \rightarrow RUN on CN2#1 | | |
| | | | Low voltage error | Α | Secure the power supply voltage of 18V or more | The unit starts up instantly | | |
| | Open | Output | Power supply voltage has been 15V or less for 1sec, | | After securing the power supply voltage of 18V c and start up the unit by RUN \rightarrow STOP \rightarrow RUN on (| | | |
| ÷ | 0 | 0 | or decreases to 15V or less 5 times within 500ms | M | After securing the power supply voltage of 18V or more, switch ON \rightarrow OFF \rightarrow ON or OFF \rightarrow ON \rightarrow OFF on CN2#2 | Start up the unit by RUN \rightarrow STOP \rightarrow RUN on CN2#1 | | |
| | | | Back EMF error | A | Voltage applied to MDR has been 30V or less for 1sec | The unit starts up instantly | | |
| | Voltage applied to the MDR has been 40V or more for 2 sec, or has been 60V or more for 0.1sec | | | After voltage applied to MDR has been 30V or I signal, and start up the unit by RUN→STOP→F | | | | |
| Blinking twice OFF (1.5 sec) | ð | Out | more for 0.1sec *This error may occur when the MDR has rotated at speeds faster than the setting speed. | M | After voltage applied to MDR has been 30V or less for 1sec, switch $ON \rightarrow OFF \rightarrow ON$ or $OFF \rightarrow ON \rightarrow OFF$ on $CN2#2$ | Start up the unit by RUN→ STOP→RUN on CN2#1 | | |
| | Open | Output | A current of 7A or more flows in the MDR | No | error signal | _ | | |

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

Original notice - A1.28

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:OFF

9. Maintenance/Inspection

[CB-016]

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For roller transfer LED display explanation :ON

Т

-:Blinking(1Hz)

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

- When error signals have been released by CN2#1 (RUN / STOP), the F-RAT instantly starts up when RUN is input. When the power supply voltage becomes insufficient, operation may be disabled, or an unexpected operation may occur.
 - To restart the F-RAT, switch the ON \rightarrow OFF \rightarrow ON / OFF \rightarrow ON \rightarrow OFF / RUN \rightarrow STOP \rightarrow RUN signals at intervals of 100 ms or more.

-:Blinking (6Hz)

Error details

M :Manual recovery setting (SW1#1 ON) / A :Automatic recovery setting (SW1#1 OFF <factory setting>)

| PWR (Green) ERR (Red) | CN2#4 (Error signal) SW1#4 SW1#4 OFF ON | | | How to release error signals | Recovery operation | |
|--------------------------------|--|--------|---|------------------------------|---|--|
| | Output | Open | (Normal operation) | | _ | |
| | Open | Open | No power supply | Su | pply 24V DC | Refer to P.35 7-3. Wiring |
| | Open | Output | Damage to driver cards | | rn off the power, and replace driver card | Refer to P.33, 35 7-2. Installation 7-3. Wiring |
| | | | | | When one minute has elapsed after decreasing the error signal is released, and the unit starts | |
| | | | T he sum of sum of | | After decreasing to the recovery temperature, r and start up the unit by RUN→STOP→RUN or | |
| | c | nt | Thermal error Thermal protection has | <u>(A)</u> | After decreasing to the recovery temperature, switch $ON \rightarrow OFF \rightarrow ON$ or $OFF \rightarrow ON \rightarrow OFF$ | Start up the unit by RUN \rightarrow STOP \rightarrow RUN on CN2#1 |
| | Open | Output | worked due to a temperature rise of driver | | on CN2#2 | The unit starts up within 1min |
| | | 0 | cards or MDR | | After decreasing to the recovery temperature, r and start up the unit RUN→STOP→RUN on C | |
| | | | | (M) | After decreasing to the recovery temperature, switch ON \rightarrow OFF \rightarrow ON or OFF \rightarrow ON \rightarrow OFF on CN2#2 | Start up the unit by RUN \rightarrow STOP \rightarrow RUN on CN2#1 |
| | L | out | Connector | - | | Refer to P.35 |
| | Open | Output | disconnected | lur | n off the power, and connect the connector | 7-3. Wiring |
| | Open | Output | MDR disconnection | Tur | n off the power, and replace the MDR | Refer to P.58 9-2. Before replacement work |
| | _ | t | Lock error | Rele | ase the error signal, and start up the unit by RUN | N→STOP→RUN on CN2#1 |
| | Open | Output | MDR has been locked, and 4sec have elapsed | Swite CN2 | ch ON \rightarrow OFF \rightarrow ON or OFF \rightarrow ON \rightarrow OFF on #2 | Start up the unit by RUN \rightarrow STOP \rightarrow RUN on CN2#1 |
| | | | | A | Secure the power supply voltage of 18V or more | The unit starts up instantly |
| | Open | Output | Low voltage error Power supply voltage is | | After securing the power supply voltage of 18V c and start up the unit by RUN→STOP→RUN on 0 | |
| | ō | O | D 15 V or less | M | After securing the power supply voltage of 18V or more, switch ON \rightarrow OFF \rightarrow ON or OFF \rightarrow ON \rightarrow OFF on CN2#2 | Start up the unit by RUN \rightarrow STOP \rightarrow RUN on CN2#1 |

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

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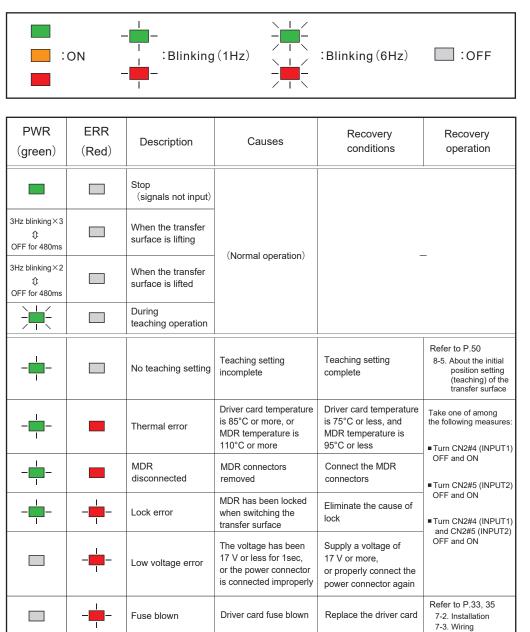
9. Maintenance/Inspection

(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.

LED display explanation

LED details

(information LED)

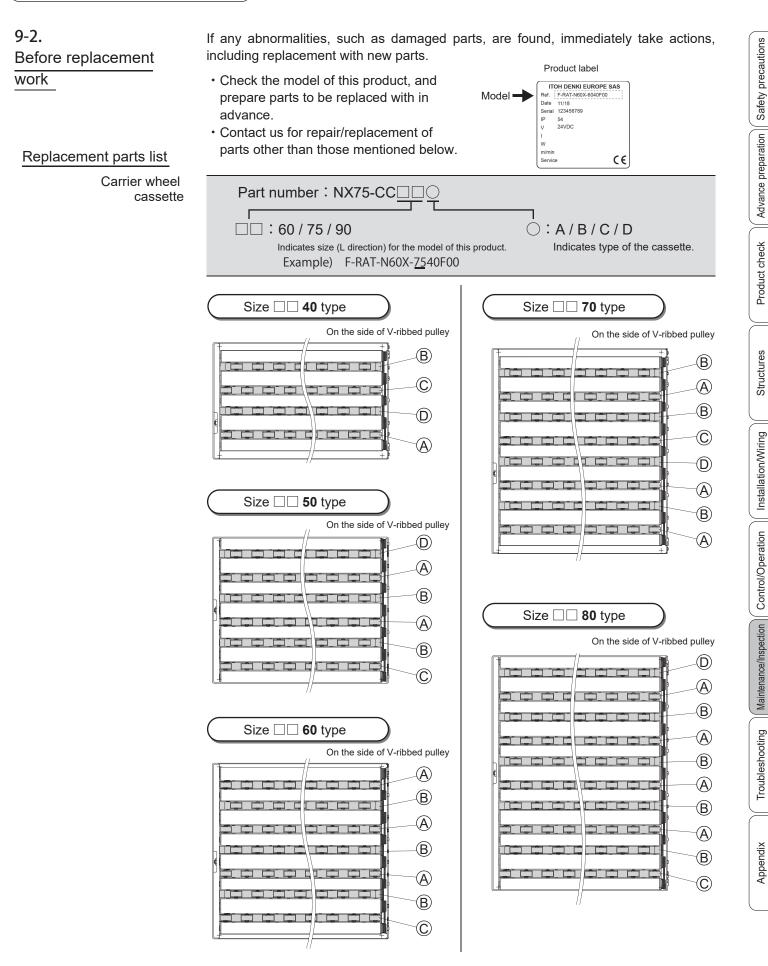


STATUS (Orange) details

| STATUS (Orange) | Description |
|-----------------|---|
| | No teaching setting/During teaching operation/When the transfer surface is being switched |
| | Horizontal surface standby/Tilted surface standby |



9. Maintenance/Inspection



Example) Carrier wheel cassette Type (B) for F-RAT-N60X- 7540F00 : NX75-CC-75(B)

60/75/9060

60/75/9070

60/75/9080



9. Maintenance/Inspection

| Parts name | Length L fo size (40→ | | Width | Speed / Ø | ltoh Denki reference |
|----------------------------|---|--|-------|-----------|-----------------------------------|
| | 60XX | All v | width | 60m/min | PM486FE0600542XRNT N000 |
| MDR for roller transfer | 75XX | Ally | width | 60m/min | PM486FE0600692XRNT N000 |
| | 90XX | All v | width | 60m/min | PM486FE0600842XRNT N000 |
| | CONN | A 11 - 2 | | Ø38 | FR380IDZDS0542XRN0 N000 |
| | 60XX | | width | Ø48,6 | FR486IDZHS0542XRN0 N000 |
| Idler roller for | 75222 | A 11 - | | Ø38 | FR380IDZDS0692XRN0 N000 |
| roller transfer | 75XX | | width | Ø48,6 | FR486IDZHS0692XRN0 N000 |
| | 00222 | A 11 | | Ø38 | FR380IDZDS0842XRN0 N000 |
| | 90XX | | width | Ø48,6 | FR486IDZHS0842XRN0 N000 |
| V-ribbed belt | Only for linking Ø38 idler in size XX60 | | | 2PJ246 | |
| V Hobed beit | For the others | | | | 2PJ265 |
| | For MDR for carrier wheel transfer | | | CBK-109FP | |
| Driver card for CB type | For MDR for roller transfer | | | CB016BP-7 | |
| | For MDR for drive switching | | | HBM-201BP | |
| Driver card | For MDR for c | For MDR for carrier wheel transfer & roller transfer | | | IB-P02F-P-FT (or IB-E04F-P-FT) |
| for IB type | For MDR for d | rive switchin | ıg | | HBM-201BP |
| RAT-N60X-xxxx | 2PJ246 | 2PJ265 | | | 2PJ246 |
| 75/9040 | - | 4 | | | |
| 75/9050 | - | - 6 | | | |

6

8

10

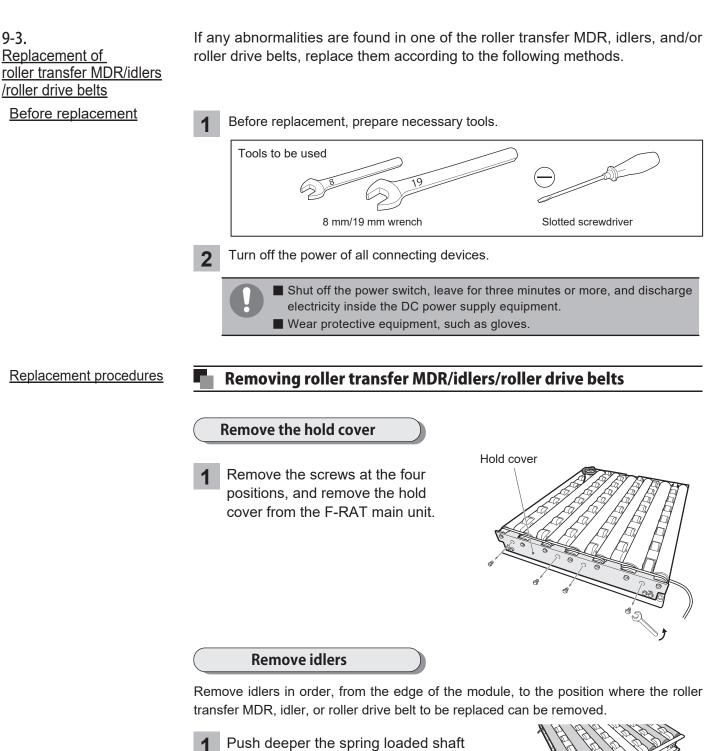
1

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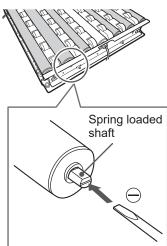
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9. Maintenance/Inspection



Push deeper the spring loaded shaft of the idler using the tip of a slotted screwdriver, etc.



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Installation/Wiring



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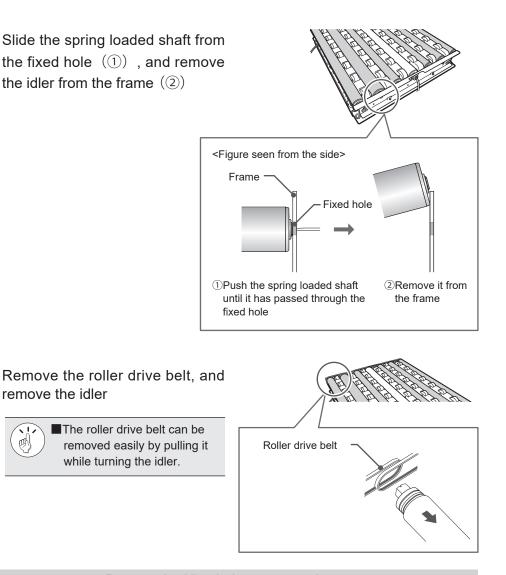
Installation/Wiring

Maintenance/Inspection Control/Operation

9. Maintenance/Inspection

Replacement procedures

Slide the spring loaded shaft from 2 the fixed hole (1) , and remove the idler from the frame (2)



Remove other idlers in the same procedures.

Remove the roller transfer MDR

Remove the cable tie securing the power cable (1), and remove the mounting bracket from the power cable (2)



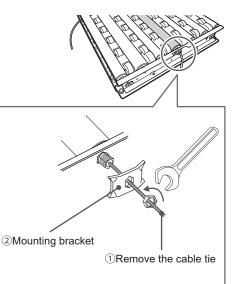
3

remove the idler

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When removing the mounting bracket, be careful not to damage the cable.



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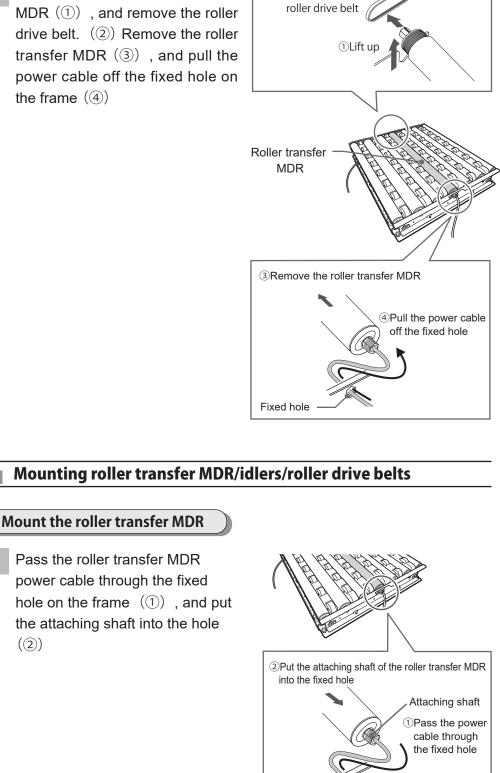
9. Maintenance/Inspection

2

(2)

Replacement procedures

Lift up the tip of the roller transfer MDR (1) , and remove the roller drive belt. (2) Remove the roller transfer MDR (3), and pull the power cable off the fixed hole on the frame (④)



Fixed hole

②Remove the



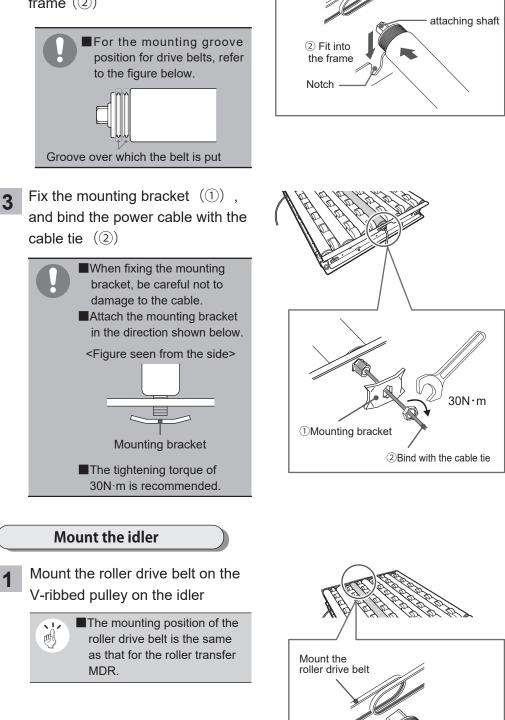
1 Mount the roller

drive belt

9. Maintenance/Inspection

Replacement procedures

Mount the roller drive belt on the V-ribbed pulley of the roller transfer MDR (①), align the tip of the attaching shaft with the notch shape, and fit it into the frame (②)



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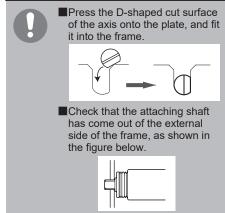
Troubleshooting

Appendix

9. Maintenance/Inspection

Replacement procedures

2 Align the tip of the attaching shaft on the side of the belt on the V-ribbed pulley, where the roller drive belt has been mounted, with the notch shape on the frame, and fit it into the frame



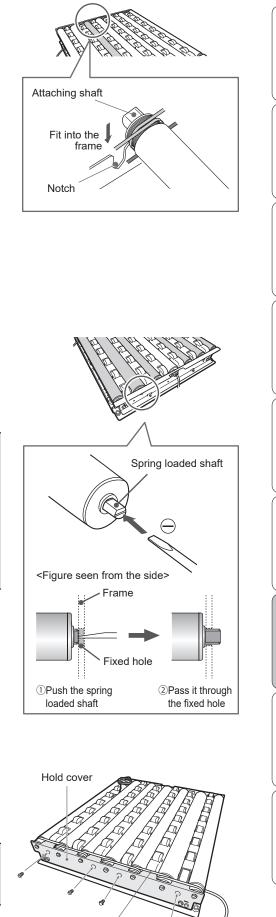
- **3** Push the spring loaded shaft of the idler by the tip of a slotted screwdriver, etc. (1), and pass it through the fixed hole (2)
 - Check that the spring loaded shaft has sufficiently come out of the external side of the frame, as shown in the figure below.





1 Mount the hold cover in the reverse of the procedures on page 60, "Remove the hold cover".

Make sure to mount the hold cover so that the roller drive belt can be seen.



Roller drive belt 3.2N · m Original notice - A1.28

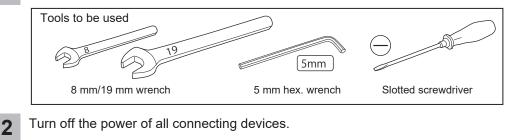
9. Maintenance/Inspection

9-4. Replacement of the carrier wheel cassette

If any abnormalities are found in the carrier wheels, replace the whole carrier wheel cassette.

Before replacement

Before replacement, prepare necessary tools.





electricity inside the DC power supply equipment.

Wear protective equipment, such as gloves.

Replacement procedure

Removing roller transfer MDR/idlers/roller drive belts

Remove the idlers in order, from the edge of the module to the position where the carrier wheel cassette to be replaced can be removed.

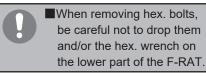


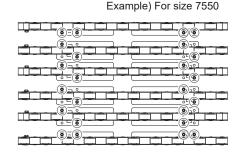
Replacement of roller transfer MDR/idlers/roller drive belts

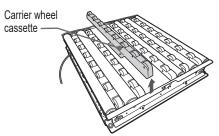
Removing roller transfer MDR/idlers/roller drive belts

Remove the carrier wheel cassette

Remove hex. bolts at four positions circled on the carrier wheel cassette to be replaced, and lift up the cassette.







On the side of

V-ribbed pulley

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Location of the carrier wheel cassette

model indication

9. Maintenance/Inspection

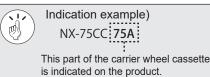
Replacement procedures



6

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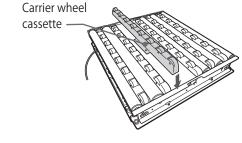
Check the model of the removed carrier wheel cassette and replacement carrier wheel cassette.



Mount the replacement carrier 2 wheel cassette with hex. bolts at four positions circled in the figure, and secure it.

The tightening torque of 11 N·m is recommended. Excessive tightening may result in damage to hex. bolts.

| I | Example) For size 7550 |
|---|------------------------|
| | |
| | |
| | |
| | |
| | |
| | |



Mounting roller transfer MDR/idlers/roller drive belts

Mount the roller transfer MDR, idlers, and/or roller drive belt that have been removed.



9-3.

Replacement of roller transfer MDR/idlers/roller drive belts

Mounting roller transfer MDR/idlers/roller drive belts



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10. Troubleshooting

If you believe the product may be malfunctioning, check the contents described in this section before contacting the supplier and/or asking for repair.

Symptoms

F-RAT does not operate

| Items to be checked | Countermeasures | References |
|---|---|--|
| Is PWR LED (Green) for each driver card ON? Or, has 24 VDC been supplied in the power connector part of driver cards? | Supply 24V DC. | 7. Installation/ Wiring (⇒P.23) |
| Is ERR LED (Red) for each driver card blinking, or is it ON and is there an error output? | Remove the cause of error, and release the error. | 9. Maintenance/ inspection (⇒P.54) |
| Has each connector been connected correctly? Has wiring been performed properly? | Check wiring, and perform wiring properly if it has not already been done so. | 7. Installation/ Wiring (⇒P.23) |
| Has each driver card type * (NPN input/output / PNP input/output) matched the input and output signals (NPN input/output / PNP input/output) on PLCs? *Check the model of driver cards. | Match each driver card type (NPN input/output / PNP input/output) with the input and output signals on PLCs (NPN input/output / PNP input/output). | 7. Installation/ Wiring (⇒P.23) |
| Has the same voltage to be input as the power supply voltage been used? | Use the same voltage to be input as the power supply voltage. | 7. Installation/ Wiring (⇒P.23) |

The transfer surface cannot be switched, or transfer surface switching operation is incorrect

| Items to be checked | Countermeasures | References |
|--|--|--|
| Has the initial setting (teaching setting) been performed? | Perform the initial setting (teaching setting). | Initial setting (Teaching setting) (⇒P.50) |
| Is ERR LED (Red) on the driver card for M3: drive switching blinking, or is it ON and is there an error output? | Remove the cause of error, and release the error. | 9. Maintenance/ inspection (⇒P.54) |
| Has the RUN signal input to the driver card for M3: drive switching corresponded to the transfer surface? Also, is the input timing correct? | Check the signal input and input timing when the transfer surface is switched. | 8. Control/ Operation (⇒P.40) |
| Has the setting of the driver card for M3: drive switching not been changed? | Check the setting of the driver card for M3: drive switching switch. | 8. Control/ Operation (⇒P.40) |

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10. Troubleshooting

Symptoms

When loading, trays get stuck, or cannot be transferred

| Items to be checked | Countermeasures | References |
|--|---|--|
| Is the load conveyor level the same as the level of the F-RAT? | Align levels of the load conveyor and the F-RAT. | 7. Installation/ Wiring (⇒P.23) |
| When loading by carrier wheels, have they been set on the top of the surface? When loading by rollers, have they been set on the top of the surface? | Set either carrier wheels or rollers on the top of the surface according to the loading direction. | 8. Control/ Operation (⇒P.40) |
| When loading by carrier wheels, have you run the carrier wheel MDR (M1)? When loading by rollers, have you run the roller MDR (M2)? Also, have you run the MDR until loading ends? | Run either carrier wheel MDR (M1) or roller MDR (M2) according to the loading direction until transfer ends. | 8. Control/ Operation (⇒P.40) |
| When loading by carrier wheels, are there any carrier wheels rotating slower than others? | Replace the carrier wheel cassette including the slow rotating wheels. | 9. Maintenance/ inspection (⇒P.54) |
| Has the transfer drive switching MDR (M3) not run at the time of loading? | Do not run the drive switching MDR (M3) until transfer ends. | 8. Control/ Operation (⇒P.40) |

When discharging, trays get stuck, or cannot be transferred

| Items to be checked | Countermeasures | References |
|--|--|--|
| Is the discharge conveyor level same as the level of the F-RAT? | Align levels of the discharge conveyor and the F-RAT. | 7. Installation/ Wiring (⇒P.23) |
| When discharging by carrier wheels, have they been set on the top of the surface? When discharging by rollers, have they been set on the top of the surface? | Set either carrier wheels or rollers on the top of the surface according to the discharging direction. | 8. Control/ Operation (⇒P.40) |
| When discharging by carrier wheels, have you run the carrier wheel MDR (M1)? When discharging by rollers, have you run the roller MDR (M2)? Also, have you run the MDR until discharging ends? | Run either carrier wheel MDR (M1) or roller MDR (M2) according to the discharging direction until discharging ends. | 8. Control/ Operation (⇒P.40) |
| When discharging by carrier wheels, are there any carrier wheels rotating slower than others? | Replace the carrier wheel cassette including the slow rotating wheels. | 9. Maintenance/ inspection (⇒P.54) |
| Has the transfer drive switching MDR (M3) not run at the time of discharging? | Do not run the drive switching MDR (M3) until discharging ends. | 8. Control/ Operation (⇒P.40) |

POWER MOLLER.

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10. Troubleshooting

Symptoms

- The speed cannot be changed
- The speed setting is incorrect

| Items to be checked | Countermeasures | References |
|---|--|---|
| To change the carrier wheel speed, have you operated the switch on the driver card for M1: carrier wheels [CBK-109]? To change the roller speed, have you operated the switch on the driver card for M2: rollers [CB-016]? | To change the carrier wheel speed, operate the switch on the driver card for M1: carrier wheels [CBK-109]. To change the roller speed, operate the switch on the driver card for M2: rollers [CB-016]. | Changing the transfer speed (⇒P.47) |
| Have you changed the external speed by the voltage input to CN2#3 on CBK-109/CB-016? Have you changed the internal speed with the switch on CBK-109/CB-016? | Check the external and internal speed settings, and change the speed according to the settings. | Changing the transfer speed (⇒P.47) |
| When changing the speed by the external voltage, is the power supply 0 V of the external voltage common to 0 V on the driver card? | Use the common power supply 0V. | 7. Installation/ Wiring (⇒P.23) |

The transfer direction (rotating direction of carrier wheels/rollers) is incorrect

| Items to be checked | Countermeasures | References |
|---|---|-------------------------------------|
| Is the transfer/diverting direction based on the rotating direction settings for the driver card for M1: carrier wheels/M2: rollers? | Set the correct transfer/diverting direction, and the correct the rotating direction for the driver card for M1: carrier wheels/ M2: rollers. | 8. Control/ Operation (⇒P.40) |

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Appendix

Appendix 1. Product specifications

F-RAT main unit specifications

| Size 60 | | | | 6040 | 6050 | 6060 | 6070 | 6080 |
|----------------|------------------------------|---|--|--|---|---|------------------------------------|------------------|
| | | Total length (L) Carrier wheel trar | nsfer direction | | | 595mm | | |
| | F-RAT main unit | Total width (W) Roller transfer di | rection | 395mm | 495mm | 595mm | 695mm | 795mm |
| | | Weight | | 32kg | 38kg | 44kg | 52kg | 60kg |
| | Maximum Ic | ad weight | ad weight | | | 50kg | | |
| Size 75 | | | | 7540 | 7550 | 7560 | 7570 | 7580 |
| | | Total length (L) Carrier wheel trar | sfer direction | | | 745mm | 1 | |
| | F-RAT | Total width (W) Roller transfer di | | 395mm | 495mm | 595mm | 695mm | 795mn |
| | main unit | Weight | | 42kg | 48kg | 54kg | 63kg | 71kg |
| | Maximum Ic | , C | | | Folkg | 50kg | UONG | 7 11.9 |
| | | | | 00.40 | 0050 | 0000 | 0070 | 0000 |
| Size 90 | | | | 9040 | 9050 | 9060 | 9070 | 9080 |
| | F-RAT | Total length (L) Carrier wheel trar | nsfer direction | | | 895mm | | |
| | main unit | Total width (W) Roller transfer di | rection | 395mm | 495mm | 595mm | 695mm | 795mn |
| | | Weight | | 52kg | 58kg | 64kg | 74kg | 82kg |
| | Maximum Ic | ad weight | | | | 50kg | | |
| | the abov | de size range. | | | | | | |
| Common | | | 61.6 m/min (D | | tupa) | | | |
| Common | Speed * The above | Carrier wheel Roller /e shows the transfer speed wh | | M486FE-60 ot placed o | type) | wheels an | d rollers w | ith |
| Common | Speed * The abov SW1#5 | Carrier wheel Roller Ve shows the transfer speed wh ON / SW5: 9 specified on CBK During operation, the ris ambient temperature. Per Values described above m weight, material, bottom su | 61.7 m/min (Pl nen trays are n -109 and CB-0 ing time to th fform running nay differ from | M486FE-60 ot placed o 116. he setting g operatio hte actua | type) on carrier g speed n thoroug al transfer | may vary ghly. r speed de | depend | ing on on the |
| Common | Speed * The abov SW1#5 | Carrier wheel Roller Ve shows the transfer speed wh ON / SW5: 9 specified on CBK During operation, the ris ambient temperature. Per Values described above m | 61.7 m/min (Pl nen trays are n -109 and CB-0 ing time to th fform running nay differ from | M486FE-60 ot placed o 116. he setting g operatio hte actua | type) on carrier g speed n thoroug al transfer | may vary ghly. r speed de | depend | ing on on the |
| Common | Speed * The abov SW1#5 | Carrier wheel Roller Ve shows the transfer speed wh ON / SW5: 9 specified on CBK During operation, the ris ambient temperature. Per Values described above m weight, material, bottom su ture. | 61.7 m/min (Pl nen trays are n -109 and CB-0 ing time to th rform running nay differ from urface, and/or | M486FE-60 ot placed of 116. he setting operatio the actua shape of | type) on carrier g speed n thoroug al transfer | may vary ghly. r speed de | depend | ing on on the |
| Common | Speed * The abov SW1#5 | Carrier wheel Roller Ve shows the transfer speed wh ON / SW5: 9 specified on CBK During operation, the ris ambient temperature. Per Values described above m weight, material, bottom su ture. | 61.7 m/min (Phen trays are n -109 and CB-0 ing time to th fform running nay differ from urface, and/or 0 to 40°C (no | M486FE-60 ot placed of 16. he setting operation the actua shape of freezing) | type) on carrier g speed n thoroug al transfer trays, as | may vary ghly. r speed de | depend | ing on on the |
| Common | Speed * The abov SW1#5 | Carrier wheel Roller Ve shows the transfer speed wh ON / SW5: 9 specified on CBK During operation, the ris ambient temperature. Per Values described above m weight, material, bottom su ture. Ambient temperature Ambient humidity | 61.7 m/min (Phen trays are n -109 and CB-0 ing time to th fform running nay differ from urface, and/or 0 to 40°C (no 90%RH or les | M486FE-60 ot placed of 116. he setting operation the actua shape of freezing) ss (no conde | type) on carrier g speed n thoroug al transfer trays, as | may vary ghly. r speed de | depend | ing on on the |
| Common | Speed * The abov SW1#5 | Carrier wheel Roller Ve shows the transfer speed wh ON / SW5: 9 specified on CBK During operation, the ris ambient temperature. Per Values described above m weight, material, bottom su ture. | 61.7 m/min (Phen trays are n -109 and CB-0 ing time to th fform running nay differ from urface, and/or 0 to 40°C (no | M486FE-60 ot placed of 116. he setting operation the actua shape of freezing) ss (no conder ss | type) on carrier g speed n thoroug al transfer trays, as | may vary ghly. r speed de | depend | ing on on the |
| Common | Speed * The abov SW1#5 | Carrier wheel Roller Ve shows the transfer speed wh ON / SW5: 9 specified on CBK During operation, the ris ambient temperature. Per Values described above m weight, material, bottom su ture. Ambient temperature Ambient humidity Altitude | 61.7 m/min (Phene trays are n -109 and CB-0 ing time to the fform running hay differ from urface, and/or 0 to 40°C (no 90%RH or les 1,000 m or les | M486FE-60 ot placed of 116. he setting operation the actua shape of freezing) ss (no conder ss | type) on carrier g speed n thoroug al transfer trays, as | may vary ghly. r speed de | depend | ing on on the |
| Common | Speed * The abov SW1#5 | Carrier wheel Roller A shows the transfer speed wh ON / SW5: 9 specified on CBK During operation, the ris ambient temperature. Per Values described above m weight, material, bottom su ture. Ambient temperature Ambient temperature Ambient humidity Altitude Atmosphere | 61.7 m/min (Phen trays are n -109 and CB-0 ing time to th fform running hay differ from urface, and/or 0 to 40°C (no 90%RH or les 1,000 m or le No corrosive | M486FE-60 ot placed of 116. he setting operation the actua shape of freezing) ss (no conder ss | type) on carrier g speed n thoroug al transfer trays, as | may vary ghly. r speed de | depend | ing on on the |
| Common | Speed * The abov SW1#5 | Carrier wheel Roller Roller //e shows the transfer speed whon / SW5: 9 specified on CBK During operation, the ris ambient temperature. Per Values described above m weight, material, bottom su ture. Ambient temperature Ambient temperature Ambient humidity Altitude Atmosphere Vibration | 61.7 m/min (Phene trays are n -109 and CB-0 ing time to the form running hay differ from urface, and/or 0 to 40°C (no 90%RH or less 1,000 m or le No corrosive 0.5G or less Indoor | M486FE-60 ot placed of 116. he setting operation the actua shape of freezing) ss (no conder ss | type) on carrier g speed n thoroug al transfer trays, as | may vary ghly. r speed de | depend | ing on on the |
| Common | Speed * The abov SW1#5 | Carrier wheel Roller Ve shows the transfer speed wh ON / SW5: 9 specified on CBK During operation, the ris ambient temperature. Per Values described above m weight, material, bottom su ture. Ambient temperature Ambient temperature Ambient humidity Attitude Vibration Installation location | 61.7 m/min (Phene trays are n -109 and CB-0 ing time to the form running hay differ from urface, and/or 0 to 40°C (no 90%RH or less 1,000 m or le No corrosive 0.5G or less Indoor | M486FE-60 ot placed of 116. he setting operation the actua shape of freezing) ss (no conder ss | type) on carrier g speed n thoroug al transfer trays, as | may vary ghly. r speed de | depend | ing on on the |
| Common | Speed * The abov SW1#5 | Carrier wheel Roller Ve shows the transfer speed whON / SW5: 9 specified on CBK During operation, the ris ambient temperature. Per Values described above m weight, material, bottom su ture. Ambient temperature Ambient temperature Ambient temperature Ambient temperature Installation location Mounting surface tilt (inclination) | 61.7 m/min (Phene trays are n -109 and CB-0 ing time to the form running hay differ from urface, and/or 0 to 40°C (no 90%RH or les 1,000 m or le No corrosive 0.5G or less Indoor 0.5% or less | M486FE-60 ot placed of 16. he setting goperatio the actua shape of freezing) ss (no conde ss gas | type) on carrier g speed n thoroug al transfer trays, as | may vary ghly. r speed de well as ar | depend epending nbient ter | ng on on the |

(8) Lot No. (three digits)

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

⑤ Year (last two digits) ⑥ Month ⑦ Day



Advance preparation Safety precautions Product check

Original notice - A1.28

F-RAT-NX75 Technical document

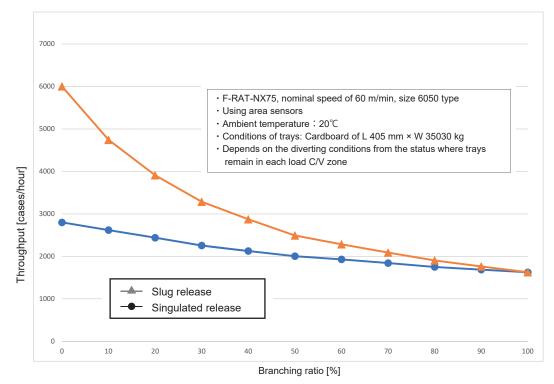


Appendix

Appendix 1. Product specifications

Driver card specifications

| | | For carrier wheel transfer | For roller transfer | For drive switching | |
|--|----------------------------|--|--|--|--|
| | | | | 5 | |
| Model | | CBK-109F (| CB-016B7 (=N : NPN, P : PNP) | HBM-201B (□=N : NPN, P : PNP) | |
| Power suppl | ly voltage 24V DC±10% | | | | |
| Rated voltag | е | 24V DC | | | |
| Static curren | t | 0.06A | 0.03A | 0.06A | |
| Starting curr | ent | 6.6A to 7.4A | 4.0A | 3.7A to 4.4A | |
| Peak current | t | 30A (1ms or less) | 20A (1ms or less) | 20A (1ms or less) | |
| Wire diameter | Power connector (CN1) | 0.80 to 1.5mm ² (AWG:18 to 14) | 0.50 to 1.5mm ² (AWG:20 to 14) | 0.50 to 1.5mm ² (AWG:20 to 14) | |
| Applicable wires to connectors included as standard | Control connector (CN2) | 0.08 to 0.5mm ² (AWG:28 to 20) | | | |
| Protection | | | | Incorrect wiring protection Built-in 7 A fuse | |
| Thermal prot | tection | | | Driver card: 85ºC Motor: 110ºC | |
| Current limit | ation | 7.0A | 4.0A | 4.0A | |
| | Ambient temperature | | 0 to 40°C (no freezing) | | |
| o " | Ambient humidity | 90 | %RH or less (no condensatio | n) | |
| Operating environment | Atmosphere | | No corrosive gas | | |
| chillionnicht- | Vibration | | 0.5G or less | | |
| | Installation location | | Indoor | | |
| Time from R to motor star | UN signal input ting | 15 msec or less | 15 msec or less | | |



st Values on the graph are only references based on our measurement and are not guaranteed.

* The stopping distance of trays and throughput depends on the size, material, bottom status of trays, ambient temperature, and/or the speed.

Transfer throughput

Structures

Appendix

Appendix 2.

Options

Do not store carrier wheel cassettes in places subject to high temperature, high humidity, and/or direct sunlight. Failure to follow this could result in its lifetime to be significantly shortened

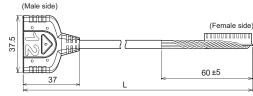
Carrier wheel cassette

| Length | Width | Speed / Ø | Itoh Denki reference |
|--------|-----------|-----------|----------------------------------|
| 60XX | All width | | NX75-CC60X (X: A, B, C or D)* |
| 75XX | All width | | NX75-CC75X (X: A, B, C or D)* |
| 90XX | All width | | NX75-CC90X (X: A, B, C or D)* |

* Each alphabet (A, B, C or D) indicates the type of the cassette. Refer to page 58

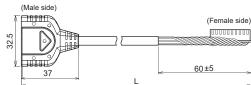
Extension cable

| CBK-109: 12P extension cable length | | | | | | | |
|-------------------------------------|---------------|----------------------------|--|--|--|--|--|
| | Model | 12P extension cable length | | | | | |
| | ACE-CBM-G0600 | L= 600mm | | | | | |
| | ACE-CBM-G1200 | L=1200mm | | | | | |



CB-016 / HBM-201 : 10P extension cable length

| Model | 10P extension cable length | | |
|---------------|----------------------------|--|--|
| ACE-CBM-A0600 | L= 600mm | | |
| ACE-CBM-A1200 | L=1200mm | | |



Handling kit

| | Size | Part reference | |
|--------------|------|-------------------|--|
| Handling kit | 60xx | NX75-IRT60 | |
| for | 75xx | NX75-IRT75 | |
| F-RAT NX75 | 90xx | NX75-IRT90 | |

The kit is an composed of :

4 pcs of eye bolt (1)

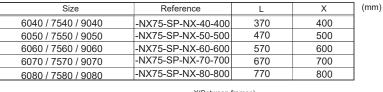
4 pcs of stays for pulling up (2)

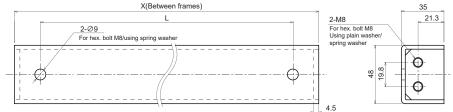
(3) 2 pcs of stays

Note that the plate is inserting inside the looms at each side of the module

Stay

(with hex. bolt/plain washer/ spring washer)





* For X dimensions (between frames) other than those mentioned above, contact us.



Advance preparation Safety precautions

Product check

Structures

Installation/Wiring

Appendix

Appendix 3. Residual risk list/MAP

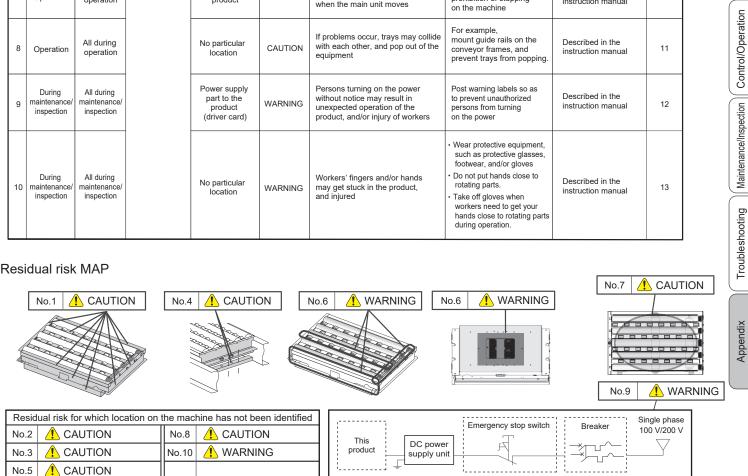
[Seriousness of harm] WARNING: Indicates that there is a possibility that severe injury or even death may result if protective measures have not been taken

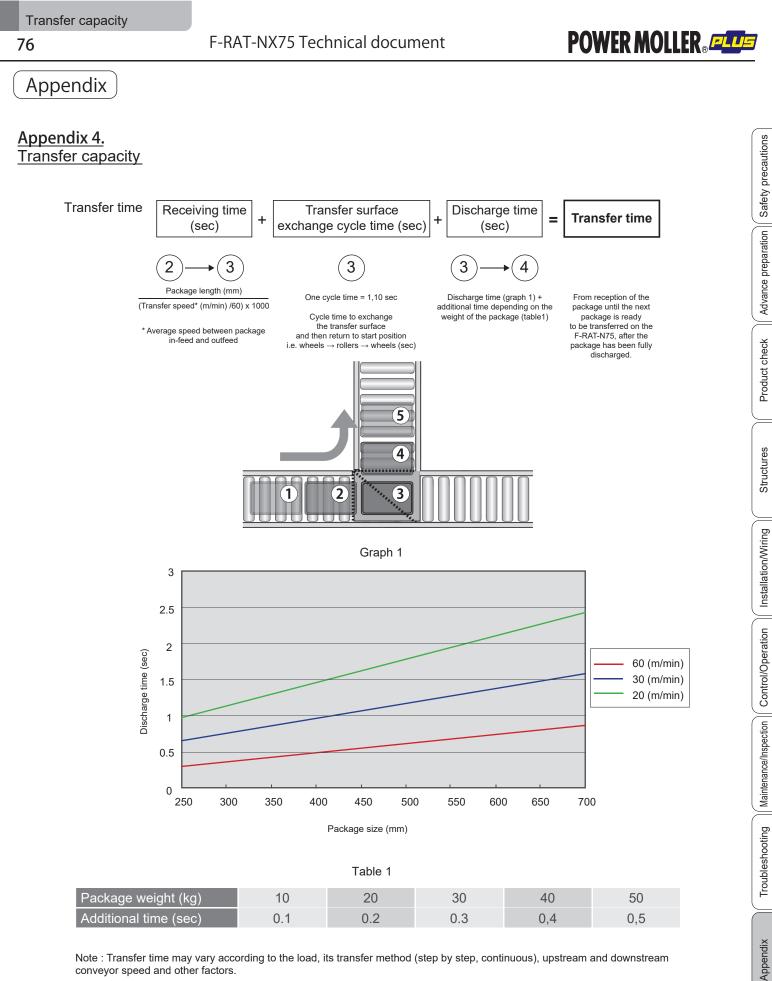
CAUTION: Indicates that there is a possibility that minor injury may result if protective measures have not been taken

Residual risk list

| No. | Operation stage | Work | Qualifications/ education required for work | Locations on machine | Seriousness of harm | Remaining risk factors | Examples of assumed measures | Measures that have been taken independently | Reference page |
|-----|--------------------------------------|--|---|---|------------------------|--|--|--|-------------------|
| 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 | Wear protective equipment, such as gloves, when working. | Described in the instruction manual | 10 |
| 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 | Have more than one person hold and support the bottom when carrying. Use special tool kit to carry the module with Block and tackle / lanyard. | Described in the instruction manual | 74 |
| 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 | Described in the instruction manual | 10 |
| 4 | Installation | Install | | Bottom of the product | CAUTION | Fingers may get stuck and workers may be injured when securing the main unit on the stay | When putting the main unit on the stay, hold the very bottom of the main unit, and prevent fingers from getting stuck | Described in the instruction manual | 33 |
| 5 | 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 | Described in the instruction manual | 43 |
| 6 | 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 | Cover the sides of the product with a frame and/or covers. Install protective structures to block the access to the openings at the bottom of the unit. | Posting of warning and caution labels Described in the instruction manual | 8 |
| 7 | Operation | All during operation | | Top panel of the product | CAUTION | Workers may step on the main unit and lose their footing, or may fall when the main unit moves | Keep workers informed thoroughly about the prohibition of stepping on the machine | Described in the instruction manual | 8 |
| 8 | Operation | All during operation | | No particular location | CAUTION | If problems occur, trays may collide with each other, and pop out of the equipment | For example, mount guide rails on the conveyor frames, and prevent trays from popping. | Described in the instruction manual | 11 |
| 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 | Post warning labels so as to prevent unauthorized persons from turning on the power | Described in the instruction manual | 12 |
| 10 | During maintenance/ inspection | All during maintenance/ inspection | | No particular location | WARNING | Workers' fingers and/or hands may get stuck in the product, and injured | Wear protective equipment, such as protective glasses, footwear, and/or gloves Do not put hands close to rotating parts. Take off gloves when workers need to get your hands close to rotating parts during operation. | Described in the instruction manual | 13 |

Residual risk MAP





Note : Transfer time may vary according to the load, its transfer method (step by step, continuous), upstream and downstream conveyor speed and other factors.



Appendix

<u>Appendix 5.</u> Incorporation declaration

Incorporation declaration

in accordance with the EC Machinery Directive 2006/42/EC, Annex II B

The manufacturer : ITOH DENKI CO., Ltd 1146-2 Asazuma-Cho, Kasai, Hyogo 679-0105 Japan

Distributed in Europe by :

ITOH DENKI Europe SAS 490 avenue des Jourdies - PAE les Jourdies - BP 323 74807 St Pierre en Faucigny Cedex - France

hereby declares that the product series:

F-RAT-NX75 transfer module

is an incomplete machine as defined in the EC Machinery Directive and therefore does not fully meet the requirements of this Directive. Service entry is prohibited until the whole machine/system in which it is incorporated is declared to be in compliance with the EC Machinery Directive.

This incomplete machine conforms to the following points of 2006/42/EC Machinery Directive :

1.1.2 Principles of safety integration

1.1.3 Materials and products

- 1.1.4 Lighting
- 1.3.2 Risk of break-up during operation
- 1.3.4 Risks due to surfaces, edges or angles
- 1.3.8.1 Choice of protection against risks arising from moving transmission parts
- 1.3.8.2 Choice of protection against risks arising from moving parts involved in the process
- 1.4.1 REQUIRED CHARACTERISTICS OF GUARDS AND PROTECTIVE DEVICES : General requirements
- 1.4.2.1 Special requirements for fixed guards
- 1.5.1 RISKS DUE TO OTHER HAZARDS : Electricity supply
- 1.5.4 Errors of fitting
- 1.5.8 Noise
- 1.6.1 Machinery maintenance
- 1.7.1 Information and warnings on the machine
- 1.7.3 Marking of machinery
- 1.7.4 Instructions
- 1.7.4.1 General principles of writing the instructions
- 1.7.4.2 Contents of the instructions

The health and safety requirements of Annex I have been applied. The special technical documents in accordance with Annex VII have been drawn up (and, if appropriate, submitted to the competent authorities).

Person authorized to compile the technical documentation :

ITOH DENKI CO., Ltd Toshiyuki TACHIBANA 1146-2 Asazuma-Cho, Kasai, Hyogo 679-0105 Japan

ITOH DENKI EUROPE SAS Masayuki SHIMODA 490 Avenue des Jourdies, 74800 St Pierre en Faucigny - France

EC Directives applied :

- Machinery Directive 2006/42/EC
- European EMC Directive 2014/30/EC
- European RoHS Directive 2011/65/EU

ITOH DENKI EUROPE SAS, undertakes to forward, following a duly motivated request from the national authorities, the relevant information concerning the quasi-machine.

Saint Pierre en Faucigny, 19 July 2021 T. AKASHI, General Director

P. akashr

Structures

Troubleshooting || Maintenance/Inspection || Control/Operation || Installation/Wiring

Appendix





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