

F-RAT-S User Manual

Flat-Right Angle Transfer



Thank you for purchasing Flat Right Angle Transfer unit.

- Before using the product, carefully read this manual and retain it for future reference.
- Make sure whether the product you received complies to your purchased order, with its designation, specification and operating voltage.
- Photo and drawing on this manual is Size C for explanations.

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1. Important safeguards

- Handle F-RAT properly in accordance with the information in each section as well as the precautions and instruction of this manual to use it correctly.
- Confirm the operation first to make sure there is no damage on F-RAT and to avoid an accident.

1-1. WARNING and CAUTION

WARNING and CAUTION are placed at critical points on this manual to direct the operator's attention to significant items. They are defined as DANGER and CAUTION as follows;



WARNING

Failure to comply with DANGER may cause hazardous conditions, resulting in death or severe injury.



CAUTION

Failure to comply with CAUTION may cause hazardous conditions, resulting in medium or slight injury, or may cause physical damage only.

1-1-1. WARNING



WARNING

Incorrect handling may cause hazardous conditions, resulting in death or severe injury.

- Do not use the product in the condition of inflammable gas, explosive environment or corrosive environment.

1-1-2. CAUTION



CAUTION

Incorrect installation or handling may cause hazardous conditions, resulting in medium or slight injury, or cause damage of peripheral devices.

- Do not step on the product, which may cause a failure or an accident.
- Do not touch the product while it is operated, which may cause injury.
- Do not modify the product, which may cause a severe accident.
- Do not pull or bend wires / cables, and not place a heavy stuff on wires / cables, which may cause damage, fire and electric shock.
- Make sure the DC power supply is grounded. Otherwise, it may cause electric shock when failures or leakage occur.
- Do not touch the product just behind operation stop. Otherwise, it may cause burn injury.
- Keep the product away from water. Otherwise, it may cause a failure or electric shock.
- Stop the operation if you hear an abnormal noise while operation.
- Make sure the product is used in range of the product specifications.

1-2. Risk category of the product



WARNING

About risk category of the product

- This product is in compliance with risk category 2 or lower of EN954-1, and not applies to risk category 3 or higher.

2. Product designation

F-RAT-S- ① ② - ③ - ④

① Speed

17 ... 17 m/min (Belt / Roller transfer : 17 m/min)

60 ... 60 m/min (Belt / Roller transfer : 60 m/min)

90 ... 90 m/min (Belt / Roller transfer : 90 m/min)

② Signal type selection

N ... NPN signal type (NPN sensor / driver card)

P ... PNP signal type (PNP sensor / driver card)

③ Size

A...W379mm×L758mm

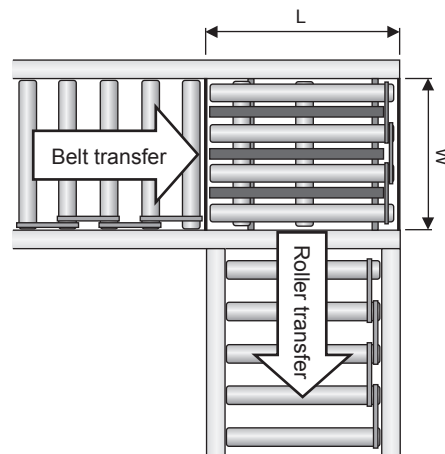
B...W497mm×L758mm

C...W597mm×L758mm

D...W697mm×L758mm

④ Type

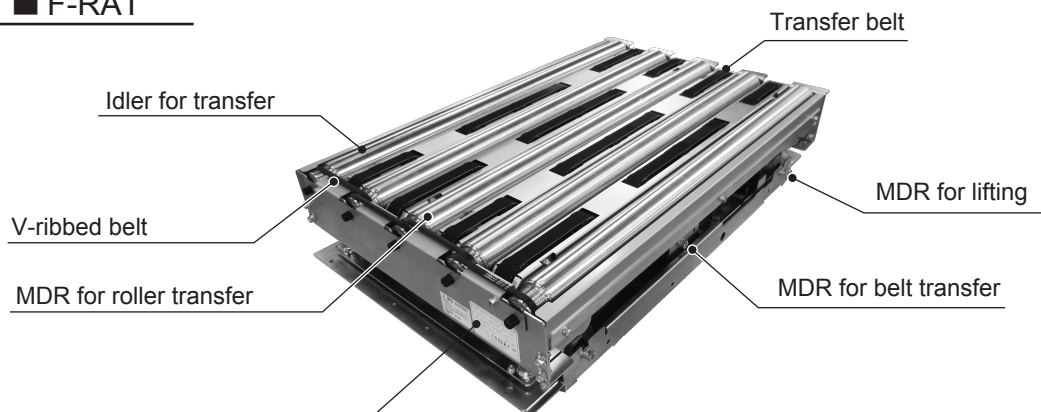
S1



Example : **F - RAT - S - 17N - B - S1** Speed 17 m/min, NPN signal type, W 497 x L 758 mm, S1type

3. Structure

■ F-RAT



Product label

FLAT RIGHT ANGLE TRANSFER
F-RAT-S- ① ② - ③ - ④
RATED INPUT : DC24V, ⑤ A
PAYLOAD : max ⑥ kg
SERIAL No. ⑦ ⑧ ⑨ ⑩
ITOH DENKI CO.,LTD
MADE IN JAPAN

Label detail

- ① Speed type
- ② Signal type
- ③ Size
- ④ Type (S)
- ⑤ MDR rated current
- ⑥ Max load weight
- ⑦ ⑧ ⑨ Serial NO; YY/MM/DD
- ⑩ Lot No

■ Accessories

- F-RAT mounting hardware
 - 4 sets of M8-20 bolt / M8 nut
- Standard driver card :
 - MDR for roller transfer / belt transfer ; CB-016N × 2 or CB-016P × 2
 - MDR for lifting ; CBR-305FN-B or CBR-305FP-B
 - * The other driver cards are also available as option.
- Proximity NPN sensor or Proximity PNP sensor

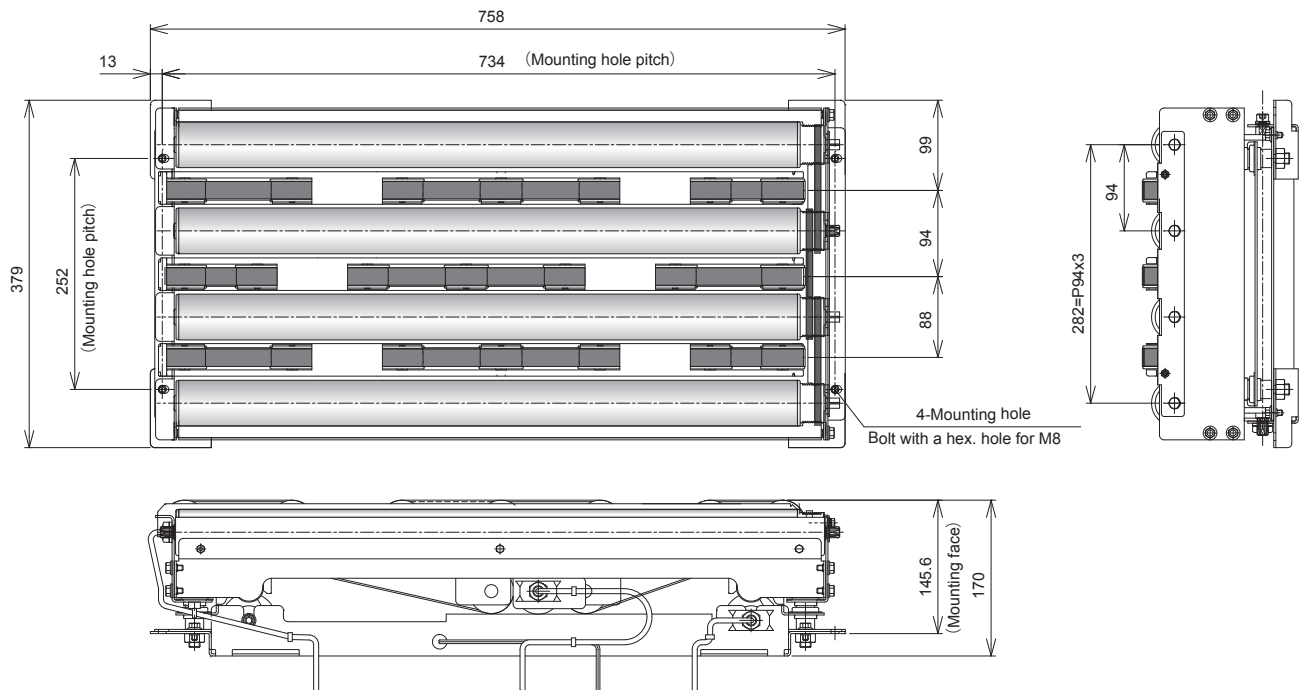
4. Power

- Switching power supply (DC24V, 5A)

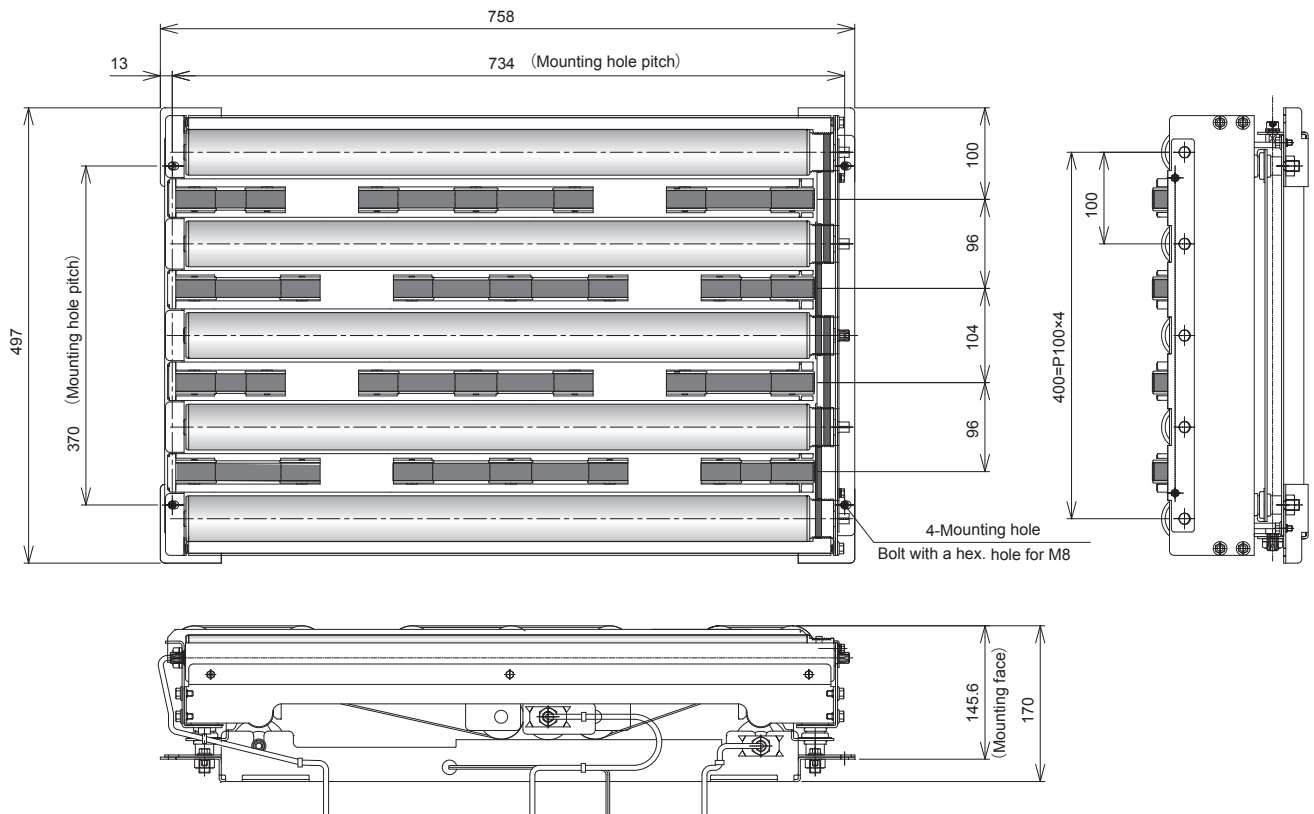
5. Dimensions

■ F-RAT

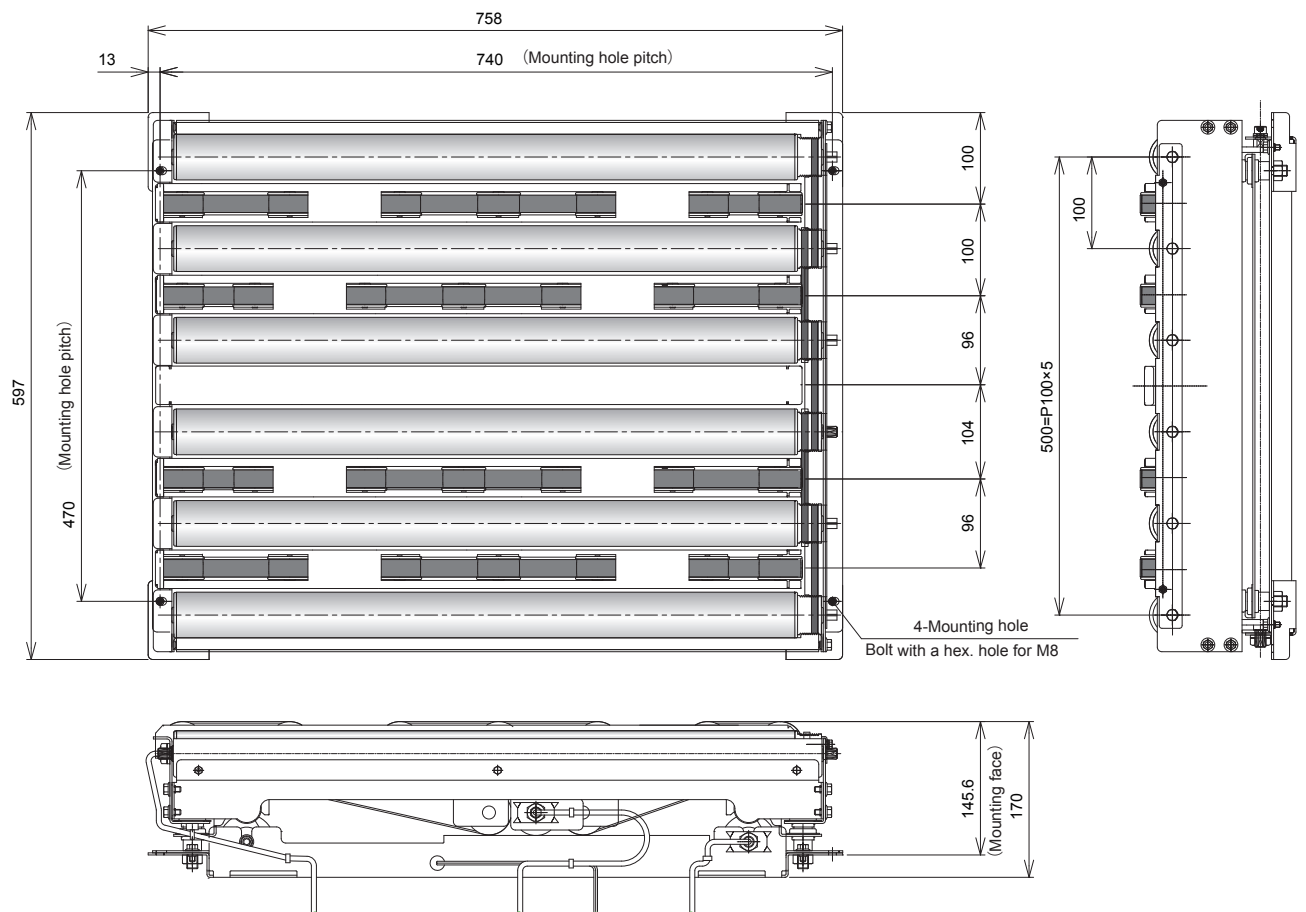
● SIZE A … W379mm×L758mm



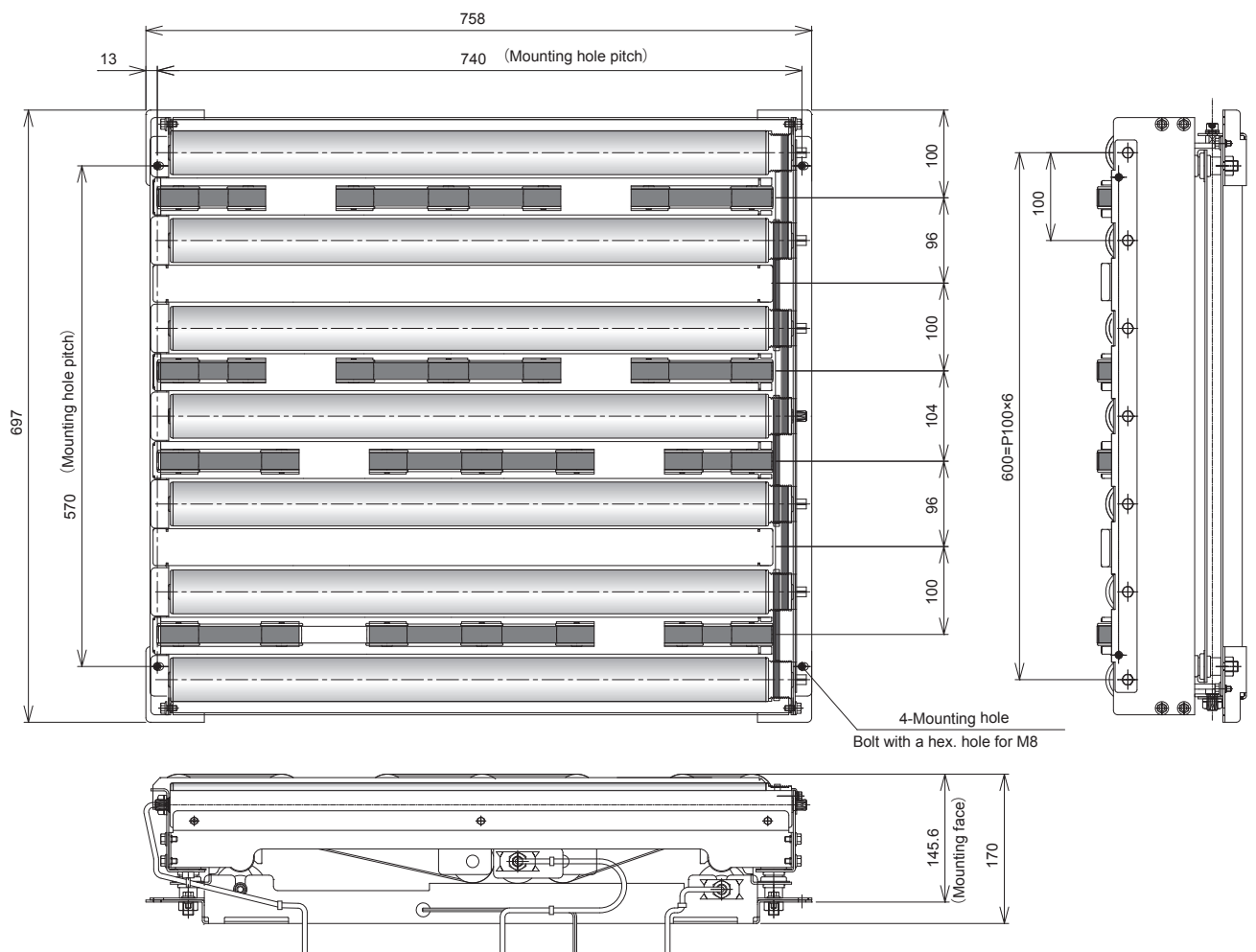
● SIZE B … W497mm×L758mm



● SIZE C ... W597mm×L758mm



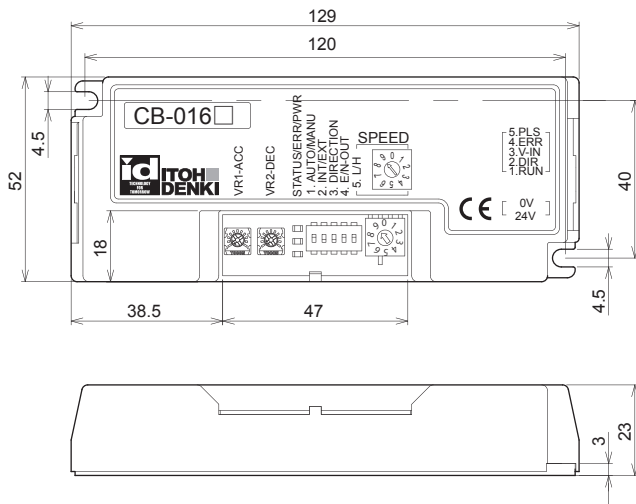
● SIZE D ... W697mm×L758mm



■ Accessory

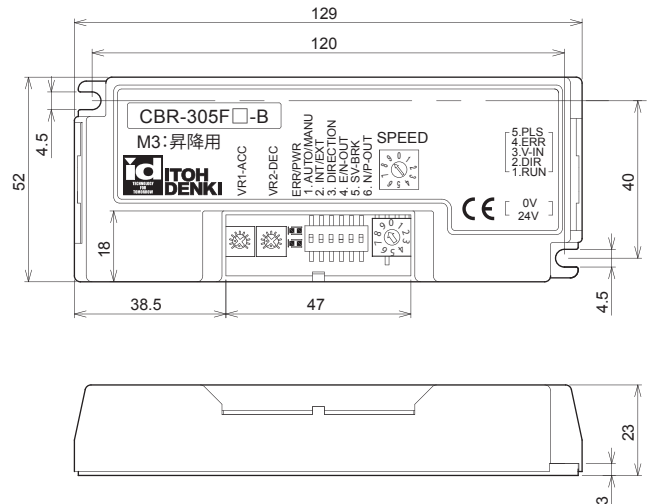
● CB-016□

* □=N (NPN input / output) or P (PNP input / output)



● CBR-305F□-B

* □=N (NPN input / output) or P (PNP input / output)



6. Installation and operation

6-1. Precautions for handling

6-1-1 Use assistance when handling

- Use assistance when carrying F-RAT-S. Some products weigh 50kg or heavier.

6-1-2 Handle with care

- Do not drop F-RAT-S, or subject it to impact. Otherwise, precision parts like microchip and bearing employed in F-RAT-S may be damaged.

6-2. Precautions for unpacking

6-2-1 Preventing injury

- Please put the gloves on your hand to not get hurt by metal parts that may be sharp.

6-2-2 Checking appearance of F-RAT-S

- Please check the followings.
 - ① Make sure there is no crack, damage, rust or corrosion.
 - ② Make sure all bolts are tightened properly.If any concerns are found, please contact our customer support.

6-3. Precautions for installation [Electric concerns]

6-3-1 Circuit breaker

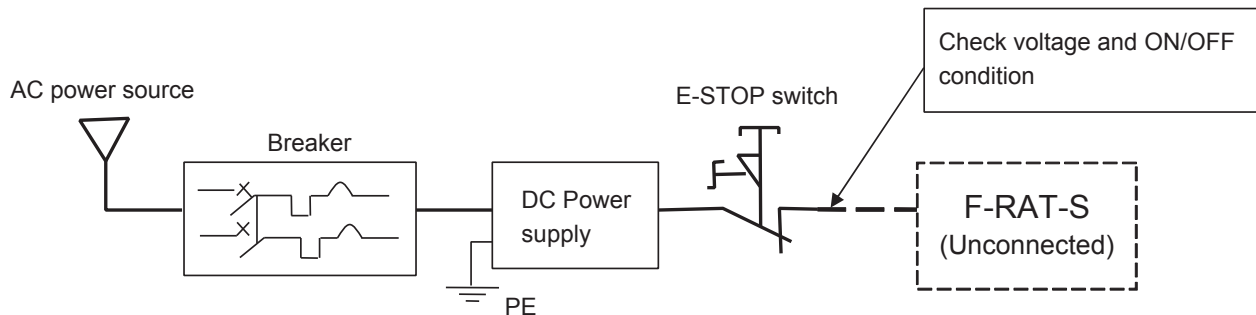
- Breaker should be selected with proper capacity and installed. In case the earth leakage breaker is selected, make sure it is designed for inverter circuit. Otherwise, some earth leakage breakers may malfunction by high frequency component of switching power supply.

6-3-2 DC power supply

- Use isolated type switching power supply that conforms to safety standard (IEC60950-1 or UL60950-1). Non-isolated type power supply is not recommended to use because of safety issue and radiate-noise restriction.
- DC power supply and wiring material should be selected with proper current capacity to F-RAT-S.

6-3-3 Wiring Check

- Test the operation of the breaker and emergency switch to check whether they are operated correctly when DC power supply is installed. Trial operation should be done after this testing.
 - ① Make sure DC power supply turns ON / OFF in accordance with breaker or Emergency Stop ON / OFF.



- Make sure the wiring material does not contact with moving-parts.

6-4. Precautions for installation [Hardware concerns]

6-4-1 Environment

- Avoid places where F-RAT-S is exposed to water or dust, and use this product in the environment of Pollution level 2 that is defined by IEC60664-1.
- Vibration level for the place of installation is 0.5G or less
- Install F-RAT-S horizontally.
- Keep enough space in surroundings of F-RAT-S for maintenance.
- Comply with the safety regulation that is required for installation places or devices.

6-4-2 Product installation

- Attach and fix F-RAT-S holding the base plate with assistants.
(see Fig. 6-4-2) F-RAT-S weight is approx. 50kg.
- Check installation direction of F-RAT-S, otherwise it may cause a malfunction / a failure.
- Be sure to not catch the motor / sensor cable in the product.

6-4-3 Safety assurance

- Exposed moving parts may cause injury. Please check the moving-parts referring to Fig. 6-4-3.
- Keep the safety label (Warning / Caution label) in sight.
- Be sure to shut off the power before maintenance.

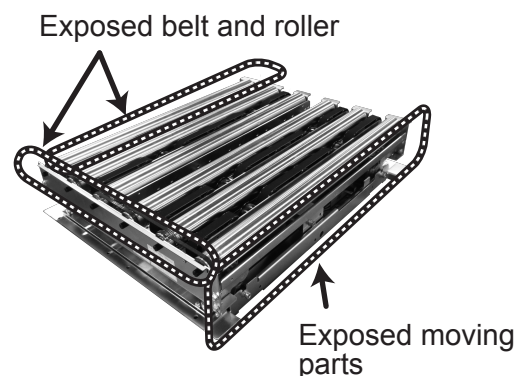
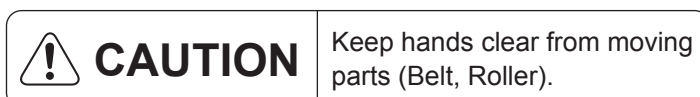
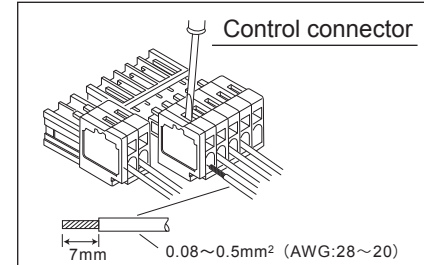
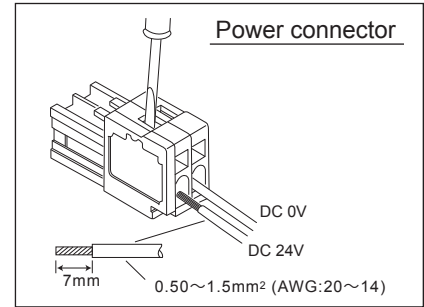


Fig. 6-4-3:

■ Supplying power

- ① Connect DC24V / 0V wires to power connector CN1.
 - * Do not connect two or more wires to the terminal of CN1 and not distribute the power to other. It may cause exceeding capacity of connector CN1, and this would cause electrical shock, short circuit or failure. (Connector capacity is 10A)
 - * Do not wire in reverse polarity.
 - * Wiring should be made before inserting the connector into the driver card.
- ② Connect wires to control connector CN2.
 - * When inject 0V signal (NPN) to CN2-1 (RUN/STOP) and CN2-2 (DIR), use same 0V line as the one of power supply. (Connector capacity is 4A)
- ③ Plug power connector (CN1), control connector (CN2), and motor connector (CN3) to the driver card.
 - * Plug connectors while power is shut off.
 - * Make sure connectors are plugged to the driver card properly.



Refer to the user manual of the driver card for the detailed instruction.

■ M3 : CBR-305F□-B Switch setting*

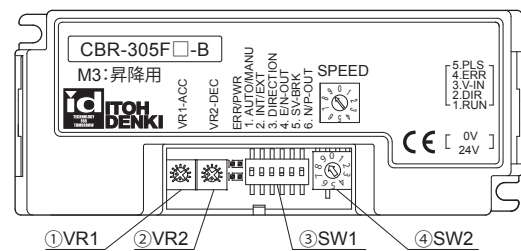
- ① VR1 : Minimum (Turns to CCW)
- ② VR2 : Minimum (Turns to CCW)
- ③ SW1 : #1-ON, #2-OFF, #3-OFF, #4-OFF
#5-OFF, #6-NPN [OFF] / PNP [ON]
- ④ SW2 : 9



* Do not change switch and potentiometer from factory setting.

● CBR-305F□-B

* □=N (NPN input / output) or P (PNP input / output)



■ Installation procedure

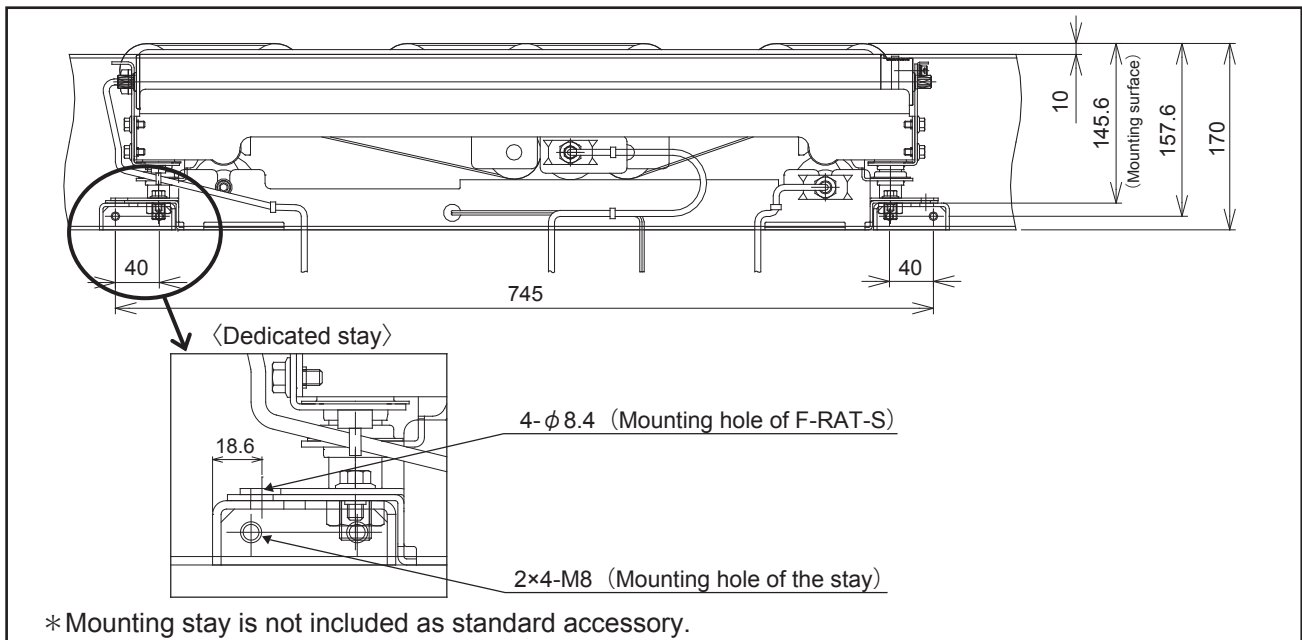
● F-RAT-S installation

Mounting

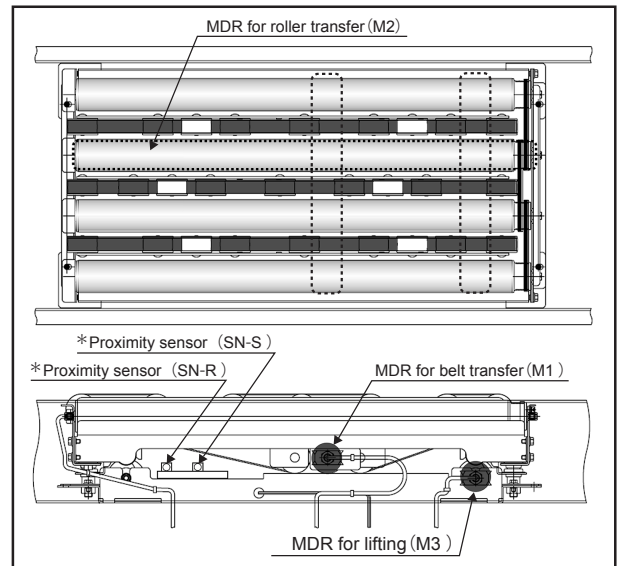
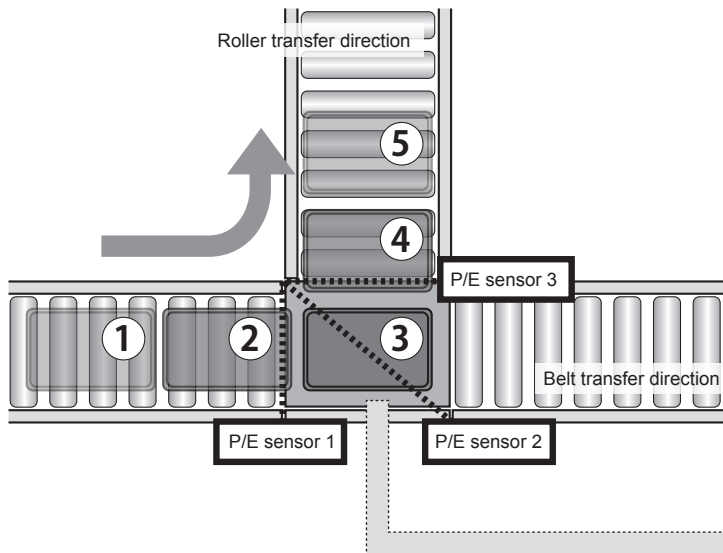
- Use assistance and recheck the installation precaution before starting the installation.
- Firmly mount the product in consideration of product weight, load weight and vibration.

Transfer level adjustment

- Transfer level of F-RAT-S and conveyors connected to F-RAT-S need to be adjusted. (Refer to the drawing below)

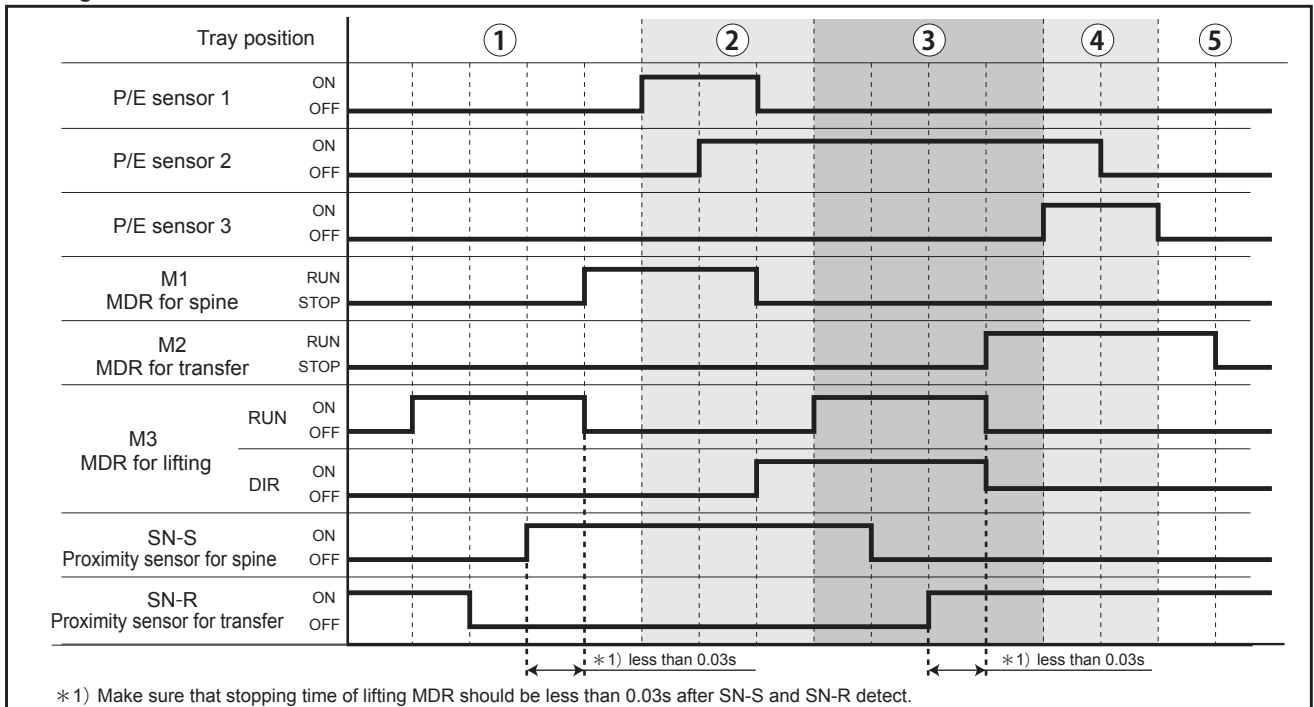


■ F-RAT-S control



* Make sure wiring of the proximity sensor is correct. Otherwise, it may cause damage.

Timing chart



Response time of a control device should be within 20ms. If not, it may cause a malfunction.

When using CBR-305F□-B, MDR for lifting will be stopped by the CBR-305 at proper position of MDR. Refer "CBR-305F□-B operation"

■ CBR-305F□-B operation

Same timing chart can be used for CBR-305 to operate F-RAT-S.

MDR for lifting is stopped when...

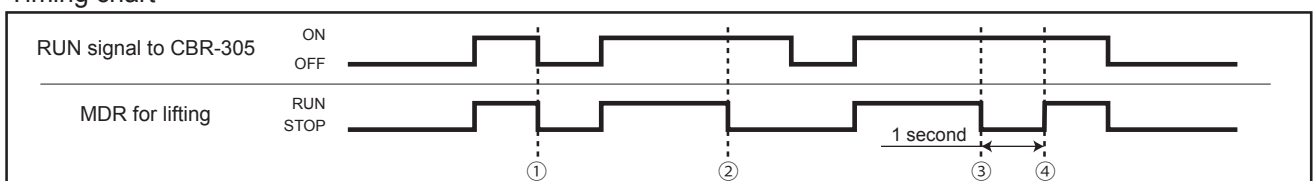
- RUN signal to CBR-305 is disappeared.
- Stop the MDR by CBR-305.

CBR-305 counts motor pulse to detect position of MDR for lifting and when the MDR reached to the proper position to stop, CBR-305 stops turning the MDR automatically.

- Error is occurred.

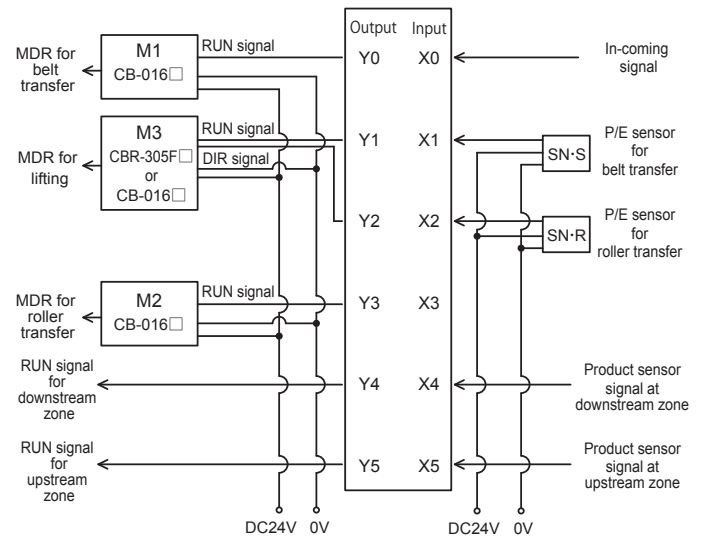
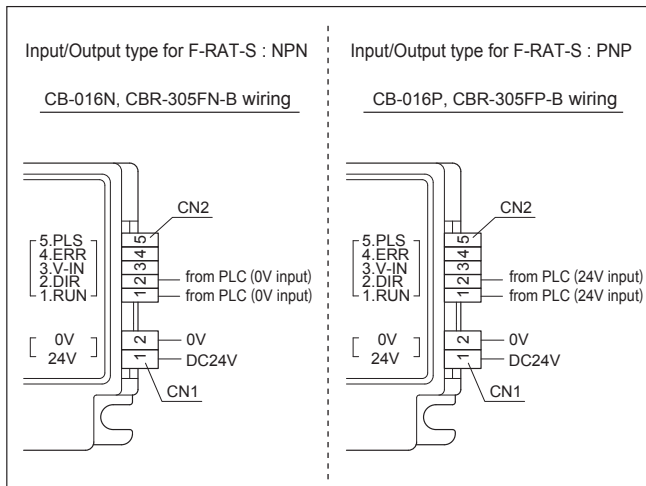
When the MDR was stopped by CBR-305 automatically, the MDR will re-start turning after 1 second if RUN signal is continue to input.

Timing chart



- ① MDR is stopped when RUN signal is disappeared.
- ② MDR is stopped when CBR-305 completed count motor pulses.
- ③ MDR is stopped when CBR-305 completed count motor pulses.
- ④ MDR is re-started after 1 second. Re-start counting motor pulse.

■ Wiring diagram



Note) Do not drive relay with sensor output because it may cause a malfunction of the proximity sensor.
Make sure all of wiring is correct. Otherwise, it may cause damage / a malfunction.

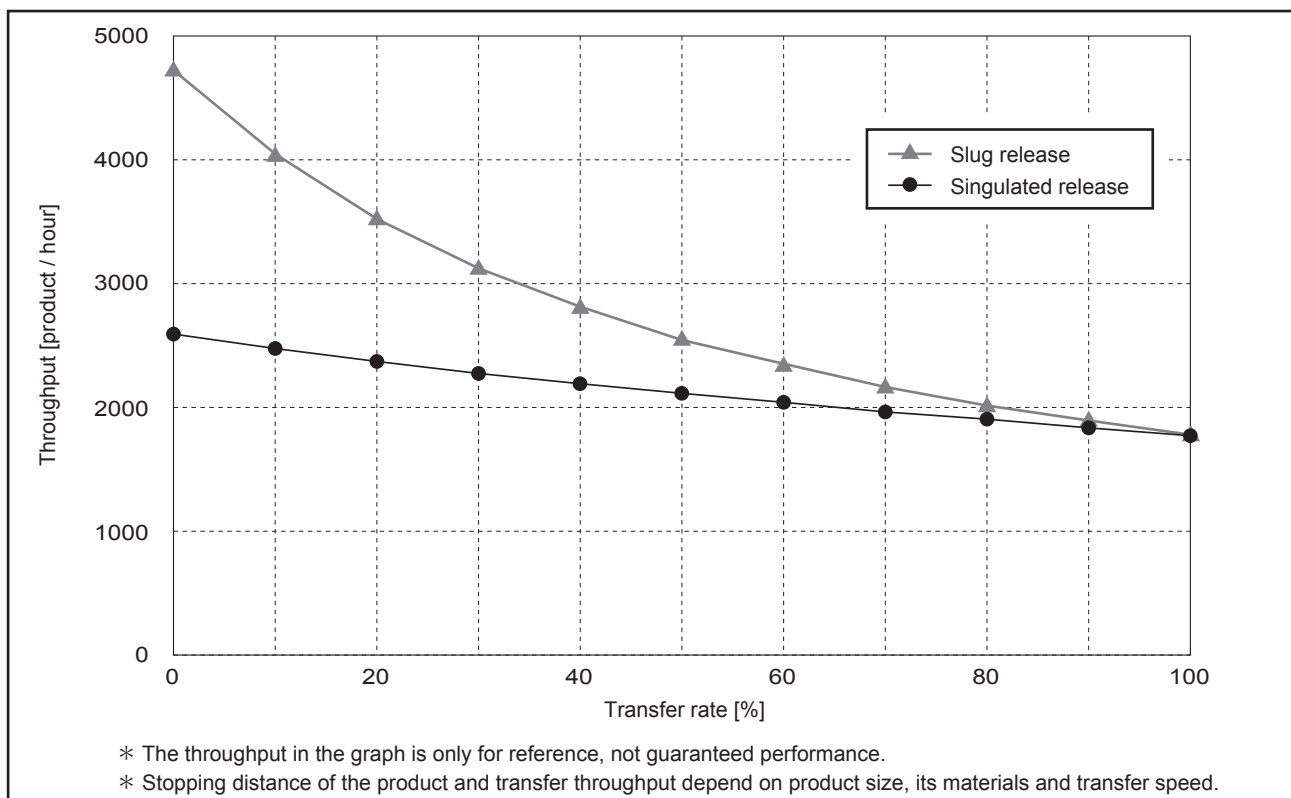
6-5. Precautions for Trial Run

6-5-1 Checking point for trial run

- Make sure other devices in a system do not run.
During trial run, no tote should flow from upstream side. It may cause injury if a tote comes into F-RAT-S during trial run.
Before trial run, make sure other devices or functions do not operate.
- Trial run should be performed without tote on F-RAT-S and make sure there is no abnormal operation.
Check the following points.
 - ① No LED blinking on driver card.
 - ② No abnormal noise / No heat-up portion.

■ Transfer throughput

Transfer Speed of F-RAT-S: 60m/min Size: B type
Condition of transferred product: cardboard W350xL405mm / 30kg



7. Maintenance

7-1. Precautions for Maintenance and Inspection

7-1-1 Safety check before maintenance and inspection

- Make sure to confirm your safety before maintenance and inspection to prevent any accident, damage or injury.
 - ① To prevent damages, shut-off all electric power connected F-RAT-S.
 - (a) To discharge all electric power by leaving 3 minutes after shut-off power supply.
 - (b) To prevent Power-in by mistake, warning sign will be recommended.

7-1-2 Parts repair / replacement

- ① Repair / replace parts immediately when you find damaged parts.
- ② Do not disassembly unit except for designated portion / parts. It may cause damage / an accident.
- ③ It is necessary to run / up-down manually to replace / repair parts. Be careful for injury.

7-1-3 Check after maintenance and inspection

- After maintenance / inspection, make sure the following checking before running.
 - ① Cover is properly closed.
 - ② All parts are attached.

■ Transfer MDR replacement

《Replacement procedure》

- ① Turn off F-RAT-S and then remove the motor cable of MDR for roller transfer from the dedicated driver card (CB-016N6).
- ② Loosen the screws for the pulley holding plate to remove it.
- ③ Remove the screws for the side cover, and then remove the side cover.
- ④ Remove idlers and belts.
- ⑤ Remove a mounting bracket and MDR paying attention to not damage on motor cable or connector.
- ⑥ Make sure v-ribbed belts are placed in correct position as showing on fig.2. Motor cable must be fixed with a cable tie not to contact with moving-parts.
- ⑦ Install new MDR in the step ⑤ ~ ① mentioned above.

Fig.1

- ① Dedicated driver card (CB-016N6)



- ⑤ Mounting bracket of MDR for roller transfer

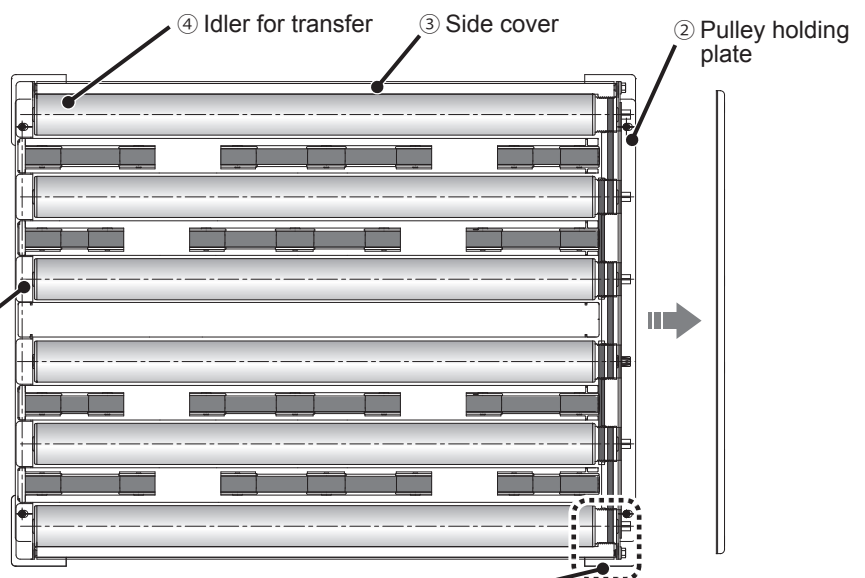
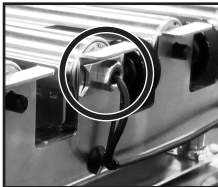
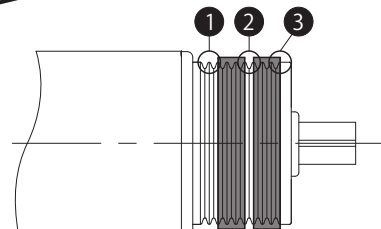


Fig.2

- ⑤ V-ribbed belt position

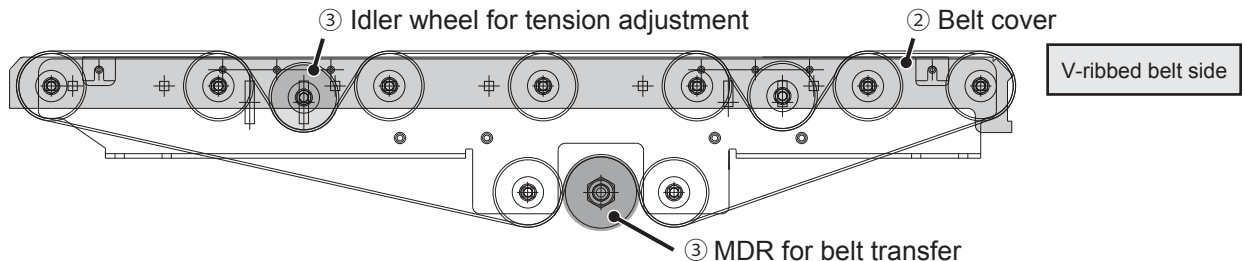
- ⑤-① Leave two grooves at inside of pulley.
- ⑤-② Leave one groove between v-ribbed belts.
- ⑤-③ Make sure that the belt at the end of pulley does not come off.



■ Transfer belt replacement

《Replacement procedure》

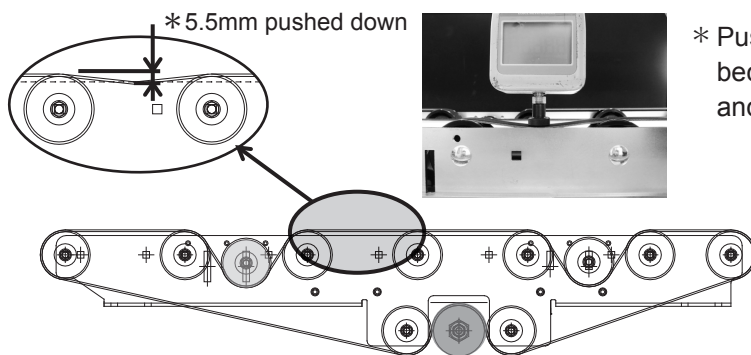
- ① Remove idlers for roller transfer adjoining the replaced transfer belt. (Refer to Transfer MDR replacement, P10.)
- ② Loosen the screws for the belt cover, and then remove the belt cover.
- ③ Loosen the screws for idler wheel that is for belt tension adjustment. (Do not remove the screws).
- ④ Remove transfer belt.
 - * Remember installed position of the transfer belt.
- ⑤ Install the new transfer belt from MDR for belt transfer first, and then tighten screw tensioning by idler wheels. (the wheel is described ③ at below figure.)



CAUTION for transfer belt

Adjust belt tension by idler wheel, and then check the current of MDR for belt transfer.

《Belt tension adjustment with push-pull gauge》



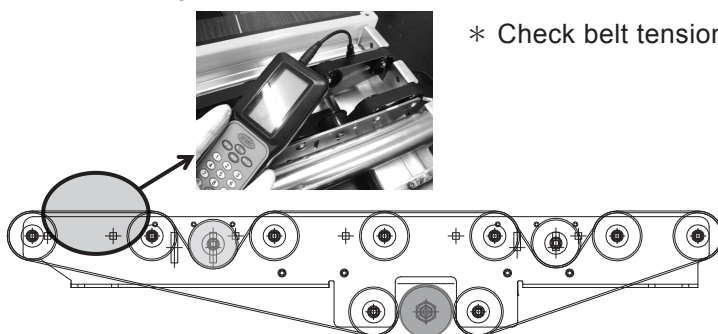
* Push the transfer belt until the belt surface becomes the same level as the roller plate and then check belt tension. See below table.

■ Belt tension reference

Transfer speed type	Tension
17m/min, 60m/min type	12 N
90m/min type	10 N

* Use a push-pull gauge after reading the manual provided by the manufacturer.

《Belt tension adjustment with belt tension meter》



* Check belt tension at the right position. (See page 12)

■ Belt tension reference

Transfer speed type	Tension
17m/min, 60m/min type	45 N
90m/min type	45 N

* Use a belt tension meter after reading the manual provided by the manufacturer.

- After tension adjustment in the steps mentioned above (See P12), current value should be as shown in the right table.
- After transfer belt and MDR for belt transfer replacement, make sure there is no interference and do running test. After running test, check tension according to the belt tension reference mentioned above.
- Too strong tension of transfer belt may cause a malfunction because overload is applied to MDR for belt transfer. On the other hand too loose tension may cause decrease transfer belt's speed.
- The check position of belt tension depends on the plate attaching position. (See P12)

Speed Code	Current of MDR for belt transfer
17	1.5A or less
60	2.3A or less
90	3.2A or less

Checking Position of tension for transfer belt

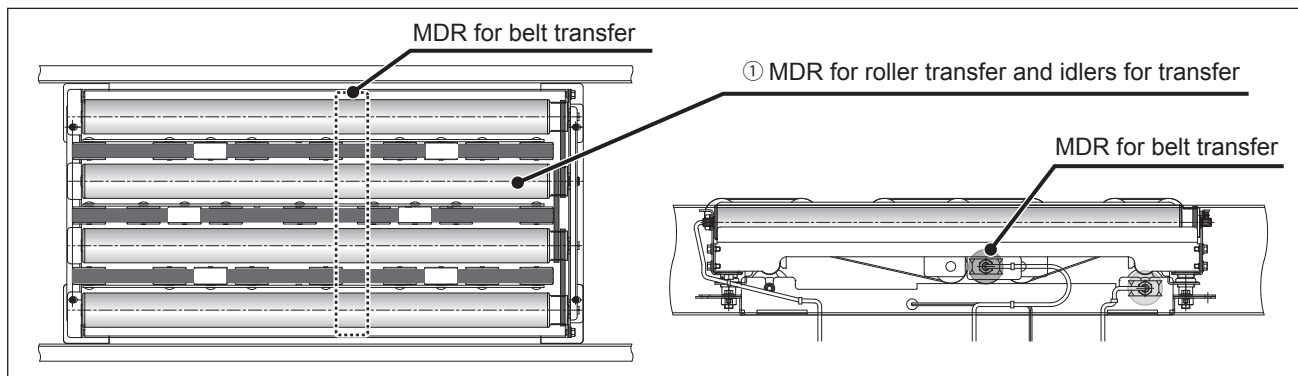
	《With push-pull gauge》	《With belt tension meter》
Size A	V-ribbed belt side	V-ribbed belt side
Size B	V-ribbed belt side	V-ribbed belt side
Size C	V-ribbed belt side	V-ribbed belt side
Size D	V-ribbed belt side	V-ribbed belt side
	108mm Idler wheel Idler wheel for tension adjustment * Make a measurement in 108mm-pitch between idlers wheel.	117mm Idler wheel Idler wheel for tension adjustment * Make a measurement in 117mm-pitch between idlers wheel.

■ Belt transfer MDR replacement

《Replacement procedure》

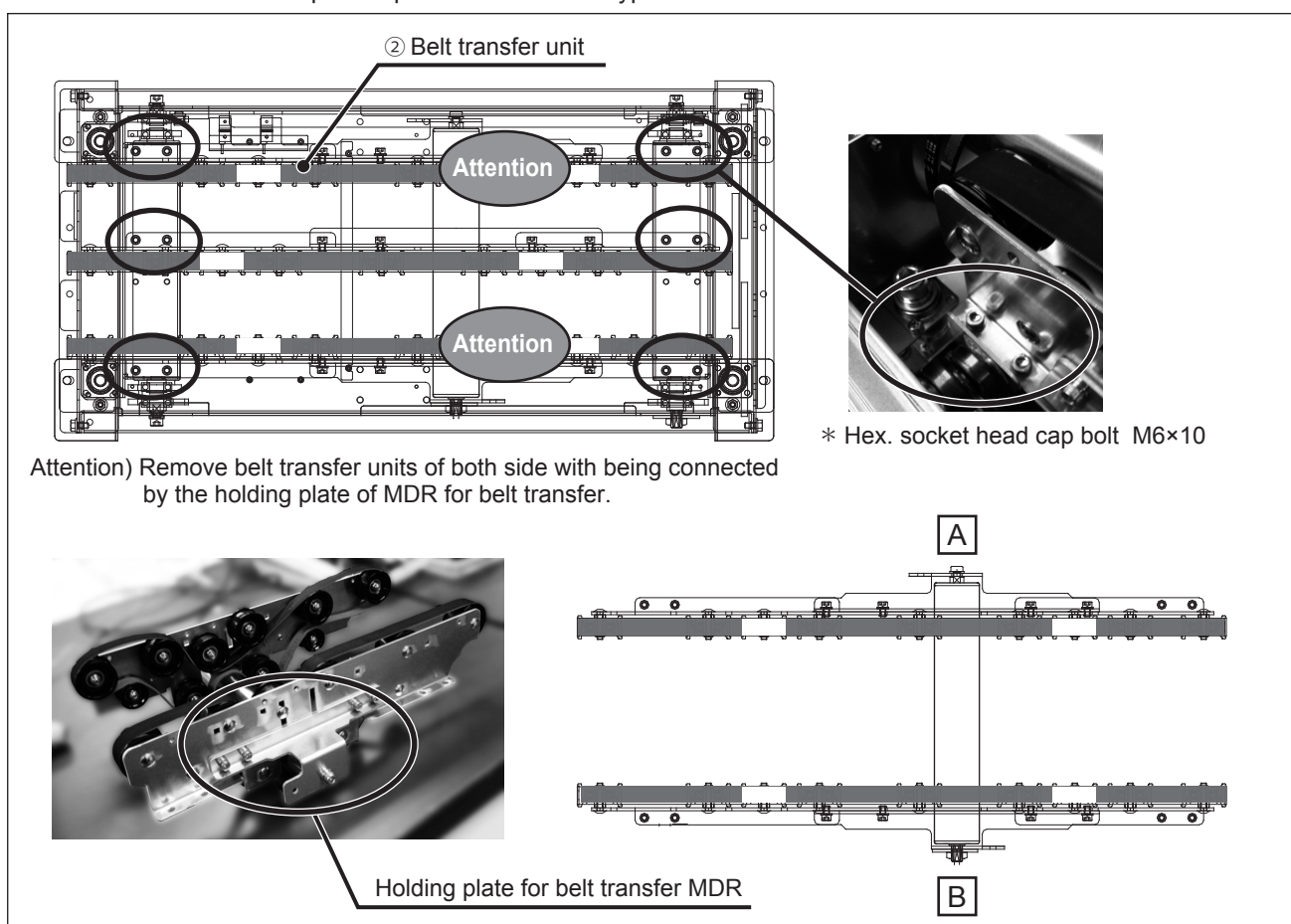
* Before replacing please turn off F-RAT-S and remove the motor cable of each MDR from the dedicated driver card.

- ① Remove the MDR and all idlers. (Refer to Transfer MDR replacement , P10.)

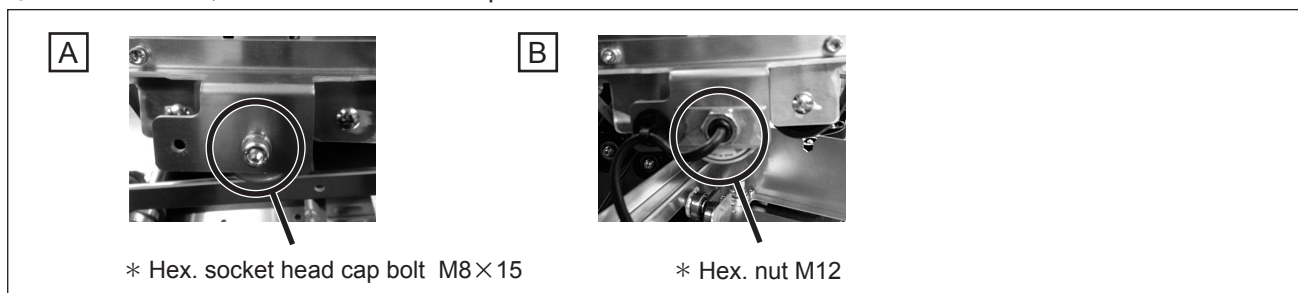


- ② Remove all belt transfer units from the belt transfer unit in the center.

* Belt transfer unit multiplier depends on F-RAT-S type's size.



- ③ Remove nut A, B and bolt and then replace MDR for belt transfer.



- ④ Follow steps ③ to ① mentioned above to install.

* Make sure the belt transfer unit position is right. (See the dimensional drawing, P3- 4)

* Adjust the belt tension. (See the transfer belt replacement, P11)

8. Product specification

Product specification

■ F-RAT-S

Roller Diameter	φ 50mm
Size	Width (W) Transfer direction
	379mm, 497mm, 597mm, 697mm
	Length (L) Spine direction
	758mm
Height	170mm
Transfer / Spine Speed	17, 60, 90m/min
Stroke	10mm
Power voltage	DC24V
Ambient temperature	0 ~ 40°C (No freezing)
Humidity Below	90%RH or less (No condensation)
Atmosphere	No corrosive gas
Vibration	0.5G or less
Installation	Indoor

* Standard motor cable length : 1500mm
Standard sensor wire length : 1000mm

■ Product weight

F-RAT-S size	Weight
Size A	37kg
Size B	43kg
Size C	49kg
Size D	55kg

■ CB-016□

* □ = N (NPN) or P (PNP)

Power voltage	DC24V±10%
Rated voltage	DC24V
Static current	0.03A
Starting current	4.0A
Wire size	Power connector CN1
	0.50 ~ 1.5mm ² (AWG:20 ~ 14)
	Control connector CN2
	0.08 ~ 0.5mm ² (AWG:28 ~ 20)
Time difference from RUN signal to motor starting	15msec or less
Protections	Integral 6.3A fuse Diode against miss-wiring
Thermister protection	95°C for circuit board 105°C for motor
Current limitation	4.0A
Ambient temperature	0 ~ 40°C (No freezing)
Humidity	90%RH or less (No condensation)
Atmosphere	No corrosive gas
Vibration	0.5G or less
Installation	Indoor

■ CBR-305F□-B

* □ = N (NPN) or P (PNP)

Power voltage	DC24V±10%
Rated voltage	DC24V
Static current	0.03A
Starting current	4.0A
Wire size	Power connector CN1
	0.50 ~ 1.5mm ² (AWG:20 ~ 14)
	Control connector CN2
	0.08 ~ 0.5mm ² (AWG:28 ~ 20)
Time difference from RUN signal to motor starting	15msec or less
Protections	Integral 7.0A fuse Diode against miss-wiring
Thermister protection	95°C for circuit board 105°C for motor
Current limitation	4.0A
Ambient temperature	0 ~ 40°C (No freezing)
Humidity	90%RH or less (No condensation)
Atmosphere	No corrosive gas
Vibration	0.5G or less
Installation	Indoor

Transferred goods

■ Recommended size of transferred goods

F-RAT-S size	Size
Size A	W300 × L300mm ~ W300 × L650mm
Size B	W300 × L300mm ~ W400 × L650mm
Size C	W300 × L300mm ~ W500 × L650mm
Size D	W300 × L300mm ~ W600 × L650mm

■ Maximum load weight

Speed code	Max. load weight	
	Size A	Size B, C, D
17	37.5kg	50kg
60	37.5kg	50kg
90	10kg	10kg

Note: Size and load weight are just guidance. (This may differ by conditions of transferred goods)

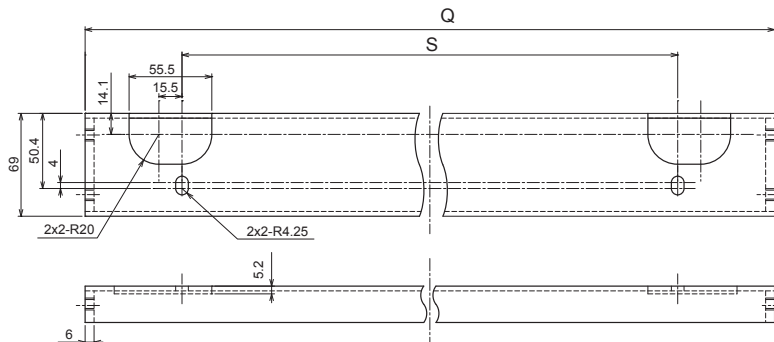
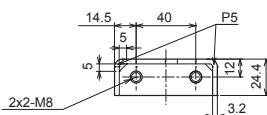
■ Replacement parts for F-RAT-S

- ① Transfer belt
 - Flat belt : TF10 L1630 W19
- ② V-ribbed belt
 - 3PJ336 (For pitch 100mm)
 - 3PJ316 (For pitch 94mm) * For size A
- ③ MDR for belt transfer
 - For size A • PM500FE- *speed code-277-D-024-JG-C150
 - For size B • PM500FE- *speed code-392-D-024-JG-C150
 - For size C • PM500FE- *speed code-492-D-024-JG-C150
 - For size D • PM500FE- *speed code-592-D-024-JG-C150
 - * Select speed from 17 (17m/min), 60 (60m/min) or 90 (90m/min) .
 - * Note that it's "PM500FC-90" for 90m/min type.
- ④ MDR for roller transfer
 - PM500FE- *speed code-674-D-024-JW-C150-VG
 - * Select speed from 17 (17m/min), 60 (60m/min) or 90 (90m/min) .
 - * Note that it's "PM500FC-90" for 90m/min type.
- ⑤ Idler for transfer
 - IDR-50-674-JH-VG for all types
- ⑥ Driver card (Specify input and output type NPN (N) or PNP (P).)
 - CB-016N for NPN type
 - CB-016P for PNP type

■ Option for F-RAT-S

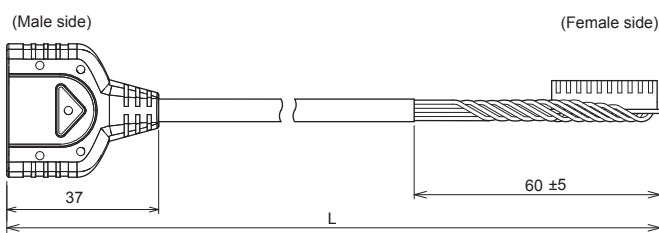
● Dedicated stay

F-RAT-S size	Dimension (mm)	
	Q (Between frame)	S
A	381 ~ 499	252
B	500 ~ 599	370
C	600 ~ 699	470
D	700 ~	570



● Extension cable

Model	Specifications
ACE-CBM-B0600	9P Extension cable 600mm long
ACE-CBM-B0850	9P Extension cable 850mm long
ACE-CBM-B1200	9P Extension cable 1200mm long



● Holding plate for F-RAT-S driver card

Disposal of the Products

- Treat as industrial waste.



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