

Hot Roll Pre-Heater

Instruction manual



January 2003
REVISION 4.0



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■ Introduction

Thank you for purchasing the Hot Roll Preheater unit manufactured by Hakuto Co., Ltd.

This instruction manual describes the methods of operation and maintenance for the system.

Read this manual before using the system, and refer to it as necessary.

Please note that this instruction manual is based on the standard specifications, which may differ slightly from those of your system.

If you have any question regarding the specifications of your unit, please contact Hakuto Co., Ltd. or its agent.

This manual consists of Part 1, "Installation;" Part 2, "Specification;" Part 3, "Operation;" Part 4, Maintenance" and Part 5, "Drawings".

Part 1 "Installation"

This Part provides precautions regarding the preparation and installation of the system, and is primarily for those installing the system.

Please read this Part before installing the system.

Part 2 "Specification"

This Part provides specifications regarding the system, and is primarily for those installing the system.

Part 3 "Operation"

This Part explains to users how to operate the system.

Part 4 "Maintenance"

This Part explains the methods of daily maintenance, monthly maintenance, and adjustments for those who have gained an understanding of Part 2, "Specification," Part 3 "Operation and Part 5 " Drawings"

Part 5 "Drawings"

This Part includes electrical drawings , parts layout, etc.

Be sure to gain a full understanding of the contents of this manual to ensure the optimal performance of the system.

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- This manual is provided only to support the Hot Roll Preheater marketed by Hakuto Co., Ltd., and shall not be used for other purposes.
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Reproduction includes the translation of this manual into other languages or formats, and the rewriting of this manual.
- Customers who purchase a Hot Roll Preheater marketed by Hakuto Co., Ltd. are requested to gain a full understanding of the methods and processes for use of the system, and must use it at their own risk.
- Before using the system, customers are requested to provide a suitable environment and prepare rules and restrictions to ensure appropriate actions for the maintaining the safety and health of operators.
- The contents of this manual are subject to change without notice.

■ Warning labels

This Section explains the definitions and locations of the warnings and cautions indicated by the labels that are used in this manual or affixed to the system.

(1) Definitions of Warning and Caution.

This section explains the meanings of the label marks used in this manual or affixed to the system.



This mark indicates that there is a danger of serious or minor injury if the user ignores the related instructions in using the system.



This mark indicates the danger of damaging the system or auxiliary machines (property damage) if the user ignores the related instructions in using the system.





The above "serious and minor injuries," "property damage," and "user" have the meanings specified below.





Serious injury	Blindness, injury, burns (high- and low-temperature), electric shock, fractures, and toxicosis that accompany after-effects, and injuries that require admission or long-term hospital stays.
Minor injury	Injury, burns (high- and low-temperature), and electric shock that do not require admission or long-term hospital stays.
Property Damage	Secondary damage to the production line, peripheral devices, or other auxiliary equipment.
User	Users of the unit, including the purchaser and those who are requested to operate the unit by the purchaser.

(2) The contents of the warning label

The warning label is pasted on several places of the system in the meaning which calls attention to this system.

The meaning of each label and a pasting point are explained in this chapter.

Type of label	Discription	Location
	Caution : Electric shock	<ul style="list-style-type: none">● Primary power supply terminal.● Main breaker inside the operation panel.● The back side of the operation panel.
	Caution : High Temperature	<ul style="list-style-type: none">● Top cover
	Caution : Keep fingers away to prevent them from being caught	<ul style="list-style-type: none">● PWB entrance
	Caution : Keep fingers away to prevent from being caught	<ul style="list-style-type: none">● Drive chain inside the rear cover

Type of label	Discription	Location
	Ground line : Display	Primary power supply terminal
	Warning of the danger inside the system	Rear cover
	Close the cover	Top cover
	Power-supply connection	Primary puwer-supply connection point

〈1〉 INSTALLATION

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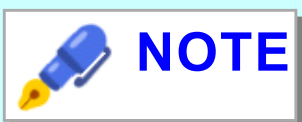
< 1 > INSTALLATION

(1) Unpacking

- 1) Remove the vinyl cover, strings and other packing accessories from the package.

(2) Transfer

- 1) Carry the preheater to the installation site by a adequate forklift or pallet-jack.
- 2) Turn the four leveling bolts. Then, shorten the length of the bolt.



NOTE

Shorten the length of the bolt more than a caster.

- 3) Land the preheater with care by casters slowly.
- 4) Fix the installation site.



NOTE

- Do not move the preheater over a difference in level by casters. (Caster is easy to break)
- When pushing the preheater by hand, do not touch other parts than the frame.

(3) Installation

- 1) Adjust the height of the leveling bolt by turning it.



NOTE

The maximum height of the leveling bolt is 175mm.

If a higher height is needed, put spacers under the leveling bolts.

2) Leveling

Adjust the leveling bolt by placing level onto the upper hot rolls.

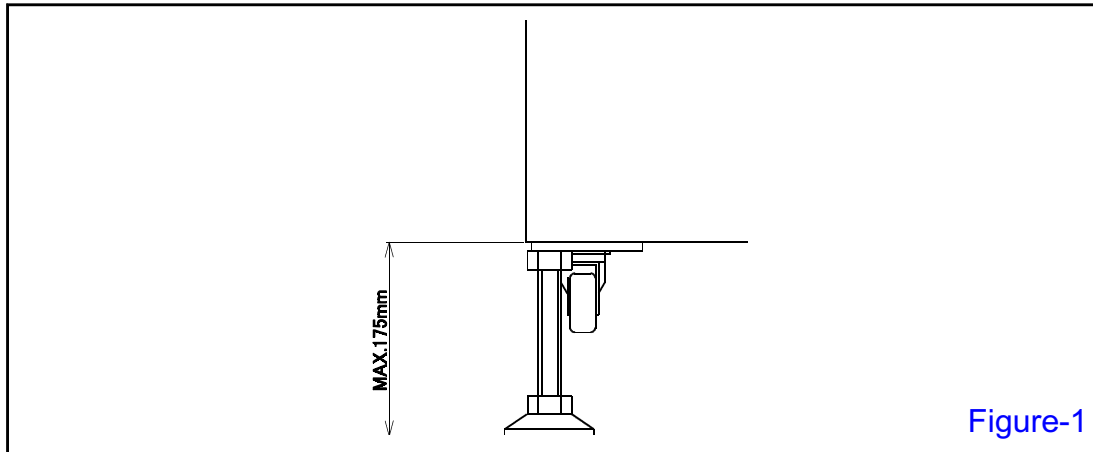


Figure-1

(4) Wiring

1) Electricalwiring

Make the wiring to the terminals Inside the body frame.



NOTE

- The power supply should be 3 phase , 200V (220V) , 50Hz or 60Hz .
- Do not forget to earth terminals .

(5) Checking

1) Check if all section are in good order.



NOTE

- Check if screws at mechanical sections and electrical sections are well tightened.
- Check if there are damages, foreign bodies, rust, etc..

2) Trial run

Check if eavh section runs without problem according to instruction manual.

〈2〉 SPECIFICATIONS

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〈2〉 SPECIFICATIONS

(1) Outline

1) Purpose

This equipment preheats boards by hot rolls while sending the boards from the upstream system.

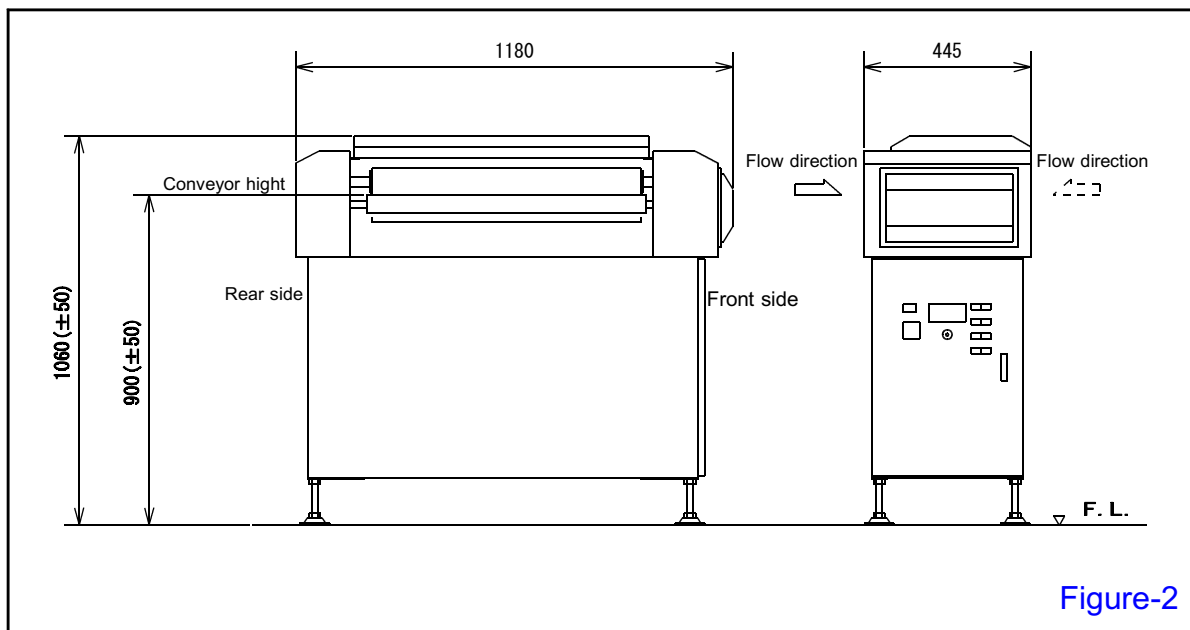
2) Structure of the equipment

1	Rolls at entrance and exit	Board feeding
2	Preheat section	Board feeding and heating
3	Electrical section	Operation Panel. Control Panel. Sensor. Wiring.
4	Frame. Cover	

3) Power source and weight

1	Power source	φ 3. 200V(220V). 50Hz or 60Hz 5.5KW (6.0KW)
2	Net weight	170Kg

4) Dimensions and external appearance



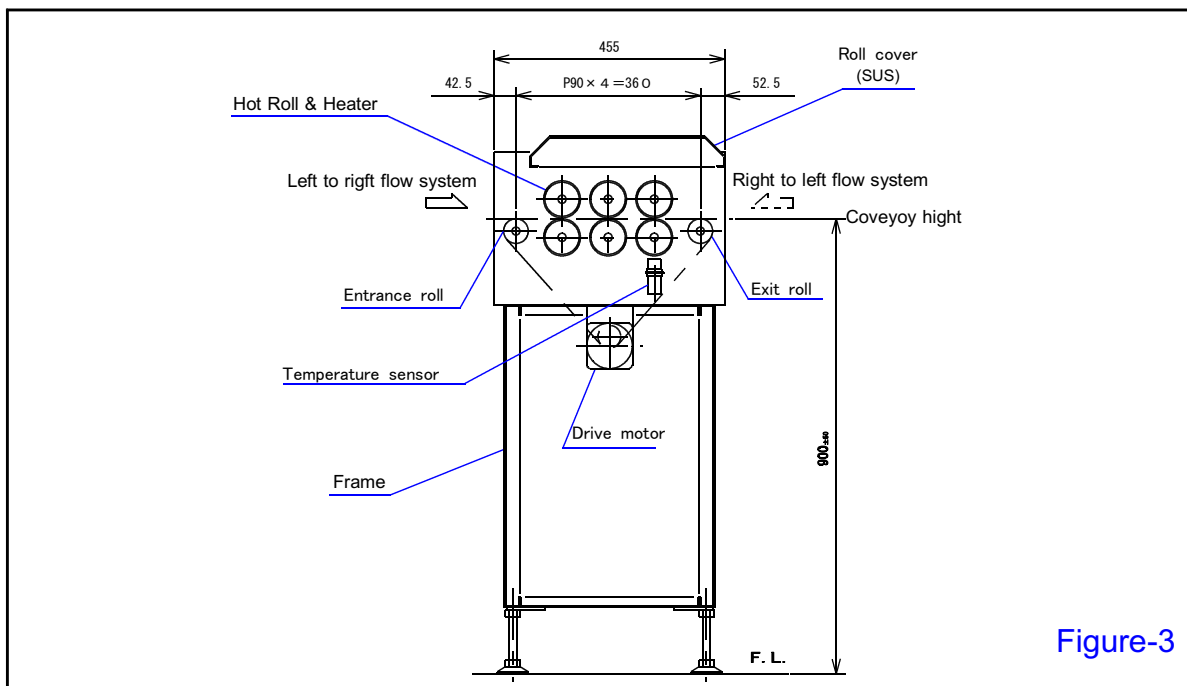
(2) Processing capacity

1	Board width	Min. 200 - Max. 650 mm
2	Board thickness	0.15-3.5mm (Both sides copper foil plating)
3	Output	240 boards / hour (400 mm long board)
4	Conveyor speed	1.0 - 5.5 m / min variable
5	Effective width	Min. 200 - Max. 700 mm

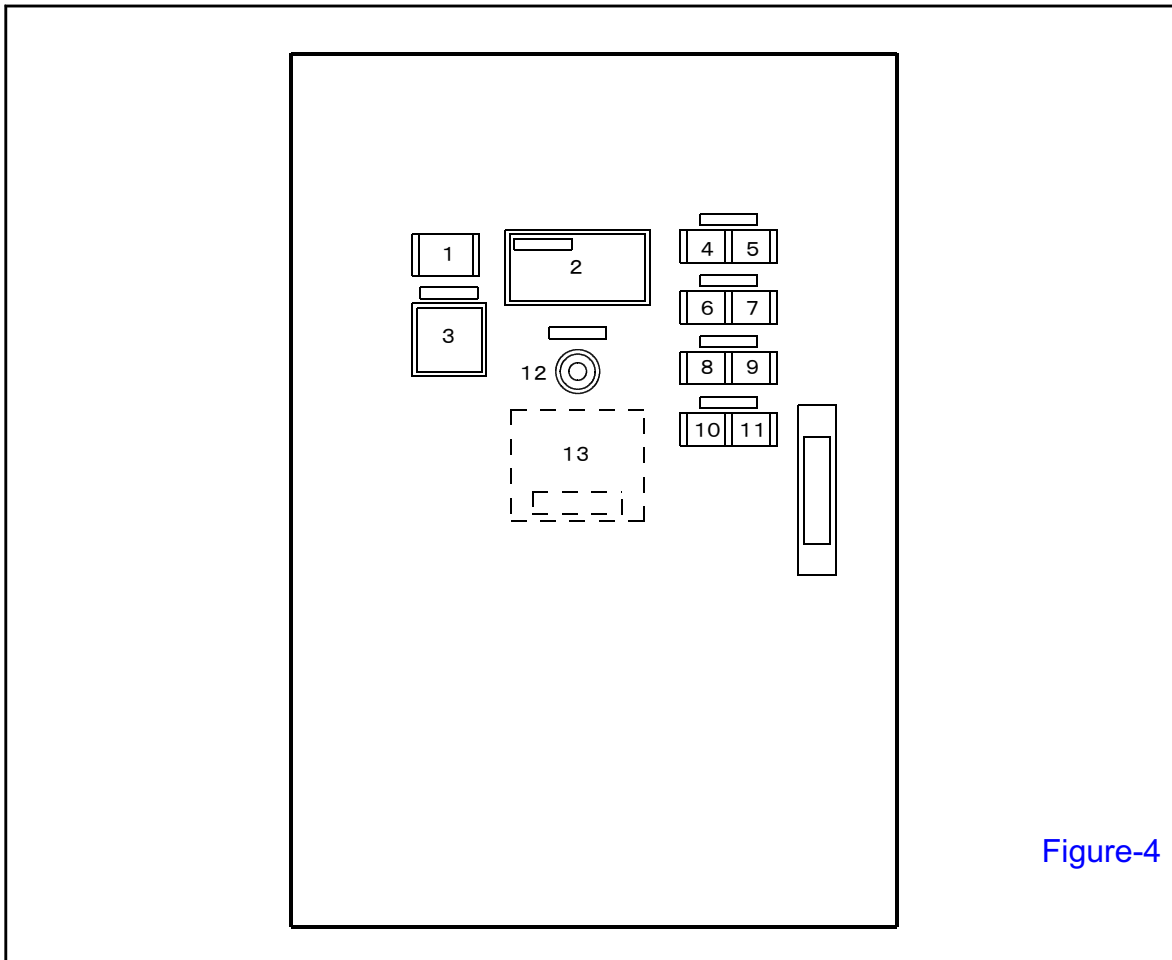
(3) Specifications of each section

1) Conveyor section and frame (Figure- 3)

1	Hot Roll	Dimensions : ϕ 73.4 \times L730m (\times 6) Pitch between hot roll axes : 90 mm Surface temperature : Room temp. - Max.150'C Pressure : By weight of hot roll it self Heater : 0.8Kw \times 200V (0.9Kw \times 220V) Sheath heater (\times 6)
2	Front & Rear Roll	Dimensions : ϕ 50 \times L760mm (one roll each at entrance and exit) Pitch between roll and hot roll axes : 90mm
3	Driving	Motor : ϕ 1 100V 40W Speed variable geared motor With a gear head (\times 1)
4	Roll Temp Sensor	Noncontacting surface temperature thermocouple
5	F rime	Unitized structure by 1.6t steel plate. Baked finish Color ivory white
6	Cover	Stainless steel hairline fnish



2) Operation panel



1. SOURCE Lamp

Lights when the main breaker is turned on to supply the power to the system.

2. CONVEYOR SPEED Indicator

The present conveyer speed is displayed. (unit: cm/min)



As to method of speed control, please see (1) - 4) of <3> OPERATION.

3. Temperature controller

Temperature controller of hot roll.

Setting : The digital setup by key operation.

Indication : The present value and the setting value are digital-displayed.

4. POWER ON Button / Lamp

Used to turn on the power supply to system components.

The lamp of a button lights up.

5. POWER OFF Button / Lamp

Used to turn off the power supply to system components.

The lamp of a button lights up.

6. CONVEYOR ON Button / Lamp

If this button is pushed, the conveyer will start forward turn and button will light up.

7. CONVEYOR OFF Button / Lamp

If this button is pushed, the conveyer will stop and button will light up.

8. HEATER ON Button / Lamp

If this button is pushed, the power supply will supply electric power for the heater. And button will light up.



This switch is effective only when the conveyer is ON.

9. HEATER OFF Button / Lamp

If this button is pushed, the power supply stopped supply electric power to the heater and button will light up.

10. REVERSE ON Button / Lamp

This switch is for reverse turn of conveyor.



Rolls rotate in reverse turn while pushing this button.

The heater become OFF after this button use.

11. Spare button / lamp

This is spare button and lamp.

12. Speed regulation dial

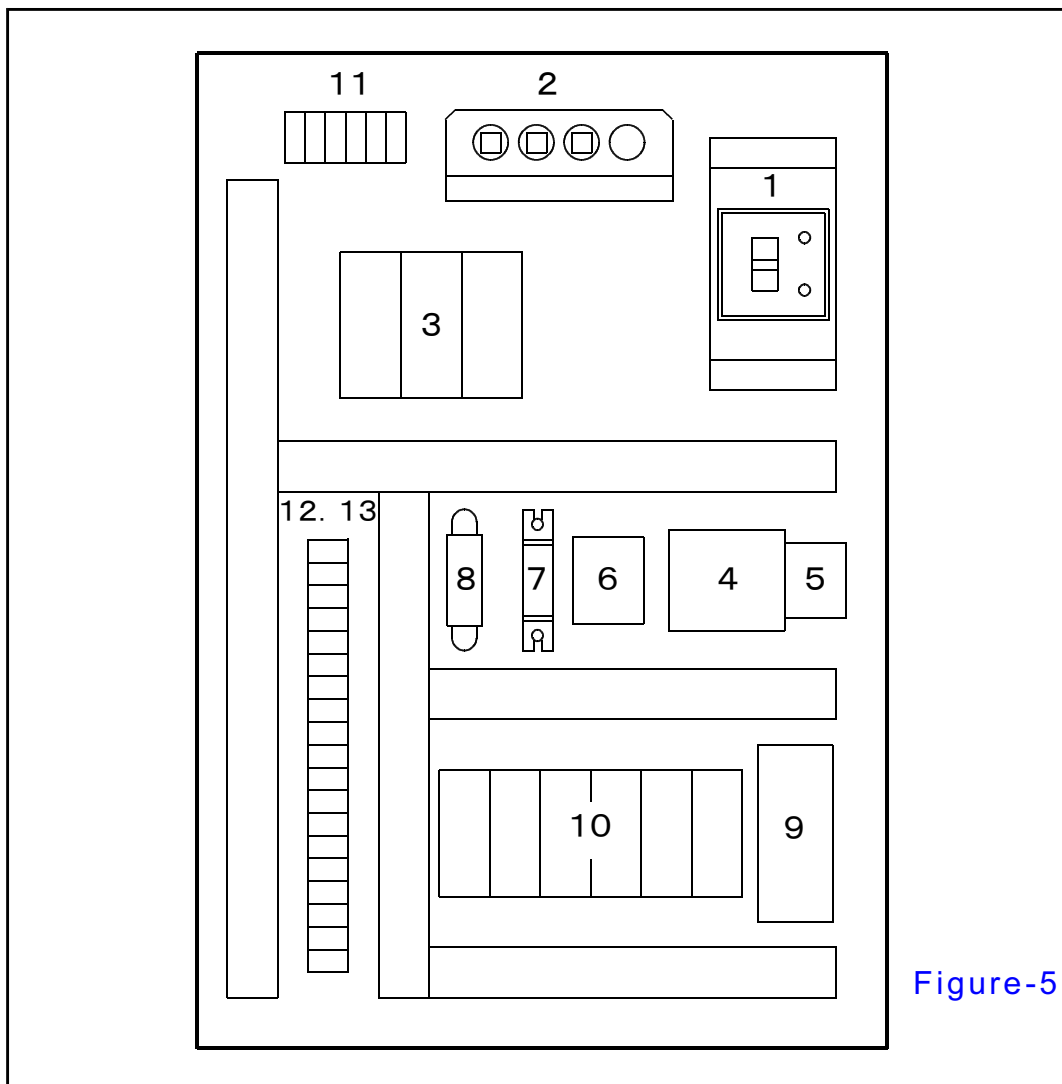
This is the volume which adjusts the speed of the conveyer roll.

13. F. V. Converter

Converter of frequency.

The revolving pulse of the drive motor is changed into the speed of the actual conveyer roll, and made to indicate it.

3) Control panel



- | | |
|--|-------------------------|
| 1. Electric leak breaker (main power source) | 8. Condensor |
| 2. Circuit protector x 3 | 9. Power supply (DC24V) |
| 3. Solidstate relay x 3 | 10. Relay x 6 |
| 4. Magnet relay | 11. Terminal |
| 5. Magnet relay | 12. Terminal |
| 6. Motor controller (with speed controller) | 13. Terminal |
| 7. Resistor | |

〈3〉 OPERATION

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〈3〉 OPERATION

WARNING



Do not touch the high temperature part and the electric connection part with a hand.

(1) Operation

- 1) Open the front door and turn on the main breaker.
[SOURCE] lamp lights.
- 2) Push the POWER [ON] button.
POWER [ON] lamp lights
- 4) Push the CONVEYOR [ON] button.
CONVEYOR [ON] lamp lights
- 5) Conveyor speed adjustment
Adjust the speed control dial on the operation panel.

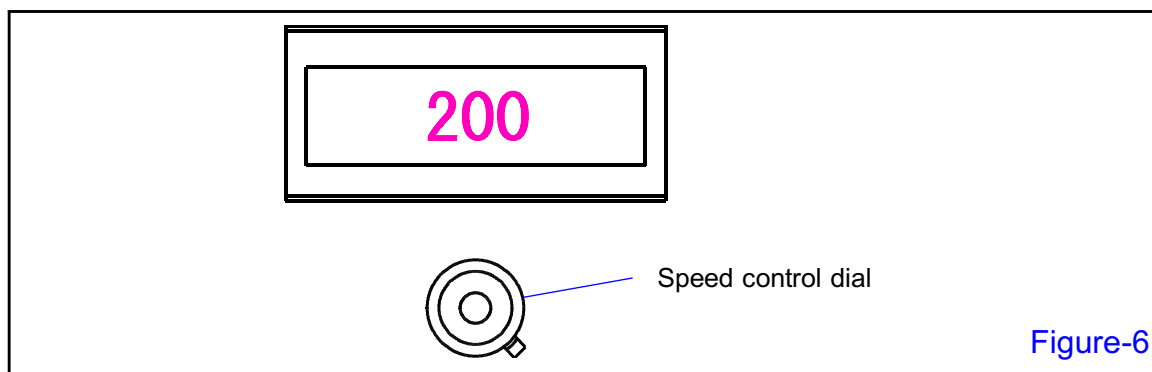


Figure-6

- 5) Set the temperature controller.
Hot roll temperature is set up using the mode change of a temperature controller , and a setting key.

CAUTION

Please do not set it as 150 degrees C or more.
The damage may be given to a hot roll.

6) Push the HEATER [ON] button.

HEATER [ON] lamp lights.

**NOTE**

- It takes for about 20 to 30 minutes till temperature of the hot roll stabilizes.
- If the temperature of the hot roll became much different from the setting temperature, the heater is switched off automatically.

Operation starts.

CAUTION

Please do not process anythings other than the PWB.
There is a possibility that a hot roll may be damaged.

(2) Stop

1) Push HEATER [OFF] button.

HEATER [OFF] lamp lights.



Continue to run conveyor till the temperature the hot roll becomes about 50 °C (about 15 to 20 minutes).
his keeps the life of the hot roll longer.

2) Push CONVEYOR [OFF] button.

CONVEYOR [OFF] lamp lights.



If the CONVEYOR OFF button is pushed earlier than the HEATER OFF button, heater is automatically switched off .
his has a bad influence on the life of the hot roll.
So, please be careful not to make mistake in procedure.

3) Push POWER [OFF] button.

POWER [OFF] lamp lights.

4) Open the front door and turn off the main breaker.

[SOURCE] lamp goes off.

Operation stops.

〈4〉 MAINTENANCE

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〈4〉 MAINTENANCE

WARNING



- When you do the work of a maintenance of system etc. please turn OFF a main breaker and be sure to perform it.
- Do not touch the high temperature part and the electric connection part with a hand.
Do not touch the system with wet hand for maintenans.
An electrical shock may be caused.

(1) Daily inspection

	Item	Check point
1	Temperature controller	Checking of set temperature and present temperature.
2	Speed display	Checking of present speed
3	Roll	Scratches and dirt of hot rolls and front and rear rolls.
4	Others	Unusual vibration, Heat generation, Noise

(2) Monthly inspection

(Interval:month)

	Item	Check point	Interval
1	Roll temp. sensor	Cleaning of sensing section	1
2	Surface temperature of hot roll	Check by a thermometer if the surface temperature is same as the set temperature.	3
3	Speed display	Check if the indicated speed is equal to the actual speed.	3
4	Electrode & carbon brush	Wearing of carbon brush and electrode ring	3

	Item	Check point	Interval
5	Up / down movement of hot roll	Sliding situation. dust, scratch, wearing, and grease application of sliding section,	3
6	Dive chain	The tension of a chain, wear, a grease application	6
7	Drive sprocket	Wear, a position gap, a grease application	6
8	Bearing	Wear of bearing at both ends of roll	6
9	Slack of a screw	Slack of each attachment bolt and a nut.	6
10	Indicators and switches on operationl panel	Breakage of lamps. A defect of operation	6
11	Control system and others	Damage and insulation of electric wire. Dirt and damage of contacts of each relay and magnet. Maloperation of electric devices.	6
12	Warning labels	Check the peel off or disappearance of the warning label.	6

(3) Maintenance method



After adjustment and maintenance of each maintenance item, check if the fasteners of the bolts and nuts, are in their original and are not

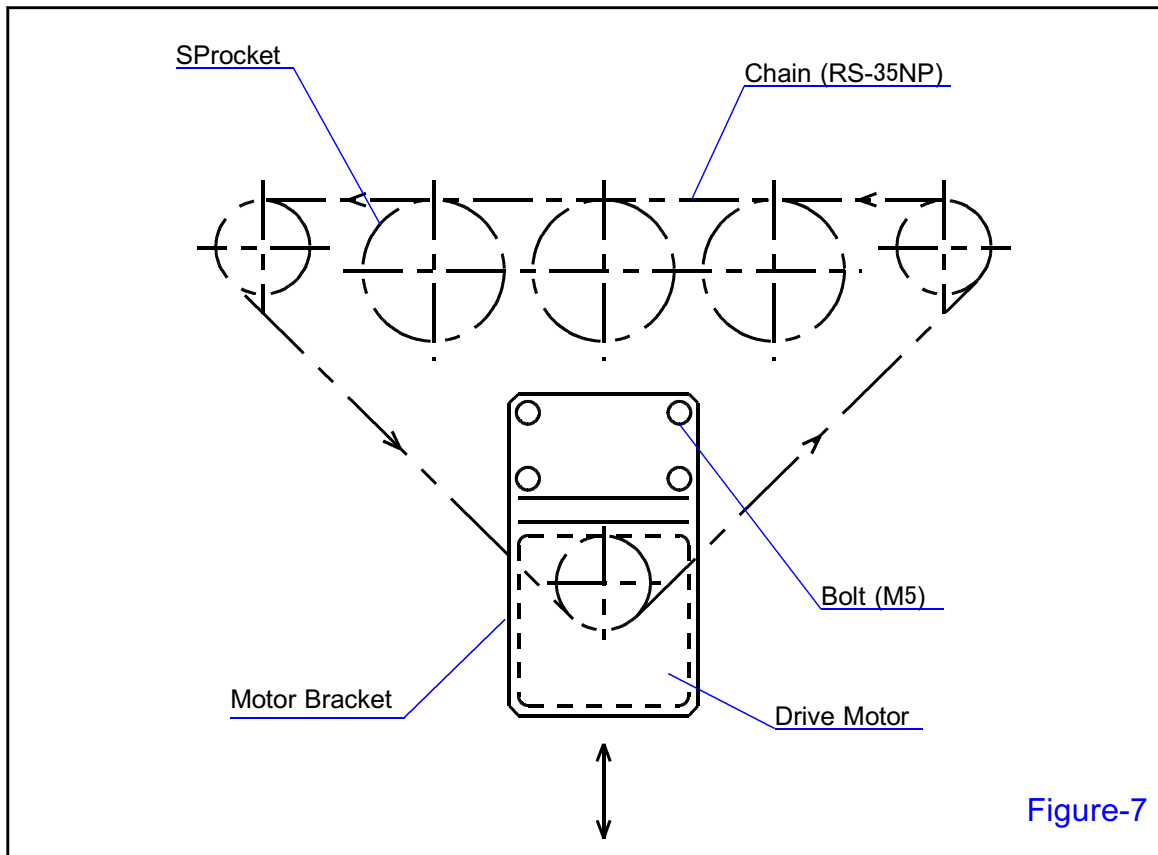
1) Maintenance of hot roll slide section

The upper hot rolls have a slide construction at both sides so that contact the PWB is preheated by roll weight.

Be alert for dust, scratche, etc. at the slide section.

Coat the slide section with greases once every three months.

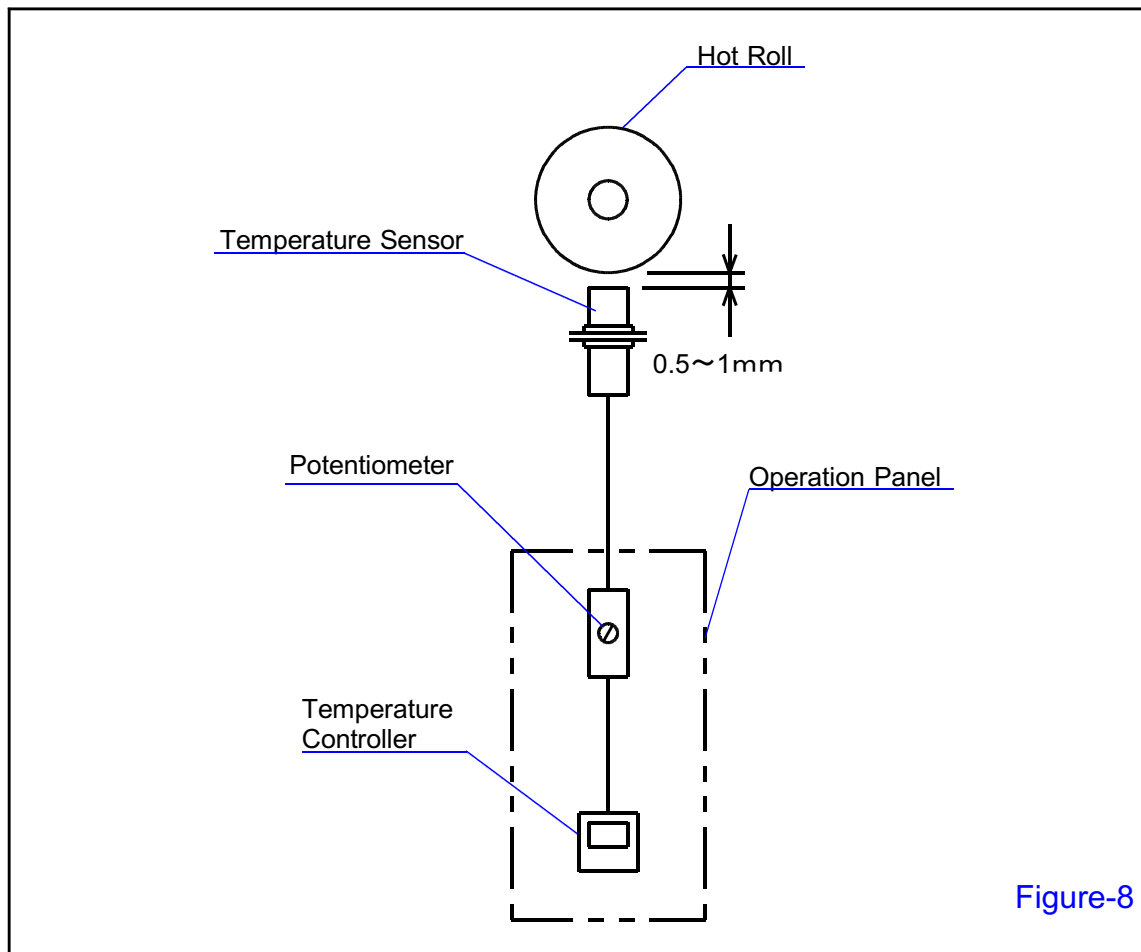
2) Chain tension adjustment



Loosen the bolt (M5x4) of the motor bracket, and adjust in the direction of an arrow.

If it seems that a chain and a sprocket have little grease, please apply to them.

3) Roll temperature sensor adjustment



1. Make the gap between the hot roll surface and temperature sensor, 0.5 to 1mm.
2. If the actual roll surface temperature and the temperature controller indication are different, adjust the difference by turning the potentiometer with a screwdriver.

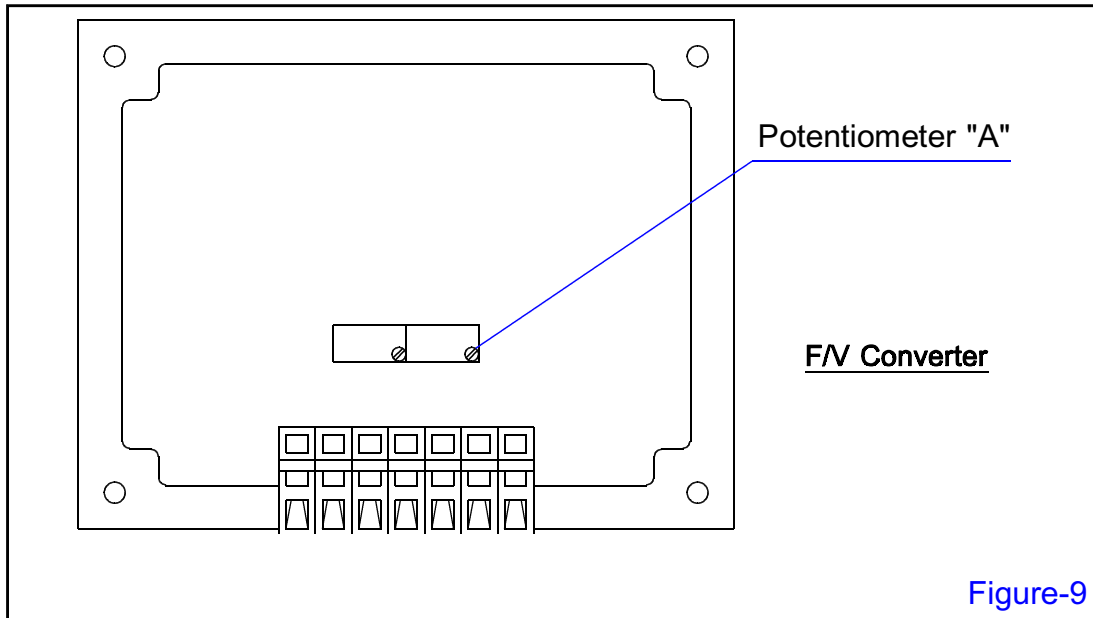


When the temperature sensor gap is adjusted, the actual roll surface temperature may be often different from the temperature controller indication.

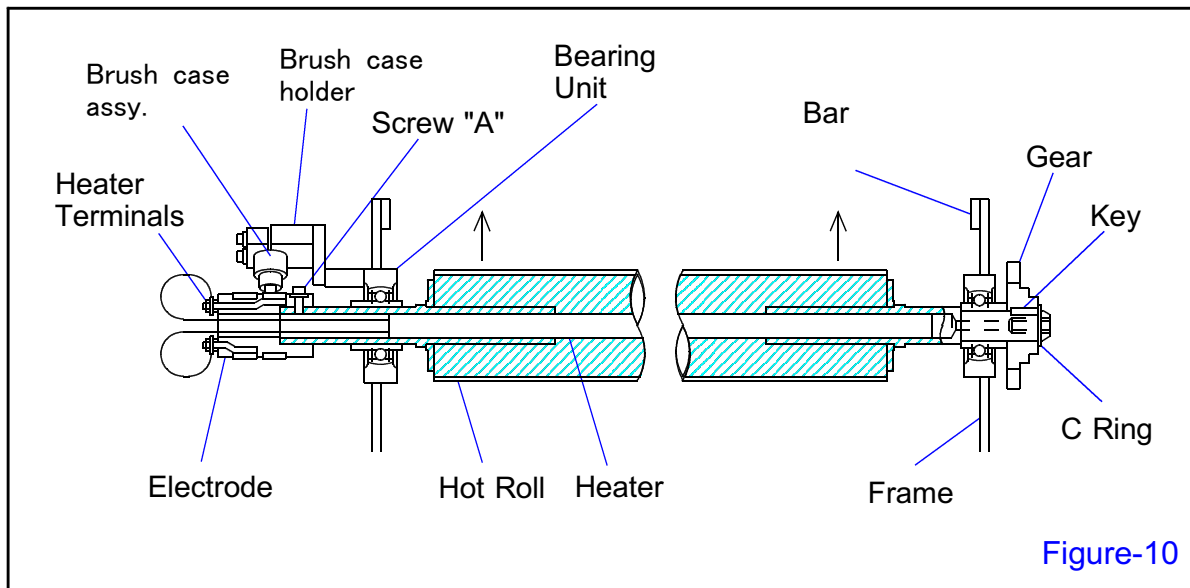
In this case, adjust the difference as described in the above item 2.

4) Correction of speed indication

If there is a difference between actual speed and indicated speed, correct the indicated speed by turning the potentiometer "A" inside F/V converter with driver located at the back of the operation panel.



5) Hot roll (Upper) and Roll heater replacement



1. Take off the bar from the frame side.
2. Take off the brush case assy. from the brush cas holder.
3. Pull out the entire hot roll to the ↑ direction (upper direction) from the frame.
(Works hereafter are to be done on a work bench)
4. Take off the C ring and key and pull out the gear.
5. Take off the heater lead wire from the heater terminal and the electrode fixation screw "A" from the hot roll and pull out the electrode.
6. Pull out the both bearing units.
7. To take off the heater, push the heater by a rod (ϕ 6 to ϕ 8 about 300mm long) through a hole from the gear shaft side to the electrode side.

To re-assemble the hot rolls, take the reverse procedure of the above.



Before replacing the heater, be always coated the silicon grease mentioned below to the whole surface of the heater.

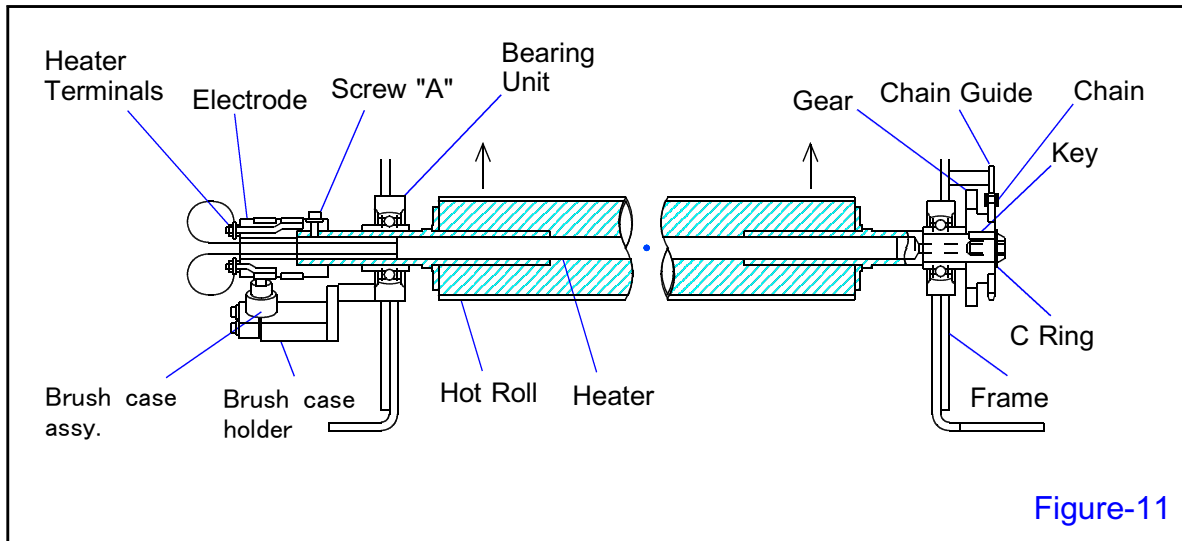
Maker : Toshiba Silicone,Co Ltd.

Name : Silicone grease

Type : YG6111

The part number of Hakuto Co.,Ltd.
#055002

6) Hot roll (L) and Roll heater replacement



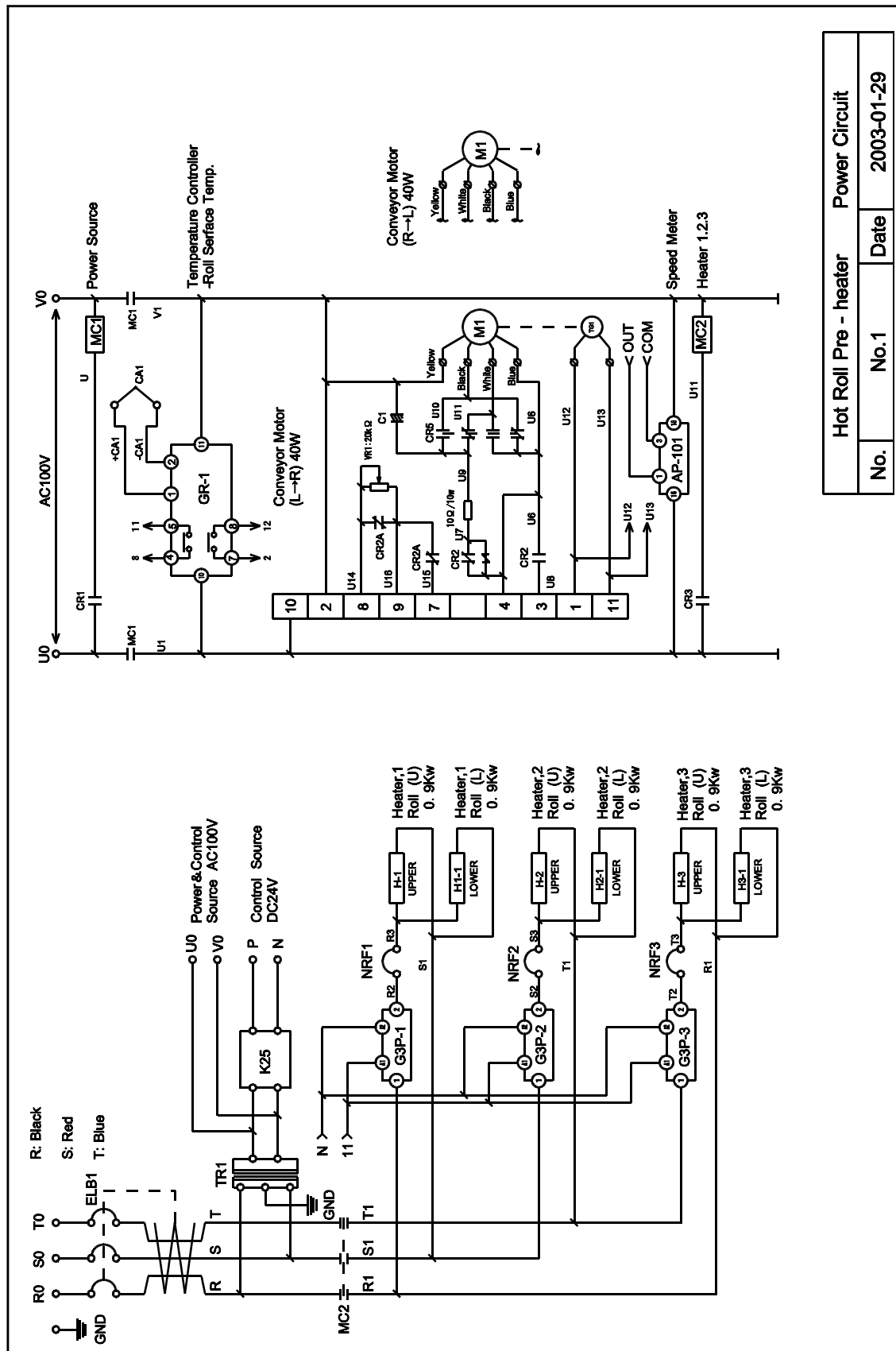
1. Pull out the upper hot roll according to the procedure 1. to 3. mentioned in "Hot Roll (U) and Roll heater replacement."
2. Take off the chain guide together with the strut.
3. Loosen the chain tension and remove the chain
4. Pull out the entire hot roll from the frame to the ↑ direction (upper direction).
(Works hereafter are to be done on a work bench)
5. Remove C ring and key and pull out the gear.
6. Remove the heater lead wire from the heater terminal and the electrode fixation screw "A" from the hot roll and pull out the electrode.
7. Pull out the both bearing units.
8. Take off the heater, push the heater by a rod ($\phi 6$ to $\phi 8$ about 300mm long) through a hole from the gear shaft side to the electrode side.

To re-assemble the hot rolls, take the reverse procedure of the above.

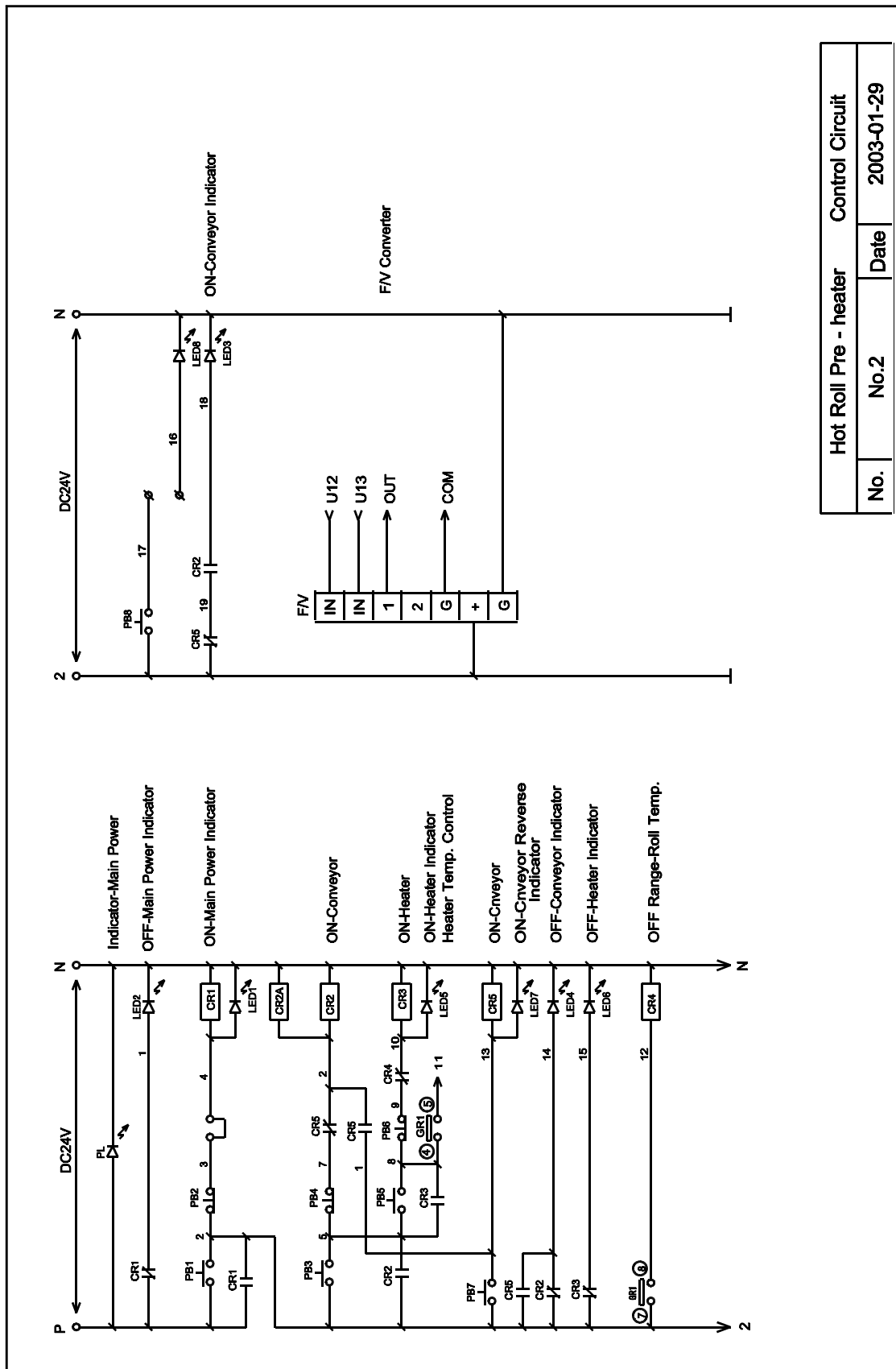
〈5〉 DRAWINGS

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■ Control Box Layout	DIA-5



Hot Roll Pre - heater		Power Circuit	
No.	No.1	Date	2003-01-29



Hot Roll Pre - heater		Control Circuit	
No.	No.2	Date	2003-01-29

TB1

R0	
S0	
T0	AC220V INPUT
GND	GRAND

TB2

P	
N	DC24V-
N	DC24V-
2	DC24V+
2	DC24V+
2	DC24V+
4	ON-Main Power Indicator
1	OFF-Main Power Indicator
3	OFF-Main Power
5	ON-Conveyor
7	OFF-Conveyor
8	ON-Heater
9	OFF-Heater
10	ON-Heater Indicator
11	Heater Temp. Control
12	OFF Range-Roll Temp.
13	ON-Conveyor Reverse
14	OFF-Conveyor Indicator
15	OFF-Heater Indicator
16	Spare Indicator
17	Spare Switch

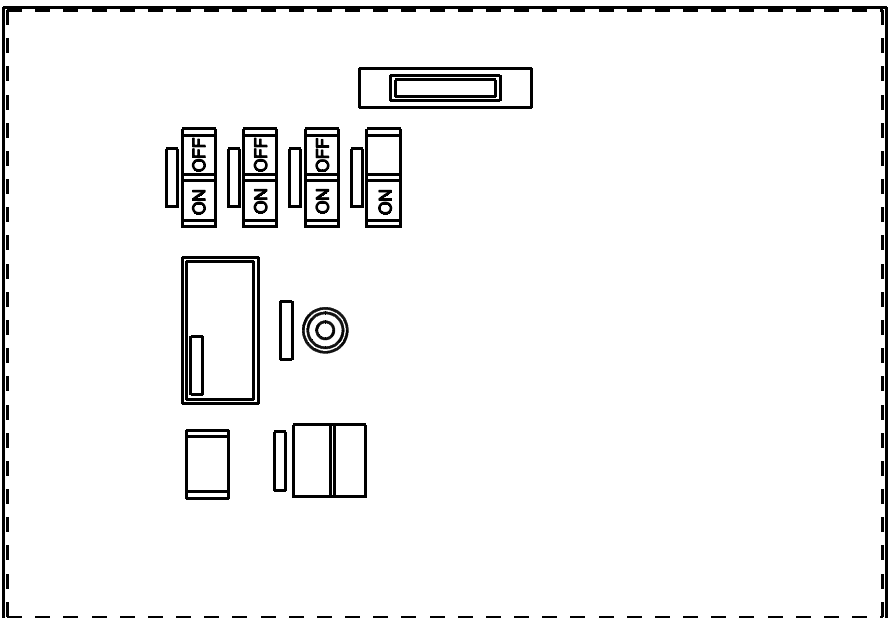
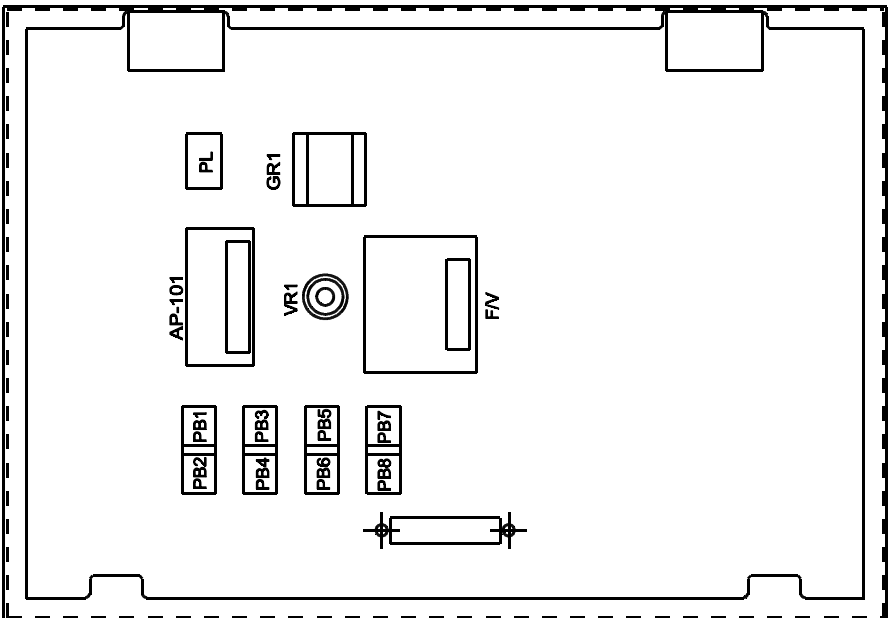
18	ON-Conveyor Indicator
V1	AC100V
U1	AC100V
U6	Motor
U10	Motor
U11	Motor
U12	Tachometer Generator
U13	Tachometer Generator
U14	Speed Control
U16	Speed Control
R	AC
S	AC
U0	AC
V0	AC
G	GR

TB3

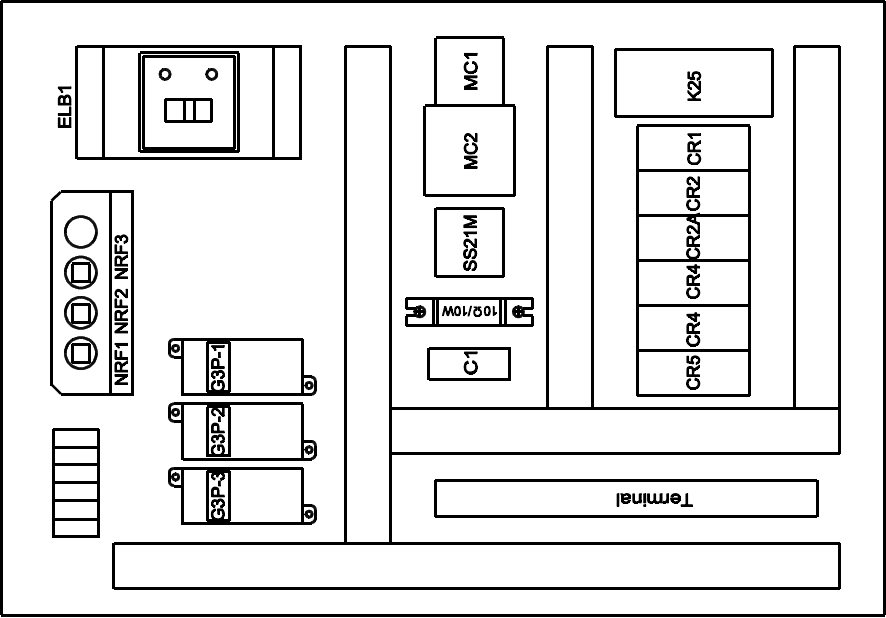
R3	Heater,1-Roll (U/L)
S1	Heater,1-Roll (U/L)
S3	Heater,2-Roll (U/L)
T1	Heater,2-Roll (U/L)
T3	Heater,3-Roll (U/L)
R1	Heater,3-Roll (U/L)

Hot Roll Pre - heater Terminal Layout

No.	No.3	Date	2003-01-29
-----	------	------	------------



Hot Roll Pre - heater Operation Panel Layout		
No.	No.4	Date
		2003-01-29



Hot Roll Pre - heater		Control Box Layout	
No.	No.5	Date	2003-01-29

Hot Roll Pre-Heater

Parts List

January. 2003
Parts List 4.0



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1. The information contained in this Parts List is pertinent to standard system configuration in which board flow in the normal direction ("from left to right," as viewed from the operator position in front of the system).
If your system is right to left direction, it may require different component parts.
2. If your system incorporates any mechanical function or customer special function, it may require different component parts.
3. For any inquiry or question about this Parts List, tell the serial number with the date of manufacture of the system, contact the Hakuto Service Department, or your local Hakuto agent.
4. All specifications, dimensions and design characteristics shown in this Parts List are subject to change without notice.

Figure 1-3

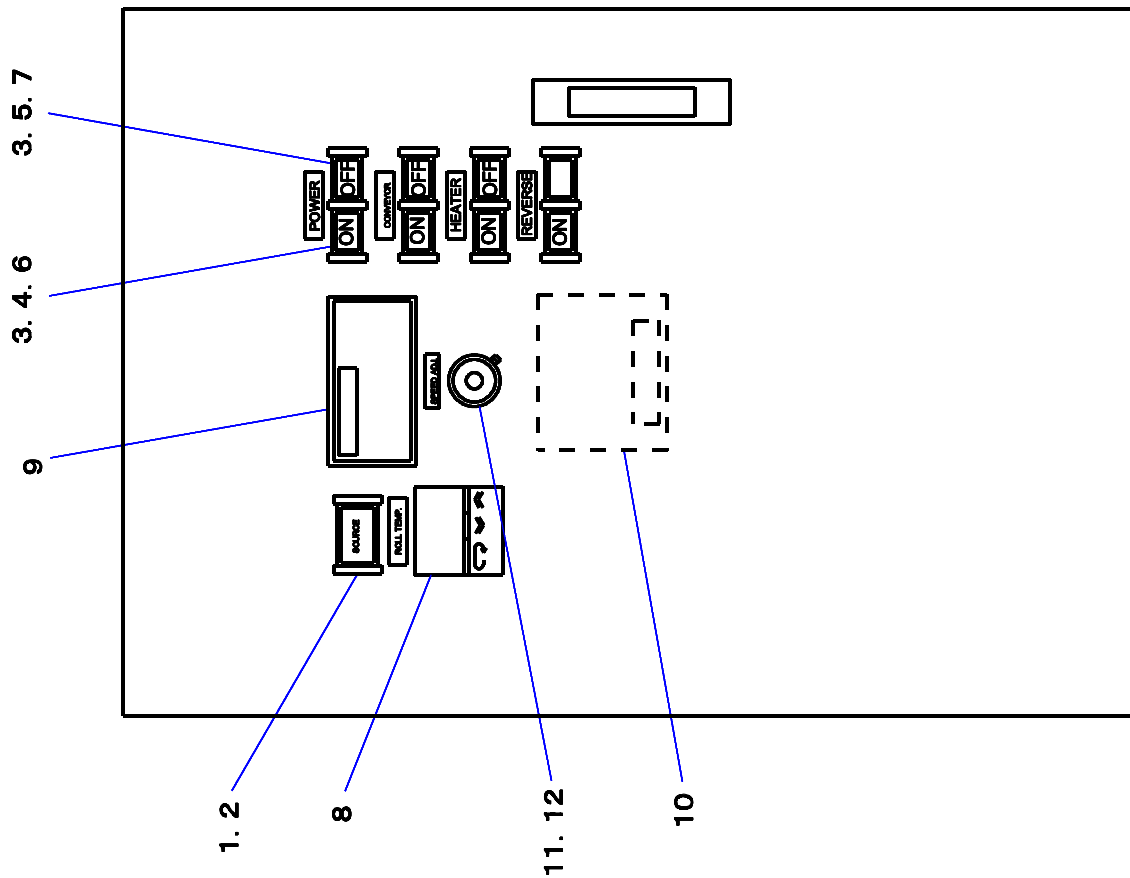


Table 1-3

Item	P/N	S/N	Name	QTY	Remark
1	000208		Indicator	1	
2	000209		Operator Indicator	1	Yellow
3	000055		Switch	8	
4	000057		Operator Indicator	4	Green
5	000059		Operator Indicator	4	Yellow
6	000060		LED(Green)	8	
7	000062		LED(Yellow)	8	
8	007005	#311-	Temperature Controller	1	
9	009001		Digital Meter	1	
10	000404	#205-	F/V Converter	1	
11	009003	#145-	Potentiometer	1	20KΩ
12	000009	#145-	Dial	1	

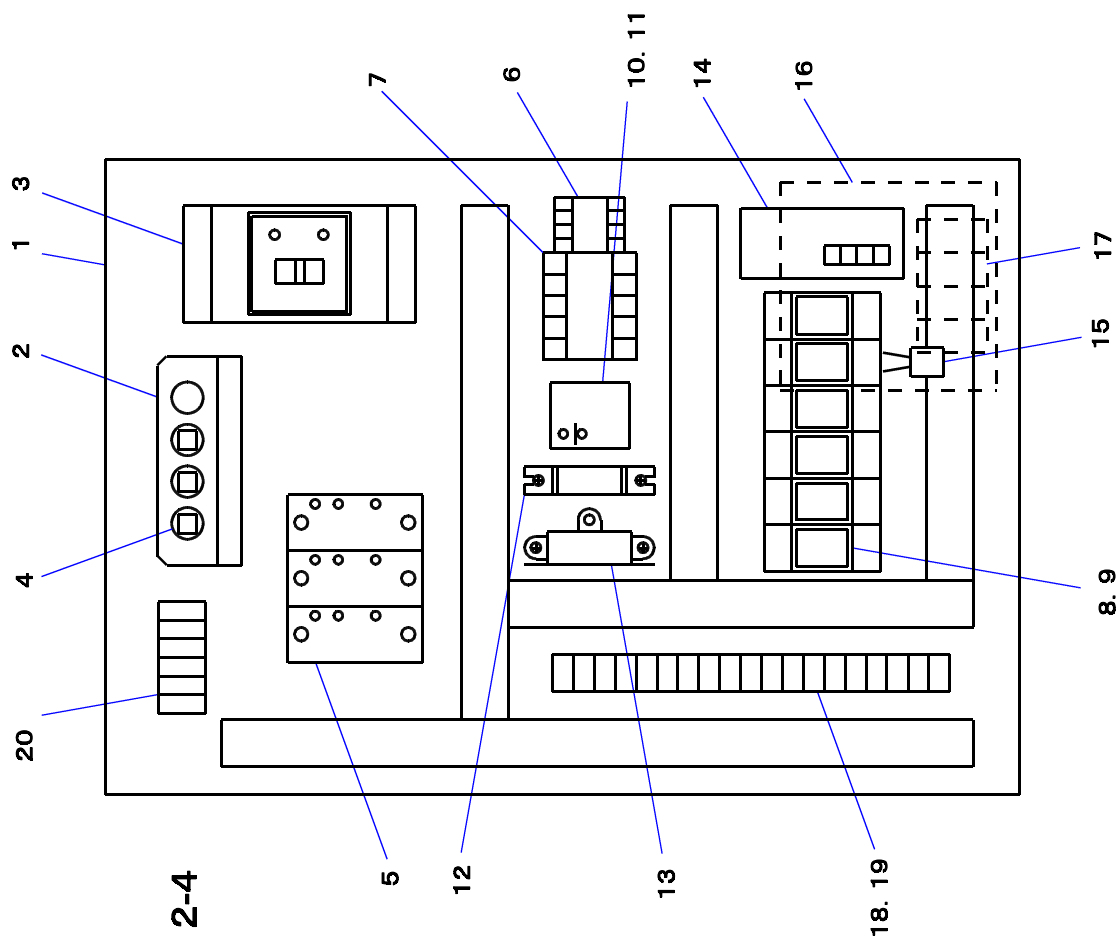


Figure 2-4

Table 2-4

Item	P/N	S/N	Name	QTY	Remark
1	51811602		Panel	1	
2	51811603		Bracket	1	
3	000211		Leakage Breaker	1	3P 30A
3	000213		Circuit Breaker	3	
4	001205	#244-	Solid State Relay	3	G3PA-220B
5	001025	#217-	Magnetic Relay	1	
6	001204	#217-	Magnetic Relay	1	
6	001017	#217-	Relay	6	DC24V
7	001014		Relay Holder	6	
8	018105		Motor Controller	1	SS21M
9	018106		Controller Holder	1	
10	018010		Resistor	1	
11	018013		Capacitor	1	
12	000225	#427-	Power Supply	1	
13	000042		Spark Killer	1	
14	000210		Transformer	1	
15	000217		Terminal	4	BN-50
16	000085		Terminal	7	260-341
17	000084		Terminal	29	260-311
18	000086		Terminal	6	262-341

Figure 3

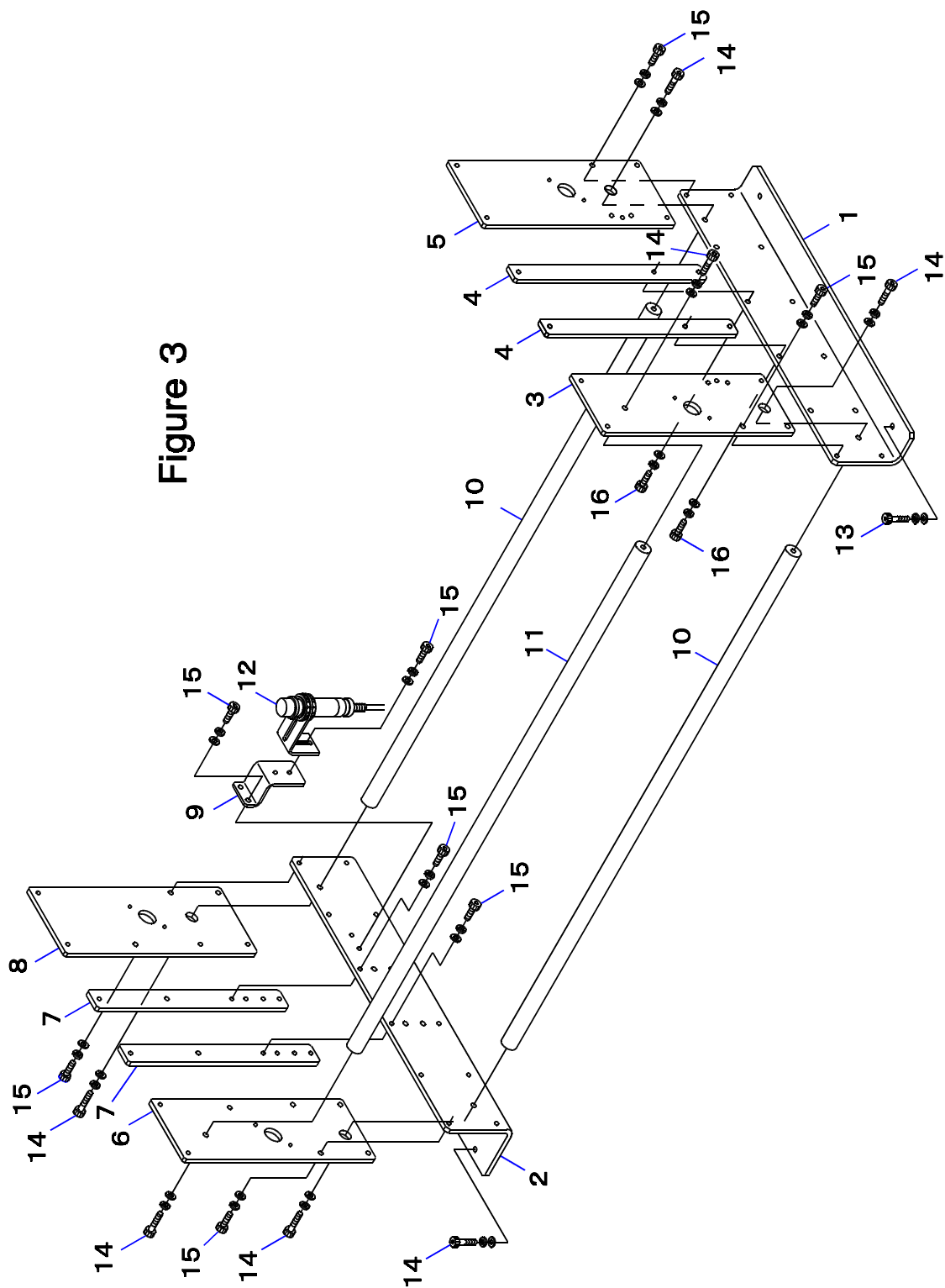


Table 3

Item	P/N	S/N	Name	QTY	Remark
1	51810602		Slide Plate Bracket (F)	1	
2	51810601		Slide Plate Bracket (R)	1	
3	51810701		Slide Plate (F-1)	1	
4	51810702		Slide Plate (F-2)	2	
5	51810703		Slide Plate (F-3)	1	
6	51810803		Slide Plate (R-1)	1	
7	51810802		Slide Plate (R-2)	2	
8	51810801		Slide Plate (R-3)	1	
9	51810603		Sensor Bracket	1	
10	51811103		Tie Rod	2	
11	51811104		Tie Rod	1	
12	006007		Roll Temp. Sensor	1	
13	610620		Bolt	6	M6*20L
14	610625		Bolt	6	M6*25L
15	610512		Screw	18	M5*12L
16	610515		Screw	10	M5*15L

Figure 4

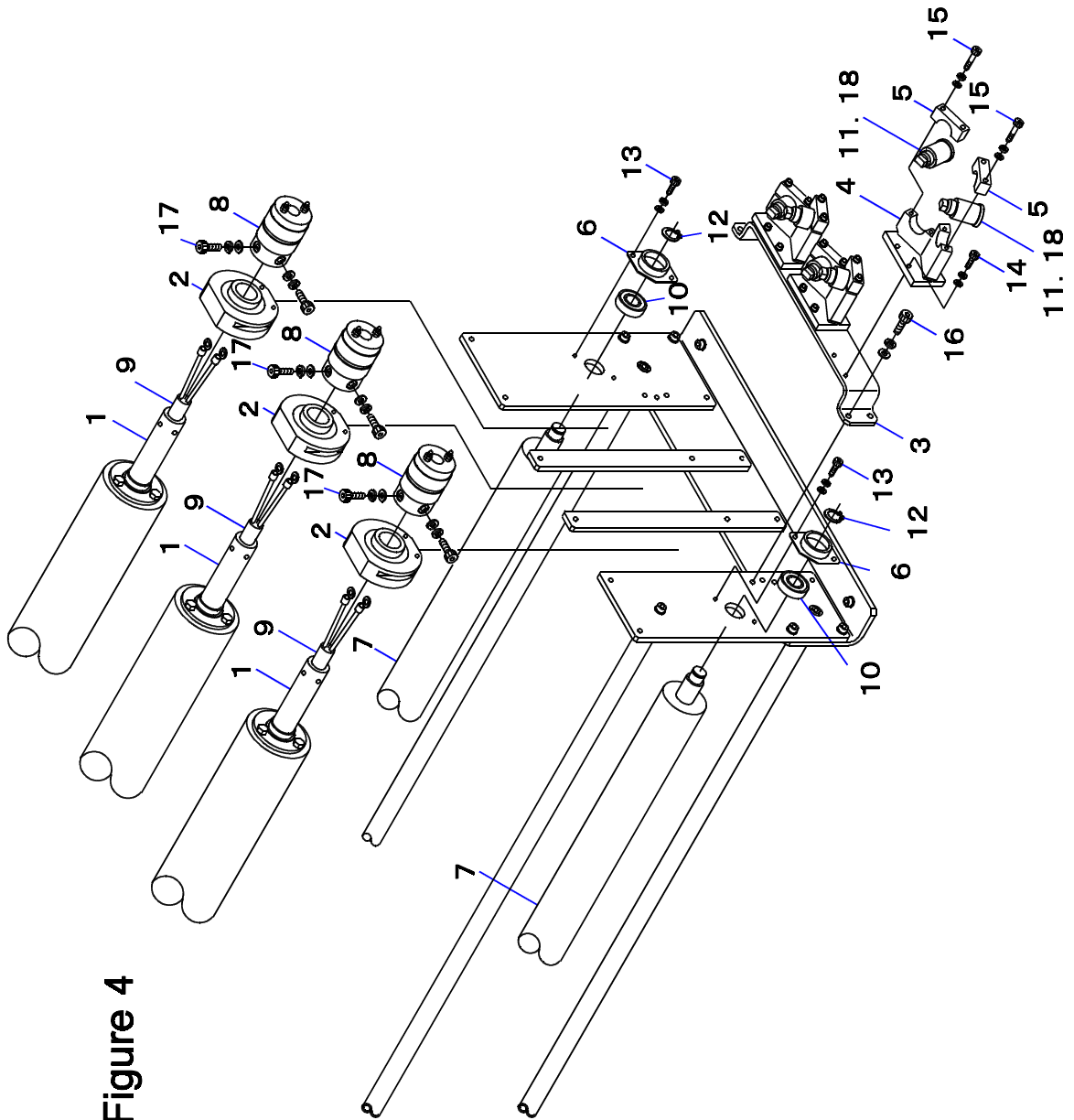


Table 4

Item	P/N	S/N	Name	QTY	Remark
1	11603101		Hot Roll	3	
2	51811001		Unit Type Baearing (F)	3	
3	51811106		Holder Bracket	1	
4	51811801		Holder	3	
5	11602705		Holder	6	
6	11510501		Baearing Housing	2	
7	51811701		Rubber Roll	2	
8	11502801		Electrode Assy	3	
9	142005		Roll Heater	3	220V*0.9KW
10	045002		Bearing	2	6002ZZ
11	11502810		Carbon Brush Assy	6	
12	600315		C Ring	2	
13	610410		Screw	4	M4*10L
14	610415		Screw	6	M4*15L
15	610425		Screw	12	M4*25L
16	610515		Screw	4	M5*15L
17	610512		Screw	6	M5*12L
18	11502811		Carbon Brush	6	

Figure 5

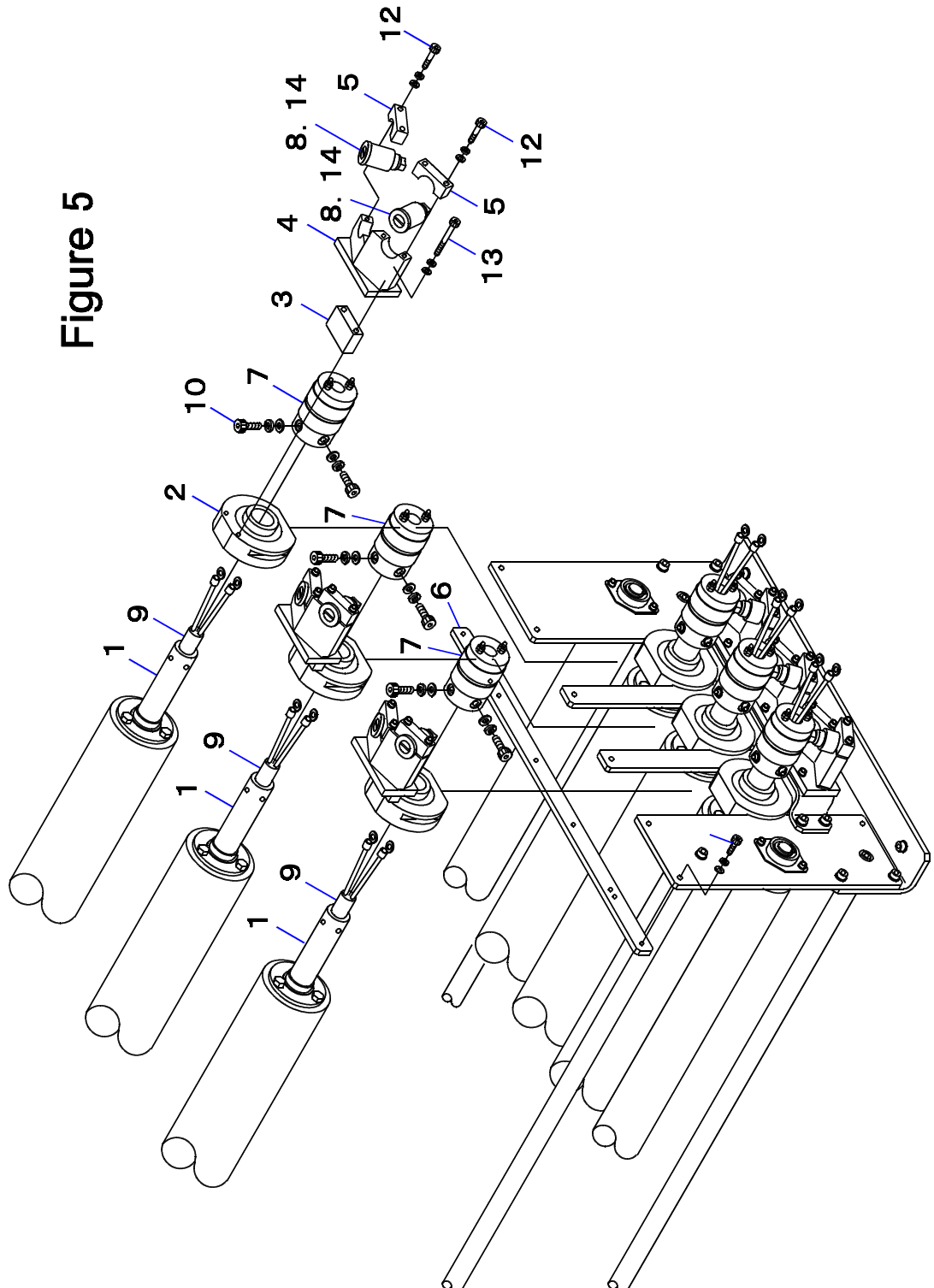


Table 5

Item	P/N	S/N	Name	QTY	Remark
1	11603101		Hot Roll	3	
2	51811001		Unit Type Baearing (F)	3	
3	51811103		Spacer	3	
4	51811801		Holder	3	
5	11602705		Holder	6	
6	51810704		Joint Bar	1	
7	11502801		Electrode Assy	3	
8	11502810		Carbon Brush Assy	6	
9	142005		Roll Heater	3	220V*0.9KW
10	610512		Screw	6	M5*12L
11	610412		Screw	6	M4*12L
12	610425		Screw	12	M4*25L
13	610445		Screw	6	M4*45L
14	11502811		Carbon Brush	6	

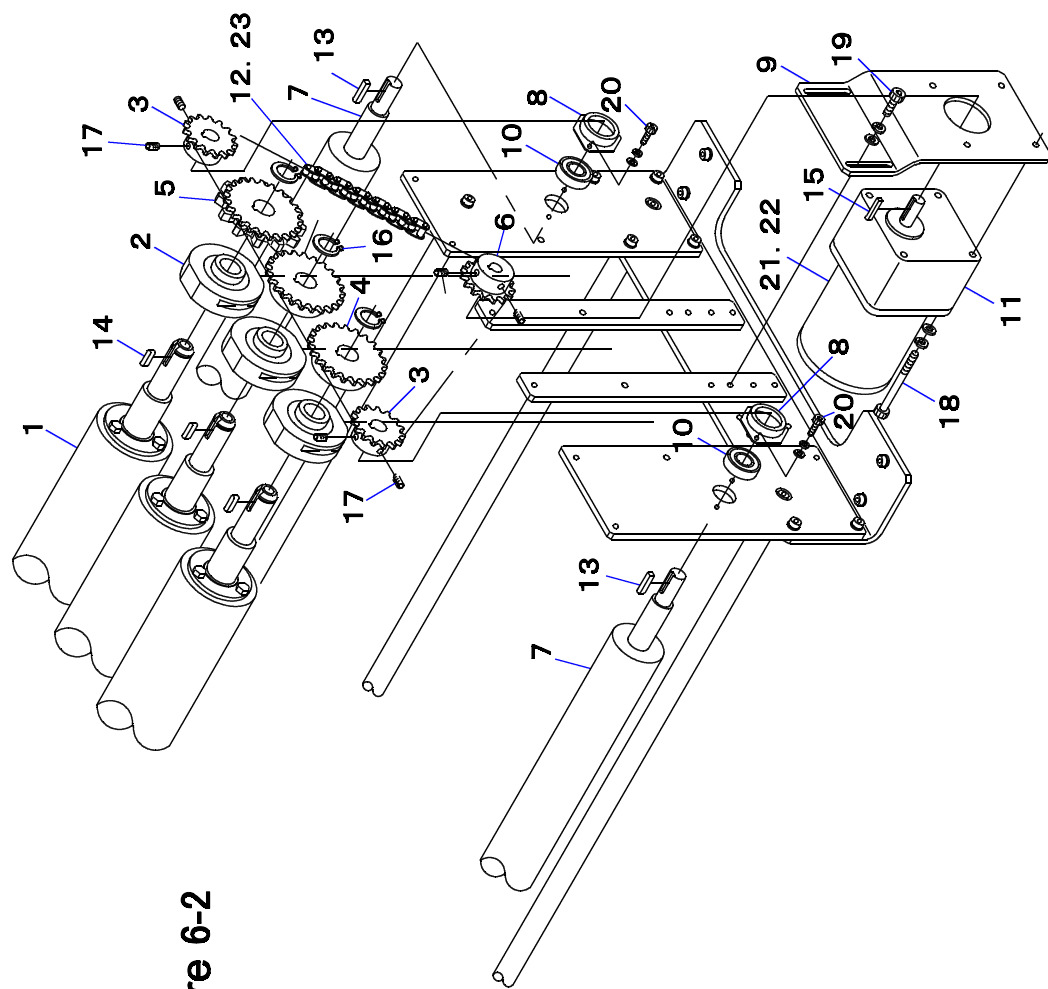


Figure 6-2

Table 6-2

Item	P/N	S/N	Name	QTY	Remark
1	11603101		Hot Roll	3	
2	51811002		Unit Type Bearing(R)	3	
3	51810902		Sprocket	2	RS35-15T
4	51810901		Sprocket	2	RS35-23T
5	51810904		Spur Gear & Sprocket	1	
6	51810903		Sprocket	1	RS35-15T
7	51811701		Rubber Roll	2	
8	11510501		Bearing Housing	2	
9	51811101		Motor Bracket	1	
10	045002		Bearing	2	6002ZZ
11	016010	#229	#229- Gear Head	1	1/50
11	016202	#542	#542- Gear Head	1	1/36
12	044205		Chain	1	RS35NP-109Link
13	51811703		Key	2	5*5*24L
14	11503107		Key	3	5*5*16L
15	044046		Key	1	4*4*25L
16	600320		C Ring	3	
17	880506		Set Screw	6	M5*6L
18	610675		Bolt	4	M6*75L
19	610515		Screw	4	M5*15L
20	610410		Screw	4	M4*10L
21	013102	#229	#229- #229-	1	40W
22	013006	#229	#229- Motor Tachometer	1	
23	044014		Joint Link	1	RS35NP

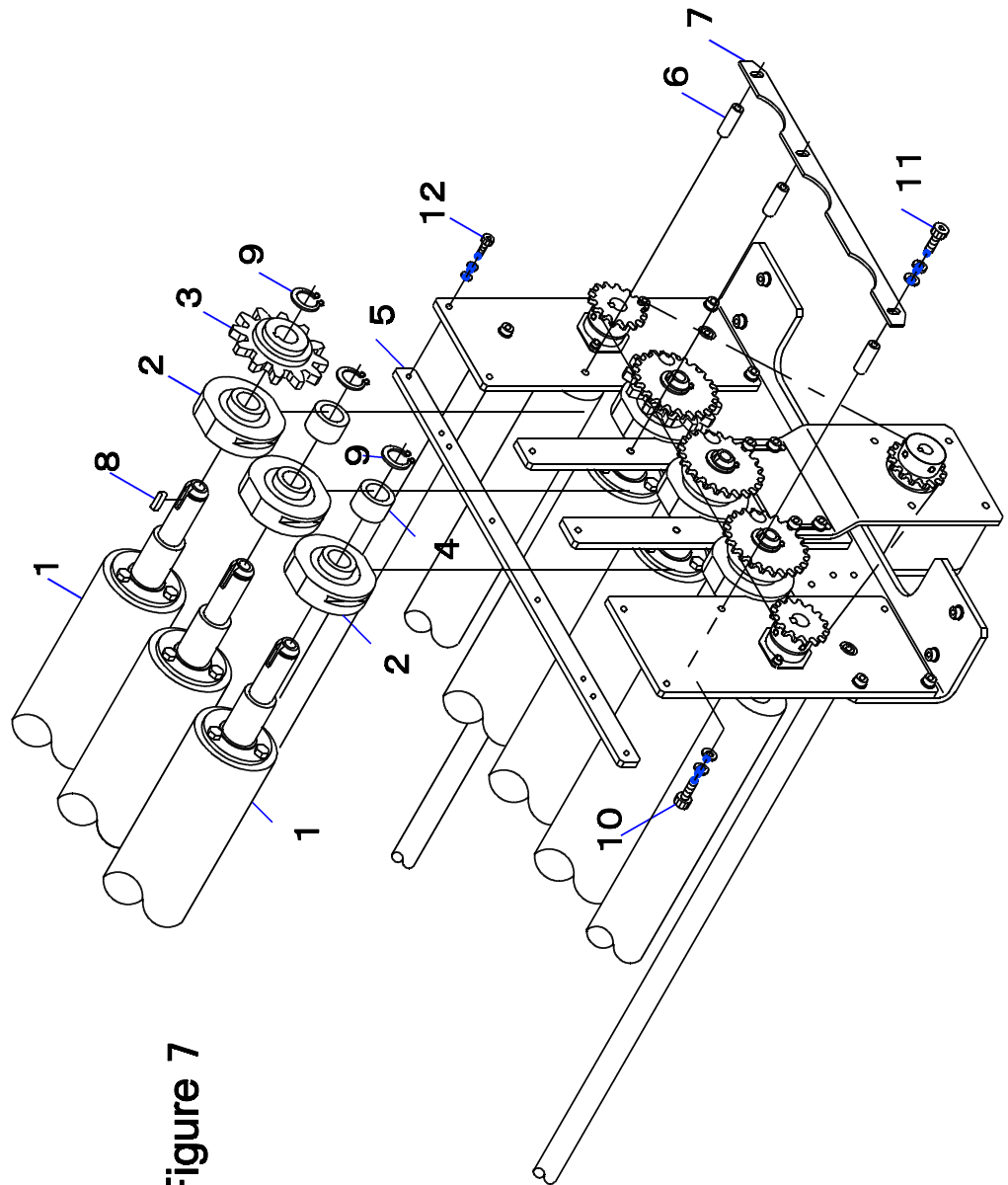


Figure 7

Table 7

Item	P/N	S/N	Name	QTY	Remark
1	11603101		Hot Roll	3	
2	51811002		Unit Type Baearing (R)	3	
3	51810905		Spur Gear	1	
4	51801101		Spacer	2	
5	51810804		Joint Bar	1	
6	51811105		Spacer	3	
7	51811102		Chain Guide	1	
8	11503107		Key	1	5*5*16L
9	600320		C Ring	3	
10	610520		Screw	3	M5*20L
11	610515		Screw	3	M5*15L
12	510412		Screw	6	M4*12L

Figure 8-3

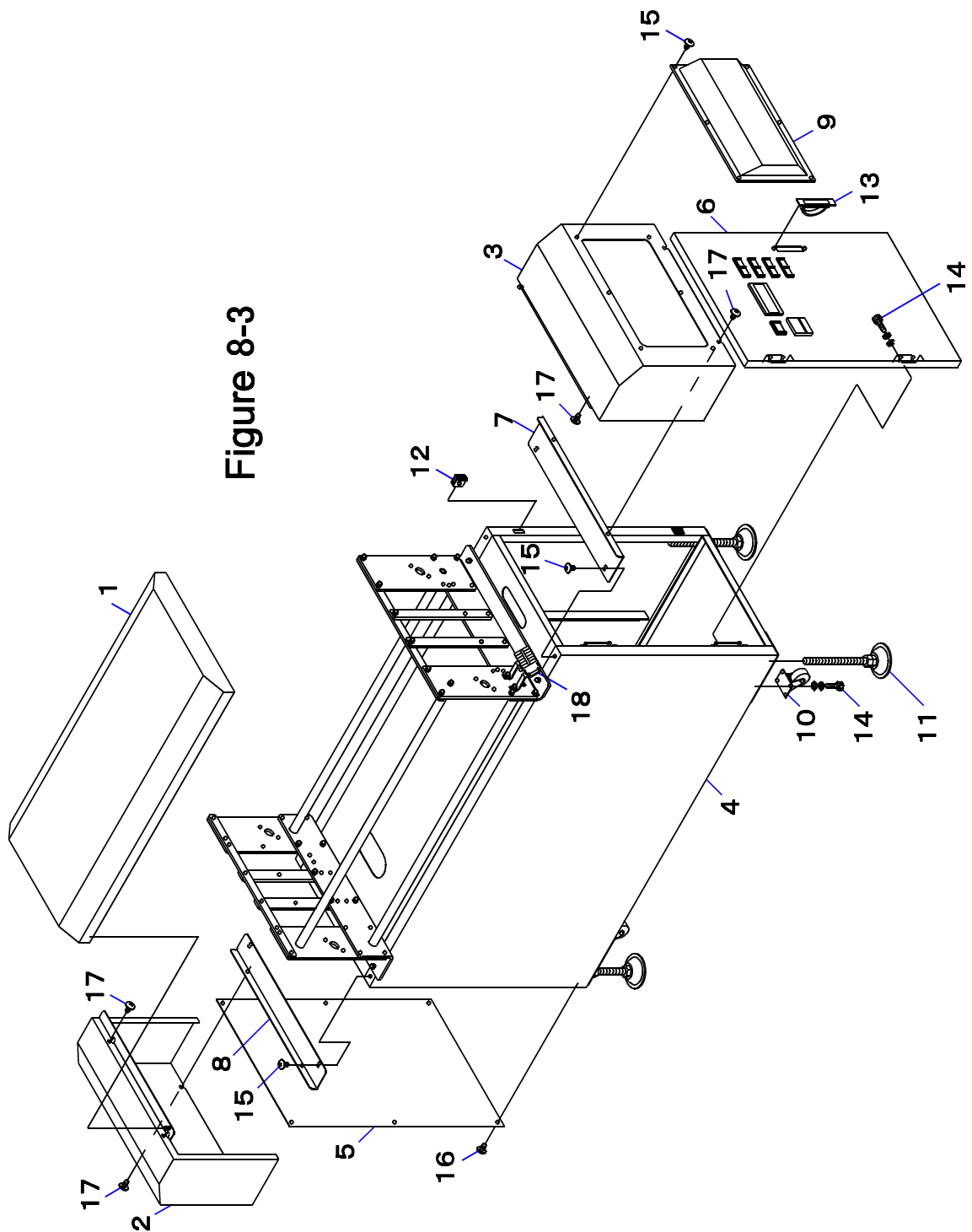


Table 8-3

Item	P/N	S/N	Name	QTY	Remark
1	51811501		Roll Cover	1	
2	51811351	#464-	Conveyor Cover (R)	1	
3	51811402	#129-	Conveyor Cover (F)	1	
3	51811452	#464-	Conveyor Cover (F)	1	
4	51810551	#464-	Frame	1	
5	51811651	#464-	Rear Cover	1	
6	51811211	#311-	Operation Panel	1	
6	51811251	#464-	Operation Panel	1	
7	51811553	#464-	Cover Bracket (F)	1	
8	51811552	#464-	Cover Bracket (R)	1	
9	51804301	#129-	Electrode Cover	1	
10	049300		Caster	4	
11	049019		Level Foot	4	
12	049202		Magnet Catch	2	
13	049003		Handle	1	
14	610412		Screw	20	M4*12L
15	640410		Screw	10	M4*10L
16	640408		Screw	6	M4*8L
17	640406		Screw	8	M4*6L
18	000018		Terminal	6	BN-15L