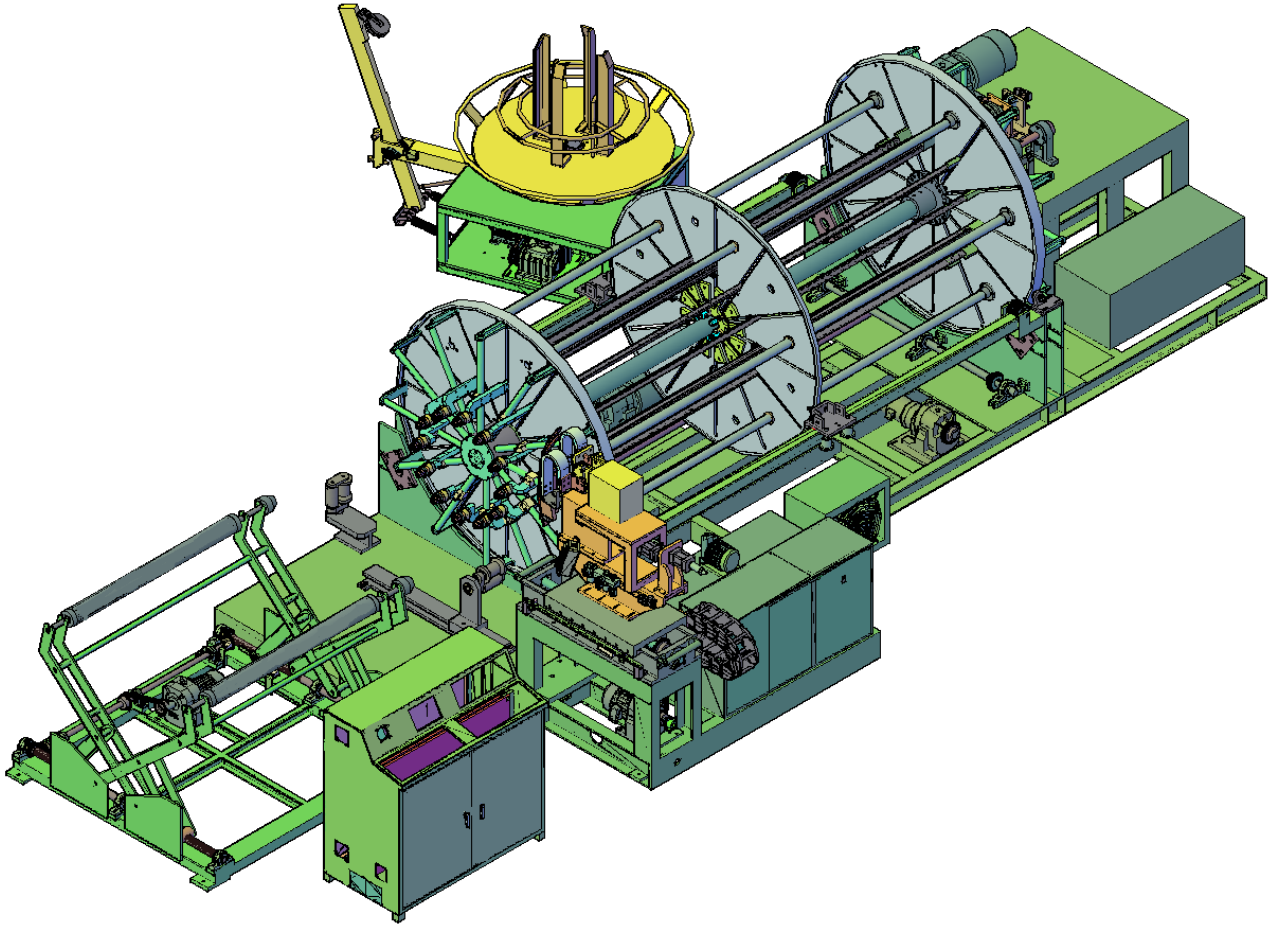


MANUAL OF CAGE WELDING MACHINE

MODEL: KN-1248-G3



MAKER:



K.N. Machine
KYUNGNAM MACHINE COMPANY

135 SEONGJU-RI, WONGOG-MYEON

ANSEONG-CITY, KYUNGGI-DO, KOREA

TEL.: 82-31-656-5385 FAX.: 82-31-656-5386

E-mail: knhslee@hanmail.net

EXPORTER:

BM TRADING COMPANY

ROOM#3304, KOREA WORLD TRADE CENTER

159 SAMSUNG-DONG, KANGNAM-KU

SEOUL 135-729, KOREA

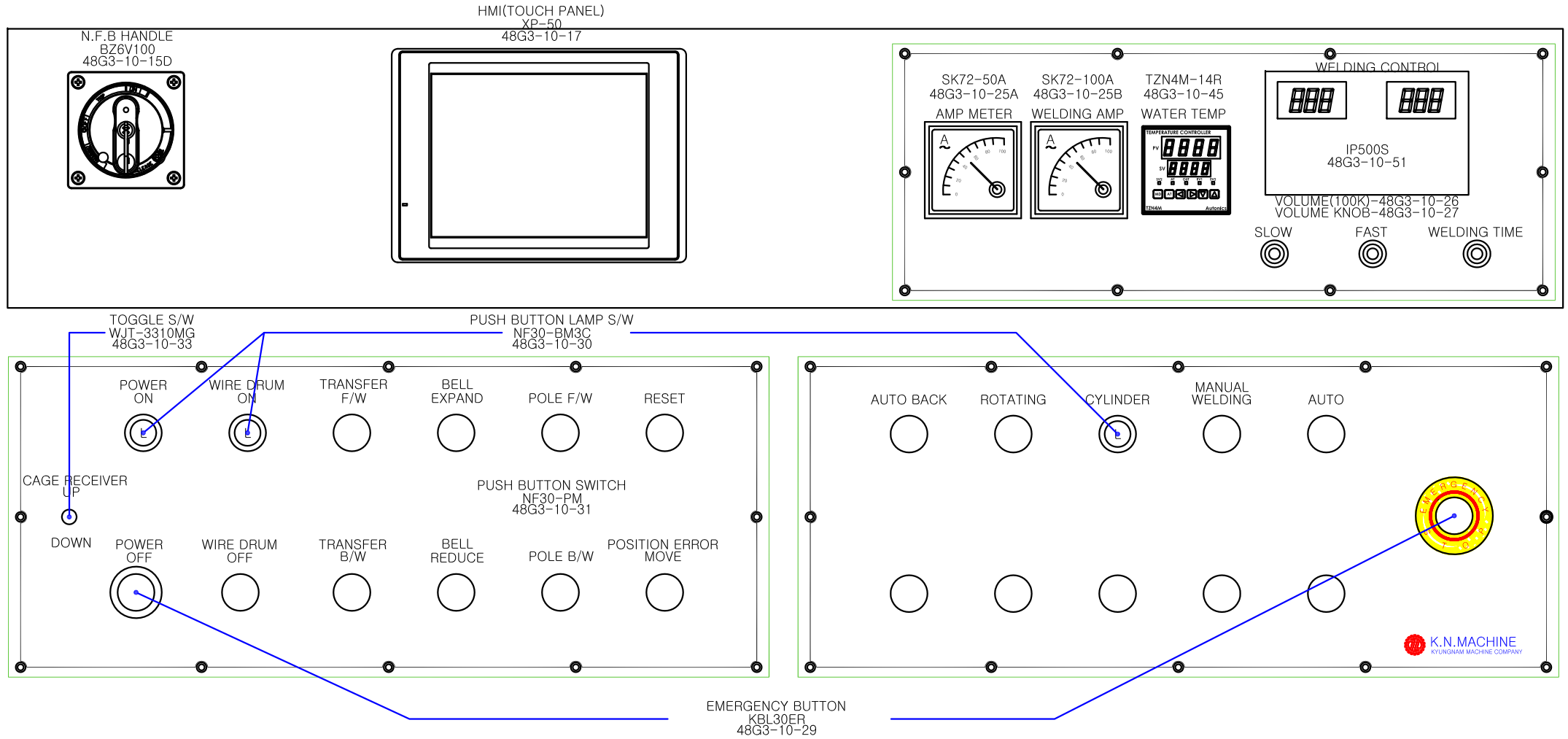
TEL.: 82-2-551-2716 FAX.: 82-31-272-2470

E-mail: bmtrading@hanmail.net or bmtrading3304@yahoo.co.kr

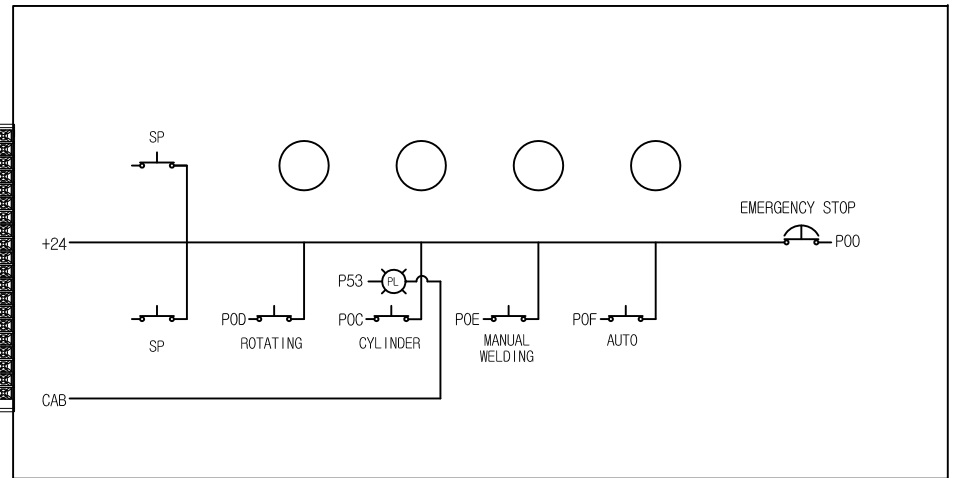
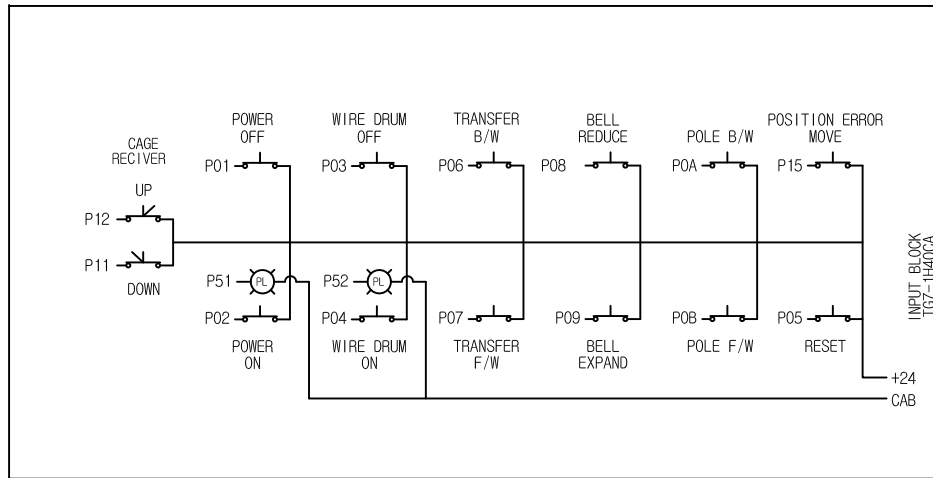
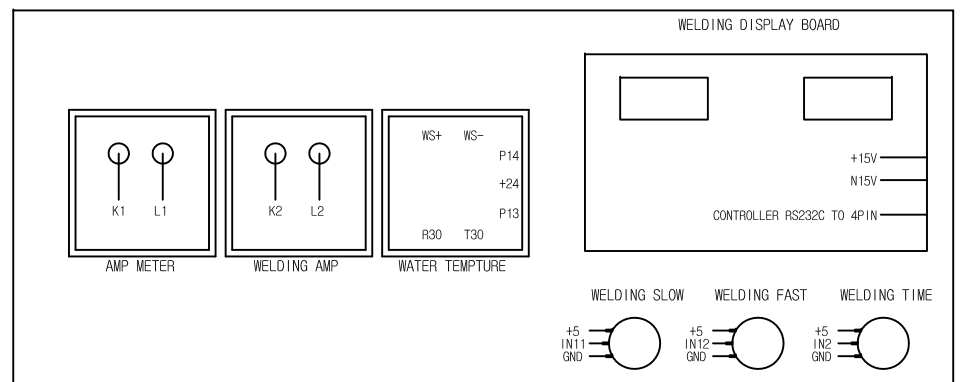
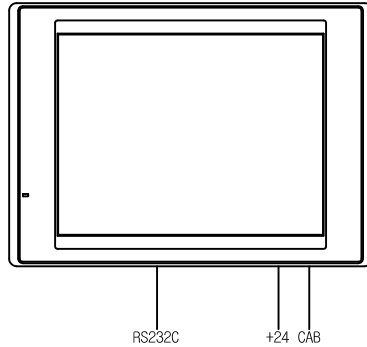
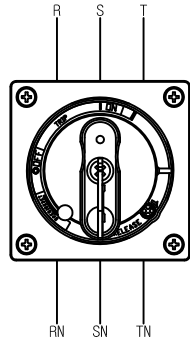
CONTENTS

- 1.OPERATION PANEL DIAGRAM
- 2.ELECTRIC COMPONENTS DIAGRAM
- 3.PANEL DIAGRAM
- 4.FUNCTION OF CONTROL PANEL SWITCH
- 5.TOUCH PANEL FUNCTION
- 6.CHECK POINTS BEFORE PRODUCTION
- 7.CHANGE PRODUCT SPECIFICATION
- 8.HOW TO MAKE CAGES
- 9.PROXIMITY SWITCH FUNCTION
- 10.ERROR DISPLAY
- 11.REPLACE SPARE PARTS
- 12.MACHINE SPECIFICATION
- 13.WEARING PARTS
- 14.ELECTRIC SEQUENCE
- 15.TOUCH PANEL MANUAL – www.lsis.biz
- 17.TZ4ML(TEMPERATURE CONTROLLER MANUAL) –www.autonics.com
- 18.AC FREQUENCY DRIVE MANUAL(LS) – www.lsis.biz
- 19.P.L.C. MANUAL(LS) – www.lsis.biz

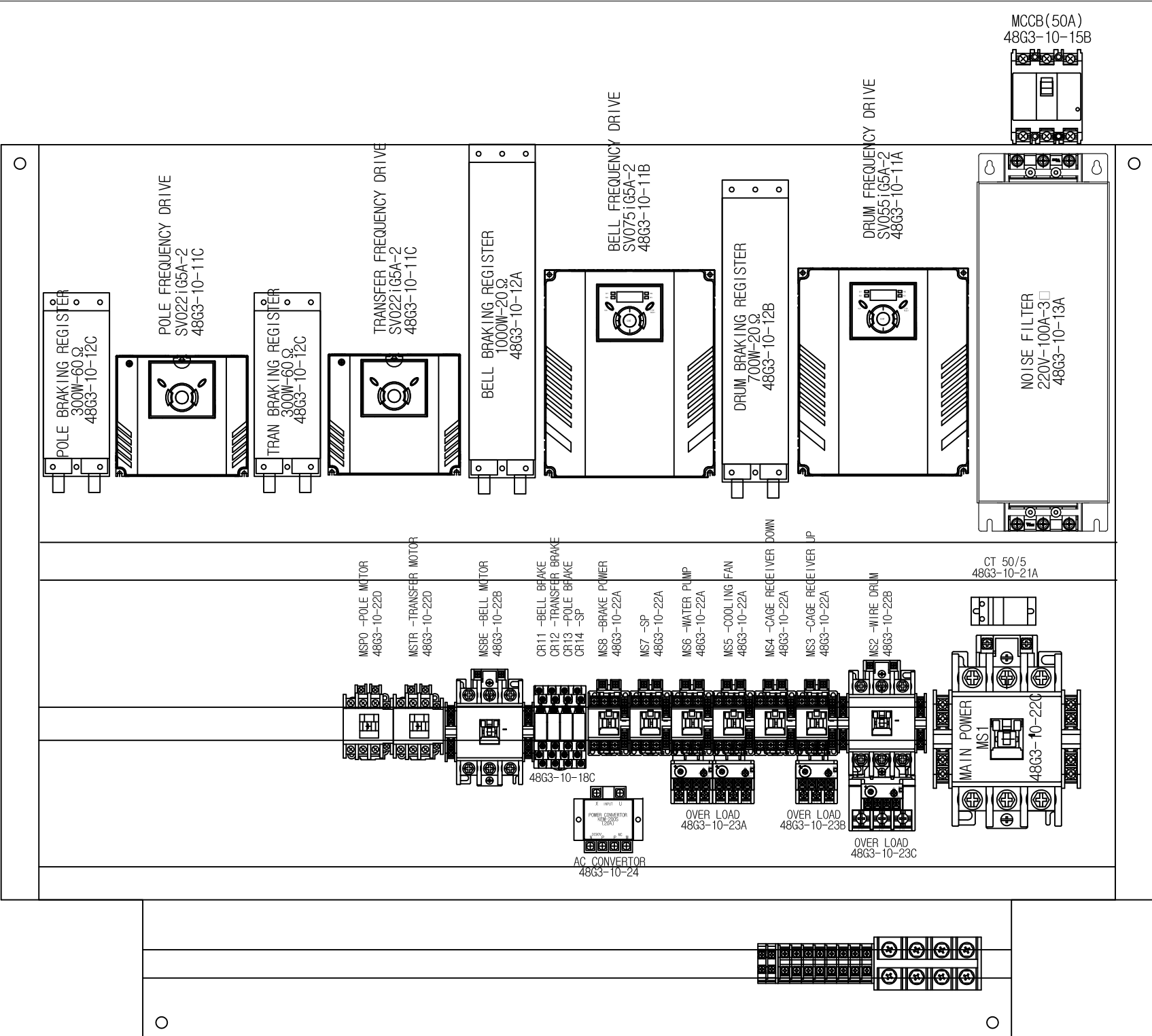
OPERATION PANEL PART



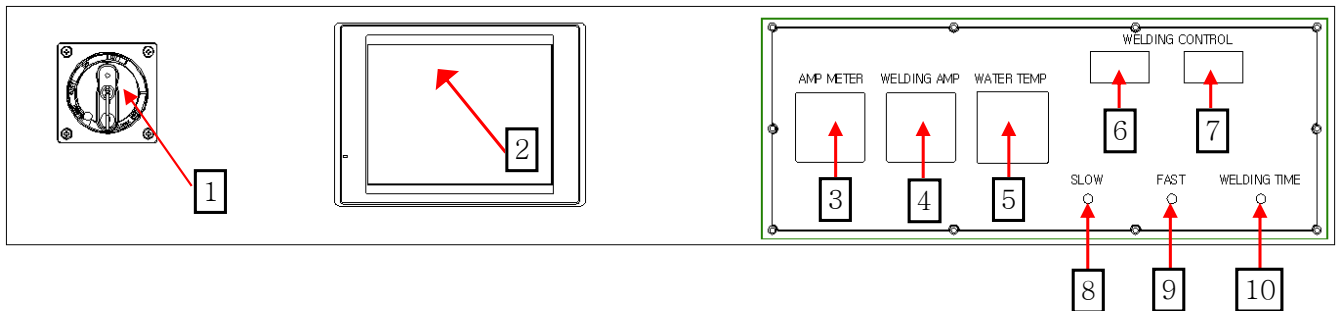
OPERATION PANEL BACK WIRING



NO	PART NAME	MATERIAL	QTY	NOTE
DATE	15. SEPTEMBER. 2013	 K.N.Machine KYUNGNAM MACHINE COMPANY		
SCALE :	UNIT :	m/m	MODEL	KN-1248-G3
DESIGNED	CHECKED	APPROVE	PART NO	ELECTRIC NOTE
			DRAW NO	OP-BACK



4. FUNCTION OF CONTROL PANEL SWITCH

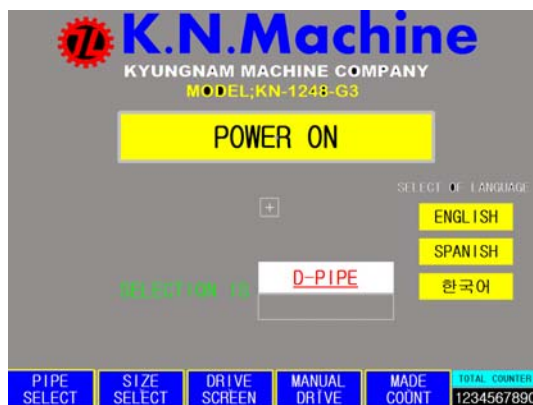


1. Main Power ON/OFF : Press bottom of wheel to be locked, and locking with a key for repair or inspection.

2. TOUCH PANEL: Touch Panel must be turned on before operating the machine to check or entry various datas.

- If turn on main power "ON", PLC and Touch Panel is power "ON".

TOUCH PANEL displays main screen as follow;



- Touch POWER ON bar to turn on power and display READY for operation.
- Sometimes, display EMERGENCY INFORMATION.
- Select language from SELECT OF LANGUAGE. ENGLISH is selected basically.
- After select one language, it stays forever before changing another language.
- Display present pipe type and specification.
- Touch DRIVE SCREEN to make same pipe w/same datas.
- TOTAL COUNTER displays total cages made accumulated.

3. AMP METER: Display the current electric motors power, except welding AMP.

All motors are driving with 20~25A.

4. WELDING AMP: Display welding current consumption.

Depending on the welding status, current will be increased or decreased.

5. WATER TEMP: Coolant temperature is displayed.

- If coolant temperature is over setting temperature, emergency stop is displayed and the machine is stopped. - Then, please check the motor and cooling fan.
- Cooling fan can start running at set up temperature.
- More information, please refer to separated manual.

6. WELDING CURRENT: Display digit number for welding current.

- Setting digit shows when adjust SLOW or FAST welding current.

During AUTO operation, display SLOW current for slow welding area (Spigot + Bell) and display FAST current for fast welding area (Barrel).

Note: Setting is 0~40, Max. 30 is recommended.

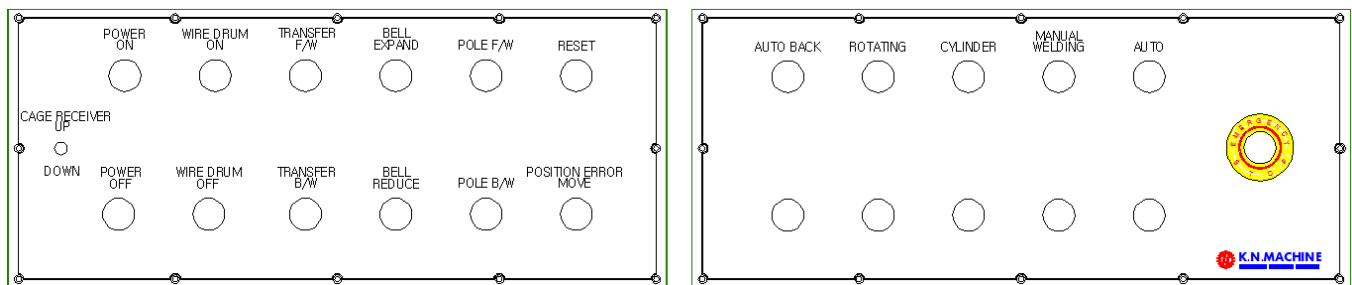
7. WELDING TIME: Display welding time of 1 spot adjusted by welding time dial switch.

- Basic value is m Sec.
- Setting : 0~65 m Sec.

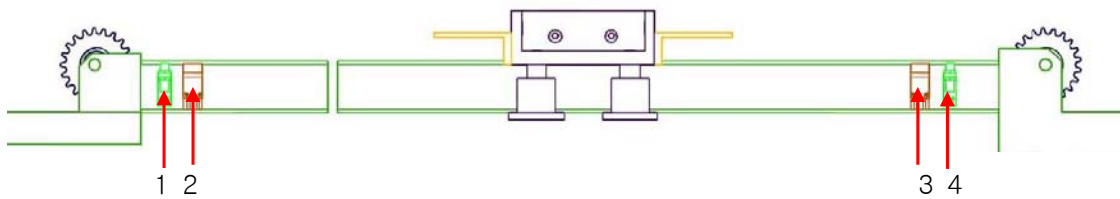
Note: Depending on spiral wire diameter and drum speed, adjust welding time.

Longer welding time is helpful for good welding, but jumping one point with bad welding.

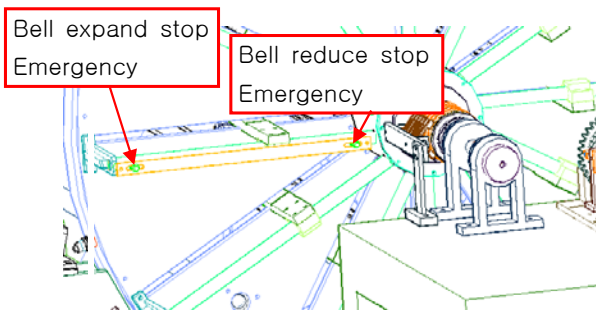
Down Side



- CAGE RECEIVER UP/DOWN : Adjusting toggle switch for height of 2 receiving rollers according to cage diameter. It is moving up/down as long as pushed switch, but stop by touch of top/bottom proximity switch (Safety Switch)
- POWER ON/ POWER OFF ; Power "ON" or "OFF", except P.L.C. and TOUCH PANEL.
 - TOUCH PANEL can power "ON", but can not power "OFF".
 - POWER OFF button can turn off power.
 - When POWER OFF or EMERGENCY STOP button pushed, TOUCH PANEL display EMERGENCY STOP in red lit on EMERGENCY STOP INFORMATION column.
- WIRE DRUM ON/OFF – Push button for turning WIRE DRUM(Turn Table = KN-2AS) ON or OFF.
 - If turn on machine with WERE DRUM in OFF or speed lever touched the limit switch, machine is stopped with WIRE DRUM ERROR on EMERGENCY STOP INFORMATION is lit in red color. and air cylinder is OPEN and AUTO running is stopped.
 - Turn table has ON / OFF switch on the front box.



- TRANSFER F/W , B/W ; For moving center drum forward or backward. It works as long as the button is pushed. During AUTO operation, it does not work.
- TRANSFER forwarding is stop at position 2 and backward is stop at position 3.
- If TRANSFER touch position 1 or 4, TRANSFER stop moving and TRANSFER/BELL POSITION ERROR (on EMERGENCY STOP INFORMATION) is lit in red, then push "POSITION ERROR MOVE" button and move center drum forward (stopped at position 4) or backward (stopped at position 1).
- During TRANSFER F/W or AUTO operation is stopped at position 2, actual value is 50 and encoder value "0", but - digit is displayed due to acceleration phenomenon. Encoder value display 46780585.
- BELL EXPAND/REDUCE : BELL EXPAND for larger diameter. BELL REDUCE for smaller diameter.
- It works as long as the button is pushed. During the AUTO operation, this button does not work. Also, this button is not work, unless TRANSFER is backward completely.



- Safety proximity switch is attached at end of BELL EXPAND and end of BELL REDUCE.
- If this switch is touched, TRANSFER/BELL POSITION ERROR (on EMERGENCY STOP INFORMATION screen) is lit in red, and EXPAND or REDUCE is stopped. Then push "POSITION ERROR MOVE" button to move BELL inside.

POLE F/W, B/W : For moving POLE forward or backward. It works as long as the button is pushed, it works during AUTO operation.

- POLE F/W is touched proximity switch, value is "0 and POLE ENCODER is "0"

RESET : All most errors are released by pushing RESET button, except TRANSFER/BELL POSITION ERROR. If not release ERROR by this RESET button, it should be released by manual button.

POSITION ERROR MOVE : In case of TRANSFER/BELL POSITION ERROR, push this button.

- TRANSFER or BELL is positioned out of Max./Min. position.
Push POSITION ERROR MOVE button together with TRANSFER F/W, B/W, BELL EXPAND or BELL REDUCE to move it inside.

※ Note: In case BELL POSITION ERROR, BELL expands or reduces, if push POSITION ERROR MOVE button with BELL EXPAND or BELL REDUCE button. Please check the position visually before pushing button.

AUTO BACK : After moving center drum, BELL expand or POLE forward, push this button to reduce BELL and POLE backward completely at initial position automatically.

ROTATING : Rotate the drum clockwise manually as long as button pressed

- During the AUTO operation, it is not works.

CYLINDER OPEN/CLOSE: Pole CYLINDER closes to fix up a spiral wire for welding.

- During CYLINDER is closed, BELL REDUCE and POLE B/W is not works.
- Press CYLINDER button to open and press it again to close.
- After 10 seconds CYLINDER opened, BELL REDUCE and POLE B/W will moves.
- After CYLINDER closed, push AUTO button, but CYLINDER open and machine is stop if TURN TABLE is "OFF". Reset and TURN TABLE should be "ON".

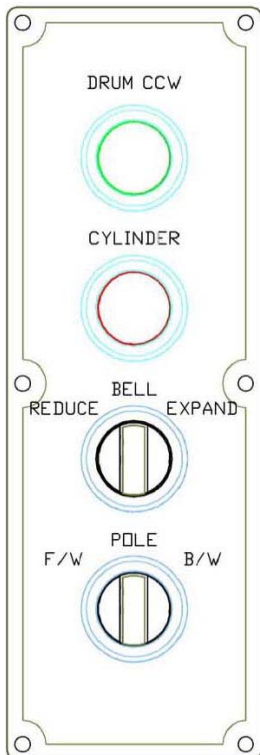
MANUAL WELDING : Manual weld 1 point until setting welding time to secures a spiral wire to be welded on longitudinal wire firmly. Push it longer time, but weld with set time.

AUTO: This button pressed, 1 cycle of operation will be done automatically and stop after drum turning 1 revolution.

- Before pressing AUTO button, check all set up data are correct.
- ※ During AUTO running operation, do not push any other button.
- ※ After CYLINDER closed, push AUTO button, but CYLINDER open and machine is stop if TURN TABLE is "OFF". Reset and TURN TABLE should be "ON".
- ※ Before start AUTO running, please check TURN TABLE is "ON"

EMERGENCY STOP: If EMERGENCY STOP switch is pressed during the automatic operation, all functions except TURN TABLE are stopped, and EMERGENCY STOP ON (on EMERGENCY STOP INFORMATION of TOUCH PANEL) is lit.

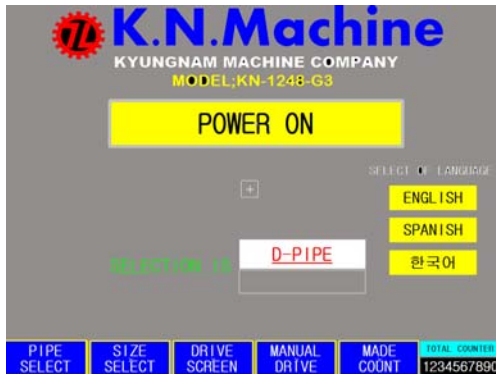
- Release EMERGENCY STOP button, and press RESET button.



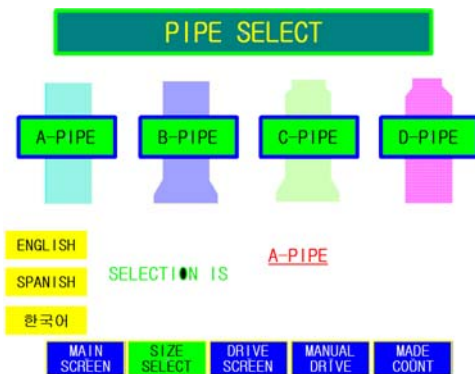
- This operator buttons have same function as panel button.
- This button is not working during the AUTO operation
- This button is working when a operator stands on the Pressure Pad.
- During a operator are standing on Pressure Pad, main panel is not works at all, except EMERGENCY STOP button.
- FOOT SWITCH on Pressure Pad can make DRUM turning clockwise.

5. TOUCH PANEL FUNCTION

– When the power “ON”, following screen is displayed.

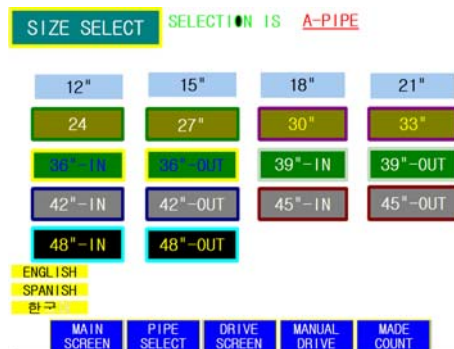


- Power "ON" by pressing POWER ON button on the panel or taps POWER ON display, then ground color change to green color and display READY.
- If error was not solved, EMERGENCY is display.
- Select menu to move to each screen.



From this screen, select pipe shape to produce.

- A-PIPE means Flush Joint (Straight) Pipe
- B-PIPE means Confined Rubber Joint Pipe.
- C-PIPE means Confined Rubber Joint Pipe (Spigot Bent)
- D-PIPE means Flush Joing (Straight) Pipe (Spigot Bent)

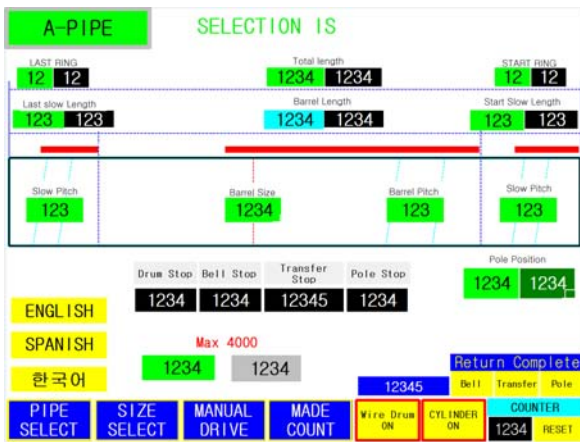


From this screen, select size from 12 inch to 48 inch.

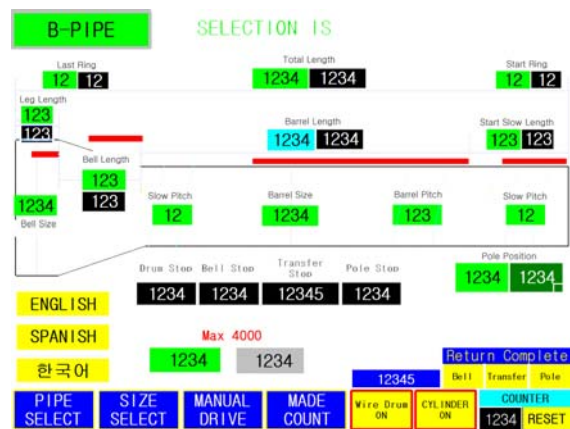
- Over 36" size, IN and OUT cage for dual cages.
- KN-1248-P3 can produce all sizes mentioned here.
- Tap the SIZE to move the operation screen selected.

Following screen shows dimension for A or B pipe.

A Pipe Product Screen

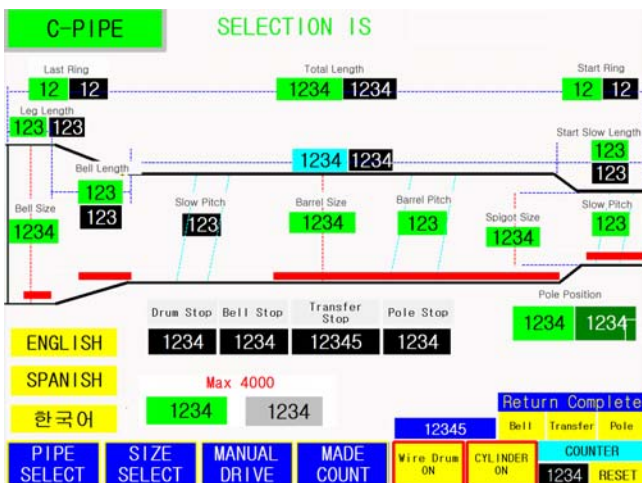


B Pipe Product Screen

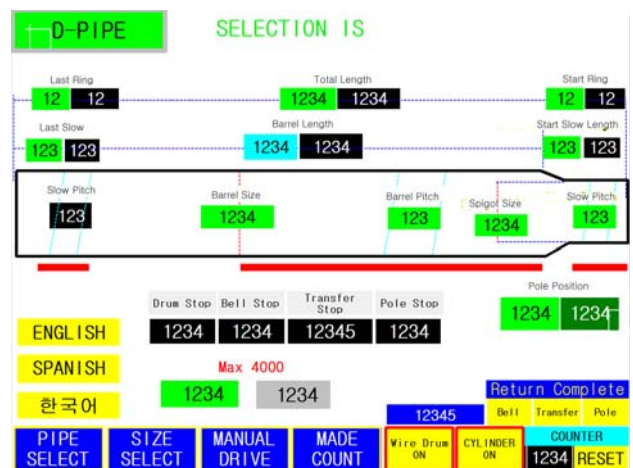


Following screen shows dimension for C or D pipe.

C Pipe Product Screen



D Pipe Product Screen



A-Pipe Product Screen

The diagram illustrates the A-PIPE system architecture, showing the flow of data and control signals between various components.

Top Section: Data Flow and Timing

- A-PIPE** (Green box) is connected to **SELECTION IS** (Green box) and **A-PIPE** (Red box).
- Last Ring** (Green box) outputs **12** and **12** to the **Start Ring** (Green box), which outputs **12** and **12**.
- Total Length** (Green box) outputs **1234** and **1234** to the **Start Slow length** (Green box), which outputs **123** and **123**.
- Last Slow** (Green box) outputs **123** and **123** to the **Barrel length** (Green box), which outputs **1234** and **1234**.

Bottom Section: Control Logic and Timing

- Slow Pitch** (Green box) outputs **123** to the **Barrel Size** (Green box), which outputs **1234**.
- Barrel Pitch** (Green box) outputs **123** to the **Slow Pitch** (Green box), which outputs **123**.
- Pole Position** (Green box) outputs **1234** and **1234** to the **Drum Stop** (Green box), which outputs **1234**.
- Transfer Sto** (Green box) outputs **12345** to the **Pole Stop** (Green box), which outputs **1234**.
- Return Complete** (Blue box) outputs **12345** to the **Wire Drum ON** (Blue box), which outputs **ON**.
- CYLINDER ON** (Blue box) outputs **ON** to the **COUNTER** (Blue box), which outputs **1234**.
- RESET** (Blue box) outputs **RESET** to the **COUNTER** (Blue box).

- Green color buttons from above screen can be insert digit to produce.
- Other color buttons shows present status.
Each buttons digit will be changed high or low during the operation.
- Start Ring : After push AUTO button, weld point as much as set points from 0 to 12 at same position and TRANSFER moves forward automatically.
Restart in the middle of cage, it works same as above.
- Total Length : Total length of cage up to 2,600mm.
 - ※ Max. digit to insert is 26000.
 - ※ This digit will be decreased as much as moved (in metric mm), and stop TRANSFER F/W at 50 to touch Proximity Switch.
- Last Ring : During AUTO operation, TRANSFER F/W is stopped and weld points as much as set points from 0 to 12.
- Start Slow : Starts slow Drum r.p.m. and TRANSFER F/W with pitch for distance set up.
 - ※ Speed for DRUM, TRANSFER, BELL and POLE can not be changed randomly, but green color button below Max. 6000 can be changed for DRUM r.p.m.
- Barrel Pitch : DRUM and TRANSFER are moving fast speed with set pitch set up.
- Barrel Size : Diameter of barrel can be set up.
 - ※ Digit set up one time will be saved and call same digit when it will be selected.
Therefore, barrel size to be set up one time only for each size, so be sure to check correct digit before start.

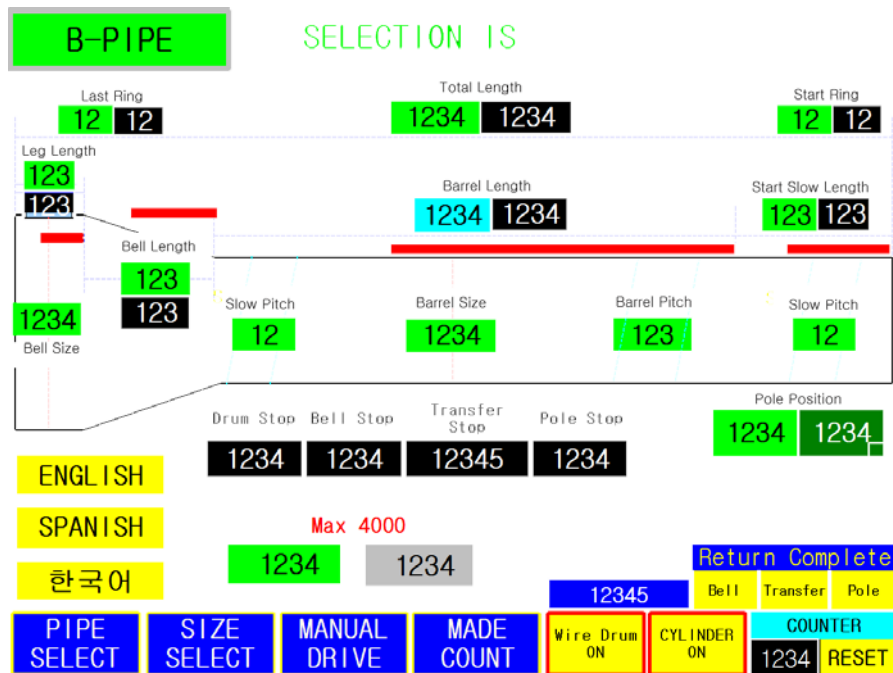
- Pole Position : Set up POLE position value. Be sure to check digit correctly.
 - ※ When the Electric Rings or Copper Sheet are worn out, this value should be smaller than new one, so move POLE position little bit forward, and set up value same as actual value showing on right side bar (dark green)
 - ※ Digit set up one time will be saved and call same digit when it will be selected. Therefore, POLE position to be set up one time only for each size, so be sure to check correct digit before start.
- Actual value of Drum Stop, Bell Stop, Transfer Stop, Pole Stop are showing in each bar(black) in digit and Hz for AC Frequency drive.
 - ※ Digit set up one time will be saved and call same digit when it will be selected. Therefore, Barrel Size to be set up one time only for each size, so be sure to check correct digit before start.
- DRUM bar shows Drum Stop, Drum Slow, Drum Fast, Drum CCW, Drum CW
- TRANSFER bar shows Transfer Stop, Transfer Slow, Transfer Fast, Transfer F/W, Transfer B/W.
- BELL bar shows Expand, Reduce
- POLE bar shows Pole F/W, Pole B/W.
- Max 6000 green bar(left) can be set up high speed of Drum Rotating, grey bar(right) can not set up due to low speed of Drum Rotation fixed up.
- Max 6000 can be changed to 4000 or 5000 according to cage diameter.
 - ※ More than 6000 can not set up for safety of machine
- Return Complete bar shows complete return of BELL, TRANSFER, POLE.

As soon as Proximity Switch touched, Yellow color change to Green color.

 - ※ If Transfer changed Green color, but Bell or Pole is Yellow color, it will makes STAR ERROR which should be changed Green color by push AUTO BACK button to be backward completely.
- Wire Drum ON/OFF : Tap this bar to make Wire Drum ON or OFF.
- Cylinder ON/OFF : Tap this bar to make Cylinder ON(close) OFF(open).
- COUNTER : Shows total quantity produced for selected pipe type (A-PIPE)

If push RESET bar, digit will be "0"
- Red bar : To be changed red color according to Transfer moving and disappeared after TRANSFER return back completely.

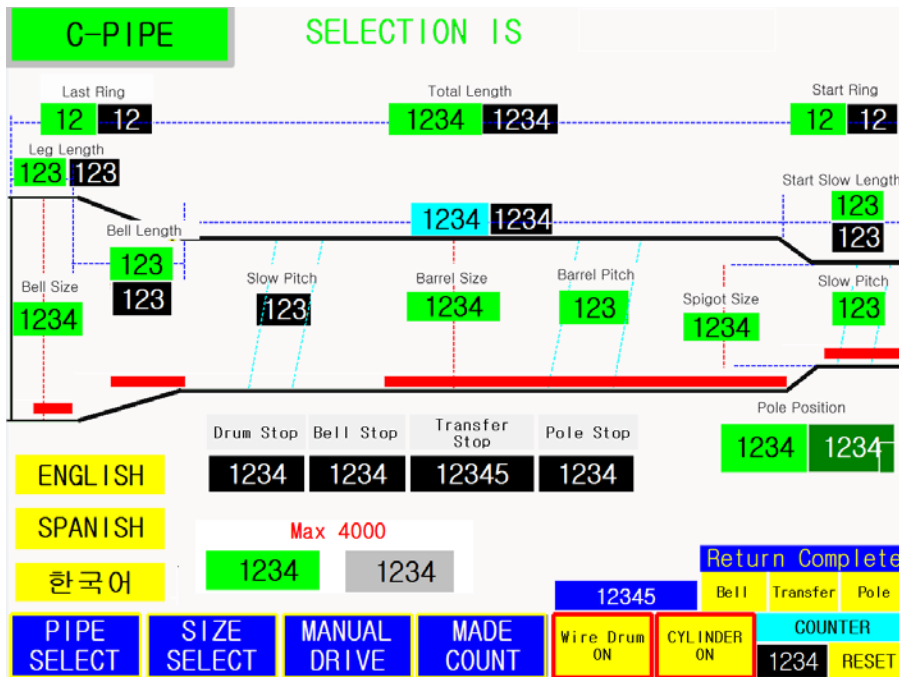
B Pipe Product Screen



- Green color buttons from above screen can be insert digit to produce.
- Other color buttons shows present status.
 - Each buttons digit will be changed high or low during the operation.
- Start Ring : After push AUTO button, weld point as much as set points from 0 to 12 at same position and TRANSFER moves forward automatically.
 - Restart in the middle of cage, it works same as above.
- Total Length : Total length of cage up to 2,600mm.
 - ※ This digit will be decreased as much as moved (in metric mm), and stop TRANSFER F/W at 50 to touch Proximity Switch.
- Barrel Length: Distance for high r.p.m of DRUM and high speed of TRANSFER
 - ※ DRUM is turning as per set up Hz (6000/5000/4000) and TRANSFER is moving as per set up Hz.
 - ※ DRUM and TRANSFER will be changed to slow r.p.m/speed before 50mm from end of Barrel Length.
- Last Ring : During AUTO operation, TRANSFER F/W is stopped and weld points as much as set points from 0 to 12.
- Start Slow : Starts slow Drum r.p.m. and TRANSFER F/W with pitch for distance set up.
 - ※ Speed for DRUM, TRANSFER, BELL and POLE can not be changed randomly, but green color button below Max. 6000 can be changed for DRUM r.p.m.
- Barrel Pitch : DRUM and TRANSFER are moving fast speed with set pitch set up.

- Barrel Size : Diameter of barrel can be set up.
 - ※ Digit set up one time will be saved and call same digit when it will be selected.
 - Therefore, barrel size to be set up one time only for each size, so be sure to check correct digit before start.
- BELL Dimension: Barrel size, Bell Length, Bell Size should be set up correctly, otherwise proper cage can not be made.
- Bell Length: Distance of BELL start expand and end of expand.
 - ※ During AUTO operation, BELL expand is stop when BELL Expand Stop P/X Switch touched or end of Bell Length.
- Bell Size: Max. size of BELL Expanded. ※ Be sure exact diameter of Bell.
- Leg Length: Last length of straight Bell. Transfer stops at 70 against 120 Set up value because copper ring length and last welding distance is 50mm. .
- Pole Position : Set up POLE position value. Be sure to check digit correctly.
 - ※ When the Electric Rings or Copper Sheet are worn out, this value should be smaller than new one, so move POLE position little bit forward, and set up value same as actual value showing on right side bar (dark green)
 - ※ Digit set up one time will be saved and call same digit when it will be selected.
 - Therefore, POLE position to be set up one time only for each size, so be sure to check correct digit before start.
- Actual value of Drum Stop, Bell Stop, Transfer Stop, Pole Stop are showing in each bar(black) in digit and Hz for AC Frequency drive.
- DRUM bar shows Drum Stop, Drum Slow, Drum Fast, Drum CCW, Drum CW
- TRANSFER bar shows Transfer Stop, Transfer Slow, Transfer Fast, Transfer F/W, Transfer B/W.
- BELL bar shows Expand, Reduce – POLE bar shows Pole F/W, Pole B/W.
- Max 6000 can be changed to 4000 or 5000 according to cage diameter.
 - ※ More than 6000 can not set up for safety of machine
- Return Complete bar shows complete return of BELL, TRANSFER, POLE.
 - As soon as Proximity Switch touched, Yellowow color change to Green color.
 - ※ If Transfer changed Green color, but Bell or Pole is Yellow color, it will makes STAR ERROR which should be changed Green color by push AUTO BACK button to be backward completely.
- Wire Drum ON/OFF : Tap this bar to make Wire Drum ON or OFF.
- Cylinder ON/OFF : Tap this bar to make Cylinder ON(close) OFF(open).
- COUNTER : Shows total quantity produced for selected pipe type (A-PIPE)
 - If push RESET bar, digit will be "0"
- Red bar : To be changed red color according to Transfer moving and disappeared after TRANSFER return back completely.

C Pipe Product Screen



- Green color buttons from above screen can be insert digit to produce.
- Other color buttons shows present status.
Each buttons digit will be changed high or low during the operation.
- Start Ring : After push AUTO button, weld point as much as set points from 0 to 12 at same position and TRANSFER moves forward automatically.
Restart in the middle of cage, it works same as above.
- Total Length : Total length of cage up to 2,600mm.
※ This digit will be decreased as much as moved (in metric mm), and stop TRANSFER F/W at 50 to touch Proximity Switch.
- Barrel Length: Distance for high r.p.m of DRUM and high speed of TRANSFER
※ DRUM is turning as per set up Hz (6000/5000/4000) and TRANSFER is moving as per set up Hz.
※ DRUM and TRANSFER will be changed to slow r.p.m/speed before 50mm from end of Barrel Length.
- Last Ring : During AUTO operation, TRANSFER F/W is stopped and weld points as much as set points from 0 to 12.
- Start Slow : Starts slow Drum r.p.m. and TRANSFER F/W with pitch for distance set up.
※ Speed for DRUM, TRANSFER, BELL and POLE can not be changed randomly, but green color button below Max. 6000 can be changed for DRUM r.p.m.
- Spigot Size : Spigot expand before 50mm before end of Start Slow Length, after Spigot Expand change to high speed for barrel length.
※ Speed for DRUM, TRANSFER, BELL and POLE can not be changed randomly, but green color button below Max. 6000 can be changed for DRUM r.p.m.
- Barrel Pitch : DRUM and TRANSFER are moving fast speed with set pitch set up.

- Barrel Size : Diameter of barrel can be set up.
 - ※ Digit set up one time will be saved and call same digit when it will be selected.
 - Therefore, barrel size to be set up one time only for each size, so be sure to check correct digit before start.
- BELL Dimension: Barrel size, Bell Length, Bell Size should be set up correctly, otherwise proper cage can not be made.
- Bell Length: Distance of BELL start expand and end of expand.
 - ※ During AUTO operation, BELL expand is stop when BELL Expand Stop P/X Switch touched or end of Bell Length.
- Bell Size: Max. size of BELL Expanded. ※ Be sure exact diameter of Bell.
- Leg Length: Last length of straight Bell. Transfer stops at 70 against 120 Set up value because copper ring length and last welding distance is 50mm. .
- Pole Position : Set up POLE position value. Be sure to check digit correctly.
 - ※ When the Electric Rings or Copper Sheet are worn out, this value should be smaller than new one, so move POLE position little bit forward, and set up value same as actual value showing on right side bar (dark green)
 - ※ Digit set up one time will be saved and call same digit when it will be selected.
 - Therefore, POLE position to be set up one time only for each size, so be sure to check correct digit before start.
- Actual value of Drum Stop, Bell Stop, Transfer Stop, Pole Stop are showing in each bar(black) in digit and Hz for AC Frequency drive.
- DRUM bar shows Drum Stop, Drum Slow, Drum Fast, Drum CCW, Drum CW
- TRANSFER bar shows Transfer Stop, Transfer Slow, Transfer Fast, Transfer F/W, Transfer B/W.
- BELL bar shows Expand, Reduce – POLE bar shows Pole F/W, Pole B/W.
- Max 6000 can be changed to 4000 or 5000 according to cage diameter.
 - ※ More than 6000 can not set up for safety of machine
- Return Complete bar shows complete return of BELL, TRANSFER, POLE.
 - As soon as Proximity Switch touched, Yellowow color change to Green color.
 - ※ If Transfer changed Green color, but Bell or Pole is Yellow color, it will makes STAR ERROR which should be changed Green color by push AUTO BACK button to be backward completely.
- Wire Drum ON/OFF : Tap this bar to make Wire Drum ON or OFF.
- Cylinder ON/OFF : Tap this bar to make Cylinder ON(close) OFF(open).
- COUNTER : Shows total quantity produced for selected pipe type (A-PIPE)
 - If push RESET bar, digit will be "0"
- Red bar : To be changed red color according to Transfer moving and disappeared after TRANSFER return back completely.

D Pipe Product Screen

D-PIPE SELECTION IS

Last Ring: 12 12
 Total Length: 1234 1234
 Start Ring: 12 12
 Last Slow: 123 123
 Barrel Length: 1234 1234
 Start Slow Length: 123 123
 Slow Pitch: 123
 Barrel Size: 1234
 Barrel Pitch: 123
 Spigot Size: 1234
 Slow Pitch: 123
 Pole Position: 1234 1234

Drum Stop: 1234 Bell Stop: 1234 Transfer Stop: 12345 Pole Stop: 1234
 ENGLISH
 SPANISH
 한국어

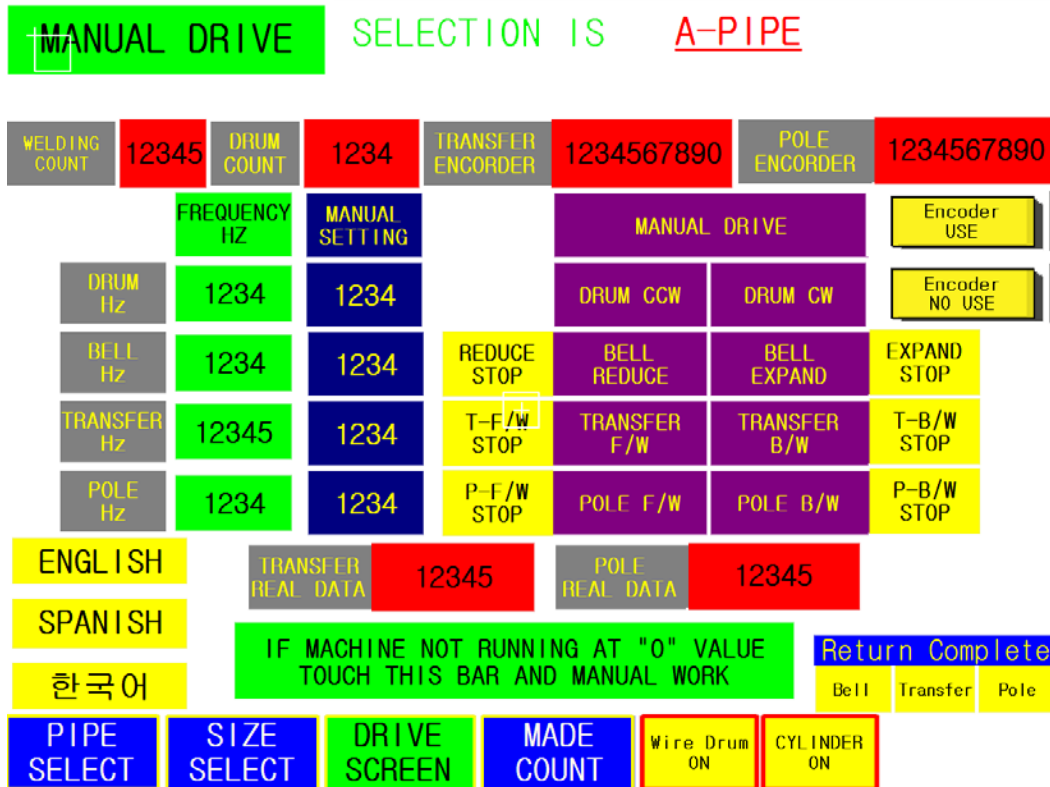
Max 4000
 1234 1234

Return Complete
 12345 Bell Transfer Pole
 PIPE SELECT SIZE SELECT MANUAL DRIVE MADE COUNT Wire Drum ON CYLINDER ON COUNTER 1234 RESET

- Green color buttons from above screen can be insert digit to produce.
- Other color buttons shows present status.
Each buttons digit will be changed high or low during the operation.
- Start Ring : After push AUTO button, weld point as much as set points from 0 to 12 at same position and TRANSFER moves forward automatically.
Restart in the middle of cage, it works same as above.
- Total Length : Total length of cage up to 2,600mm.
※ This digit will be decreased as much as moved (in metric mm), and stop TRANSFER F/W at 50 to touch Proximity Switch.
- Barrel Length: Distance for high r.p.m of DRUM and high speed of TRANSFER
※ DRUM is turning as per set up Hz (6000/5000/4000) and TRANSFER is moving as per set up Hz.
※ DRUM and TRANSFER will be changed to slow r.p.m/speed before 50mm from end of Barrel Length.
- Last Ring : During AUTO operation, TRANSFER F/W is stopped and weld points as much as set points from 0 to 12.
- Start Slow : Starts slow Drum r.p.m. and TRANSFER F/W with pitch for distance set up.
※ Speed for DRUM, TRANSFER, BELL and POLE can not be changed randomly, but green color button below Max. 6000 can be changed for DRUM r.p.m.
- Spigot Size : Spigot expand before 50mm before end of Start Slow Length, after Spigot Expand change to high speed for barrel length.
※ Speed for DRUM, TRANSFER, BELL and POLE can not be changed randomly, but green color button below Max. 6000 can be changed for DRUM r.p.m.

- Barrel Pitch : DRUM and TRANSFER are moving fast speed with set pitch set up.
- Barrel Size : Diameter of barrel can be set up.
 - ※ Digit set up one time will be saved and call same digit when it will be selected.
Therefore, barrel size to be set up one time only for each size, so be sure to check correct digit before start.
- Pole Position : Set up POLE position value. Be sure to check digit correctly.
 - ※ When the Electric Rings or Copper Sheet are worn out, this value should be smaller than new one, so move POLE position little bit forward, and set up value same as actual value showing on right side bar (dark green)
 - ※ Digit set up one time will be saved and call same digit when it will be selected.
Therefore, POLE position to be set up one time only for each size, so be sure to check correct digit before start.
- Actual value of Drum Stop, Bell Stop, Transfer Stop, Pole Stop are showing in each bar(black) in digit and Hz for AC Frequency drive.
- DRUM bar shows Drum Stop, Drum Slow, Drum Fast, Drum CCW, Drum CW
- TRANSFER bar shows Transfer Stop, Transfer Slow, Transfer Fast, Transfer F/W, Transfer B/W.
- BELL bar shows Expand, Reduce – POLE bar shows Pole F/W, Pole B/W.
- Max 6000 can be changed to 4000 or 5000 according to cage diameter.
 - ※ More than 6000 can not set up for safety of machine
- Return Complete bar shows complete return of BELL, TRANSFER, POLE.
As soon as Proximity Switch touched, Yellowow color change to Green color.
 - ※ If Transfer changed Green color, but Bell or Pole is Yellow color, it will makes STAR ERROR which should be changed Green color by push AUTO BACK button to be backward completely.
- Wire Drum ON/OFF : Tap this bar to make Wire Drum ON or OFF.
- Cylinder ON/OFF : Tap this bar to make Cylinder ON(close) OFF(open).
- COUNTER : Shows total quantity produced for selected pipe type (A-PIPE)
If push RESET bar, digit will be "0"
- Red bar : To be changed red color according to Transfer moving and disappeared after TRANSFER return back completely.

MANUAL DRIVE SCREEN



Above screen for MANUAL DRIVE.

During AUTO operation, MANUAL DRIVE screen can not be opened.

- WELDING COUNT : Total number of welded points for making one cage completely.
 - DRUM COUNT : Total number of DRUM r.p.m. for making one cage completely.
 - TRANSFER ENCODER : Present value of TRANSFER ENCODER..
 - POLE ENCODER : Present value of POLE ENCODER.
 - DRUM Hz, BELL Hz, TRANSFER Hz, POLE Hz의 FREQUENCY Hz: Shows present Hz.
 - MANUAL SETTING : Hz for each part can be set up for MANUAL DRIVE.
- ※ Note: This Hz setting value is working at MANUAL DRIVE only, and it is not effect to AUTO drive screen.
- MANUAL DRIVE: All button in MANUAL DRIVE is working as loong as pushed as same function of buttons on MAIN PANEL.
 - Each part Yellow color bar change to Red color bar at time of stop by Proximity Switch.
 - TRANSFER REAL DATA, POLE REAL DATA means actual value of ENCODER in distance (mm).
 - Operation fail in value "0", tap this bar to operate MANUAL DRIVE.

- Transfer and Pole is driven by Encoder value.
 - ※ Transfer Encoder value became "0" when Transfer F/W Stop Proximity switch is touched.
 - ※ Pole Encoder value became "0" when Pole F/W Stop Proximity switch is touched.
- Encoder value became "0" in any time at Proximity Switch is touched, and stop to move. Then touch bar to POP-UP showing following message. After then, move Transfer or Pole to touch F/W stop Proximity Switch, and touch "CONFIRM" to make Encoder value "0" and POP-UP is disappeared.

TRANSFER/POLE STOP P/X SWITCH VALUE
SHOULD BE 50(TRANSFER) AND 0(POLE).
IF NOT, MOVE THEM MANUAL CORRECT

- ※ Main reason of Encoder value "0" is touched Proximity Switch by a wire or steel material.

O.K.

NO

Encoder
USE

- This red bar to select Pole Encoder "NO USE".
- When Pole Encoder is using in the operation, Pole is moving according to Pole Position showing on Drive Screen. However, Pole Position value have a tolerance due to Back-Lash, and must be set up again manually.
- If Pole Encoder NO USE is selected, red color lit and encoder is not energized. Pole F/W Stop Proximity Switch should be moved for cage size.

Encoder
NO USE

PRODUCTS COUNTER SCREEN

COUNTER										
A-RESET		B-RESET				C-RESET		D-RESET		
		12"	15"	18"	21"	24	27"	30"	33"	36"-IN
A	123456	123456	123456	123456	123456	123456	123456	123456	123456	123456
B	123456	123456	123456	123456	123456	123456	123456	123456	123456	123456
C	123456	123456	123456	123456	123456	123456	123456	123456	123456	123456
D	123456	123456	123456	123456	123456	123456	123456	123456	123456	123456
		36"-OUT	39"-IN	39"-OUT	42"-IN	42"-OUT	45"-IN	45"-OUT	48"-IN	48"-OUT
A	123456	123456	123456	123456	123456	123456	123456	123456	123456	123456
B	123456	123456	123456	123456	123456	123456	123456	123456	123456	123456
C	123456	123456	123456	123456	123456	123456	123456	123456	123456	123456
D	123456	123456	123456	123456	123456	123456	123456	123456	123456	123456
ENGLISH										
		TOTAL		1234567890						
SPANISH										
한국어		PIPE SELECT	SIZE SELECT	DRIVE SCREEN	MANUAL DRIVE	Don't Touch				

- All products quantity are saved.
- Products for each pipe type A, B, C, D are recorded.
- Touch RESET bar for each type pipe to delete quantity and shows "0".
If touch digit beside of A, B, C, D, the digit became "0".
- If touch individual bar of digit, it became "0" only.
- TOTAL quantity can not be cleared.

Emergency stop information

EMERGENCY STOP INFORMATION

EMERGENCY STOP ON	WATER TEMPERATURE HIGH
MAGNETIC OCR TRIP	WELDER TEMPERATURE HIGH
WIRE DRUM ERROR	DRUM FREQUENCY DRIVER ERROR
SAFETY SENSOR #1 DRIVER SIDE	BELL FREQUENCY DRIVER ERROR
SAFETY SENSOR #2 MACHIN BACK SIDE	TRANSFER FREQUENCY DRIVER ERROR
SAFETY SENSOR #3 DRIVER FRONT SIDE	POLE FREQUENCY DRIVER ERROR
BELL / POLE POSITION CHECK	PLC BATTERY CHECK
TRANSFER / BELL POSITION ERROR	

RESET

– EMERGENCY STOP ON bar display POP-UP and machine is stopped if EMERGENCY STOP button is pressed or concerned it.

1. EMERGENCY STOP ON : In case of EMERGENCY STOP button is pressed.

2. MAGNETIC OCR TRIP : Over current in the panel is tripped.

※ Open panel back side cover and release trip manually.

3. SAFETY SENSOR #1~3 : In case of Safety Sensors are installed.

※ People or material is interrupted sensor.

4. TRANSFER/BELL POSITION CHECK : Proximity Switch is touched when Transfer forward or backward, or Bell Limit Proximity Switch (Backside) is touched.

※ Pole is not moving unless Bell is moving.

5. WATER TEMPERATURE HIGH : Cooling water temperature is over the temperature set up by TEMPERATURE CONTROLLER on the panel.

※ Waits temperature of cooling water to be cool down, or replace coolant water.

6. WELDER TEMPERATURE HIGH : Welder temperature is over 75。C (167 F)

7. DRUM, BELL, TRANSFER, POLE FREQUENCY DRIVER ERROR :

- Any trouble of each Frequency Driver makes ERROR and display on each bar.
- If trouble is not released by touch RESET bar, push RESET button on control panel.
- If trouble is not released by push RESET button on control panel, Frequency Driver should be replaced.
- After replacement of new Frequency Driver, set up Parameter as per Parameter Setting.

8. PLC BATTERY CHECK: P.L.C. Battery should be replaced.

- Battery should be replaced with Power "ON" by open cover of CPU.
- Failure of changing Battery in this time, built-in program is cleared to stop operation.

※ Normally, Emergency Stop trouble would be release by touch RESET bar.

If not released, press RESET button on control panel manually.

6. CHECK POINTS BEFORE PRODUCTION

1. Power "ON" by main Breaker and Welder Breaker.
2. Power "ON" by main Power Switch on Control Panel and Power on PLC Control
3. Push POWER ON button, and check Water Pump Motor is turning on.
 - If water pump motor is out of order, cooling water can not circulate through welding transformer, welding controller, electrode plate which will occur high temperature to damage parts.
 - If water temperature is higher than ambient temperature, turn on Cooling Fan. Cooling Fan should be running on Summer season
 - WATER TEMPERATURE CONTROLLER is set up 45°C (113 F). If water temperature is over 45°C (113 F) 45, machine is stop and WATER TEMPERATURE HIGH (on EMERGENCY STOP INFORMATION of Touch Panel) is lit.
 - ※ During winter time, antifreeze should be mixed up with cooling water, and avoid contamination of water, and refill the water after evaporation.
4. Select PIPE type.
5. Select Size to make cage.
 - Set up dimension is smaller than actual size, expand diameter by BELL EXPAND.
 - Pole is forward automatically, so do not need to push POLE F/W button.
6. Push POLE F/W button until 5mm gap of back cylinder, and set up Pole Position same value showing in Green Color bar (left).
 - ※ When you set up value for Pole Position, Barrel Size and Bell Size, RESET button should be pressed and entered.
7. Set up all other dimension as per actual size to produce.
8. Adjust air pressure of air cylinder.
 - Normally 3 bar for 4mm (0.157") longitudinal wire x 5mm (0.195") spiral wire.
 - High pressure of air cylinder is helpful for good welding, but make parts faster worn out and overload to Drum Motor.
9. Welding signal Proximity Switch is attached on back drum side.
 - Welding point and Proximity Switch position should be closed for good welding.
10. All sliding and moving parts should be lubricated by Dry Lubricant(Graphite) or light engine oil. Grease should be used on bearings only.
 - Grease mixed with cement dust will be became abrasive materials.
 - Check all bolts and nuts fastened tight.
 - Check welding parts to be isolated each other.

11. Cage receiver should be adjusted little bit lower than cage diameter, after then raise up to be touched cage outcoming.
12. Check oil level for gear boxes (1/2 oil window) proper tension of all chains.
13. Check welding parts such as copper rings, copper sheet (deep groove caused bad welding) wire dies, shield wires etc.
14. Electricity of all driving motors are 220 Volts, except welder (480 Volts).

Tolerance is $\pm 10\%$. Over tolerance makes welding controller and transformer damaged.

※ Proper operation temperature is $-5 \sim 40^{\circ}\text{C}$ ($23 \sim 104^{\circ}\text{F}$)

During winter time under -10°C (14°F), a glow lamp (100W) inside control panel and welding controller will be recommended for warmer.

※ Clean panel inside and Inverter cooling fan by air gun yearly two times.
(Dust accumulated on inverter fan makes inverter error to stop machine)

7. CHANGE PRODUCT SPECIFICATION

1. Select Pipe Type from PIPE SELECT screen.
2. Select Size from SIZE SELECT screen.
3. Inserts 2 longitudinal wire in opposite wire die hole, and adjust BELL EXPAND and BELL REDUCE to fix Proximity Switch.
4. Push BELL REDUCE button and push POLE F/W until 5mm gap of back cylinder.
 - If Touch Screen have correct set up chart already, push AUTO BACK button.
5. Set up new value on Touch Screen.
6. Adjust SLOW and FAST welding volume by volume dial on Control Panel.
7. Adjust wire guide roller to make a round circle.
8. Insert rest 10 longitudinal wires to make 12 longitudinal wires.
9. Adjust height of cage receiver.
10. Push MANUAL WELDING button to weld 1 – 2 points, and push AUTO button.
11. As soon as cage is coming out, raise up cage receiver to touch cage.

Make A-Pipe

SELECTION IS

A-PIPE

LAST RING 12 12		Total length 1234 1234		START RING 12 12	
Last slow Length 123 123		Barrel Length 1234 1234		Start Slow Length 123 123	
Slow Pitch 123		Barrel Size 1234		Barrel Pitch 123	
Slow Pitch 123				Slow Pitch 123	

Drum Stop

1234

Bell Stop

1234

Transfer Stop

12345

Pole Stop

1234

Pole Position

1234

1234

ENGLISH

SPANISH

한국어

Max 4000

1234

1234

Return Complete

12345

Bell

Transfer

Pole

PIPE SELECT

SIZE SELECT

MANUAL DRIVE

MADE COUNT

Wire Drum ON

CYLINDER ON

COUNTER

1234

RESET

1. Input Total Length.

- Touch green bar to Pop-UP Key Pad to input digit.
- Input length should be - 50mm from actual longitudinal wire (Copper Ring+Welding Gap)
 - ※ Max. length is 2,600mm.
 - If you put in digit more than 2600, it shows 2600 as Max.
 - ※ All input digit should be metric mm for arithmetic operation (Inch is not accepted)

2. Input Stat Ring and Last Ring.

- Touch green bar and input digit 0~12
- Start Ring makes first spigot spiral wire pitch because Transfer is not moving before welding points set up digit.
- Last Ring makes last bell bottom spiral wire pitch because Transfer is stopped but welds more points set up digit and stop Drum rotating.
- Narrow pitch for less Ring count and wider pitch for many Ring count.

3. Input Start Slow Length.

4. Input Last Slow Length.

- If input Start Slow Length and Last Slow, Barrel length is input automatically

5. Input Slow Pitch.

- Min. input is 30. Lower than 30 is not accepted.
- If input is lower than 40, drum is turning faster than barrel
- During slow pitch length, Transfer slows speed is fixed with 1000 or 1500, Drum are rotating as per pitch.

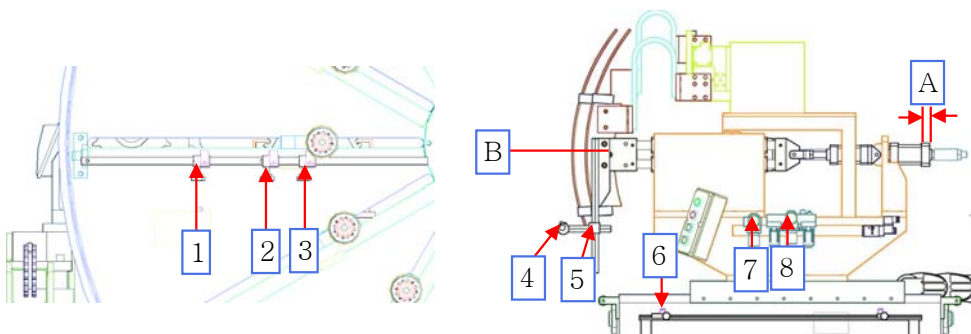
6. Input Barrel Pitch.

- Input digit more than 30.
- Drum r.p.m. is fixed between Barrel Length and Transfer is moving as per pitch.

7. Input Barrel Size.

- Insert 2 longitudinal wire in wire die with enough length to measure diameter.
- Measures distance between outside and outside of wire by a tap, and input digit.

8. As per following drawing, moves Bell Reduce Stop Proximity Switch(#3) inside until red lamp light and fix screw tight.



A-PIPE is not effected by #1 and #2 P/X switch.

9. As per above drawing, moves POLE F/W, B/W to makes gap(A) 4~5mm.

- Input digit on Pole Position green bar(Left) same digit as dark green(Right)
 - ※ If Encoder NO USE is selected from MANUAL SCREEN, moves Proximity Switch(#6) inside and fixed screw.

10. Check Bell, Transfer, Pole bar of Return Complete became green color.

- ※ If any one bar of them in not green color, START ERROR will be happened.

11. Push WIRE DRUM ON button and adjust Wire Guide Holder (#4 & #5) for round spiral wire.

12. Push DRUM ROTATING button to be positioned at Welding Point(#B).

13. Push CYLINDER button to close Cylinder to contact spiral wire to longitudinal wire.

14. Adjust air pressure of #7 and #8.

- Air pressure should be adjusted according to longitudinal and spiral wire diameter.
- Example: 5mm Longitudinal wire x 6mm Spiral wire

#7 Air pressure = 5 bar #8 Air pressure = 3 bar

15. Tuning SLOW Welding Volume on Main Panel at 8.0 in case wire condition same as 14.

- Push RESET button and tuning Fast Welding Volume more than 8.0 (9.0 or 10.0).
- Makes Welding current 0~30.
- Tuning WELDING TIME Volum at 6.0
- 6.0 means 6.0 m/s welding time of 1 point which should be changed as per Drum r.p.m.
- Welding Time is 0~65m Second. Longer welding time is helpful for good welding, but jump up one welding point which makes no welding for next point. Set up short time and slowly longer time after checking out welding condition.

16. Set up Drum r.p.m.

- Drum r.p.m. should be adjust according to Pipe diameter.
- Set up 6000 for 12"~33" Pipe, 5000 = 36~42" 4000 = 48"

Recommended slower r.p.m. than above digit. But, Faster r.p.m. is dangerous.

- Drum r.p.m. effect to Wire Drum speed. Fast Drum r.p.m. makes WIRE DRUM ERROR.

17. Push MANUAL WELDING button.

18. Push AUTO button to run machine in automatic operation.

- After Welding Start Ring points set up, Drum and Transfer is moving slow for Start Slow Length area, and Drum, Transfer and Welding is fast for Barrel area and slow moving for Last Slow area.
 - After Transfer is stopped, Last Ring welds few points (as per set up digit), and Transfer fast backwards after 4 seconds later and slow down from 100mm before the end of total length.
 - If Transfer return back completely, Transfer bar of Return Complete became green color
19. Opens Cylinder and cut a spiral wire and take off cage from the cage receiver.
- Transfer Speed is depend on pitch of slow and fast area, and can not change as you like.

Make B-Pipe

B-PIPE

SELECTION IS

Last Ring

12 12

Total Length

1234 1234

Start Ring

12 12

Leg Length

123

123

Barrel Length

1234 1234

Start Slow Length

123 123

Bell Length

123

123

Slow Pitch

12

Barrel Size

1234

Barrel Pitch

123

Slow Pitch

12

Bell Size

1234

Drum Stop

1234

Bell Stop

1234

Transfer Stop

12345

Pole Stop

1234

Pole Position

1234 1234

ENGLISH

SPANISH

한국어

PIPE SELECT

SIZE SELECT

MANUAL DRIVE

MADE COUNT

Wire Drum ON

CYLINDER ON

Return Complete

1234

1234

12345

Bell

Transfer

Pole

COUNTER

1234

RESET

1. Input Total Length.

- Touch green bar to Pop-Up key pad to put in digit.
- Input length should be -50mm from the actual longitudinal wire (Copper Ring+Welding Gap)
- ※ Max. length is 2,600mm.
 - If you put in digit more than 2,600mm, it show 2600 as Max.
- ※ All input digit should be metric mm for arithmetic operation(Inch is not accepted)

2. Input Stat Ring and Last Ring.

- Touch green bar and input digit 0~12
- Start Ring makes first spigot spiral wire pitch because Transfer is not moving before welding points set up digit.
- Last Ring makes last bell bottom spiral wire pitch because Transfer is stopped but welds more points set up digit and stop Drum rotating.
- Narrow pitch for less Ring count and wider pitch for many Ring count.

3. Input Start Slow Length.

4. Input Bell Length.

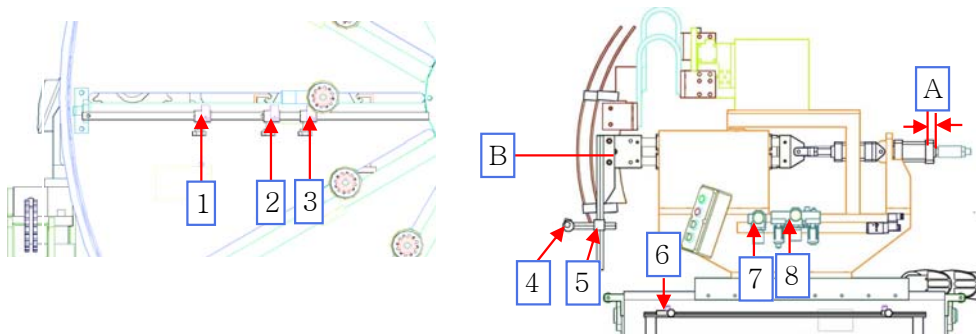
5. Input Leg Length.

- After input Start Slow Length/Bell Length/Leg Length, Barrel Length is input automatically.

5. Input Slow Pitch.

- Min. input is 30. Lower than 30 is not accepted.
- If input is lower than 40, Drum is turning faster than barrel
- During slow pitch length, Transfer slows speed is fixed with 1000 or 1500, Drum are rotating as per pitch.

6. Input Barrel Pitch.
 - Input digit more than 30.
 - Drum r.p.m. is fixed between Barrel Length and Transfer is moving as per pitch.
7. Input Barrel Size.
 - Insert 2 longitudinal wire in wire die with enough length to measure diameter.
 - Measures distance between outside and outside of wire by a tap, and input digit.
8. As per following drawing, moves Bell Reduce Stop Proximity Switch(#3) inside until red lamp light and fix screw tight.



B-PIPE is not effected by P/X Switch #2.

9. As per above drawing, moves POLE F/W, B/W to makes gap(A) 4~5mm.
 - Input digit on Pole Position green bar(Left) same digit as dark green(Right)
 - ※ If Encoder NO USE is selected from MANUAL SCREEN, moves Proximity Switch(#6) inside and fixed screw.
10. Input Bell Size.
 - BELL Expand as much as desired diameter, and P/X Switch #1 moved and fixed screw.
 - If Bell Length is short, speed of Bell and Pole is running fast.
 - If Bell Length is long, speed of Bell and Pole is running slow.
11. Push AUTO BACK button for Bell and Pole to be returned back completely.
12. Input Leg Length.
 - Actual Leg Length to be displayed -50 mm because of wire die and welding gap.
13. Push BELL EXPAND until desired Bell diameter and move Bell Expand Stop Proximity Switch(#1) and fix screw tight (red light "ON").
14. Check Bell, Transfer, Pole bar of Return Complete became green color.
 - ※ If any one bar of them in not green color, START ERROR will be happened.
15. Push WIRE DRUM ON button and adjust Wire Guide Holder (#4 & #5) for round spiral wire.
16. Push DRUM ROTATING button to be positioned at Welding Point(#B).
17. Push CYLINDER button to close Cylinder to contact spiral wire to longitudinal wire.

18. Adjust air pressure of #7 and #8.

- Air pressure should be adjusted according to longitudinal and spiral wire diameter.

Example: 5mm Longitudinal wire x 6mm Spiral wire

#7 Air pressure = 5 bar #8 Air pressure = 3 bar

19. Tuning SLOW Welding Volume on Main Panel at 8.0 in case wire condition same as 14.

- Push RESET button and tuning Fast Welding Volume more than 8.0 (9.0 or 10.0).
- Makes Welding current 0~30.
- Tuning WELDING TIME Volum at 6.0
- 6.0 means 6.0 m/s welding time of 1 point which should be changed as per Drum r.p.m.

jump up one welding point which makes no welding for next point. Set up short time and slowly longer time after checking out welding condition.

20. Set up Drum r.p.m.

- Drum r.p.m. should be adjust according to Pipe diameter.
- Set up 6000 for 12"~33" Pipe, 5000 = 36~42" 4000 = 48"
Recommended slower r.p.m. than above digit. But, Faster r.p.m. is dangerous.
- Drum r.p.m. effect to Wire Drum speed. Fast Drum r.p.m. makes WIRE DRUM ERROR.

21. Push MANUAL WELDING button.

22. Push AUTO button to run machine in automatic operation.

- After Welding Start Ring points set up, Drum and Transfer is moving slow for Start Slow Length area, and Drum, Transfer and Welding is fast for Barrel area and slow moving for Last Slow area.
- Before 50mm end of Barrel Length, Drum, Transfer and Welding is changed slow speed.
- After Transfer is stopped, Last Ring welds few points (as per set up digit), and Transfer fast backwards after 4 seconds later and slow down from 100mm before the end of total length.
- If Transfer return back completely, Transfer bar of Return Complete became green color

23. Opens Cylinder and cut a spiral wire and take off cage from the cage receiver.

- With Cylinder "CLOSE", Bell Reduce and Pole Backward is not working even if Transfer is returned back completely.
- After Cylinder "OPEN", Bell Reduce and Pole B/W is moving after 10 seconds.
- 1 revolution is 1~22.
- Transfer Speed is depend on pitch of slow and fast area, and can not change as you like.

Make C-Pipe
SELECTION IS

C-PIPE

Last ring

12

Total Length

1234

1234

Start Ring

12

12

Leg Length

123

123

Start Slow Length

123

123

Bell Length

123

123

Slow Pitch

1234

1234

Barrel Size

1234

Barrel Pitch

123

Spigot Size

1234

Slow Pitch

123

Bell Size

1234

Drum Stop

1234

Bell Stop

1234

Transfer Stop

12345

Pole Stop

1234

Pole Position

1234

1234

ENGLISH

1234

SPANISH

1234

한국어

1234

Return Complete

12345

Bell

Transfer

Pole

PIPE SELECT

1234

SIZE SELECT

1234

MANUAL DRIVE

1234

MADE COUNT

1234

Wire Drum ON

12345

CYLINDER ON

1234

COUNTER

1234

RESET

1234

1. Input Total Length.

- Touch green bar to Pop-Up key pad to put in digit.
- Input length should be -50mm from the actual longitudinal wire (Copper Ring+Welding Gap)
- ※ Max. length is 2,600mm.
 - If you put in digit more than 2,600mm, it show 2600 as Max.
- ※ All input digit should be metric mm for arithmetic operation(Inch is not accepted)

2. Input Stat Ring and Last Ring.

- Touch green bar and input digit 0~12
- Start Ring makes first spigot spiral wire pitch because Transfer is not moving before welding points set up digit.
- Last Ring makes last bell bottom spiral wire pitch because Transfer is stopped but welds more points set up digit and stop Drum rotating.
- Narrow pitch for less Ring count and wider pitch for many Ring count.

3. Input Start Slow Length.

4. Input Bell Length.

5. Input Leg Length.

- Actual operation show -50 from set up digit.

6. Input Slow Pitch

- Min. input is 30. Lower than 30 is not accepted.
- If input is lower than 40, Drum is turning faster than barrel
- During slow pitch length, Transfer slows peed is fixed with 1000 or 1500, Drum are rotating as per pitch. .

7. Input Spigot Size.

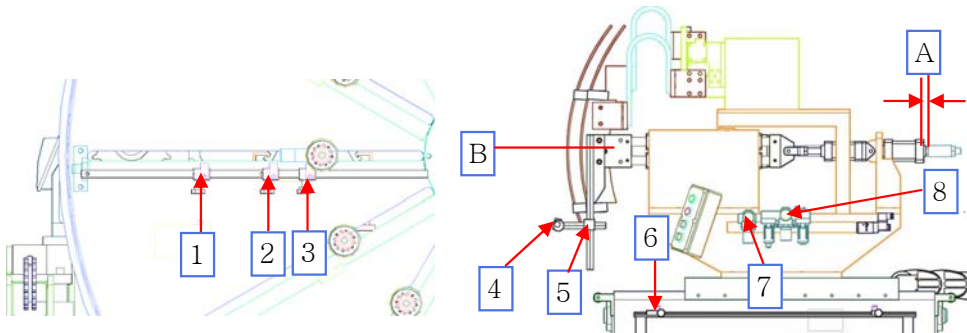
- Insert 2 longitudinal wire in wire die with enough length to measure diameter.
- Reduce Bell at desired diameter, and move P/X Switch#3 and fix screw tight.

8. As per above drawing, moves POLE F/W, B/W to makes gap(A) 4~5mm.

- Input digit on Pole Position green bar(Left) same digit as dark green(Right)
 - ※ If Encoder NO USE is selected from MANUAL SCREEN, moves Proximity Switch(#6) inside and fixed screw.

9. Input Barrel Size.

- BELL Expand as much as desired diameter, and move Spigot Expand Stop P/X Switch #2 and fixed screw.
- Measures distance between outside and outside of wire by a tap, and input digit.



10. Input Bell Size.

- BELL Expand as much as desired diameter, and P/X Switch #1 moved and fixed screw.

12. Push AUTO BACK button for Bell and Pole to be returned back completely.

13. Check Bell, Transfer, Pole bar of Return Complete became green color.

- ※ If any one bar of them in not green color, START ERROR will be happened.

14. Push WIRE DRUM ON button and adjust Wire Guide Holder (#4 & #5) for round spiral wire.

15. Push DRUM ROTATING button to be positioned at Welding Point(#B).

16. Push CYLINDER button to close Cylinder to contact spiral wire to longitudinal wire.

17. Adjust air pressure of #7 and #8.

- Air pressure should be adjusted according to longitudinal and spiral wire diameter.

Example: 5mm Longitudinal wire x 6mm Spiral wire

#7 Air pressure = 5 bar #8 Air pressure = 3 bar

18. Tuning SLOW Welding Volume on Main Panel at 8.0 in case wire condition same as 14.

- Push RESET button and tuning Fast Welding Volume more than 8.0 (9.0 or 10.0).
- Makes Welding current 0~30.
- Tuning WELDING TIME Volume at 6.0
- 6.0 means 6.0 m/s welding time of 1 point which should be changed as per Drum r.p.m.
- Welding Time is 0~65m Second. Longer welding time is helpful for good welding, but jump up one welding point which makes no welding for next point. Set up short time

and slowly longer time after checking out welding condition.

19. Set up Drum r.p.m.

- Drum r.p.m. should be adjust according to Pipe diameter.
 - Set up 6000 for 12"~33" Pipe, 5000 = 36~42" 4000 = 48"
- Recommended slower r.p.m. than above digit. But, Faster r.p.m. is dangerous.
- Drum r.p.m. effect to Wire Drum speed. Fast Drum r.p.m. makes WIRE DRUM ERROR.

20. Push MANUAL WELDING button.

21. Push AUTO button to run machine in automatic operation.

- After Welding Start Ring points set up, Drum and Transfer is moving slow for Start Slow Length area, and Drum, Transfer and Welding is fast for Barrel area and slow moving for Last Slow area.
- Before 50mm end of Barrel Length, Drum, Transfer and Welding is changed slow speed.
- After Transfer is stopped, Last Ring welds few points (as per set up digit), and Transfer fast backwards after 4 seconds later and slow down from 100mm before the end of total length.
- If Transfer return back completely, Transfer bar of Return Complete became green color

22. Opens Cylinder and cut a spiral wire and take off cage from the cage receiver.

- With Cylinder "CLOSE", Bell Reduce and Pole Backward is not working even if Transfer is returned back completely.
- After Cylinder "OPEN", Bell Reduce and Pole B/W is moving after 10 seconds.
- 1 revolution is 1~22.
- Transfer Speed is depend on pitch of slow and fast area, and can not change as you like.

Make D-Pipe

D-PIPE SELECTION IS

Last Ring	12	12	Total Length	1234	1234	Start Ring	12	12	
Last Slow	123	123	Barrel Length	1234	1234	Start Slow Length	123	123	
Slow Pitch	123	Barrel Size	1234	Barrel Pitch	123	Spigot Size	1234	Slow Pitch	123

Drum Stop: 1234 Bell Stop: 1234 Transfer Stop: 12345 Pole Stop: 1234 Pole Position: 1234 1234

ENGLISH SPANISH 한국어

Max 4000

1234 1234

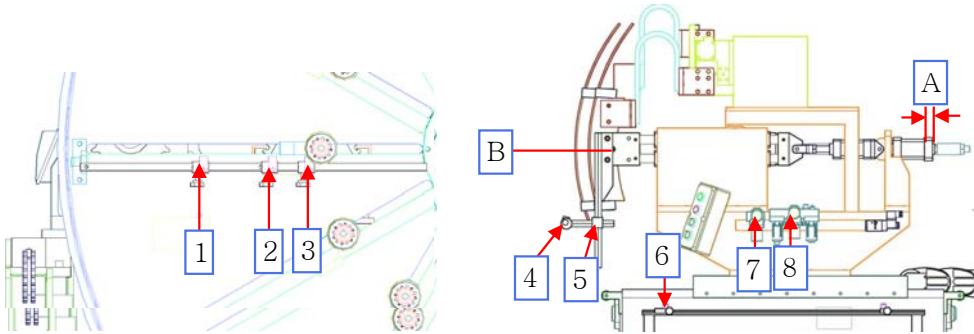
Return Complete

12345 Bell Transfer Pole

PIPE SELECT SIZE SELECT MANUAL DRIVE MADE COUNT Wire Drum ON CYLINDER ON COUNTER 1234 RESET

- Input Total Length.
 - Touch green bar to Pop-Up key pad to put in digit.
 - Input length should be -50mm from the actual longitudinal wire (Copper Ring+Welding Gap)
 - ※ Max. length is 2,600mm.
 - If you put in digit more than 2,600mm, it show 2600 as Max.
 - ※ All input digit should be metric mm for arithmetic operation(Inch is not accepted)
- Input Stat Ring and Last Ring.
 - Touch green bar and input digit 0~12
 - Start Ring makes first spigot spiral wire pitch because Transfer is not moving before welding points set up digit.
 - Last Ring makes last bell bottom spiral wire pitch because Transfer is stopped but welds more points set up digit and stop Drum rotating.
 - Narrow pitch for less Ring count and wider pitch for many Ring count.
- Input Start Slow Length.
- Input Last Slow.
 - If input Start Slow Length and Last Slow, Barrel Length is input automatically
- Input Slow Pitch
 - Min. input is 30. Lower than 30 is not accepted.
 - If input is lower than 40, Drum is turning faster than barrel
 - During slow pitch length, Transfer slows peed is fixed with 1000 or 1500, Drum are rotating as per pitch.
- Input Barrel Pitch.

- Input digit more than 30.
 - Drum r.p.m. is fixed between Barrel Length and Transfer is moving as per pitch.
7. Input Spigot Size.
- Insert 2 longitudinal wire in wire die with enough length to measure diameter.
 - Measures distance between outside and outside of wire by a tap, and input digit.
8. As per following drawing, moves Bell Reduce Stop Proximity Switch(#3) inside until red lamp light and fix screw tight.



9. As per above drawing, moves POLE F/W, B/W to makes gap(A) 4~5mm.
- Input digit on Pole Position green bar(Left) same digit as dark green(Right)
 - ※ If Encoder NO USE is selected from MANUAL SCREEN, moves Proximity Switch(#6) inside and fixed screw.
10. Input Barrel Size.
- BELL Expand as much as desired diameter, and move Spigot Expand Stop P/X Switch #2 and fixed screw.
 - D-Pipe is not effected by P/X Switch #1.
 - If Bell Length is short, speed of Bell and Pole is running fast.
 - If Bell Length is long, speed of Bell and Pole is running slow.
12. Push AUTO BACK button for Bell and Pole to be returned back completely.
13. Check Bell, Transfer, Pole bar of Return Complete became green color.
- ※ If any one bar of them in not green color, START ERROR will be happened.
14. Push WIRE DRUM ON button and adjust Wire Guide Holder (#4 & #5) for round spiral wire.
15. Push DRUM ROTATING button to be positioned at Welding Point(#B).
16. Push CYLINDER button to close Cylinder to contact spiral wire to longitudinal wire.
17. Adjust air pressure of #7 and #8.
- Air pressure should be adjusted according to longitudinal and spiral wire diameter.
 - Example: 5mm Longitudinal wire x 6mm Spiral wire
 - #7 Air pressure = 5 bar #8 Air pressure = 3 bar
18. Tuning SLOW Welding Volume on Main Panel at 8.0 in case wire condition same as 14.
- Push RESET button and tuning Fast Welding Volume more than 8.0 (9.0 or 10.0).
 - Makes Welding current 0~30.
 - Tuning WELDING TIME Volum at 6.0

- 6.0 means 6.0 m/s welding time of 1 point which should be changed as per Drum r.p.m.
- Welding Time is 0~65m Second. Longer welding time is helpful for good welding, but jump up one welding point which makes no welding for next point. Set up short time and slowly longer time after checking out welding condition.

19. Set up Drum r.p.m.

- Drum r.p.m. should be adjust according to Pipe diameter.
- Set up 6000 for 12"~33" Pipe, 5000 = 36~42" 4000 = 48"
Recommended slower r.p.m. than above digit. But, Faster r.p.m. is dangerous.
- Drum r.p.m. effect to Wire Drum speed. Fast Drum r.p.m. makes WIRE DRUM ERROR

20. Push MANUAL WELDING button.

21. Push AUTO button to run machine in automatic operation.

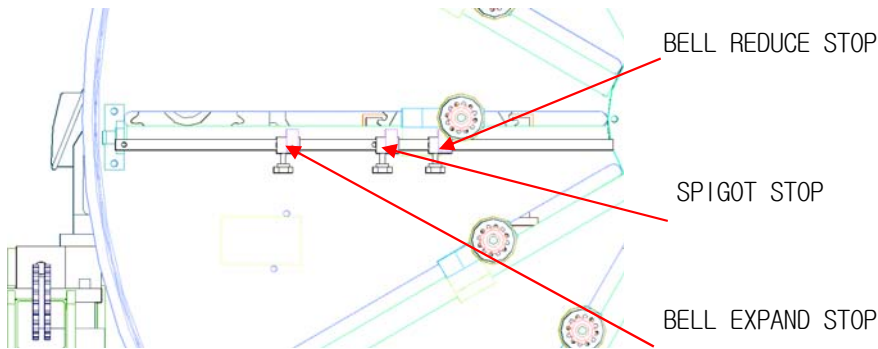
- After Welding Start Ring points set up, Drum and Transfer is moving slow for Start Slow Length area, and Drum, Transfer and Welding is fast for Barrel area and slow moving for Last Slow area.
- Before 50mm of Start Slow Length, Spigot expand until Spigot Expand Stop P/X Switch(#2), and Drum, Transfer, Welding Fast is working.
- Before 50mm end of Barrel Length, Drum, Transfer and Welding is changed slow speed.
- After Transfer is stopped, Last Ring welds few points (as per set up digit), and Transfer fast backwards after 4 seconds later and slow down from 100mm before the end of total length.
- If Transfer return back completely, Transfer bar of Return Complete became green color

22. Opens Cylinder and cut a spiral wire and take off cage from the cage receiver.

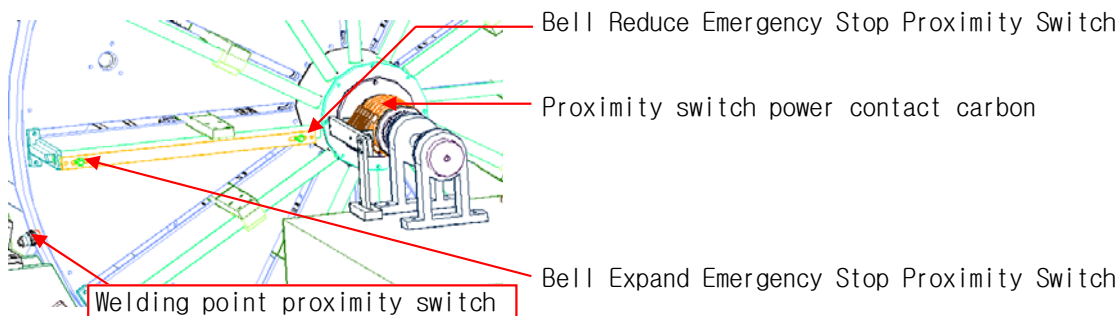
- With Cylinder "CLOSE", Bell Reduce and Pole Backward is not working even if Transfer is returned back completely.
- After Cylinder "OPEN", Bell Reduce and Pole B/W is moving after 10 seconds.
- 1 revolution is 1~21.
- Transfer Speed is depend on pitch of slow and fast area, and can not change as you like.

9. PROXIMITY SWITCH FUNCTION

Bell Part Proximity switch

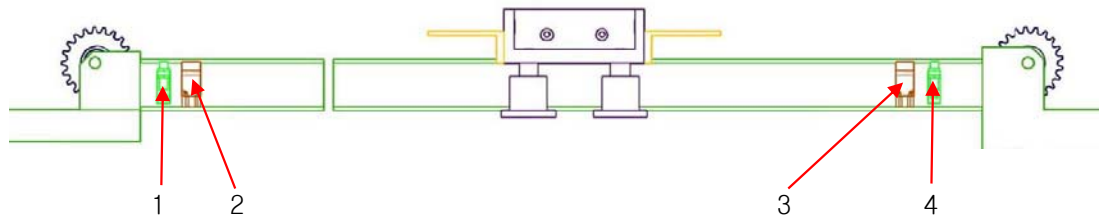


- BELL REDUCE STOP ; Before AUTO production, this P/X switch should be lit on.
 - This switch effect to make Barrel size for A or B Pipe.
 - This switch effect to make bent spigot for C or D Pipe.
- SPIGOT STOP ; - This switch make Spigot Stop for C or D Pipe.
 - This switch is not effected for A or B Pipe..
- BELL EXPAND STOP ; - This switch effect to Expand stop for B or C Pipe.
 - If Bell expand length is set up, Bell Expand is stop regardless this switch.



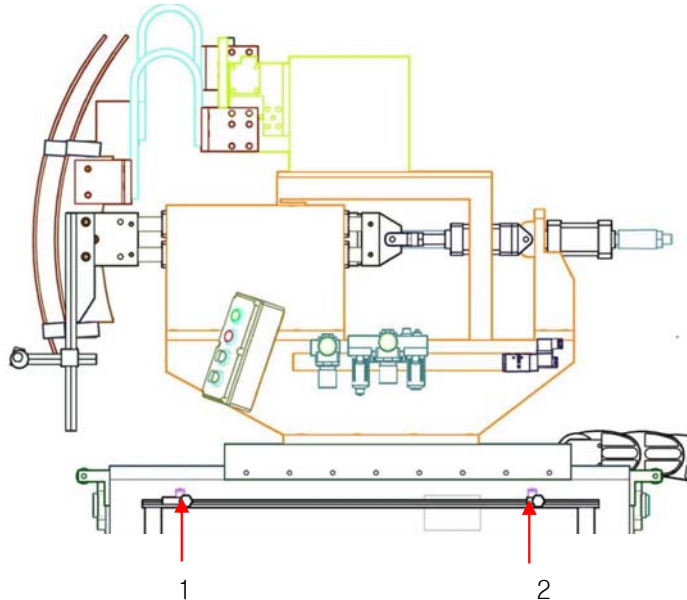
- For safety, 2 Emergency Stop P/X switches are attached on Max. dia and Min. Dia of Bell. Either one is energized, Magnetic switch (MSBE) connected with Bell AC Frequency drive is tripped and stop machine operation
- If Bell emergency stop switch is energized, TRANSFER/BELL POSITION ERROR (EMERGENCY STOP INFORMATION) is lit on Touch Screen.
 - ※ Push POSITION ERROR MOVE button on control panel and expand Bell if smaller diameter or reduce Bell if larger diameter.
- Proximity switch power contact carbon is connected with Proximity switch which should be cleaned from dust or foreign materials for good contact always.
- There are contact points from inside: BCR, P35, P34, P33, CAB, +246.
- During AUTO operation, welding point proximity switch is lit for welding.

Transfer Proximity Switch



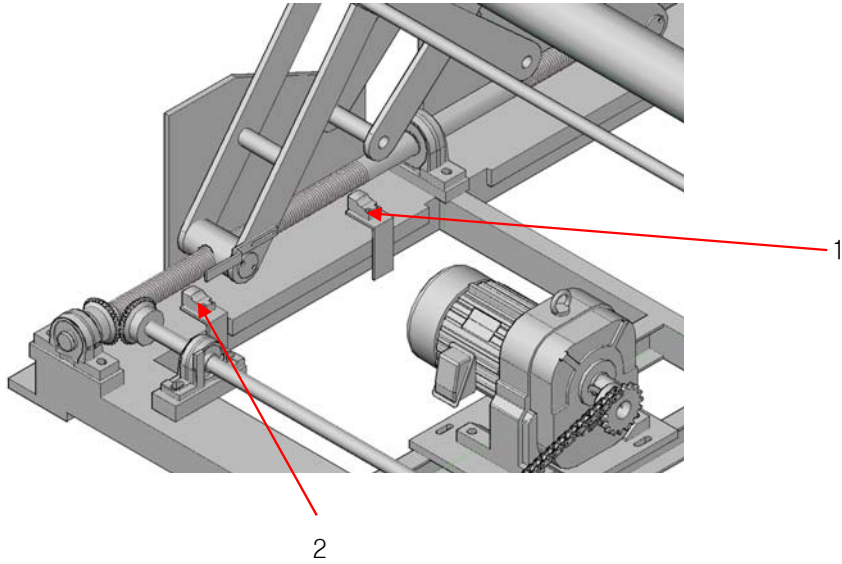
- P/X switch #1 and #4 is Transfer emergency stop proximity switch for safety.
Either one is energized, Magnetic switch (MSBE) connected with Transfer AC Frequency drive is tripped and stop machine operation.
- If Transfer emergency stop switch is energized, TRANSFER/BELL POSITION ERROR (EMERGENCY STOP INFORMATION) is lit on Touch Screen.
 - ※ Push POSITION ERROR MOVE button on control panel and Transfer F/W if transfer is positioned backward or Transfer B/W if Transfer is positioned forward.
- P/X switch #2 of Transfer forward stop switch is energized, encoder value is "0", but actual value is 50.
- P/X switch #3 is for Transfer backward limit switch.
 - ※ Max. length is 2,600mm.
 - If you put in digit more than 2600, it shows 2600 as Max.

Pole Proximity switch



- P/X switch #1 is for Pole forward stop proximity switch.
- P/X switch #2 is for Pole back ward stop proximity switch.
- If Encoder NO USE is selected from MANUAL SCREEN, P/X #1 is not energized.
If Encoder USE is selected from MANUAL SCREEN, P/X #1 is energized, so it should be moved according to cage diameter.
- Why select Encoder USE or Encoder NO USE ?
 - ※ When Pole Encoder is using in the operation, Pole is moving according to Pole Position showing on Drive Screen. However, Pole Position value have a tolerance due to Back-Lash, and must be set up again manually.
If Pole Encoder NO USE is selected, red color lit and encoder is not energized, bu Pole F/W Stop Proximity Switch should be moved for cage size.
- How can make Encoder value "0"
 - Reduce Bell at Min. diameter.
 - Forward Pole at reduce Bell Min. diameter.
 - Makes P/X switch #1 light "ON", then Pole position value is "0"
 - Encoder calibration should be done 1 time monthly.
 - ※ Otherwise, select Encoder NO USE, and move P/X switch 1 as conventional type.

Cage Receiver Proximity Switch



- P/X switch #1 is for Cage Receiver Up Stop Limit Proximity Switch for safety.
- P/X switch #2 is for Cage Receiver Down Stop Limit Proximity Switch for safety.

Poor Electrical Phenomenon

Power is "ON", but not working

1. Check encoder value is "0" on Manual operation of the touch panel screen.
 - Transfer and Pole Encoder is a " 0 " or more than 48,000, Transfer and Pole is not work.
2. Check Main Screen of touch panel display "READY".
 - If it is not green color and display "POWER ON", touch it to display "READY".
4. Check any "ERROR" is display
5. Open the panel, and check all display of Inverters shows non-numeric instead of digit number.
6. Check the status of motor brake .
 - Except Drum Motor, Bell, Transfer and Pole motor have Brake.
 - Therefore, motor is not work if brake is defeced.

During AUTO operation, Inverter is stopped due to ERROR

- 1) Find out inverter ERROR occurred, and fix up with Error Code(Refer to Manual)
- 2) Except Drum Motor, Bell, Transfer and Pole motor have DC 90V Brake, so check brake working properly (If run each Brake Motor, "clunk" sound means good brake)
- 3) Applied inverter should be readjust acceleration and deceleration time.
 - Error is occurred when switching from low speed to high speed, the inverter must increase the acceleration time .
 - Error is occurred when switching from high speed to low speed, the inverter must increase the deceleration time .
- 4) Check the mechanical status of each motor (Bearing and belt, chain or load)
- 5) Error occurred in the inverter should be disappeared when you press RESET button.
If not, inverter should be replaced new one.

Particulars Happen

- 1) Circuit breaker in panel is tripped.
 - Find the cause of the trip, and power "ON" again after about 5 minutes.
- 2) Check PLC CPU red light is lit.
 - If Battery is lit in red, replace battery same as built-in one.
 - ERROR lights on in red, please contact us to check Program
- 3) Electrical tolerance deviation is $\pm 10\%$, so identify the cause and adjust it properly.
 - During the summer time, the deviation of the voltage is occurred.
- 4) When you Mega Test, exclude P.L.C, Inverters and data cables.

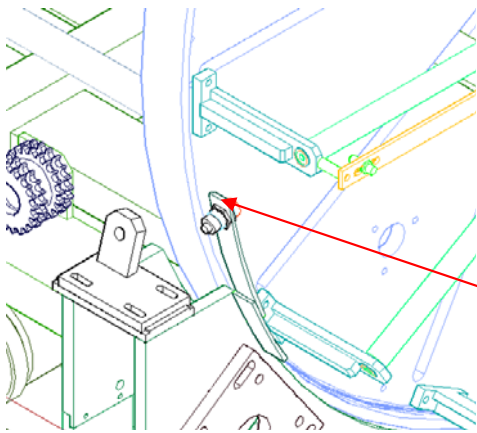
Trouble Shooting

MECHANICAL PROBLEMS

- WELDING IS NOT CARRIED OUT:
 - Welder is out of order in the function.
 - Welding controller is defected.
 - Proximity sensor is not working.
 - Relays of welder is defected.
- WELDING POINT IS WEAK :
 - Unacceptable steel wire is used.
 - Too much carbon content is not good for welding
 - Dirty, rusted or greased wire
 - Worn-out, copper sheet, copper rings,
 - Distance of (pole) electrode is not correct.
 - Broken shield wire.
 - Less electric conduction from the welder to the copper sheet.
- TWIST LONGITUDINAL WIRE :
 - Uneven between copper ring and wire die.
 - Uneven between cage and cage receiver device.
 - Wire guide is worn-out.
 - Wire drum is not rewinding smoothly.
 - After copper rings are worn out, cages are twisted more and more, then turn copper ring clockwise to be straighten cage.
- BAD WELDING ON LAST PART :
 - Uneven between cage and cage receiver.
 - Unbalance between bell expand and pole backward.
- MACHINE IS NOT "SWITCH ON" :
 - Over load switch (THR) is defected.
 - Magnet switch is defected.
 - Defection of any AC Frequency drive (INV1-4).
 - Defected relay.
 - EMERGENCY INFORMATION display ERROR.

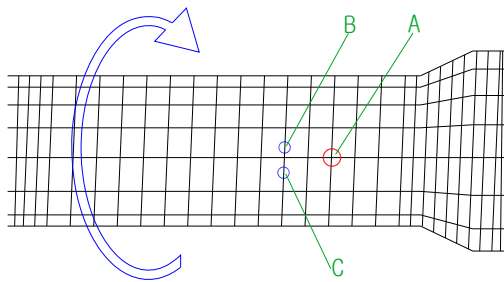


Welding Point Control



- Proximity switch should be matched on jagged position of steel plate.

Welding Proximity switch



A : Correct welding point

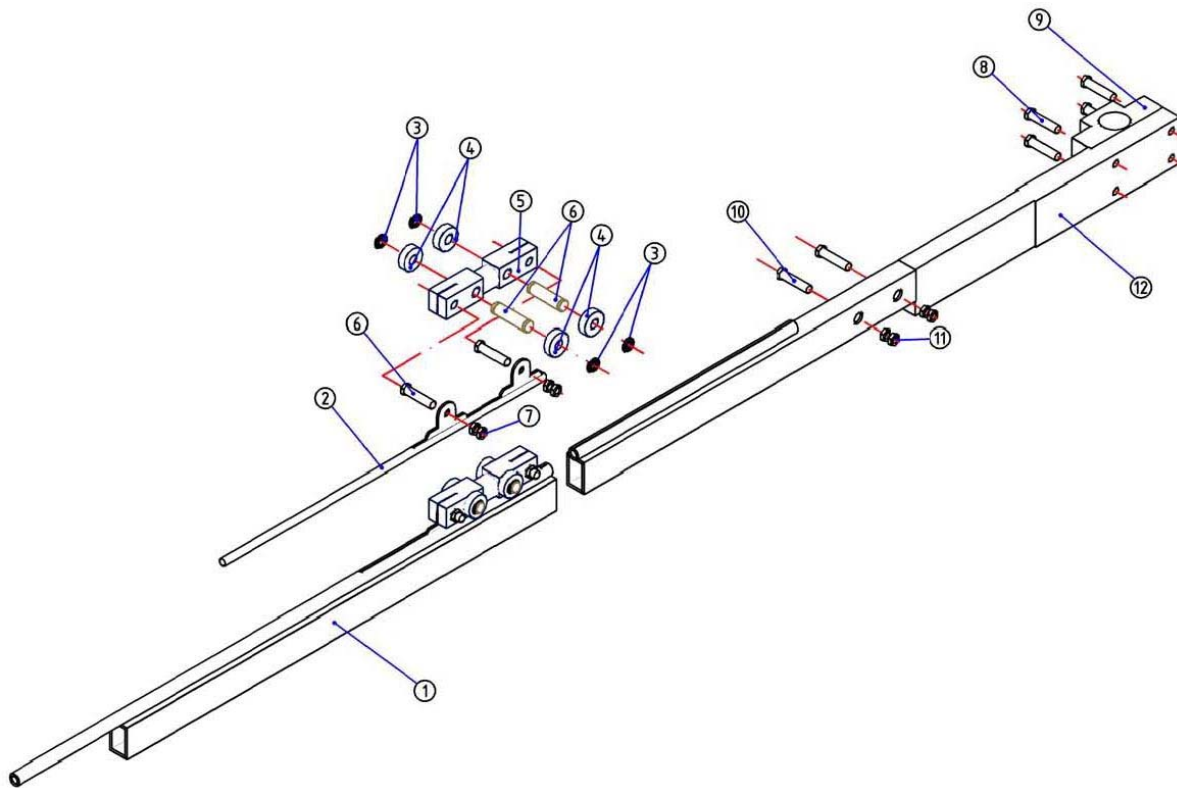
B : Faster welding point

- Move proximity switch down position.

C : Later welding point

- Move Proximity switch up position.

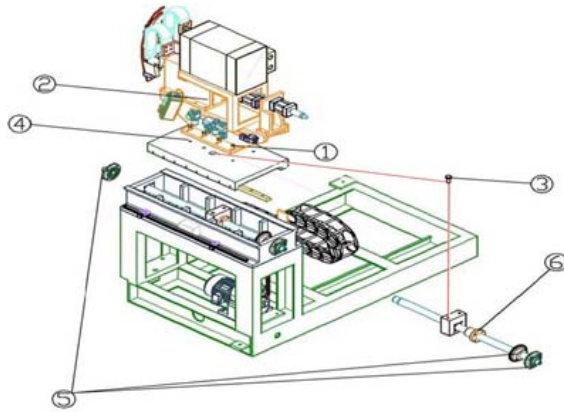
Wire Drawer & Drawer Case Replacement



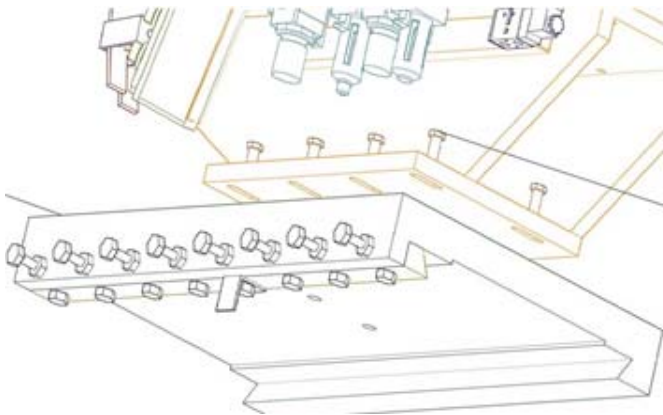
- Short longitudinal wire inserted in Drawer Case(#1) damage Wing of Drawer Rod(#2), or Drawer Case Holder(#5) or Drawer Case(#1)
- Replace damaged part.
- If Drawer Rod(#2) is damaged, take off Bolt(#6) and Nut(#7) and take off it backward.
- If Drawer Case Holder(#5) is damaged, take off Snap Ring(#3), Roller(#4) and Shaft(#6), and replace it.
- If Drawer Case(#1) is damaged, move Center Drum in the middle position and take off part#8, #9, #10, #11 and #12, and take out backward.

Pole Screw Nut Replacement

If pole slide assembly is shaking too much and backlash, change pole screw nut and adjust pole body slider.



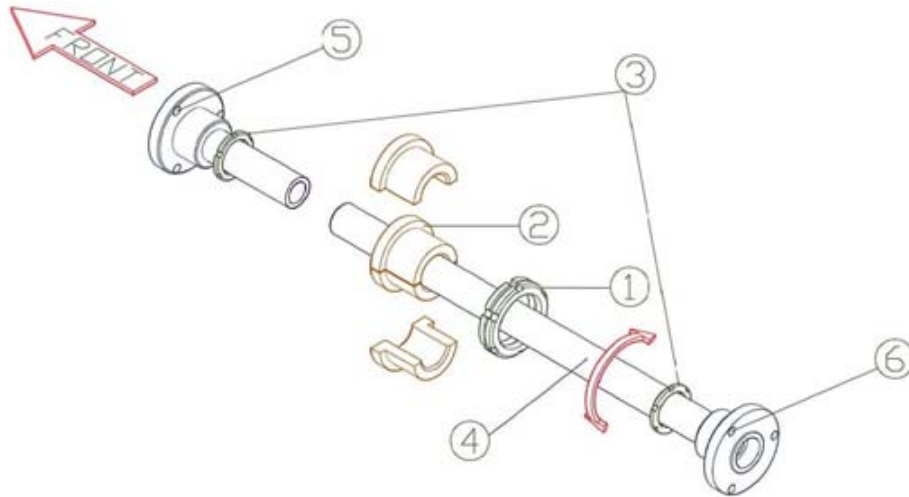
- 1- Take off 8 bolts(#1)
- 2- Lift up Pole assembly frame(#2)
 - ※ Be careful for cable and cable chain.
- 3- Take off 2bolts of Pole screw nut holder(#3)
- 4- Push out POLE SLIDE BODY to look at Pole screw nut holder.
- 5- Take off chain, chain sprocket, and bearing housing(#5)
- 6- Turns Pole screw nut out, and replace new nut.



- If Pole slide body assembly is shaking too much, it should be adjusted. Loose 8 pcs bolts underneath and side 8 bolts and slow tighten each bolt to be contacted shim.
- Too tighten bolts, over torque to move.
- Check Pole proximity switch bar is working smoothly. Otherwise Proximity switch will be damaged.

Changing Guide Shaft Bushing

- If the bushing of center drum is worn out, cage will be twisted due to different pushing to drawer rods and cases.
- Noise during drum rotation, or shaking center drum during forward / backward, guide bushings should be replaced by new bushing.



1- Loose nut(#1), bushing(#2) to be split 2 pieces.

2- Change new bushing and tighten double nut(#1)

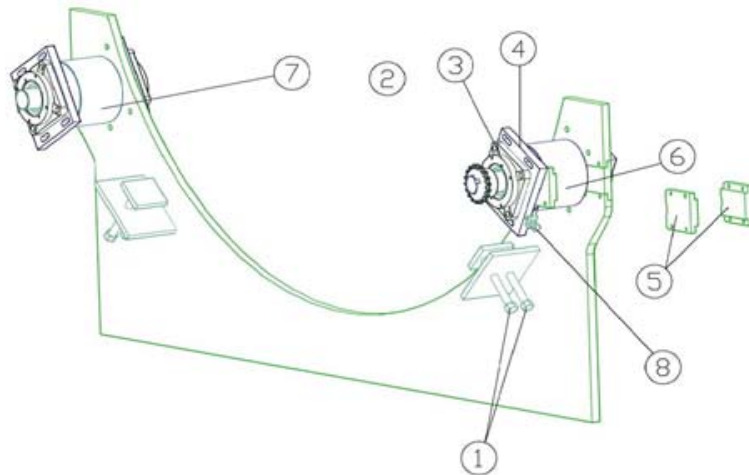
※ It is acceptable 2~3mm tolerance of moving left or right side for drum rotation.

In order to make front & back drum parallel line, loose bolts(#3), and turns each shaft by a pipe wrench to make same distance between front drum and back drum.

- Take off nut(#3) turn shaft(#4) by pipe wrench.
- Turns clockwise to close distance and anti-clockwise to open distance because screw off nut(#5) and screw of nut(#6) is opposite direction.

Changing Drum Roller and Bearing

- Due to unlevelled machine and impaction by heavy drums, drum roller or bearing should be damaged easily.
- Damaged roller or bearing are making lousy noise and bad affect to the drum.



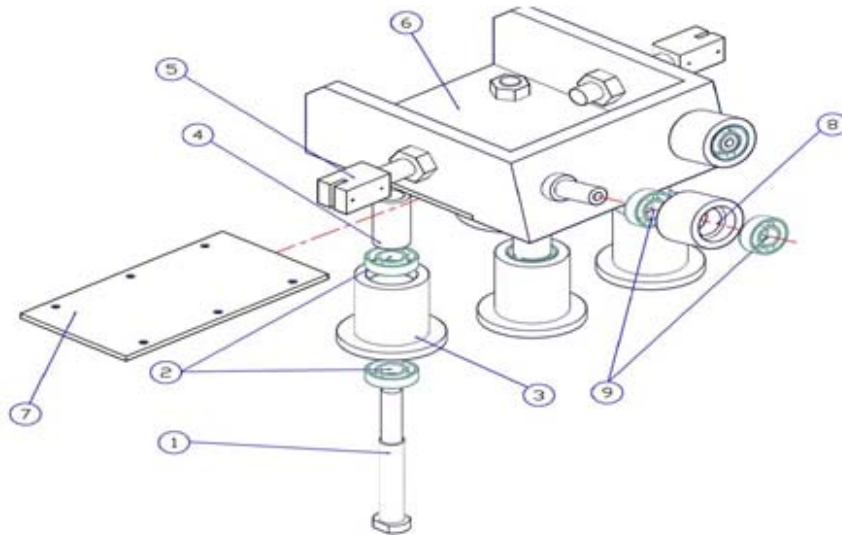
- Changing Bearing
 - 1- Lift up both Drum-Lifter(#1) to be free from rollers(free turning)
 - 2- Take off sprocket(#2) and Bearing cover(#3).
 - Be careful for different bearing size for front and back drum.
- Changing Drum Roller

Same procedure of changing bearing as above 1, 2, 3, and replace roller.

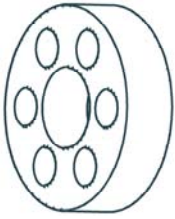
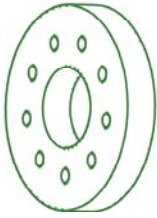
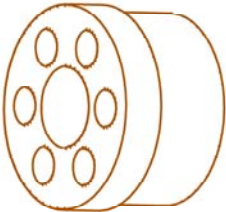
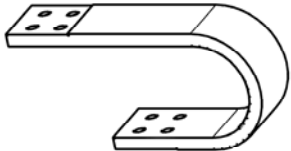
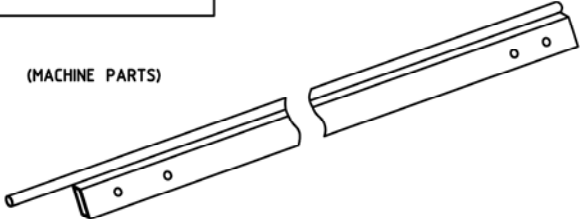
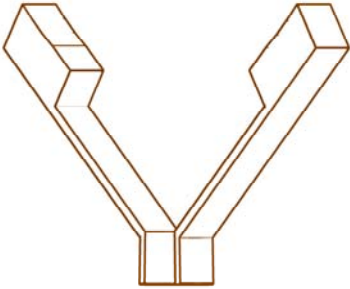
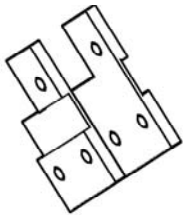
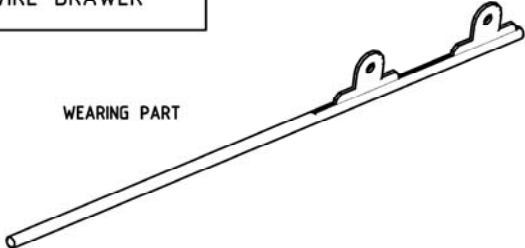
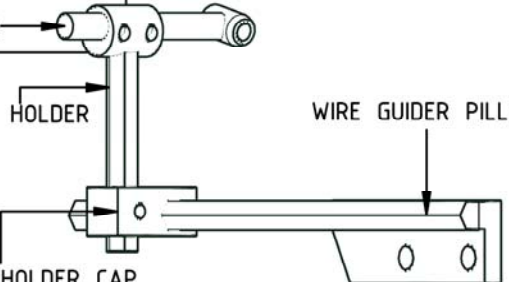
 - ※ Be careful for heavy weight of steel roller.
- Both main rollers(#6) should be changed all together at same time or matching same time because of same revolution by outside diameter.
- After changing roller or bearing, drum-lifter should be down to touch roller.

Changing Plastic Slider

- Take out all bolts and replace worn out slider by new one.
- Note : Do not lubricant to this slider moving line.
But, dry graphite lubricant is recommended.

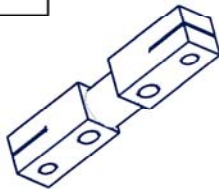


SPARE PART

COPPER RING WEARING PART 	ELECTRIC RING INSULATOR WEARING PART 
WIRE DICE WEARING PART 	ELECTRIC RING HOLDER WEARING PART 
ELECTRIC RING WEARING PART 	COPPER SHEET WEARING PART 
SHIELD WIRE 	DRAWER CASE (MACHINE PARTS) 
CARBON BRUSH WEARING PART 	SPOT SLIDER WEARING PART 
WIRE DRAWER WEARING PART 	WIRE GUIDE WIRE GUIDE HOLDER WIRE GUIDER PILLAR WIRE GUIDE HOLDER CAP 

NO	PART NAME	MATERIAL	QTY	NOTE
DATE	09. SETEMBER. 2013	K.N.Machine		
SCALE :	UNIT :	m/m	MODEL	
			PART NO	SPARE PART
			DRAW NO	SMOP

13. SPARE PART2

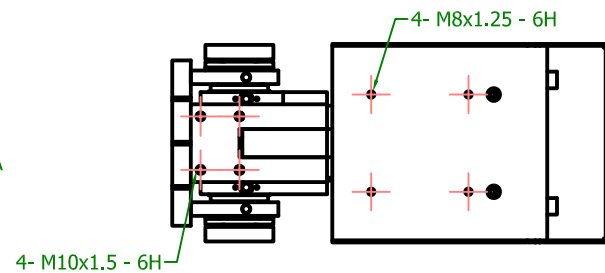
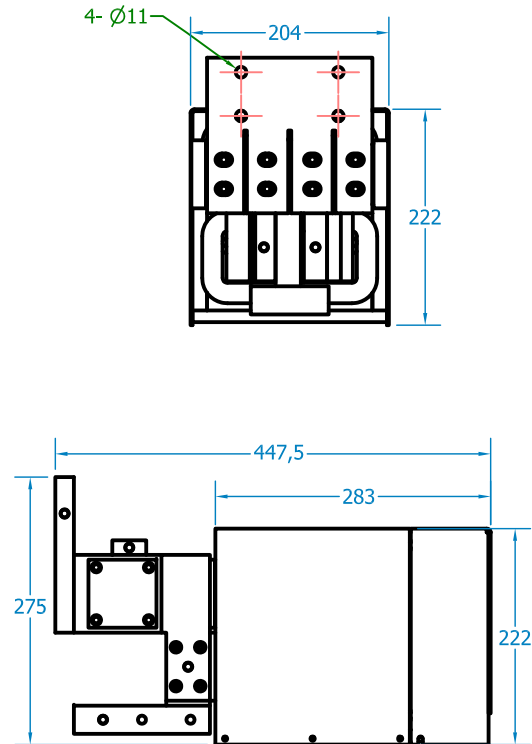
WIRE DRAWER HOLDER		WIRE DRAWER ROLLER SHAFT	
DRAWER CASE INSULATOR		WIRE DRAWER ROLLER	
COPPER SHEET HOLDER		SNAP RING	

NO	PART NAME	MATERIAL	QTY	NOTE
DATE	09. SEPTEMBER. 2013	K.N.Machine		
SCALE :	UNIT :	m/m	MODEL	KN-1248-G3
DESIGNED	CHECKED	APPROVED	PART NO	CONSUMPTION PART
			DRAW NO	SMOP2

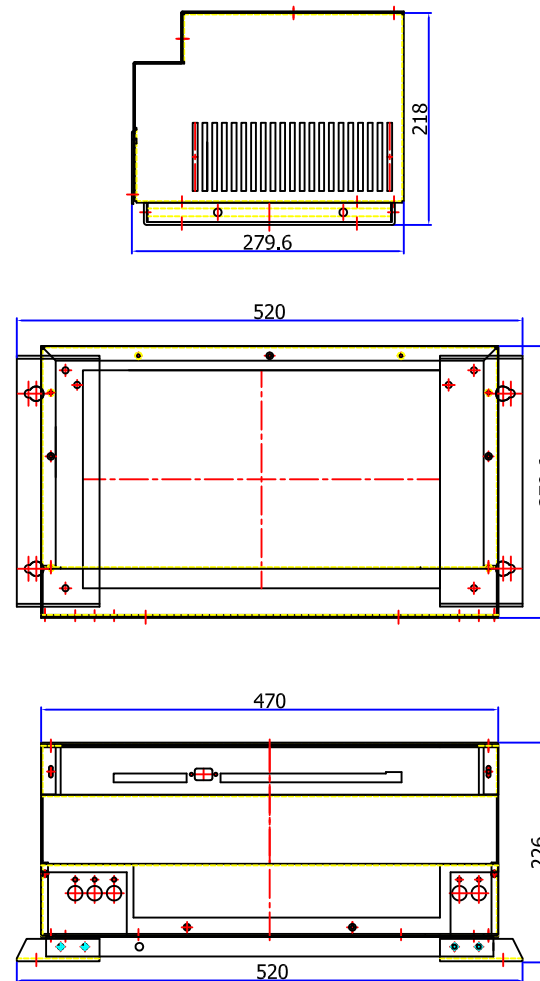
KN-1248-G3 Machine Specification

MACHINE DIMENSION	LENGTH - 9,650 mm(379.9")
	WIDTH - 3,660 mm(144.0")
	HEIGHT - 2,900 mm(114.2")
MANUFACTURING SIZE	PIPE DIA - 12" - 48" I.D BELL PIPE (300mm - 1,200mm I.D. BELL PIPE)
	LENGTH - 2,600mm PIPE LENGTH(8 FEET PIPE)
MACHINE TOTAL WEIGHT	APPROX. 15,000 KGS
LONGITUDINAL WIRE	12 EA
MAX WELDING WIRE	10 mm DIA.
PITCH OF WELDING	MAX. 150 mm ADJUSTABLE
WELDING TRANSFORMER	200Kva(WATER COOLED), 480VOLTS, 60Hz(0thers are available)
WELDING SYSTEM	S.C.R / I.G.B.T./ DIODE
MOTORS	5HP X 4P - For DRUM ROTATING(FREQUENCY DRIVE)10:1 GEARED MOTOR
	2HP X 4P - For TRANSFER(FREQUENCY DRIVE)200:1 GEARED MOTOR
	7.5HP X 4P - For BELL(FREQUENCY DRIVE)10:1 GEARED MOTOR
	2HP X 4P - For POLE(FREQUENCY DRIVE)30:1 GEARED MOTOR
	2HP X 4P - For CAGE RECEIVER 30:1 GEARED MOTOR
	400W for WATER PUMP and 300W for FAN COOLER
CONTROL SYSTEM	PROGRAMMABLE LOGIC CONTROL SYSTEM
SIZE CHANGING	BY GEARED ADJUSTABLE SCREWS
ELECTRICITY	480VOLTS, 3 PHASES for WELDER(Other volts are available)
	220VOLTS for CONTROL and MOTORS(FREQUENCY DRIVE)
SUBJECT TO CHANGE FIGURES TO IMPROVE EFFICIENCY WITHOUT PRIOR NOTICE	

INVERTER TRANSFORMER **200KVA** ITR-200



WELDING CONTROLLER -IP600



CONTROLLER SPEC(IP600)	
SIZE	520*226*280
INPUT VOLTAGE	480V 3Ø 60Hz
MAX CONTROL AMP	25000A(av)
USED %	10%(Max)
WATER	7 LPM
TRANSFORMER SPEC(ITR-200)	
SIZE	225*230*376
INPUT VOLTAGE	650V 1Khz
NO LOAD VOLTAGE	14,4V
MAX CONTROL AMP	28,000A
USED %	ED 50%(MAX)
WATER	10 LPM

USER		TITLE	KN-1248-G3 CONTROLLER/TRANSFORMER	
DWG-NO.		SCALE	1/1	
DATE	2013-04-22	UNIT	m/m	
COMPANY	D.WELCO		DESIGNER	

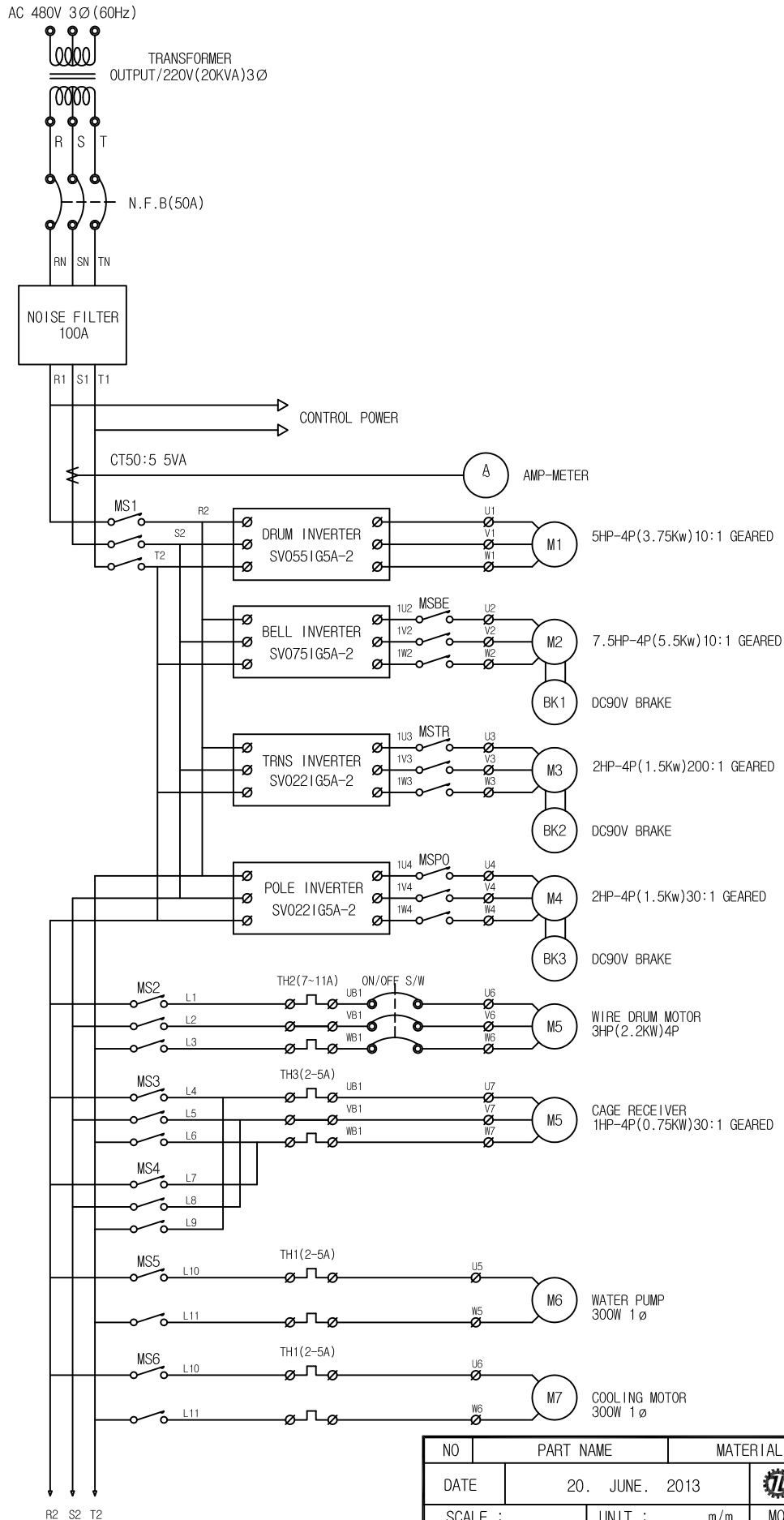
ELECTRIC PARTS LIST

NO	PART NAME	SPECIFICATION	QT'Y	MAKER	REMARK
1	P.L.C(CPU)	XGK-CPUS	1	LS	
2	P.L.C(POWER)	XGP-ACF2	1		
3	P.L.C(IN CARD)	XGI-24A	2		
4	P.L.C(OUT CARD)	XGQ-TR4B	1		
5	P.L.C(BASE)	XGB-M06A	1		
6	P.L.C(HI-SPEED CARD)	XGF-H08A	1		
7	P.L.C(INTERFACE CARD)	XGL-CH2A	1		
8	P.L.C(DUMMY)	XGT-DMMA	1		
9	P.L.C CABLE	C40HF-13PB(130 Cm)	1	IO-LINK	INPUT
		C40HF-20PB-1(200 Cm)	3		INPUT
		C40HF-20PB-XGP1(200 Cm)	1		OUTPUT
10	P.L.C INTERFACE T/B BLOCK	TG7-1H40CA	2		INPUT
		R32D-PS5A-CV	1		OUTPUT
		TG7-1H40Q	1		HI-SPEED
11	AC FREQUENCY DRIVE	SV0551G5A-2	1	LS	DRUM
		SV0751G5A-2	1		BELL
		SV0221G5A-2	2		TRANSFER
			POLE		
12	BRAKING RESISTOR	1000W-30Ω	1	SAMWHA	BELL
		700W-40Ω	1		DRUM
		300W-60Ω	2		TRANSFE/POLE
13	NOISE FILTER	WYF-T100T2M-3Ø	1	WOONYOUNG	MAIN POWER
		WYF-S06T1M-D	1		P.L.C POWER
14	POWER SUPPLY	DR120-24	1	CHINA	P.L.C I/O
		DR75-24	1		ENCORDER
		DR75	1		WELDING DISPLAY
15	N.F.B(MCCB)	EA53C(40A)	1	FUJI	TRANSFORMER 480V
		E53S(50A)	1		MAIN PANEL
		BW125JAGU(50A)	1		WELDING POWER
		HANDLE(BZ6V100	1		MAIN
	C.P	DCP52DF(5A)	1	DAERYUK	CONTROL
17	TOUCH PANEL	XP-5160	1	LS	CONTROL
18	RELAY	LY4N	1	OMRON	CONTROL POWER
		MY4N	2		
		GR-1S	16	IO-LINK	
		R1T-LC	6		
		S1T-4P(NO CONTACT)	2		
19	RELAY SOCKET	R4P	4	IO-LINK	
		MY4N	2	DAESAN	

NO	PART NAME	SPECIFICATION	QT'Y	MAKER	REMARK
20	OUTLET	125V-15A	1	ILSIN	for NOTE PC
		220V-15A	2		COOLER
21	C.T.	50/5	1	SUH KWANG	MAIN AMP
		100/5	1		WELDING
22	MAGNETIC SWITCH	SC-0	5	FUJI	POWER
		SC-N1	2		WIRE DRUM
		SC-N6	1		MAIN POWER
		SC-4	2		TRANSFER/POLE
23	OVER LOAD SWITCH	TR-ON(2.6A)	2	FUJI	PUMP, COOLER
		TR-ON(5A)	1		CAGE RECEIVER
		TR-N2(11A)	1		WIRE DRUM
24	AC CONVERTOR	KEM-200S(20A)	1	KEM	BRAKE
25	AMPER METER	SK-72(50A)	1	SK	MAIN
		LI-72(100A)	1		WELDING
26	VOLUME	100K Ω	3	UK	WELDING
27	VOLUME KNOB		3		
28	ENCODER	E60H-20-1024-T-24	2	AUTONICS	TRANSFER / POLE
29	EMERGENCY BUTTON	KBL30ER	2	KOINO	EMERGENCY
30	PUSH BUTTON LAMP SWITCH	NF30-BM3C	3		control
31	PUSH BUTTON SWITCH	NF30-PM	16		
32	SELECT SWITCH	NF30-SA3S	2		
33	TOGGLE SWITCH	WJT-3310MG	1	WOO JIN	CAGE RECEIVER
34	PILOT LAMP	KH502	1	KOINO	TRANSFORMER BOX
35	PROXIMITY SWITCH	PR30-15DP	1	AUTONICS	WELDING
		PSN30-15DP	4		TRANSFER/CAGE
		PSN17-8DP	5		BELL / POLE
		PRT12-4D0	4		EMERGENCY
36	SOLENOID VALVE	SF2120	2	YPC	CLUTCH / CYLINDER
37	FOOT SWITCH	KH-8115	1	KOINO	DRUM CW
38	CONTROL BOX	MAIN	1	EUNKYUNG	MAIN
39	WELDING/TRANSFORMER BOX	SUB	1	EUNKYUNG	WELDING/TRANS
40	SWITCH BOX	KCB-304	1	KOINO	SUB
41	TERMINAL BOX	BC-AG-10P	3	BOX TOP	BELL/POLE
		BC-AG-6P	5		TRANSFER/ENCODER
42	FAN CONTROLLER	KTC-30	1	KACON	MAIN PANEL FAN
43	FAN	SJ1238HA2	2	SUNTRONIX	PANEL COOLING
44	FAN COVER	KFC-120	10	KEM	AIR FILTER
45	TEMPERATURE CONTROLLER	TZN4M-14R	1	AUTONICS	WATER COOLING FAN
46	CA-SENSOR	1/2-400L-8	1	KEM	WATER TEMP

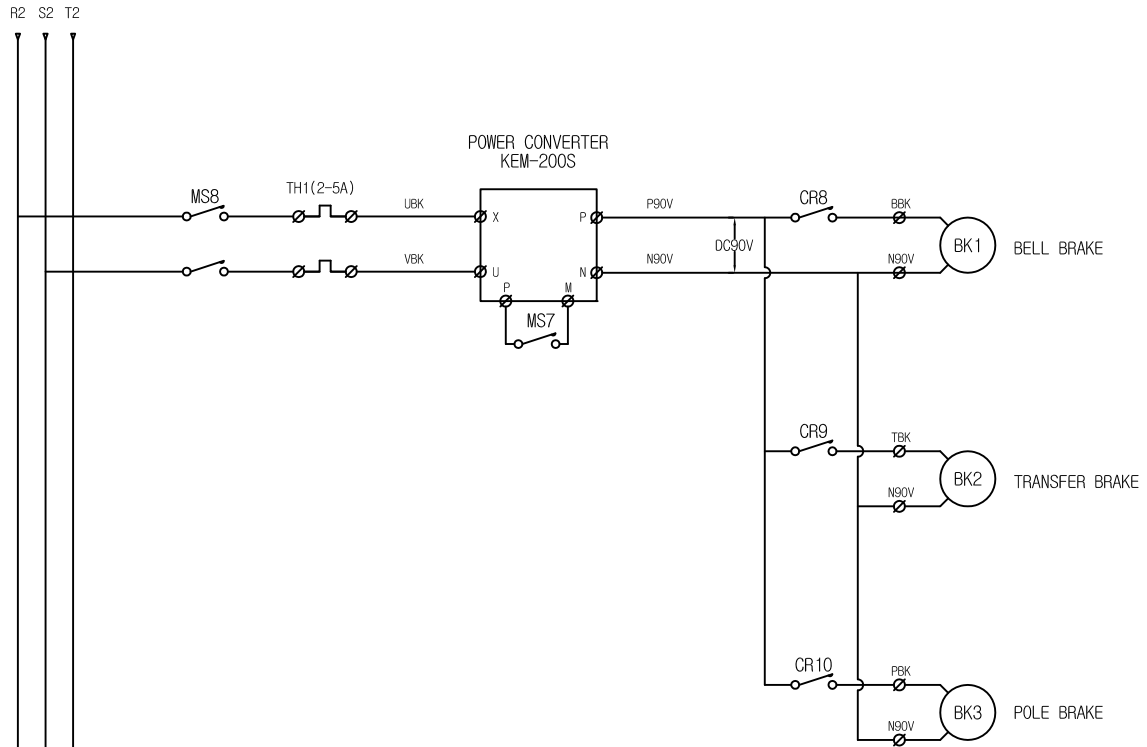
[illegible]

POWER WIRING 1



NO	PART NAME	MATERIAL	QTY	NOTE
DATE	20. JUNE. 2013	 K.N.Machine KYUNGNAM MACHINE COMPANY		
SCALE :	UNIT :	m/m	MODEL	KN-1248-G3
DESIGNED	CHECKED	APPROVE	PART NO	ELECTRIC WIRING
			DRAW NO	POWER1

POWER WIRING 2 BRAKE WIRING

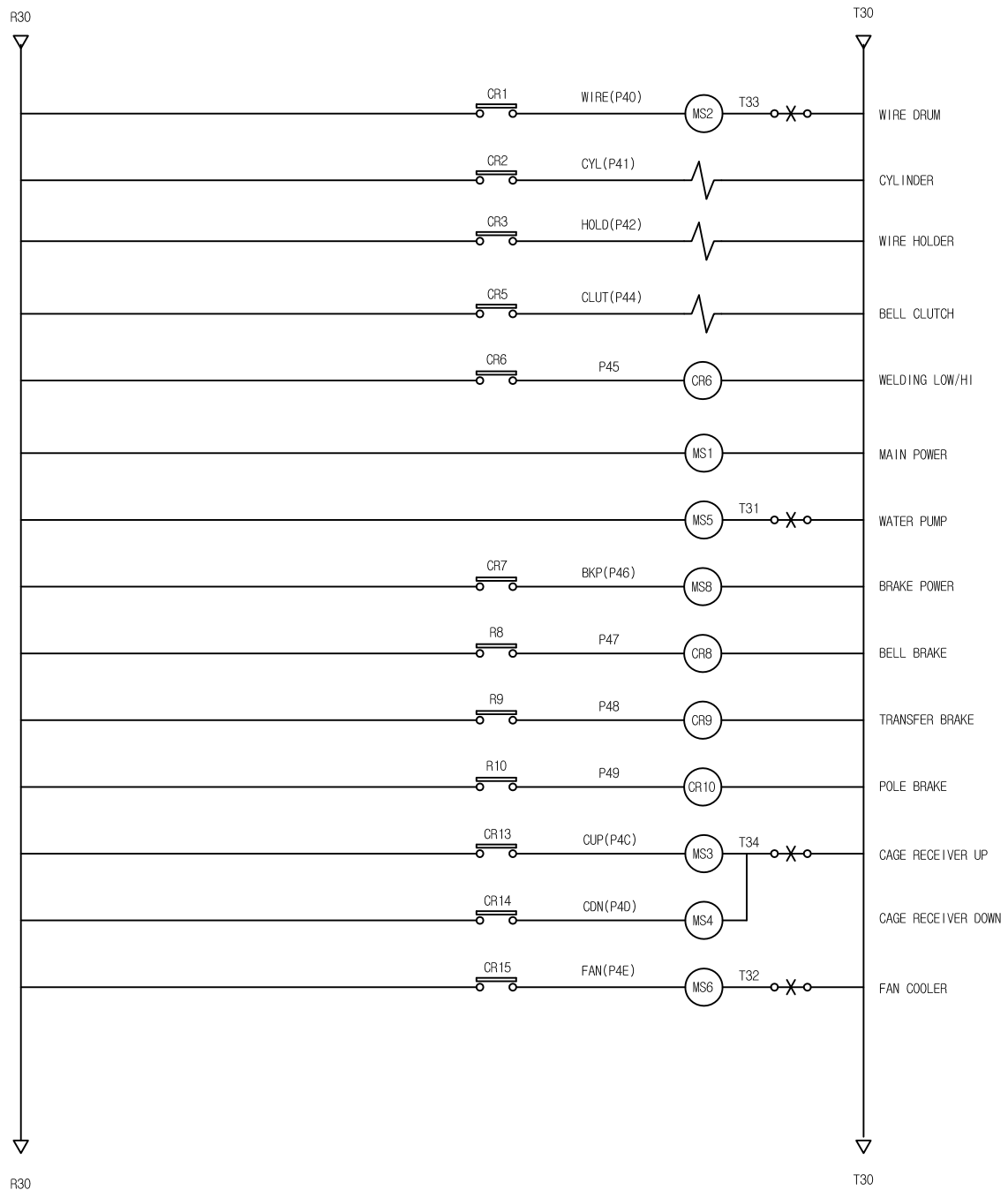


NO	PART NAME	MATERIAL	QTY	NOTE
DATE	20. JUNE. 2013	 K.N. Machine KYUNGNAM MACHINE COMPANY		
SCALE :	UNIT :	m/m	MODEL	KN-1248-G3
DESIGNED	CHECKED	APPROVE	PART NO	ELECTRIC WIRING
			DRAW NO	POW1-2

The diagram illustrates the electrical wiring for a welding power supply. It starts with an AC 220V input connected to terminals R1 and T1. A 3A circuit breaker (CP) is shown. The power is then stepped down by a transformer (220V to 220V/110V, 200VA) to 110V. This 110V line passes through a noise filter (WYFS06T1M(6A)) and a P.L.C. power section (R12, T12) before reaching the P.L.C. power supply. The P.L.C. power supply provides +24V and CAB power. A second power supply (DR-100-24(3A)) provides 1+24V and 1CAB power. A third power supply (DR-100-15V(3A)) provides +15V and GND power. The control power section includes a CR1 relay, a T10 terminal, a THERMO CONTROLLER, and two fans (FAN1, FAN2) connected to T30 terminals. The welding controller is connected to the +15V and GND lines. The diagram also shows a ground connection (R30) and a T30 terminal.

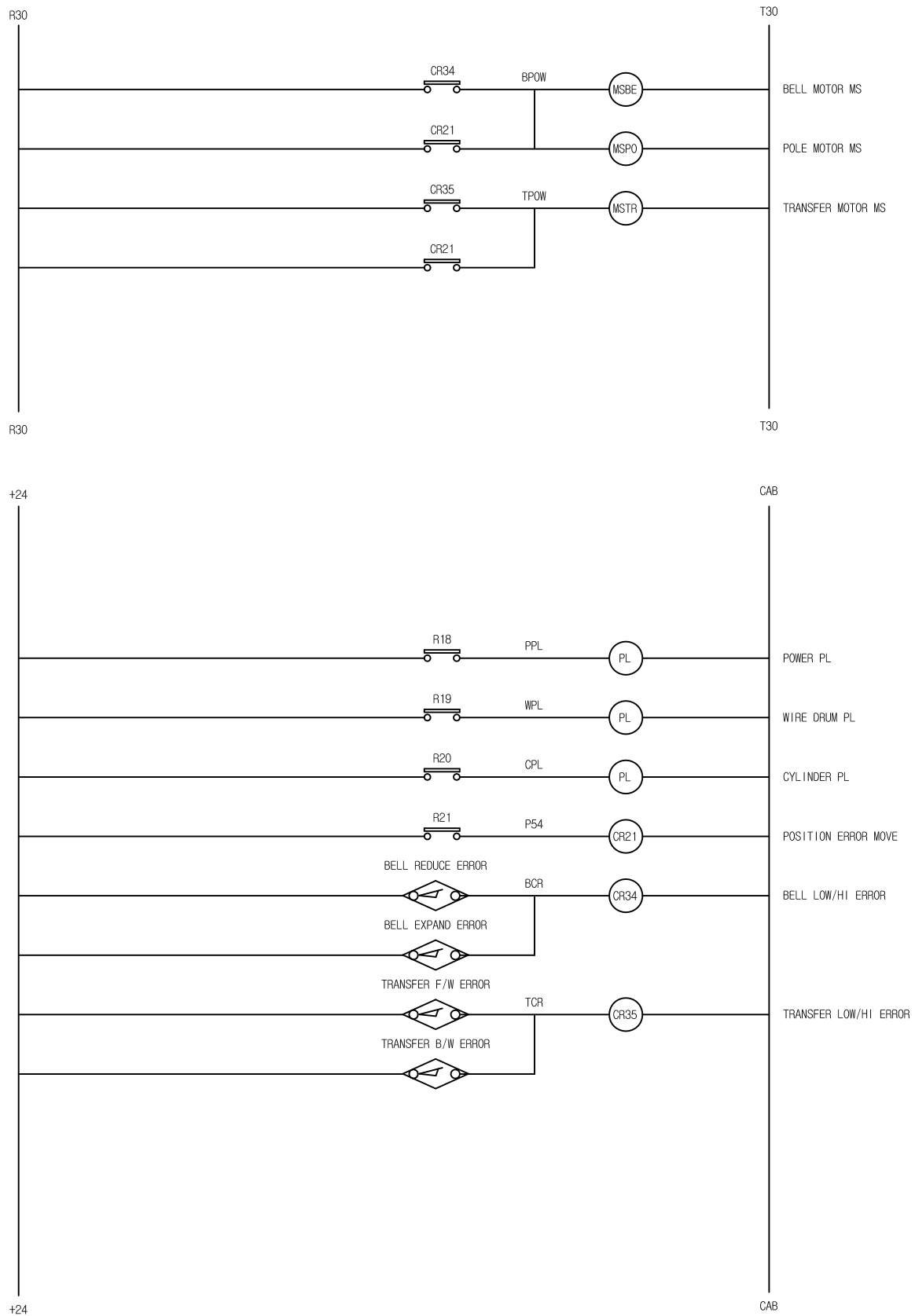
NO	PART NAME	MATERIAL	QTY	NOTE
DATE	10. JULY. 2013	 K.N.Machine KYUNGNAM MACHINE COMPANY		
SCALE :		UNIT : m/m	MODEL	KN-1248-G3
DESIGNED	CHECKED	APPROVE	PART NO	ELECTRIC WIRING
			DRAW NO	POW3

POWER WIRING 4

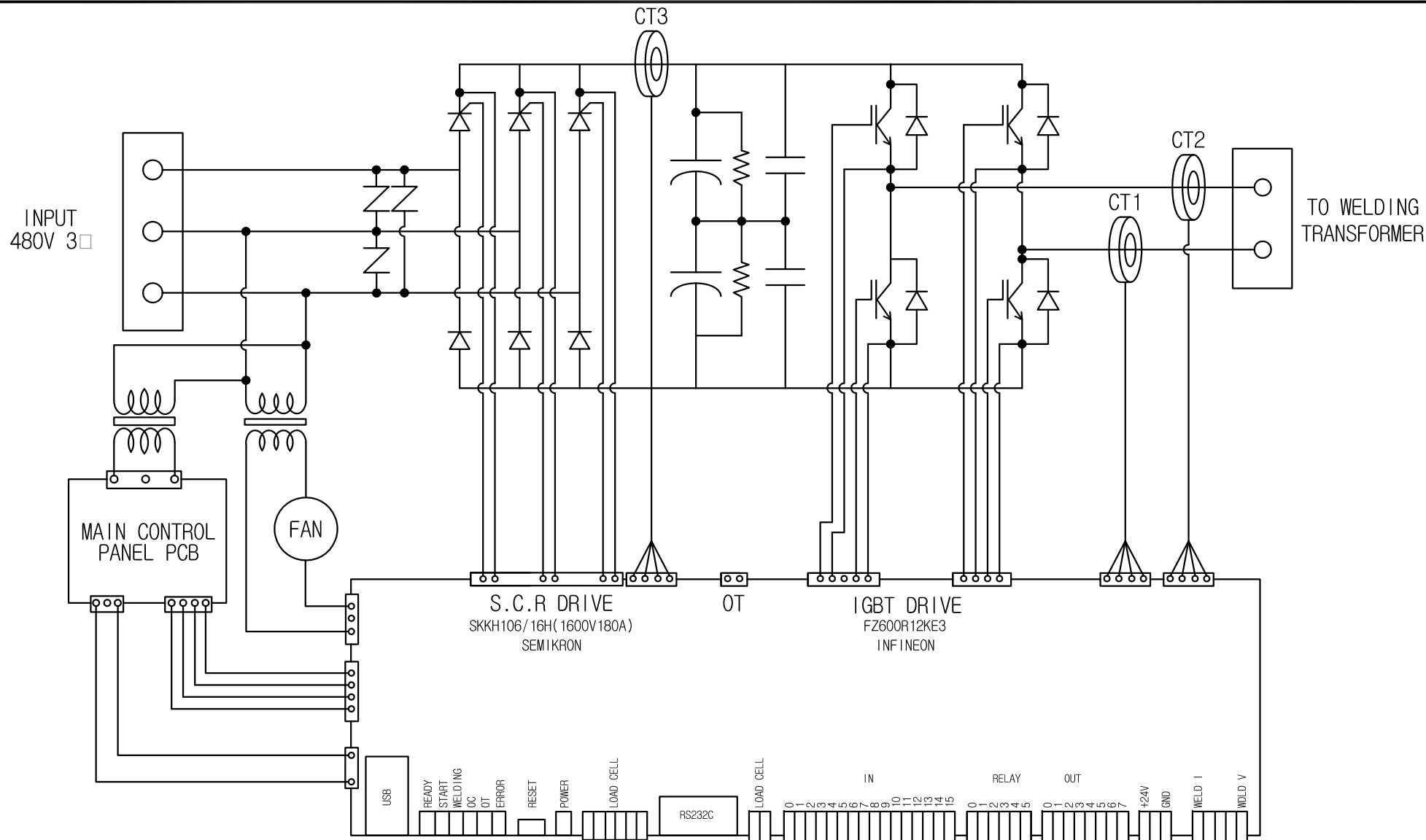


NO	PART NAME		MATERIAL	QTY	NOTE
DATE	10. JULY. 2013		 K.N.Machine KYUNGNAM MACHINE COMPANY		
SCALE :	UNIT :		m/m	MODEL	KN-1248-G3
DESIGNED	CHECKED	APPROVE		PART NO	ELECTRIC WIRING
				DRAW NO	POW4

POWER WIRING 5

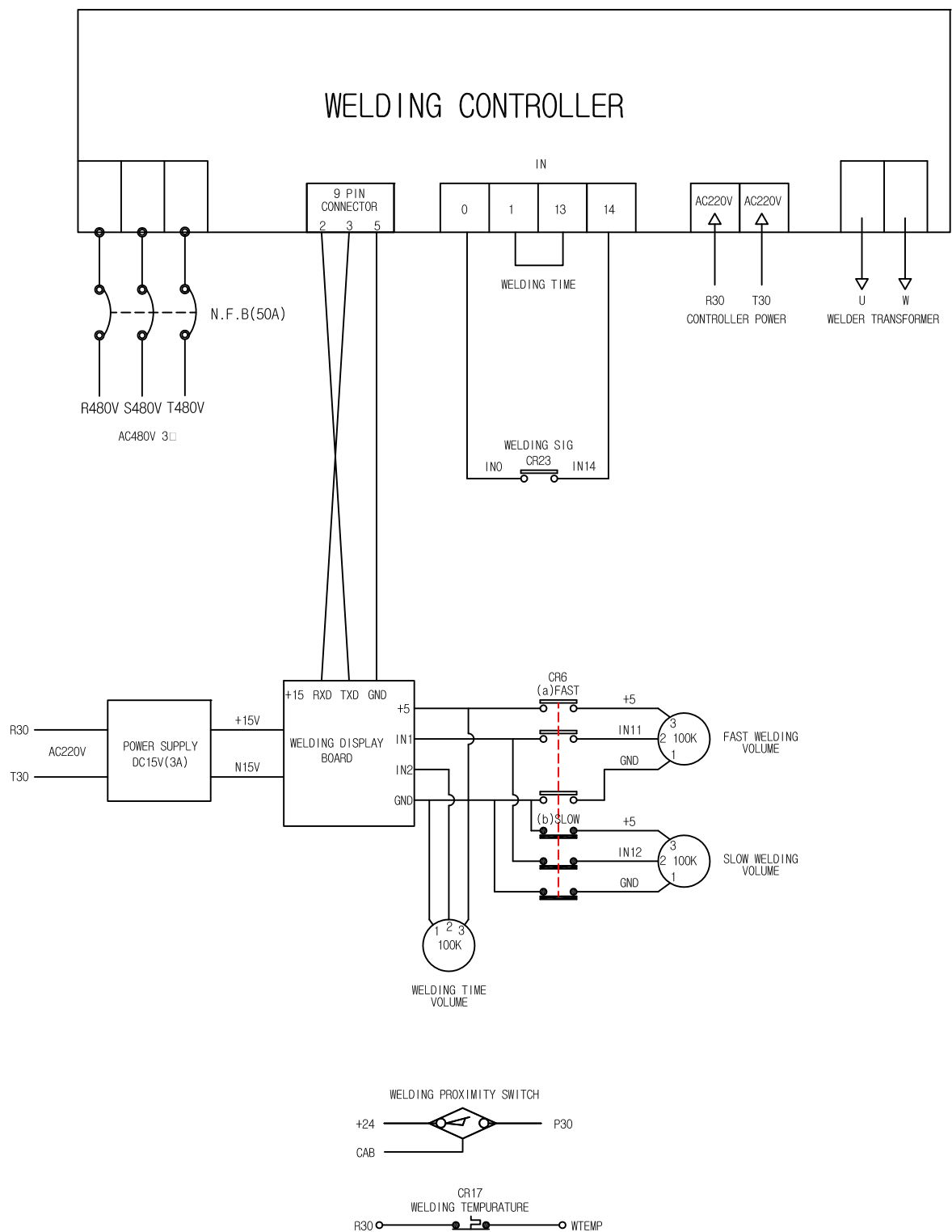


NO	PART NAME	MATERIAL	QTY	NOTE
DATE	27. JUNE. 2013	 K.N.Machine KYUNGNAM MACHINE COMPANY		
SCALE :	UNIT :	m/m	MODEL	KN-1248-G3
DESIGNED	CHECKED	APPROVE	PART NO	ELECTRIC WIRING
			DRAW NO	POW5



NO	PART NAME	MATERIAL	QTY	NOTE
DATE	20. JUNE. 2013	 K.N.Machine KYUNGNAM MACHINE COMPANY		
SCALE	UNIT :	m/m	MODEL	KN-1248-G3
DESIGNED	CHECKED	APPROVED	PART NO	WELDING CONTROLLER
			DRAW NO	WELDING POWER

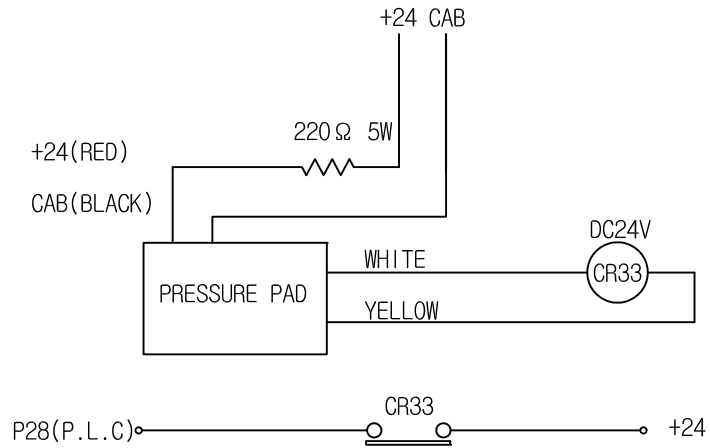
WELDING CONTROLLER WIRING



NO	PART NAME	MATERIAL	QTY	NOTE
DATE	09. SEPTEMBER. 2013	 K.N.Machine KYUNGNAM MACHINE COMPANY		
SCALE :	UNIT :	m/m	MODEL	KN-1248-G3
DESIGNED	CHECKED	APPROVE	PART NO	ELECTRIC WIRING
			DRAW NO	WELDING CONTROLLER

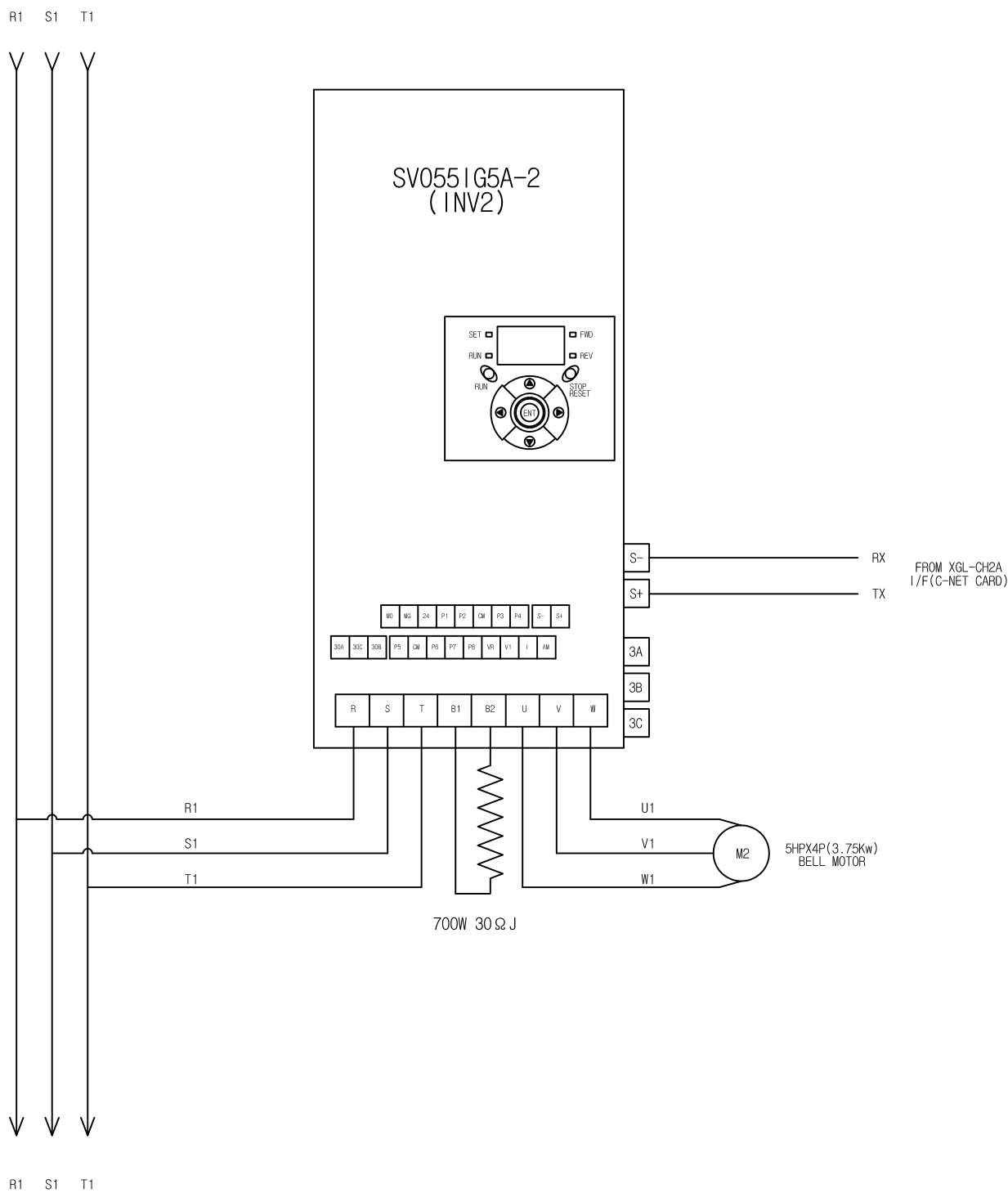
POWER WIRING 6

PRESSURE PAD CONTROL



NO	PART NAME	MATERIAL	QTY	NOTE
DATE	20. JUNE. 2013	 K.N.Machine KYUNGNAM MACHINE COMPANY		
SCALE :	UNIT :	m/m	MODEL	KN-1248-G3
DESIGNED	CHECKED	APPROVE	PART NO	ELECTRIC WIRING
			DRAW NO	WELDING

DRUM FREQUENCY DRIVE

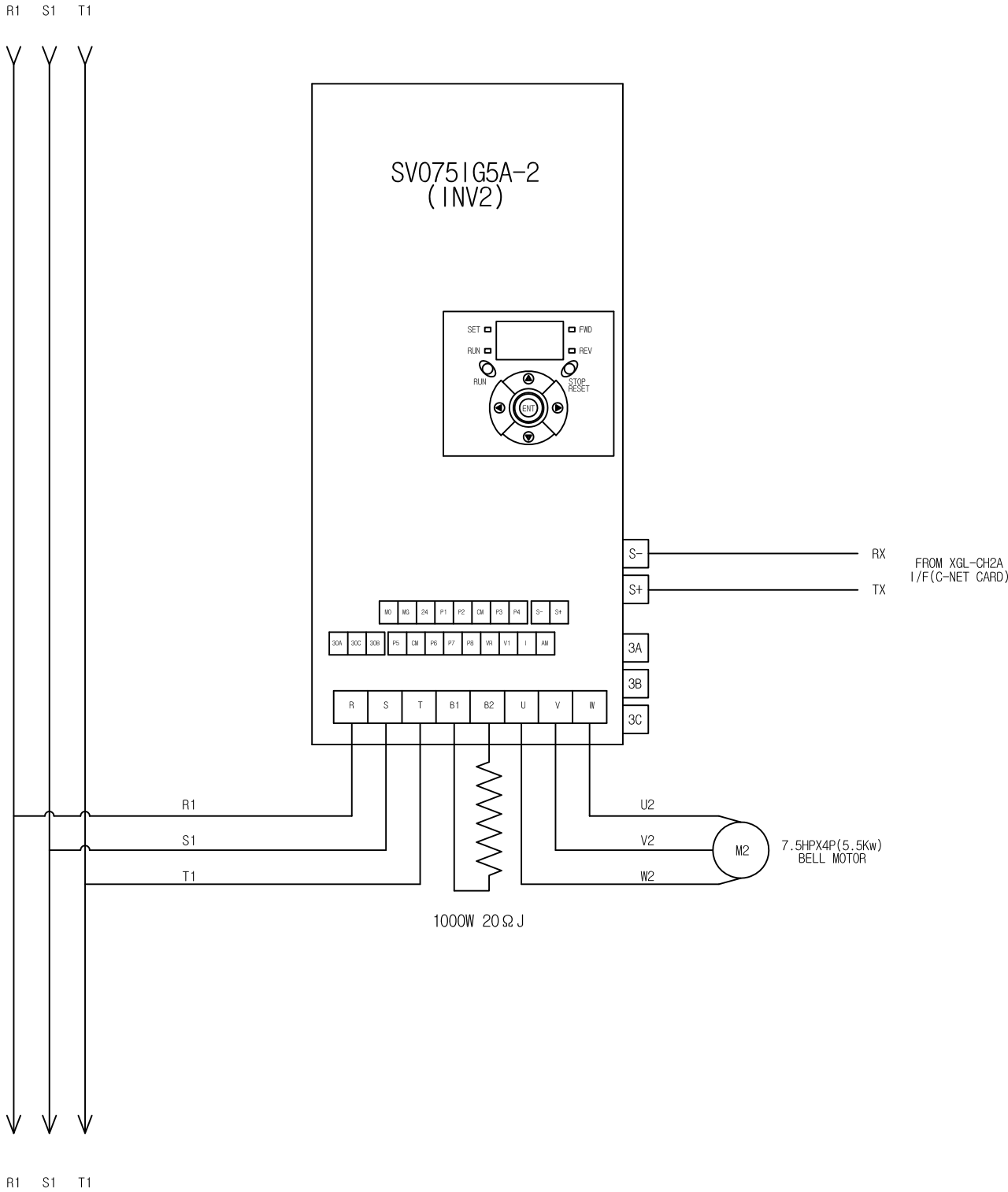


NO	PART NAME	MATERIAL	QTY	NOTE
DATE	20. JUNE. 2013	 K.N.Machine KYUNGNAM MACHINE COMPANY		
SCALE	UNIT :	m/m	MODEL	KN-1248-G3
DESIGNED	CHECKED	APPROVED	PART NO	INVERTER WIRING
			DRAW NO	INVERTER 1

Parameter Setting
DRUM AC FREQUENCY DRIVE(SV055iG5A-2)

CODE	DESCRIPTION	SETTING RANGE	FACTORY DEFAULT
DRIVE GROUP			
ACC	Acceleration time	5	10
DEC	Deceleration time	0.5	20
drv	Drive mode	4	1
Frq	Frequency Mode(Freq.Setting Method)	7	0
FUNCTION GROUP 2			
H 30	Motor type select	3.7	7.5
H 33	Motor rated current	13.8	26.3
H 36	Motor efficiency	86	87
H 41	Auto tuning	1	0
H 93	Parameter initialize -This parameter is used to initialize parameter back to the factory default value.	1	0
H 95	Parameter lock - UL(Unlock) - L(Lock)	12	0
INPUT/OUTPUT GROUP			
I 60	Drive number	1	1
I 61	Baud Rate	4	3

BELL FREQUENCY DRIVE

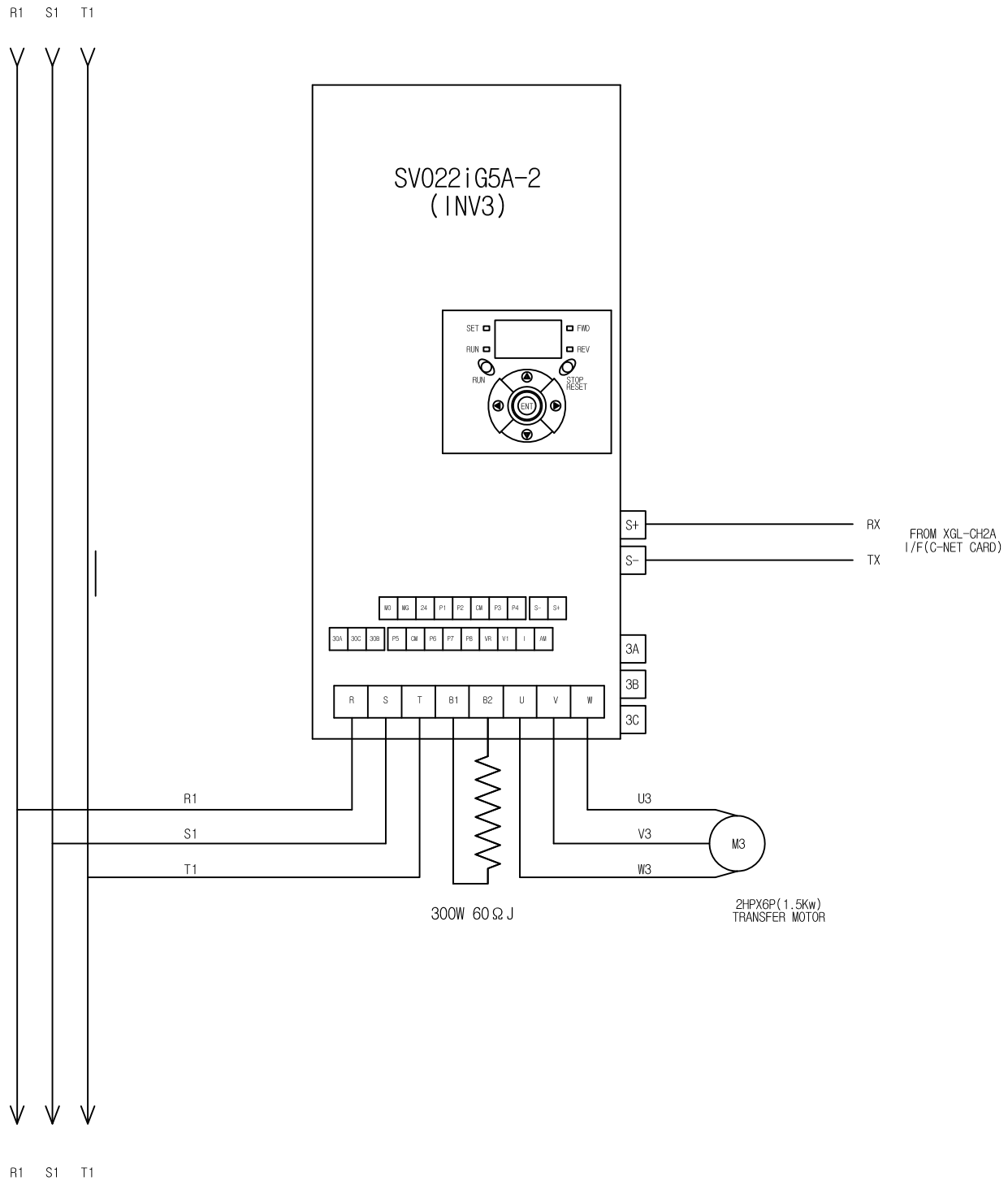


NO	PART NAME	MATERIAL	QTY	NOTE
DATE	20. JUNE. 2013		 K.N.Machine KYUNGNAM MACHINE COMPANY	
SCALE :		UNIT : m/m	MODEL	KN-1248-G3
DESIGNED	CHECKED	APPROVE	PART NO	INVERTER WIRING
			DRAW NO	INV2

Parameter Setting
BELL AC FREQUENCY DRIVE(SV075iG5A-2)

CODE	DESCRIPTION	SETTING RANGE	FACTORY DEFAULT
DRIVE GROUP			
ACC	Acceleration time	3	10
DEC	Deceleration time	0.5	20
drv	Drive mode	4	1
Frq	Frequency Mode(Freq.Setting Method)	7	0
FUNCTION GROUP 1			
F 21	Max frequency	1	60
F 24	Frequency high/low limit select	1	0
F 25	Frequency high limit	70	60
FUNCTION GROUP 2			
H 30	Motor type select	5.5	7.5
H 33	Motor rated current	13.8	26.3
H 36	Motor efficiency	86	87
H 41	Auto tuning	1	0
H 93	Parameter initialize -This parameter is used to initialize parameter back to the factory default value.	1	0
H 95	Parameter lock - UL(Unlock) - L(Lock)	12	0
INPUT/OUTPUT GROUP			
I 10	Frequency corresponding to I 9	70	60
I 60	Drive number	2	1
I 61	Baud Rate	4	3

TRANSFER FREQUENCY DRIVE



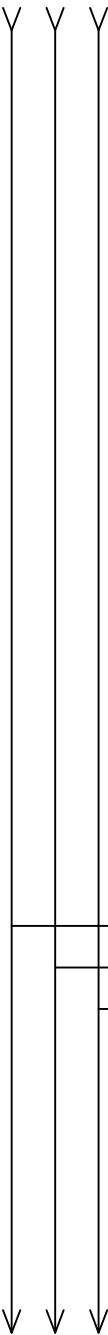
NO	PART NAME	MATERIAL	QTY	NOTE
DATE	20. JUNE. 2013	 K.N. Machine KYUNGNAM MACHINE COMPANY		
SCALE :	UNIT :	m/m	MODEL	KN-1248-G3
DESIGNED	CHECKED	APPROVE	PART NO	INVERTER WIRING
			DRAW NO	INVERTER 3

Parameter Setting
TRANSFER AC FREQUENCY DRIVE(SV022iG5A-2)

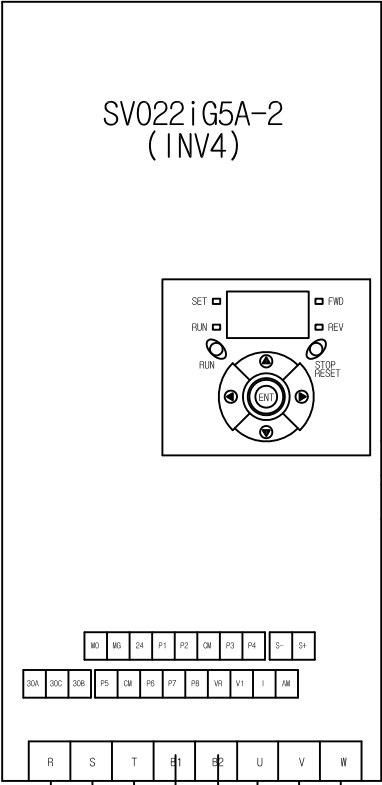
CODE	DESCRIPTION	SETTING RANGE	FACTORY DEFAULT
DRIVE GROUP			
ACC	Acceleration time	3	10
DEC	Deceleration time	0.5	20
drv	Drive mode	4	1
Frq	Frequency Mode(Freq.Setting Method)	7	0
FUNCTION GROUP 1			
F 21	Max frequency	1	60
F 24	Frequency high/low limit select	1	0
F 25	Frequency high limit	100	60
FUNCTION GROUP 2			
H 30	Motor type select	1.5	2.2
H 33	Motor rated current	8.8	26.3
H 36	Motor efficiency	83	87
H 41	Auto tuning	1	0
H 93	Parameter initialize -This parameter is used to initialize parameter back to the factory default value.	1	0
H 95	Parameter lock - UL(Unlock) - L(Lock)	12	0
INPUT/OUTPUT GROUP			
I 10	Frequency corresponding to I 9	100	60
I 60	Drive number	3	1
I 61	Baud Rate	4	3

POLE FREQUENCY DRIVE

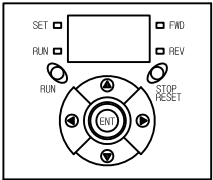
R1 S1 T1



R1 S1 T1



SV022iG5A-2
(INV4)

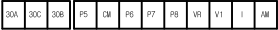


S+
S-

1/2W 120Ω

RX
TX

FROM XGL-CH2A
I/F(C-NET CARD)



R1

S1

T1

300W 60Ω J

U4

V4

W4



2HPX4P(1.5Kw)
POLE MOTOR

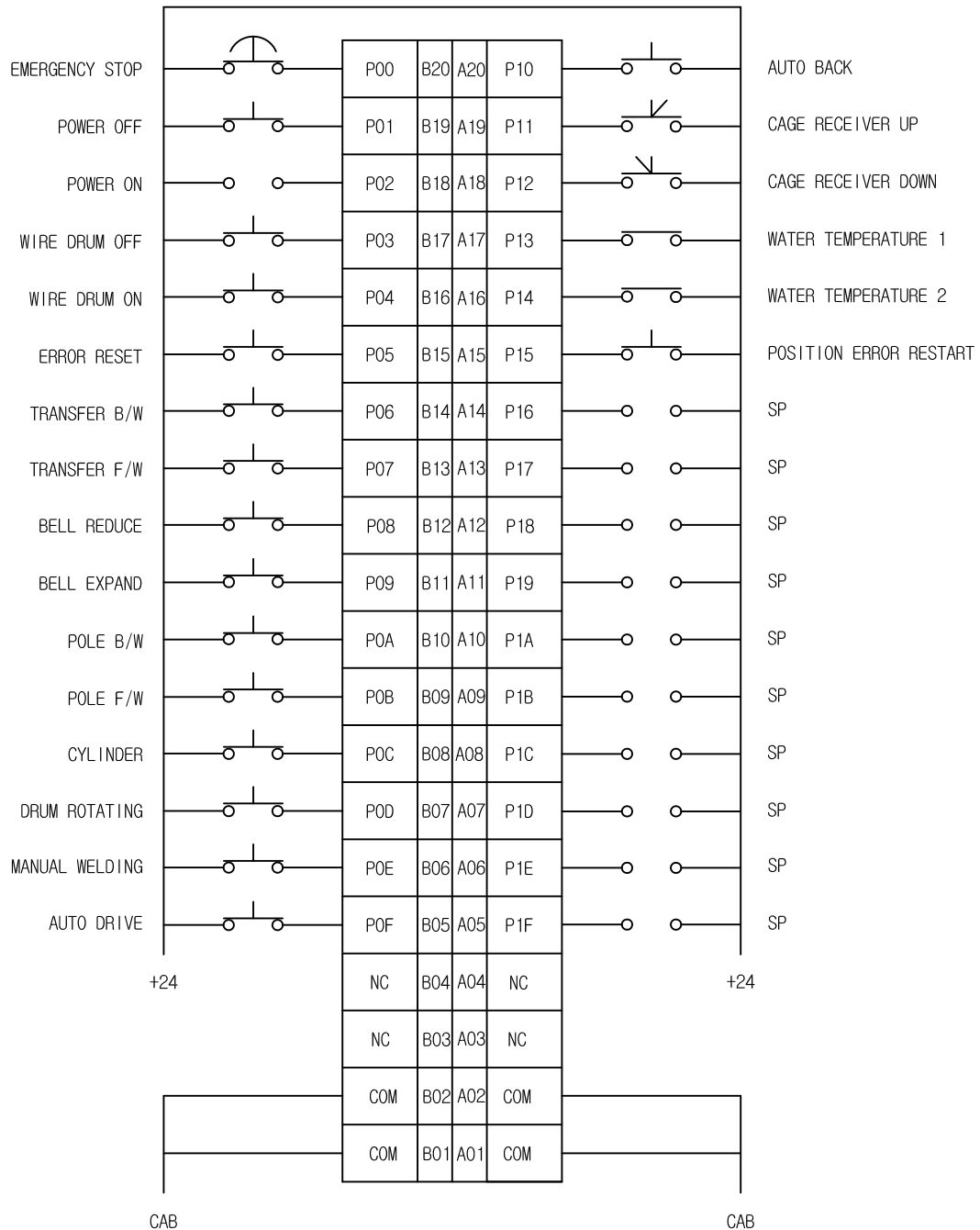
NO	PART NAME	MATERIAL	QTY	NOTE
DATE	20. JUNE. 2013	 K.N.Machine KYUNGNAM MACHINE COMPANY		
SCALE :	UNIT :	m/m	MODEL	KN-1248-G3
DESIGNED	CHECKED	APPROVED	PART NO	INVERTER WIRING
			DRAW NO	INVERTER 4

Parameter Setting
POLE AC FREQUENCY DRIVE(SV022iG5A-2)

CODE	DESCRIPTION	SETTING RANGE	FACTORY DEFAULT
DRIVE GROUP			
ACC	Acceleration time	3	10
DEC	Deceleration time	0.5	20
drv	Drive mode	4	1
Frq	Frequency Mode(Freq.Setting Method)	7	0
FUNCTION GROUP 1			
F 21	Max frequency	1	60
F 24	Frequency high/low limit select	1	0
F 25	Frequency high limit	70	60
FUNCTION GROUP 2			
H 30	Motor type select	1.5	2.2
H 33	Motor rated current	8.8	26.3
H 36	Motor efficiency	83	87
H 41	Auto tuning	1	0
H 93	Parameter initialize -This parameter is used to initialize parameter back to the factory default value.	1	0
H 95	Parameter lock - UL(Unlock) - L(Lock)	12	0
INPUT/OUTPUT GROUP			
I 10	Frequency corresponding to I 9	70	60
I 60	Drive number	4	1
I 61	Baud Rate	4	3

P.L.C INPUT LIST-1

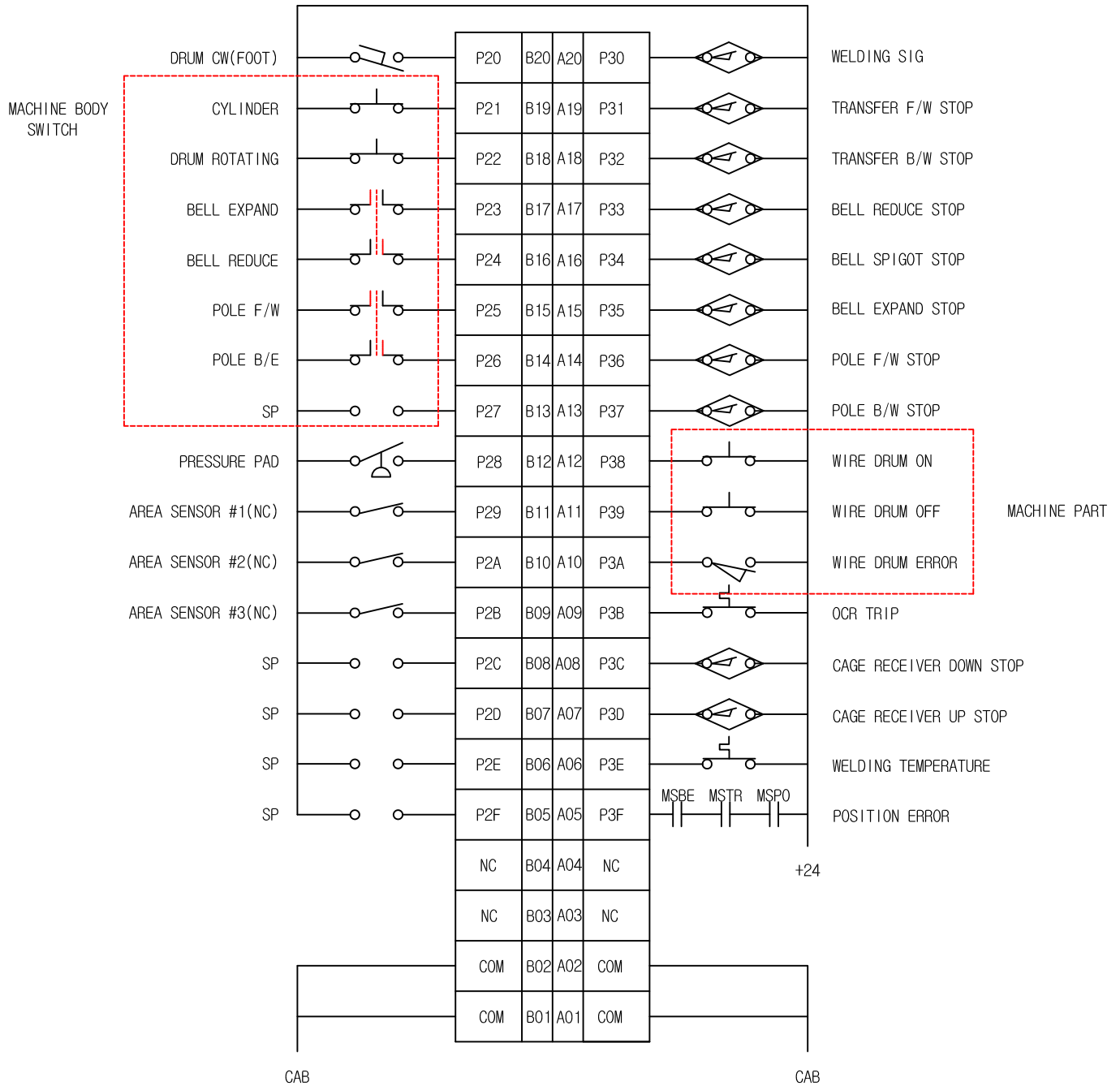
XG1-D24A
CABLE : C40HF-13PB-1
SLOT 1



NO	PAXT NAME	MATEXIAL	QTY	NOTE
DATE	20. JUNE. 2013	 K.N.Machine KYUNGNAM MACHINE COMPANY		
SCALE :	UNIT :	m/m	MODEL	KN-1248-G3
DESIGNED	CHECKED	APPROVE	PART NO	P.L.C INPUT LIST
			DRAW NO	INPUT 1

P.L.C INPUT LIST-2

XGI-D24A
CABLE : C40HF-20PB-1
SLOT 2

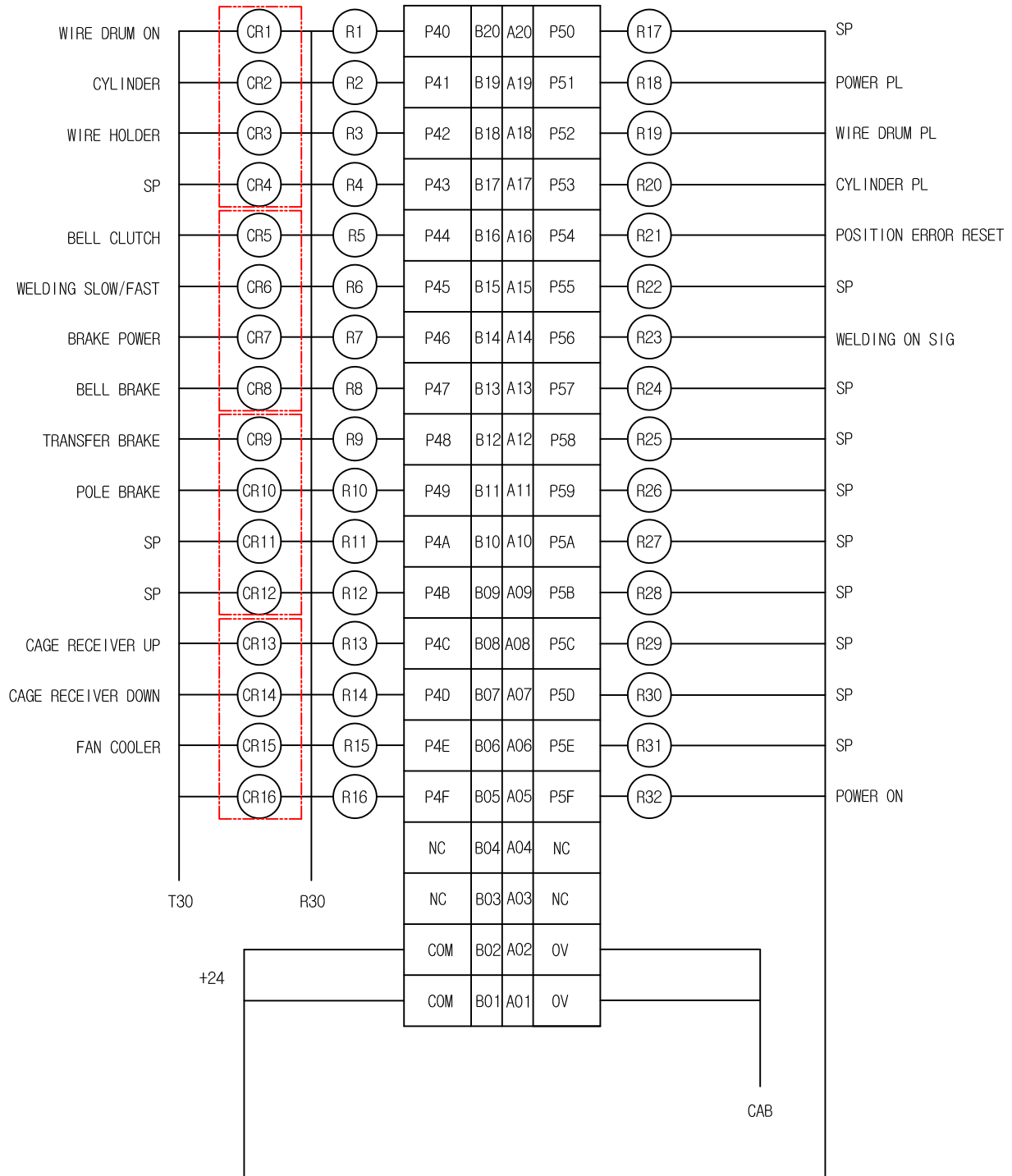


NO	PAXT NAME	MATEXIAL	QTY	NOTE
DATE	20. JUNE. 2013	 K.N.Machine KYUNGNAM MACHINE COMPANY		
SCALE :	UNIT :	m/m	MODEL	KN-1248-G3
DESIGNED	CHECKED	APPROVE	PART NO	P.L.C INPUT LIST
			DRAW NO	INPUT-2

P.L.C OUTPUT LIST

XGQ-TR4B(CABLE: C40HF-20PB-XGP1)

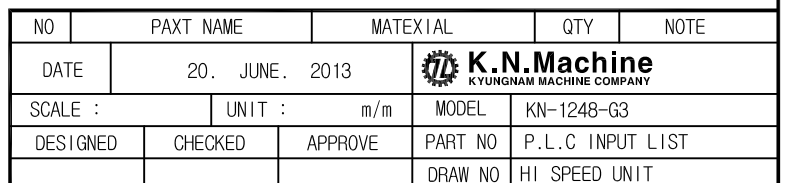
SLOT 1



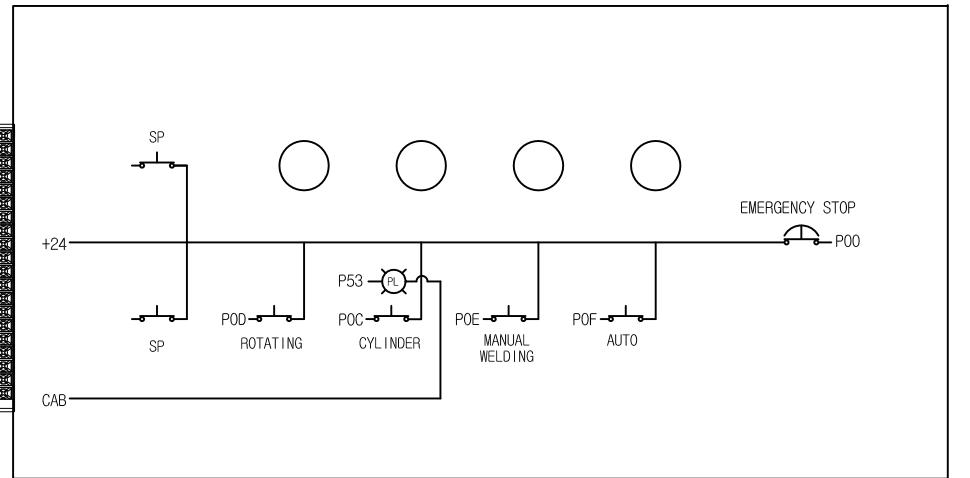
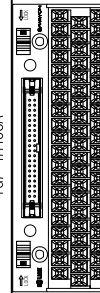
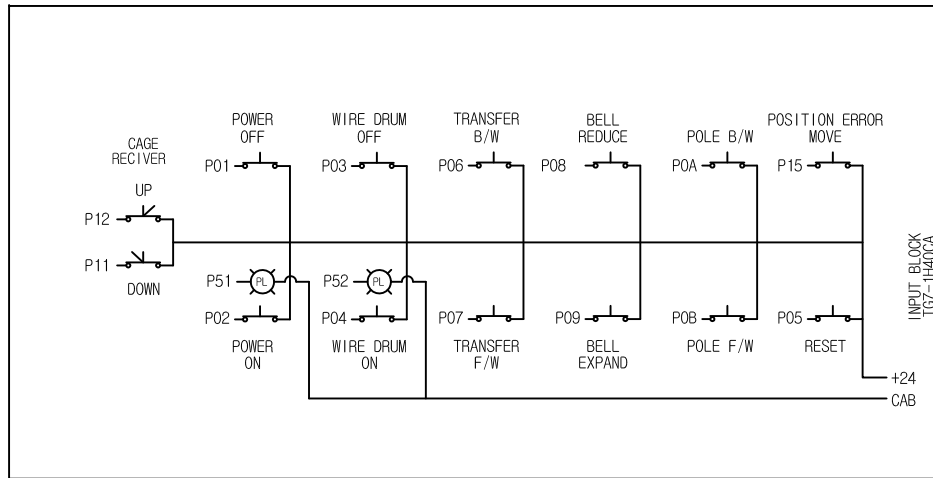
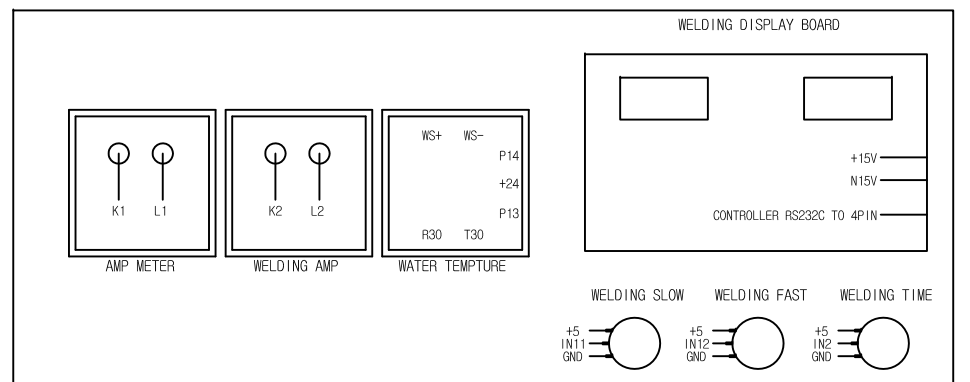
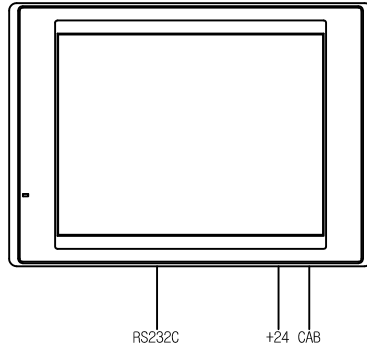
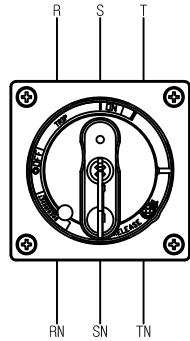
NO	PART NAME	MATERIAL	QTY	NOTE
DATE	20. JUNE. 2013	 K.N.Machine KYUNGNAM MACHINE COMPANY		
SCALE :	UNIT :	m/m	MODEL	KN-1248-G3
DESIGNED	CHECKED	APPROVE	PART NO	P.L.C INPUT LIST
			DRAW NO	OUTPUT

XGF-H08A
 SLOT 4
 CH0 = DRUM / CH1 = TRANSFER
 CH2 = BELL / CH3 = POLE

CH0 = DRUM / CH1 = TRANSFER
CH2 = BELL / CH3 = POLE



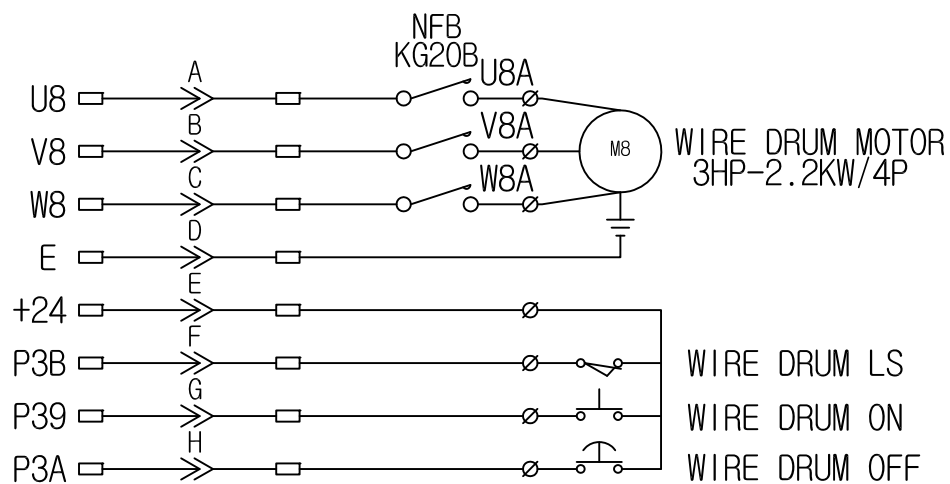
OPERATION PANEL BACK WIRING



NO	PART NAME	MATERIAL	QTY	NOTE
DATE	15. SEPTEMBER. 2013	 K.N.Machine KYUNGNAM MACHINE COMPANY		
SCALE :	UNIT :	m/m	MODEL	KN-1248-G3
DESIGNED	CHECKED	APPROVE	PART NO	ELECTRIC NOTE
			DRAW NO	OP-BACK

MS CONNECTOR CONNECTION DIAGRAM

MS CONNECTOR(22-23)CONTACT ARRANGEMENT



NO	PART NAME	MATERIAL	QTY	NOTE
DATE	20. JUNE. 2013	 K.N.Machine KYUNGNAM MACHINE COMPANY		
SCALE :	UNIT :	m/m	MODEL	KN-1248-G3
DESIGNED	CHECKED	APPROVE	PART NO	CONNECTOR
			DRAW NO	CONNECTOR

Autonics

TEMPERATURE CONTROLLER

TZN4M SERIES

M A N U A L



Thank you very much for selecting Autonics products.
For your safety, please read the following before using.

Caution for your safety

- ※Please keep these instructions and review them before using this unit.
- ※Please observe the cautions that follow;
 - Warning** Serious injury may result if instructions are not followed.
 - Caution** Product may be damaged, or injury may result if instructions are not followed.
- ※The following is an explanation of the symbols used in the operation manual.
 - caution:**Injury or danger may occur under special conditions.

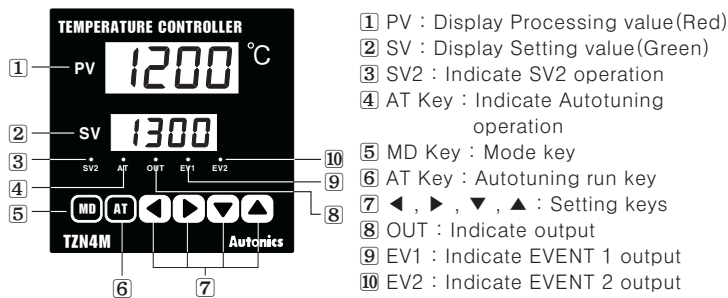
Warning

- In case of using this unit with machineries(Nuclear power control, medical equipment, vehicle, train, airplane, combustion apparatus, entertainment or safety device etc), it requires installing fail-safe device, or contact us for information on type required.**
It may result in serious damage, fire or human injury.
- This unit must be mounted on panel.**
It may give an electric shock.
- Do not connect terminals when it is power on.**
It may give an electric shock.
- Please check the number of terminal when connect power line or measuring input.**
It may cause a fire.
- Do not repair or checkup when power on.**
It may give an electric shock.

Caution

- This unit shall not be used outdoors.**
It might shorten the life cycle of the product or give an electric shock.
- When wire connection, No.20AWG(0.5mm²) should be used and screw bolt on terminal block with 0.74N・m to 0.90N・m strength.**
It may result in malfunction or fire due to contact failure.
- Please observe specification rating.**
It might shorten the life cycle of the product and cause a fire.
- Do not use the load beyond rated switching capacity of Relay contact.**
It may cause insulation failure, contact melt, contact failure, relay broken, fire etc.
- In cleaning the unit, do not use water or an oil-based detergent.**
It might cause an electric shock or fire that will result in damage to the product.
- Do not inflow dust or wire dregs into inside of this unit.**
It may cause a fire or mechanical trouble.
- Do not use this unit at place where there are flammable or explosive gas, humidity, direct ray of the sun, radiant heat, vibration, impact etc.**
It may cause a fire or explosion.
- Please check the polarity of power before connecting thermocouple sensor.**
It may cause a fire or explosion.

Front panel identification



※The above specification are changeable without notice anytime.

Ordering information

	TZN	4	M	—	1	4	R
	①	②	③		④	⑤	⑥
① Item	TZN	Temperature PID					
② Digit	4	4 Digit					
③ Size	M	DIN W72×H72mm					
④ Sub output	1	Event 1 output					
	2	Event 1+Event 2 output					
	R	Event 1+Retransmission output(PV:4~20mADC)					
	A	Event 1+Event 2+Retransmission output(PV:4~20mADC)					
⑤ Power supply	2	24VAC 50/60Hz, 24~48VDC					
	4	100~240VAC 50/60Hz					
	R	Relay output					
⑥ Control output	S	SSR output					
	C	Current output(4~20mADC)					

※All models has EV-1 output.

Specifications

Series	TZN4M	
Power supply	100~240VAC 50/60Hz	24VAC 50/60Hz, 24~48VDC
Allowable voltage range	90 to 110% of rated voltage	
Power consumption	Approx. 6VA	Approx. 8VA, Max. 7W
Display method	7Segment LED display [Processing value(PV):Red, Setting value(SV):Green]	
Input sensor	Thermocouple:K(CA), J(IC), R(PR), E(CR), T(CC), S(PP), N(NN), W(TT)(Tolerance line resistance is max. 100Ω)	
	RTD:DIN Pt100Ω, JIS Pt100Ω, 3 wires type (Tolerance of line resistance is max. 5Ω per a wire)	
	Voltage:1~5VDC, 0~10VDC, Current:4~20mADC	
Control method	ON/OFF Control P, PI, PD, PIDF, PIDS	
Control output	Relay contact output:250VAC 3A 1c	
	SSR output:12VDC ±3V Max. 30mA	
	Current output:4~20mADC(Load resistance:Max. 600Ω)	
Retransmission output	PV retransmission:4~20mADC(Load resistance:Max. 600Ω)	
Communication function	PV retransmission, SV setting	
Sub output	Event 1, 2 output:Relay contact output 250VAC 1A 1a	
Display accuracy	±0.3% based on F・S or 3℃ Max.	
Setting type	Setting by front push buttons	
Hysteresis	Adjustable 1 to 100(0.1 to 100.0)℃ at ON/OFF control	
Alarm output	Set interval between ON and OFF for alarm output from 1 to 100℃(Decimal type : 0.1 to 100.0℃)	
Proportional band(P)	0 to 100%	
Integral time(I)	0 to 3600sec.	
Derivative time(D)	0 to 3600sec.	
Control time(T)	1 to 120sec.	
Sampling time	0.5sec.	
LBA setting time	1 to 999sec.	
Ramp setting time	Ramp up, Ramp down at 1 to 99 minute	
Dielectric strength	2000VAC for 1 minute	
Vibration	Mechanical	0.75mm amplitude at frequency of 10 to 55Hz in each of X, Y, Z directions for 2 hours
	Malfunction	0.5mm amplitude at frequency of 10 to 55Hz in each of X, Y, Z directions for 10 minutes
Relay life cycle	Main output	Mechanical : Min.10,000,000 times Electrical : Min.100,000 times(250VAC 3A resistive load)
	Sub output	Mechanical : Min.20,000,000 times Electrical : Min.500,000 times(250VAC 1A resistive load)
Insulation resistance	Min. 100MΩ (at 500VDC)	
Noise strength	±2kV R Phase & S Phase 1μs	±500V R Phase & S Phase 1μs
Memory retention	10 years	
Ambient temperature	-10 to 50℃ (at non-freezing status)	
Storage temperature	-20 to 60℃ (at non-freezing status)	
Ambient humidity	35 to 85% RH	
Weight	Approx. 250g	
Approval	CE, RU, US	

Selection switch for Input sensor/ Voltage/Current

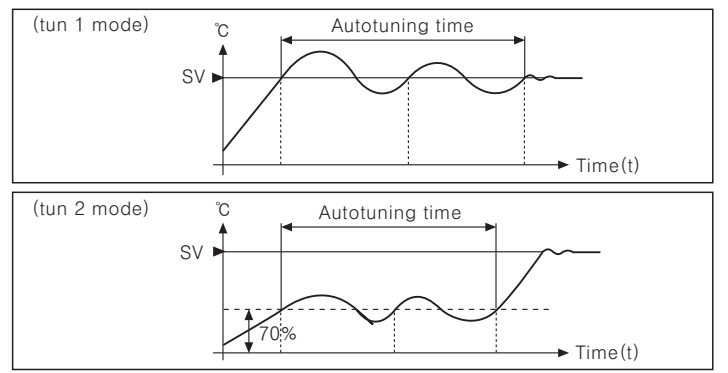
※Please select the S/W of this unit by sensors.		
A)In case of thermocouple input< K(CA), J(IC), R(PR), E(CR), T(CC), S(PR), N(NN), W(TT) > In case of RTD input< DPtL, DPtH, JPtL, JPtH >		
S/W1		S/W2
	1 1	A V
B)In case of voltage input< 1~5VDC, 0~10VDC >		
S/W1		S/W2
	2 2	A V
C)In case of current input< 4~20mADC >		
S/W1		S/W2
	2 2	A V

Input range for the sensor

Input sensor	Display	Selectable temperature range ℃	Selectable temperature range °F
K(CA)H	ECrH	-100 to 1300℃	-148 to 2372°F
K(CA)L	ECrL	-100.0 to 999.9℃	This mode can not use as °F
J(IC)H	JICrH	0 to 800℃	32 to 1472°F
J(IC)L	JICrL	0.0 to 800.0℃	This mode can not use as °F
R(PR)	r Pr	0 to 1700℃	32 to 3092°F
E(CR)H	ECrH	0 to 800℃	32 to 1472°F
E(CR)L	ECrL	0.0 to 800.0℃	This mode can not use as °F
T(CC)H	ECCH	-200 to 400℃	-328 to 752°F
T(CC)L	ECCL	-199.9 to 400.0℃	This mode can not use as °F
S(PR)	S Pr	0 to 1700℃	32 to 3092°F
N(NN)	n nn	0 to 1300℃	32 to 2372°F
W(TT)	U tL	0 to 2300℃	32 to 4172°F
JPtH	JPtH	0 to 500℃	32 to 932°F
JPtL	JPtL	-199.9 to 199.9℃	-199.9 to 392.0°F
DPtH	dPtH	0 to 500℃	32 to 932°F
DPtL	dPtL	-199.9 to 199.9℃	-199.9 to 392.0°F
0~10VDC	R--1	-1999 to 9999℃	-1999 to 9999°F
1~5VDC	R--2	-1999 to 9999℃	-1999 to 9999°F
4~20mADC	R--3	-1999 to 9999℃	-1999 to 9999°F

Autotuning operation

- PID Autotuning function automatically measures thermal characteristics and response of the control system and then executes its value under high response & stability after calculating the time constant of PID required to control optimum temperature.
- Execute the Autotuning function at initial time after connecting the controller & the sensor.
 - Execution of Autotuning is started when pressing AT key for 3sec. or more.
 - When the Autotuning is started, AT lamp will flicker, and when the lamp is OFF, this operation will stop.
 - While the Autotuning function is executing, it is stopped by pressing AT key for 5sec. or more.
 - When the power turns off or the stop signal is applied while Autotuning function is executing, time constant of PID is not changed and it remembers the value before power turns off.
 - Time constant of PID selected by Autotuning function can be changed in first setting group.
 - It has two kinds of Autotuning mode.
 - Autotuning operation is executed at setting value(SV) in Tun1 mode which is factory default.
 - Autotuning operation is executed at 70% of setting value(SV).
 - Mode change is available in second setting group.
 - Execute the Autotuning function again periodically, because the thermal characteristics for the control object can be changed when the controller is used continuously for a long time.

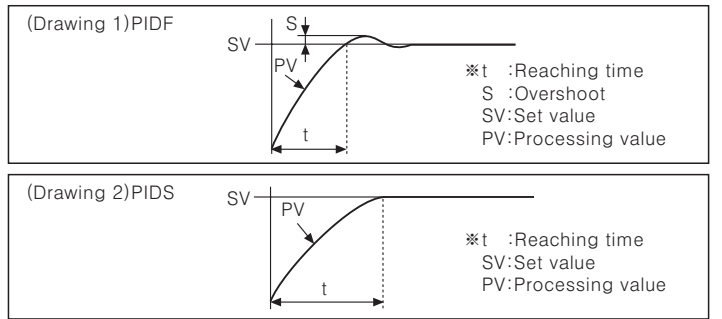


ON/OFF control

- ON/OFF control is called two position control because the output turns on when PV falls lower than SV and the output turns off when PV is higher than SV. This control method is not only for controlling temperature, but also it is basic control method for sequence control.
- If you set P value as "0.0" in first setting group, ON/OFF control will operate.
 - There is a programmable temperature difference between ON and OFF in ON/OFF control(Hysteresis width), if difference is too small, then hunting (chattering) can occur. Temperature difference can be set in **hys** position of first setting group. Setting range is 1 to 100℃ (or 0.1 to 100.0℃).
 - hys** is displayed when P value is "0", but **hys** will not be displayed, if P value is not "0".
 - This ON/OFF control should not be applied when equipment(Cooling compressor) to be controlled can be damaged by frequent ON and OFF.
 - Even if ON/OFF control is stable status, the hunting can be occurred by setting value in **hys** or capacity of the heater or response characteristic of the equipment to be controlled or installing position of the sensor. Please consider above points to minimize the hunting when designing the system.

Dual PID control function

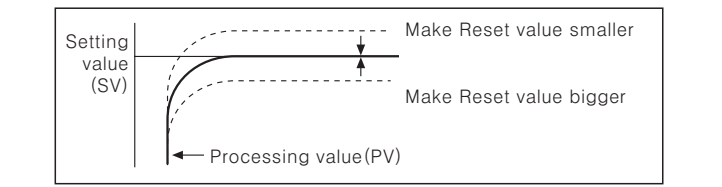
When controlling temperature, two types of control characteristic are available as below. One is when you need to minimize the time which PV reaches to SV as like(Drawing 1). The other is when you need to minimize overshoot even though the reaching(PV to SV) is slow(Drawing 2).



- There are high-speed response type and low-speed response type built in this unit. Therefore user can select each function according to their application.
- You can select dual PID control function in second setting group. It is selectable PIDF or PIDS in PIDt mode.
- PIDF(High-speed response type) : This mode is applied to machines or systems which require high-speed response.
Ex)Machines which must be applied preliminary heat before it operates
※Injection machine, an electric furnace, etc.
- PIDS(Low-speed response type) : This mode is applied at the machine which requires little overshoot.
Ex)Because a fire can be occur by overshoot of the temperature.
※Plating machine to control temperature, oiling system to control temperature of oil, etc.
- Factory specification is PIDS in TZN series.
According to control system, please select mode.

Manual reset

- Proportional control has deviation because rising time is not same as falling time, even if the unit operates normally.
- Manual reset function is used at proportional control(P) mode only.
 - If set **rESL** function in first setting group, the manual reset will run.
 - When PV and SV is equal, Reset value is 50% and when control is stable, if the temperature is lower than SV, reset value should be higher and on the other hand, reset value should be smaller.
 - rESL** setting method according to result of control



Control output

- There are 3 kinds of main output in this unit, such as relay output, SSR output, current(4~20mADC), but this unit has one main output only. Therefore please select one main output in ordering information according to your application.
- Relay output rated 250VAC 3A is indicated as "R"
 - SSR output rated 12VDC ±3V is indicated "S", the load of over 30mADC can not use.
 - Current output rated 4~20mADC is indicated as "C", resistive load can be used under 600Ω.
(Note)4~20mADC current output is different from 4~20mADC retransmission output.

Relay output

- Relay output is function for outputting ON/OFF for main control by using relay contact. It repeats ON/OFF the load in order to heat or cool continuously, in this case, driving magnet S/W or power relay(big capacity) with using relay contact of this unit.
- Do not excess contact capacity of relay to adjust in unit specification, when use relay contact output. If relay is damaged, it may cause a fire.
 - When it controls main relay or magnet switch with power relay contact, if flow reverse electromotive force from coil of power relay or magnet S/W into this unit, it may result in products damaged or output oscillated.
 - Life cycle of relay(electrical/mechanical) is indicated in specification. Please design the system after checking the life cycle of relay.
If set "t" longer in first setting group, the life cycle of relay is getting lower. If it needs to set control period "t" shorter due to thermal response is fast, SSR output type should be used.

■ Voltage pulse output(SSR)

Voltage pulse output is to control SSR unit installed in out of this unit.
Generally the capacity of relay contact is limited. If the capacity of relay is getting bigger, the life cycle will be shortened by noise or spark.

- SSR output is 12VDC and it can use max. 30mA for load.
- Response speed of SSR is faster than relay cause of using semiconductor, it can proceed high speed control.
If set "t" shorter(1 to 2sec.), it will be good condition to control the target.
- Radiation of semiconductor is very important in SSR.
Therefore it is likely use 80% of rated of SSR and if SSR is damaged, it may result in a fire.

■ **Current output(4-20mADC)**

This output, called analogue output is to control the transducer(SCR unit), it can proceed stable control because there is no a sudden change. It outputs 4–20mADC, manipulated value is 100% at 20mADC, 0% at 4mADC.

- It is used with transducer and can not be used as the other application.
- This output operates through inner separated a constant current—circuit. Therefore current output is not changed even if the resistive load is connected in outside, but if resistive load is too high(over 600Ω), the current can be changed. (Please use the resistive load less than 600Ω .)
- Do not use a current output in case of using ON/OFF control.
- When current output is used, it is changing as analogue form, the manipulated value can rarely be 100% or 0%. Therefore LBA function is not used.
- Front OUT lamp does not operates in case of using a current output.

■ Retransmission output(4-20mADC)

Retransmission output is different with current output of control output and to retransmit current (4 to 20mA DC) converting the measuring temperature to the recorder, PC, etc.

But this current output can not use at over 600Ω resistive load.

- Mode of retransmission output is selected at FS-H, FS-L in the second flow chart.
- When PV reach at value of FS-L, it output 4mA.
- When PV reach at value of FS-H, it output 20mA.
- 4 to 20mA DC is design as resolution of min. 16,000 divisions.

■ RS485 communication function

It is used on the purpose that transmitting PV to an external equipment, setting SV at the external equipment.

- It can be set at bps, Adrs in second setting group.
- bps setting : 2400, 4800, 9600(Start bit1, Stop bit1, Non parity)
- Adrs setting : 1 to 99
- Compatible PLC : LG, Mitsubishi, CIMON etc.

■ Decimal point(Dot) setting function

Decimal point is displayed as "dot" in second setting group when the input is only analog(0-10VDC, 1-5VDC, 4-20mADC).

■ Cool/Heat function

Generally there are two ways to control temperature, one(Heat-function) is to heat when PV is getting down(Heater). The other(Cool-function) is to cool when PV is getting high(Refrigerator).

These functions are operating oppositely when it is ON/OFF control or proportional control.

But in this case PID time constant will be different due to PID time constant will be decided according to control system when it is PID control.

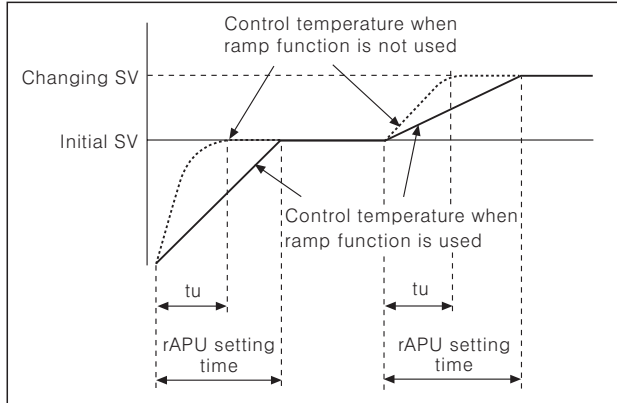
- Cool-function and heat-function can be set at "**a-FL**" mode in second setting group.
- Cool-function and heat-function must be set correctly according to the application, if set as opposite function, it may cause a fire.
(If set cool-function at heater, even if temperature is getting high, it will be maintained ON and it may cause a fire.)
- Avoid changing heat-function to cool-function or cool-function to heat-function on the unit is operating.
- It is impossible to operate both functions at once in this unit.
Therefore one function should be selected only.

■ Ramp function

Ramp function is to delay the rising time or falling time of temperature. If you change setting value at stable state of control, it forces to rise or fall the temperature of control system during setting time at rAPU, rAPd in first setting group. **If rAmP is not ON in second setting group, rAPU, rAPd will not be displayed in first setting group.**

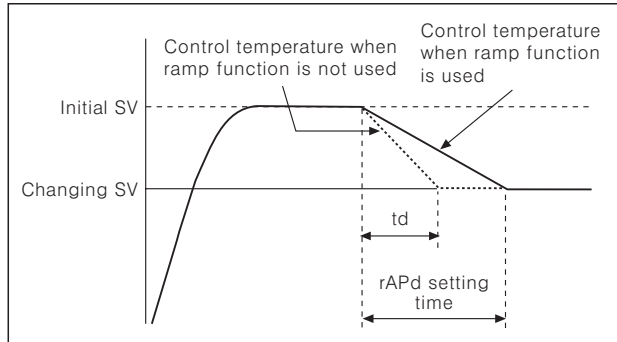
- **Set rAmP is ON in second setting group for using Ramp function.**
- Set the falling time and rising time in rAPU and rAPU mode of first setting group.
- Ramp function will be operating when changing the set value at stable control status or supply the power again after the power was removed.

※rAPU function(Delay of rising time)



It makes delay rising temperature when change the set value at stable control status or delay the initial rising temperature as above picture.
Note1)rAPu time cannot be set shorter than temperature rising time(tu), when Ramp function is not used.

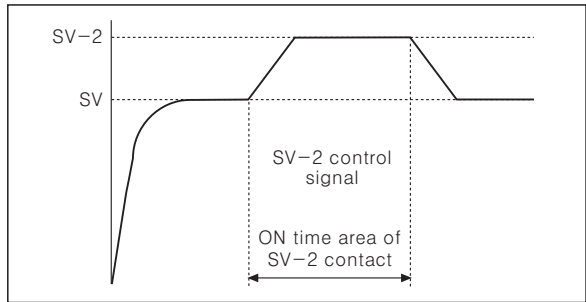
※rAPd function(Delay of falling time)



It controls falling temperature as above.
Note1)rAPd time cannot be shorter than falling time(td) of not being ramp function operated.

■ SV-2 function

If using SV-2 function, it changes the temperature of control system to the second setting value by external relay contact signal. It can change the setting value as sequentially by relay contact without key operation.



- It can set SV-2 at required time and particular area as the above chart.
- SV-2 is in first setting group.
- Application :
The control system, which has to maintain constant temperature such as oven application. If you open the door, temperature will go down. In this case if you set the second setting value higher than setting value, temperature will rise fast. Therefore, after installing a micro-switch in order to detect the door Open/Close and connect it to SV-2(the second setting value should be higher than SV) then it controls temperature of oven efficiently.

■ Input correction(ln-b) function

Input revise is to correct deviation occurred from temperature sensor such as thermocouples, RTD, Analogue sensor etc.

If you check the deviation of every thermo sensor precisely, it can measure temperature accurately.

- Input revise can be set at "First setting group".
- Use this mode after measuring deviation occurred from temperature sensor exactly. Because if measured deviation value is not corrected, displayed temperature may be too high or too low.
- Setting range of input revise is -49 to $+50^{\circ}\text{C}$ (-50.0 to $+50.0^{\circ}\text{C}$).
- When you set the input revise value, you may need to record it, because it will be useful when performing maintenance.

■ Sub output(Event) function

- Sub output can execute as main control output and sub function as well.
- There is one sub output in this unit.
 - This sub output is relay "A" contact output.
 - 1 or 2 sub mode can be selected among 7 kinds of alarm mode or LBA operated when the heater line is cut, SBA operated when the sensor line is cut.
 - The sub output can be latched on or automatically reset depending on the alarm option mode selected.
 - When the sensor line or the heater line is cut, SBA or LBA output turns on. This "output on" status must be reset by turning the power off.
 - **When using Alarm output it is able to change interval between ON and OFF within range of 1 to 100℃ (0.1 to 100.0℃).**
 Ex) When alarm set temperature is 200℃, the output turns on when PV increases from 100℃ to 200℃. In the case, the output turns on at over 200℃, the output turns off at 198℃.
[Above Ex) is that it set the interval between ON and OFF as 2℃.]
 - Select function of Sub output in second setting group and set value of operation in first setting group.

Alarm output

This unit has output for control and sub(Alarm) output by option. (This alarm output is relay output and operates regardless to output for control.)

- Alarm output operates when the temperature of target is getting higher or lower than setting value.
- 1 alarm mode can be selected among 7 kinds of alarm mode at EV1, EV2 in the second setting group.
- Please note below "Operation chart for alarm output" & "Option of alarm output" regard to detailed operation and optional operation.

■ Operation chart for alarm output

AL-0		No alarm output
AL-1	OFF ON SV 100°C PV 110°C * When set 10°C in AL 1 (AL 2) as deviation temperature.	■ Deviation High—limit alarm If deviation between PV and SV is occurring higher than deviation temperature setting value, the output will be ON. The deviation temperature is set in AL 1 or AL 2 of first setting group.
AL-2	ON OFF PV 90°C SV 100°C * When set 10°C in AL 1 (AL 2) as deviation temperature.	■ Deviation Low—limit alarm If deviation between PV and SV is occurring lower than deviation temperature setting value, the output will be ON. The deviation temperature is set in AL 1 or AL 2 of first setting group.
AL-3	ON OFF ON PV 90°C SV 100°C PV 110°C * When set 10°C in AL 1 (AL 2) as deviation temperature.	■ Deviation High/Low—limit alarm If deviation between PV and SV is higher or lower than deviation temperature setting value, the output will be ON. The deviation temperature is set in AL 1 or AL 2 of first setting group.
AL-4	OFF ON OFF PV 90°C SV 100°C PV 110°C * When set 10°C in AL 1 (AL 2) as deviation temperature.	■ Deviation High/Low—limit reverse alarm. If deviation between PV and SV is higher or lower than deviation temperature setting value, the output will be OFF. The deviation temperature is set in AL 1 or AL 2 of first setting group.
AL-5	OFF ON SV 100°C PV 110°C * When set 110°C in AL 1 (AL 2) as alarm temperature.	■ The absolute value High—limit alarm If PV is equal or higher than alarm temperature setting value, the output will be ON. The deviation temperature is set in AL 1 or AL 2 of first setting group.
AL-6	ON OFF PV 90°C SV 100°C * When set 90°C in AL 1 (AL 2) as alarm temperature.	■ The absolute value Low—limit alarm If PV is equal or lower than alarm temperature setting value, the output will be ON. The alarm temperature is set in AL 1 or AL 2 of first setting group.

※ "b" is interval between ON and OFF the setting range is 1 to 100℃ (0.1 to 100.0℃) and can be set at "RHYS" mode in first setting group.

■ Alarm option setting

Symbol	Operation name	Function
<i>AL - a</i>	General alarm	No optional alarm output.
<i>AL - b</i>	Latch function	When alarm output turns on once, the output will be ON continuously.
<i>AL - c</i>	Standby sequency function	It doesn't output at first operation. (When it reaches to first object value)
<i>AL - d</i>	Latch & Standby sequency function	It operates latch & Standby sequence function together.

■ Loop break alarm(LBA)

LBA function is to diagnose an abnormal temperature of the control system.

If the temperature of the control system is not changed within $\pm 2^{\circ}\text{C}$ during setting time of LBA, the LBA output will be ON.

Ex) When setting value(SV) is 300°C , processing value(PV) is 50°C , this unit controls 100%. In this time if there is no change of system temperature, it recognizes Heater is cut off then LBA output will be ON.

- LBA output can be selected at EV-1, EV-2 of the second setting group.
- If LBA output is not selected at event output, it will not be displayed.
- Setting range of LBA output is 1 to 999sec.
- If thermal response of the control system is slow, LBA value should be set to a high value.
- LBA output only operates when the manipulated value of the controller is 0% and 100% so, LBA cannot be used when it is Current output.
- In case the LBA function is ON, please check the following :
 - ① Short-circuit or cutting of the temp. sensor.
 - ② Abnormal condition of the equipment (Conductor, sub-relay, etc.)
 - ③ Abnormal condition of the load (Heater, cooler)
 - ④ Wrong-wiring or cutting of the other cables.
- Once LBA is ON due to broken sensor, it will not output. Although connect sensor again.

In this case, turn off the power then turn on again.

- The output of LBA function is EV-1 and EV-2 output.
- If you use LBA function, SBA and alarm operation function cannot be used.

☐ **Sensor break alarm(SBA)**

This function causes the sub output to turn on when the sensor line is cut or open.

It can easily check that the sensor line is cut or not by operating a buzzer using the relay contact.

- Set SBA mode at EV-1 or EV-2 mode in second setting group.
- If intend to use SBA function, LBA and alarm operation function cannot be used.
- The output of SBA function is EV 1 and EV 2 output.

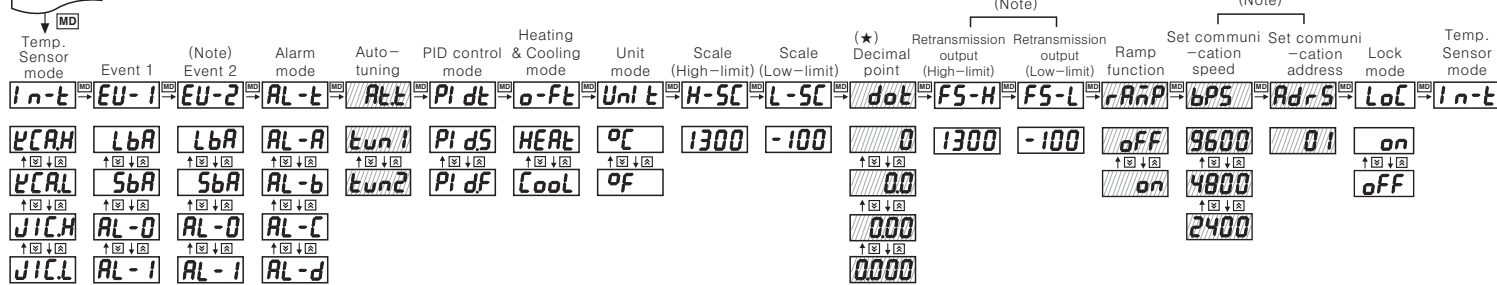
■ Error display

If error is occurred while the controller is operating, it will be displayed as follow.

- "LLLL" is flickering when measured input temperature is lower than input range of the sensor.
- "HHHH" is flickering when measured input temperature is higher than input range of the sensor.
- "oPEn" is flickering when the input sensor is not connected or its wire is cut.

■ **Flow chart for second setting group**

(MD) + ↑ Key If press **(MD)** & **(↑)** key for 3sec. at once in RUN state, it will go to second setting group.



IN-t	Input sensor : Select from 19 kinds.	dot	Select decimal point position for Analog input.
EU-1	Event 1 : Select from 9 kinds.	FS-H	Set the high-limit scale value when retransmission output is applied. (20mA)
EU-2	Event 2 : Select from 9 kinds.		
AL-t	Alarm output : Select from 4 kinds.	FS-L	Set the low-limit scale value when retransmission output is applied. (4mA)
At.t	Auto-tuning : Selectable tun1 or tun2.		
PIDt	PID : Selectable PIDF or PIDS.	rRnP	Able to set ON and OFF of Ramp function.
o-ft	Selectable heat-function or cool-function.	bPS	Set communication speed
Unl t	Temperature unit: °C or °F	AddrS	Set communication address
H-SC	Set high-limit scale value(Include analog output)	LoC	The data cannot be changed when the lock key is ON.
L-SC	Set low-limit scale value(Include analog output)		

After that if press **MD** key, the DATA will be changed then display next mode

*The setting will be completed by pressing **MD** key for 3 sec. then it will return to RUN mode.

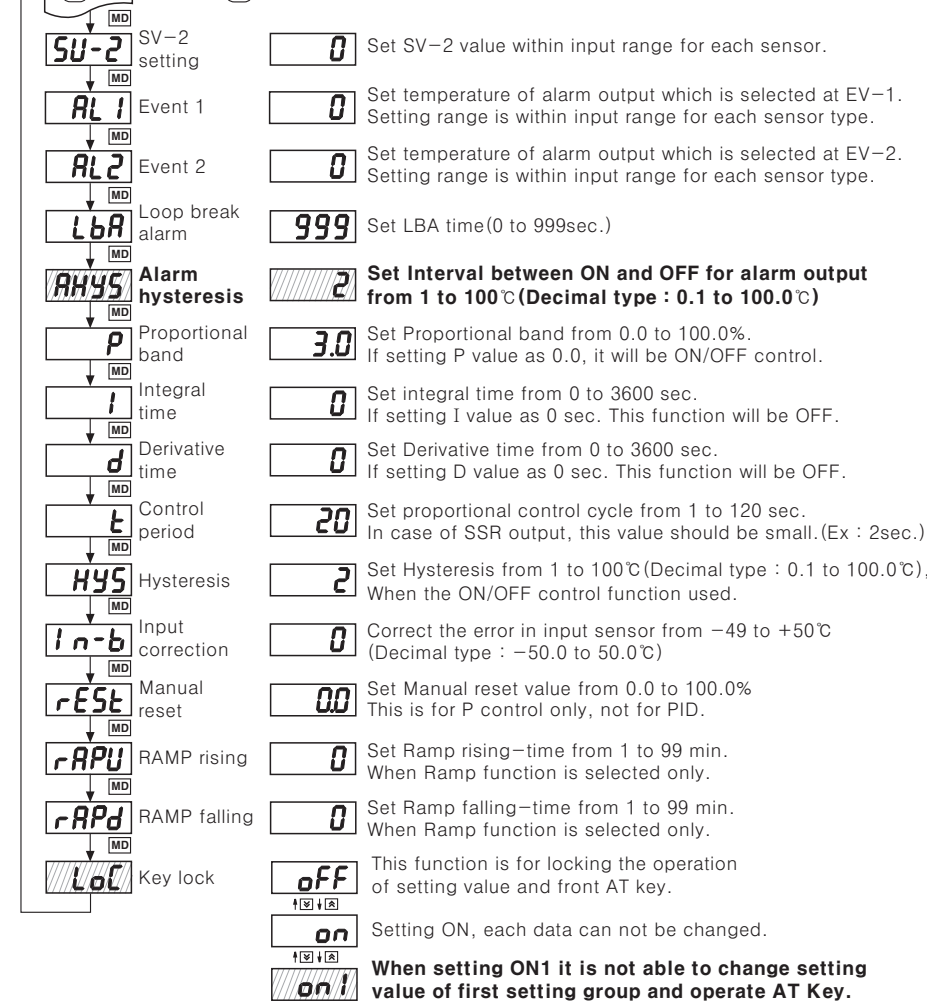
*If no key touched for 60sec. in each mode, it will return to RUN mode automatically.

※(★) might not be displayed according to the selection of input Sensor/Voltage/Current S/W.

※ " (Note) " might not be displayed according to the selection of option.

■ **Flow chart for first setting group**

→ **(MD) Key** If press **(MD)** key for 3sec. This mode changes to second flow chart.



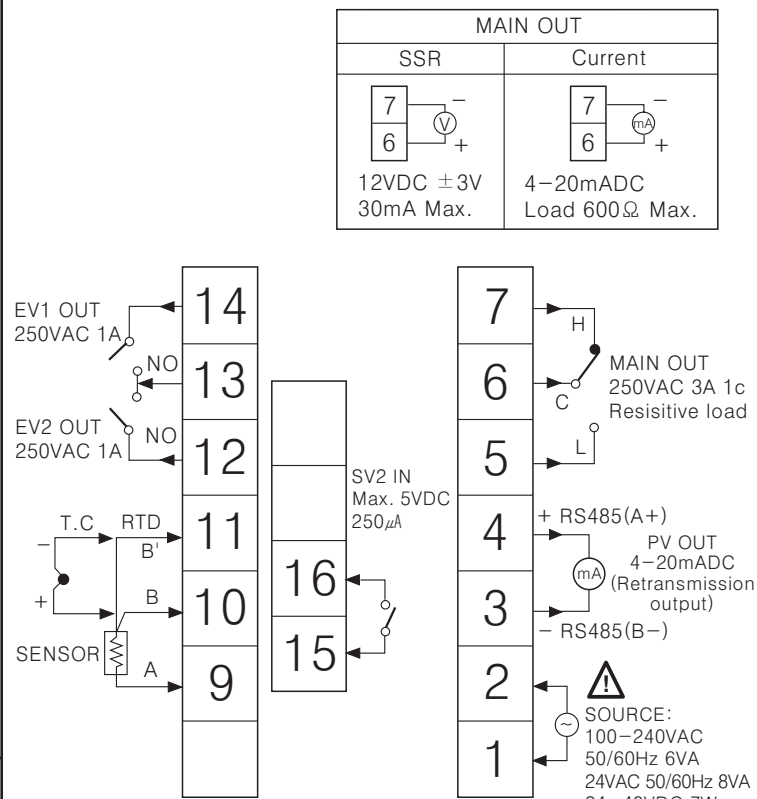
※ It will start to flicker by pressing « key and the flicker will be moved by «, » keys then set the value by ▲, ▼ keys. After that if pressing **MD** key the DATA will be changed then display next mode.

※It returns to RUN status in case of pressing **MD**

key for 3sec. after setting all mode to change.
 ※If no key touched for 60sec., it will return to RUN mode automatically.

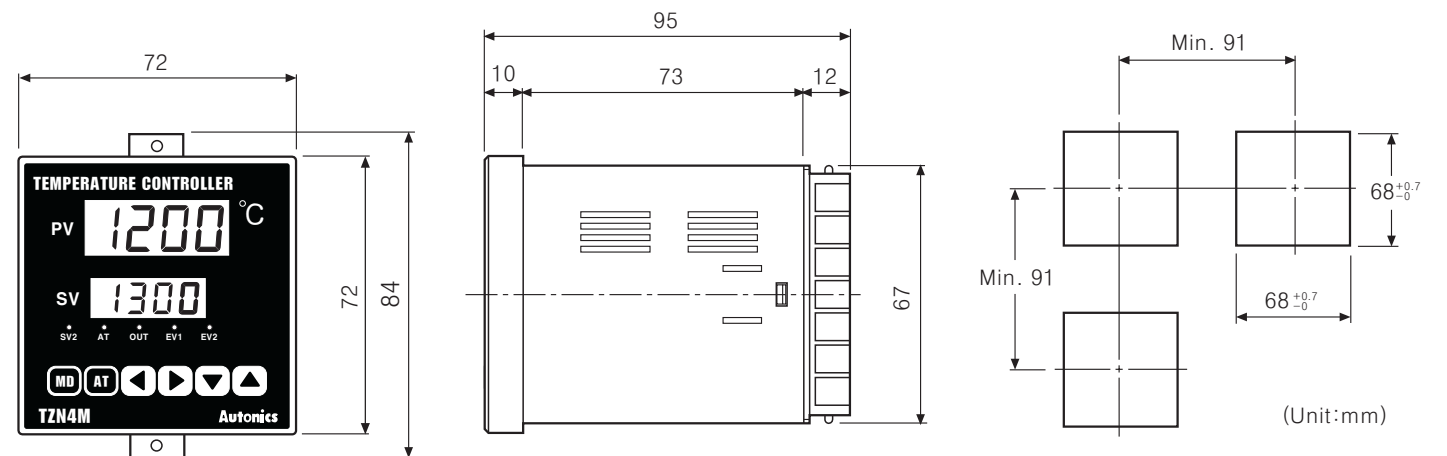
※If not to set related mode in second setting group,
AL I, AL2, LbA, RHYS, I, d, t, HYS, rAPU, rAPd mode
will disappear.

■ Connections



※Before connecting the power, please see the "■ Ordering information" of power supply categories by all means.

■ Dimensions



■ How to change the set value

① In case of changing the set value at status of RUN, press key.

10⁰ digit will flash at SV.



② Press  key, and then the flicker will be shifted step by step.



③ Press  or  at the flicker digit, and then change the set value.

④ Press **MD** key when the setting is completed. It will stop flickering, then return to RUN mode.

■ Factory defaults

●Second setting group

Mode	Set value	Mode	Set value
<i>In-t</i>	<i>PCRH</i>	<i>PIdt</i>	<i>PIdS</i>
<i>EU-1</i>	<i>AL-1</i>	<i>o-Ft</i>	<i>HEAt</i>
<i>EU-2</i>	<i>AL-2</i>	<i>Unit</i>	<i>°C</i>
<i>AL-t</i>	<i>AL-A</i>	<i>H-SC</i>	<i>1300</i>
<i>At-t</i>	<i>tun1</i>	<i>L-SC</i>	<i>-100</i>
<i>rAnP</i>	<i>oFF</i>	<i>LoC</i>	<i>oFF</i>

●First setting group

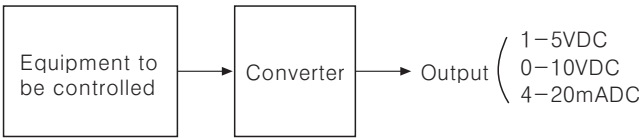
Mode	Set value	Mode	Set value
<i>SU-2</i>	<i>0</i>	<i>t</i>	<i>20</i>
<i>AL1</i>	<i>10</i>	<i>HYS</i>	<i>2</i>
<i>AL2</i>	<i>10</i>	<i>In-b</i>	<i>0</i>
<i>LbA</i>	<i>600</i>	<i>rEst</i>	<i>0.0</i>
<i>AHYS</i>	<i>2</i>	<i>rAPU</i>	<i>10</i>
<i>P</i>	<i>3.0</i>	<i>rAPd</i>	<i>10</i>
<i>l</i>	<i>0</i>	<i>LoC</i>	<i>oFF</i>
<i>d</i>	<i>0</i>		

■ Applications

Food	Packaging machinery, Banding machinery
Plastic	Plastic machinery, Film making system, etc.
Industry	Electric furnace, Auto soldering machine, Drying machine, etc.□
Textile□	Body press, Sizing machine

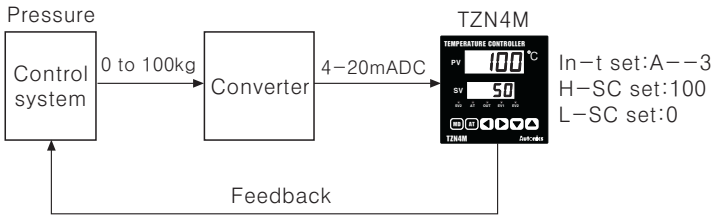
■ Analog input

In case of measuring or controlling humidity & pressure, flux, etc, it uses the proper converter which is converting the measuring value to 4-20mADC or 1-5VDC or 0-10VDC.



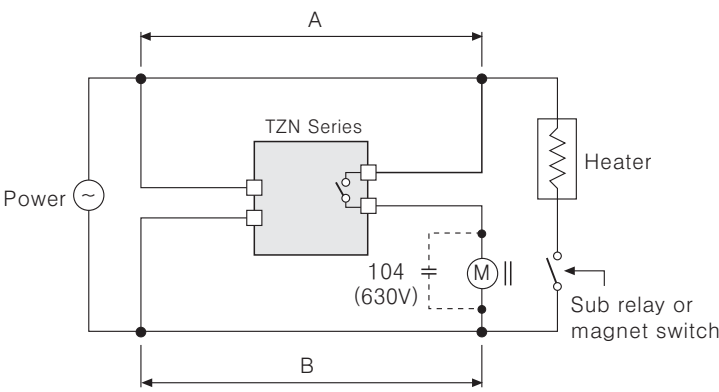
- This unit has the mode for the converter built-in. Please select A--1(0-10VDC) or A--2(1-5VDC) or A--3(4-20mADC) in selection mode of input in second setting group.
- Set the input value by H-SC and L-SC mode.
- The other operation function after doing that is same as controlling the temperature.

●Applications



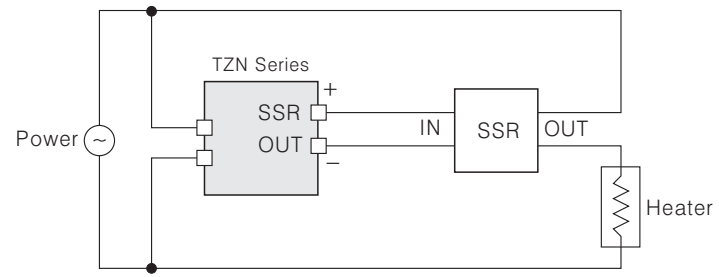
※In case of using the converter mode, please select the inner switching pin according to the chart in "Selection switch for Input sensor/Voltage/Current".

■ Application of relay output type



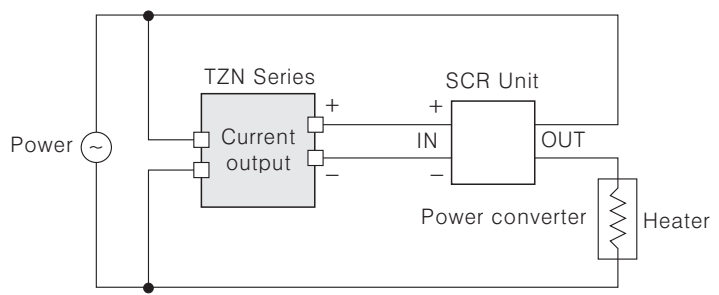
- Caution for wiring.
 1. Keep power relay as far away as possible from TZN series. If wires length of A or B part is short, electromotive force occurred from a coil of magnet switch & power relay may flow in power line of the unit, it may cause malfunction.
 2. If wires length of A or B part is short, please connect a condenser 104(630V) across coil "M" of the power relay to protect electromotive force.

■ Application of SSR output type



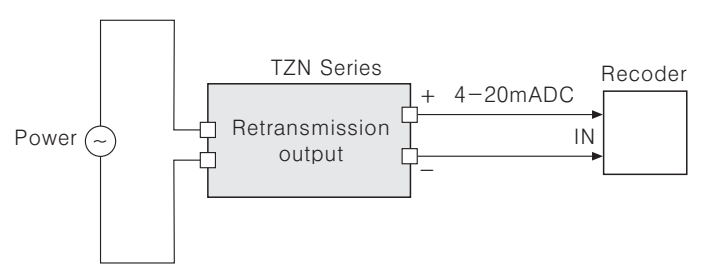
- Caution for using SSR
 1. SSR should be selected by the capacity of load, otherwise, it may short-circuit and result in a fire.
 2. Indirect heated should be used with SSR for efficient working.

■ Application of current output (4 to 20mADC)



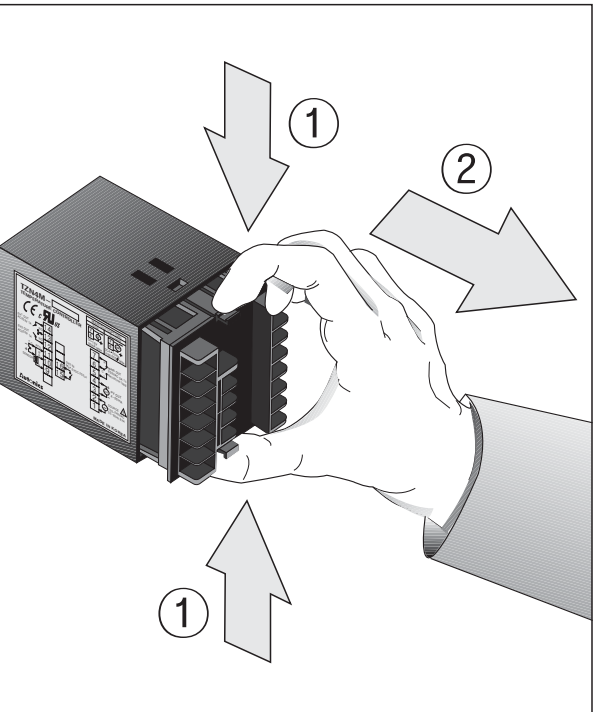
- It is important to select SCR unit after checking the capacity of the load.
- If the capacity is exceeded, it may cause a fire.

■ Application of Retransmission output (4 to 20mADC)



■ Case detachment

※Please cut power off before case detechment.



※Case detachment : Pull the handle backward after press both side of it on terminal block.

■ Simple "error" diagnosis

1. When it displays "Open" during operation.

This is a warning that external sensor is cut off. Please turn off power and check the state of sensor. If sensor is not cut off, disconnect sensor line from terminal block and +, - together. When you turn on power it can check room temperature. If this unit cannot indicate room temperature, this unit itself is faulty. Please remove this unit from equipment and service or replace. [When input mode is sensor input mode(thermocouple) only, it can indicate room temperature.]

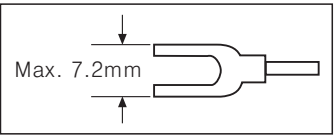
2. In case of not operating the output(the heater).

Please check operation of the Out lamp located in front panel of the unit. If lamp does not operate, please check the parameter of all programmed mode. If lamp is operating, please check the output(relay, operating voltage for SSR, current output) after separating output line from the unit.

3. In case of indicating "Err0" in display.

This Error message is indicated in case of damaging inner chip program data by outer strong noise. In this case, please send the unit to our after service center after removing the unit from system. Noise protection is designed in this unit, but it does not stand up strong noise continuously. If bigger noise than specified(Max. 2kV) flows in the unit, it can be damaged.

■ Caution for using

1. Installation environment
 - ①It shall be used indoor
 - ②Altitude Max. 2000m
 - ③Pollution Degree 2
 - ④Installation Category II.
2. Please use the terminal(M3.5, Max. 7.2mm) when connect the AC power source.
3. Please use separated line from high voltage line or power line in order to avoid inductive noise.
4. Please install power switch or circuit-breaker in order to cut power supply off.
5. The switch or circuit-breaker should be installed near by users.
6. Do not use this product as Volt-meter or Ampere-meter, this is a temperature controller.
7. Be sure to use compensating wire when extending wire from controller to thermocouple, otherwise a temperature deviation will occur at the point where wires are connected to each other.
8. In case of using RTD sensor, 3wires type must be used. If you need to extend the line, 3wires must be used with the same resistance as the line. It might cause the deviation of temperature if the resistance of line is different.
9. In case of making power line and input signal line close, line filter for noise protection should be installed at power line and input signal line should be shielded.
10. Keep away from the high frequency instruments. (High frequency welding machine & sewing machine, big capacitive SCR controller)
11. If you want to change the input sensor, reset switches (SW1, SW2) according to each input specification after power off. Turn on power and then set sensor mode by front keys at second flow chart.
12. In case of changing input sensor, after change it according to SW1, SW2 inside of the unit, select changed sensor with key operation when power on.
13. Do not connect power line to terminals No. 9, 10, 11, 12, 13, 14(Terminal No. 9, 10, 11 : Sensor connection, Terminal No. 12, 13, 14 : EV-1, EV-2).

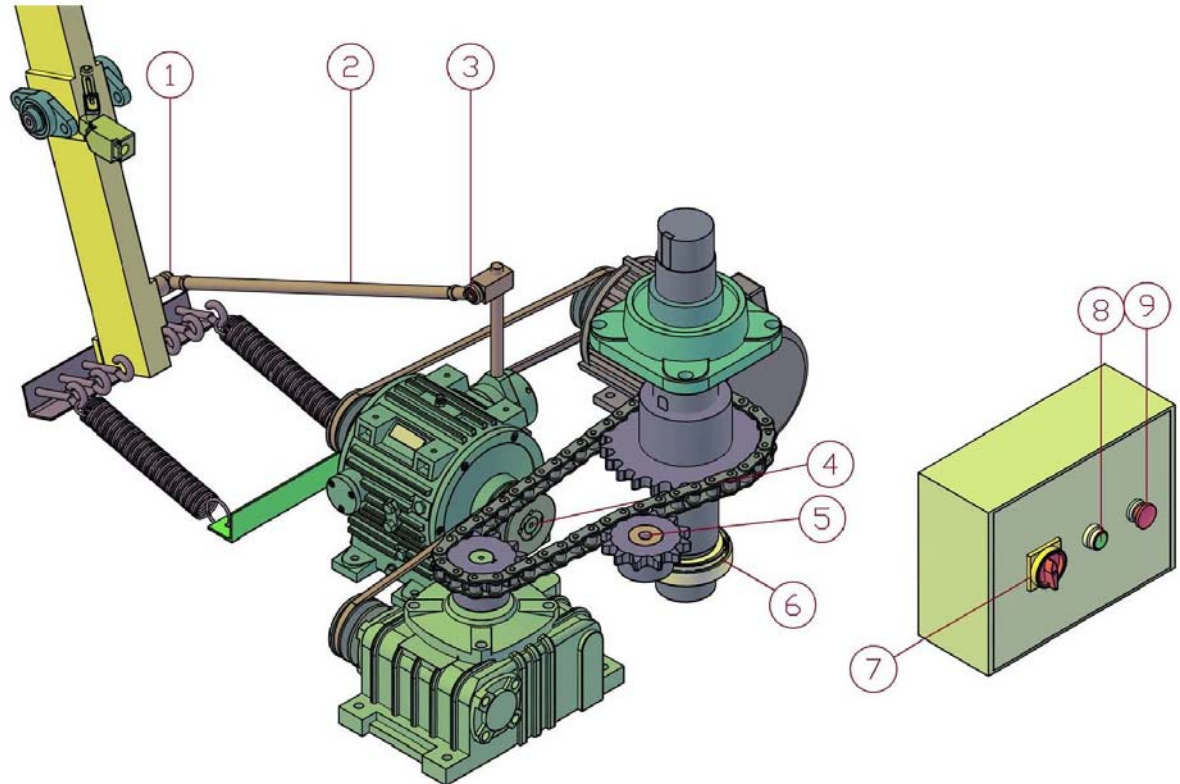
※It may cause malfunction if above instructions are not followed.

■ Main products

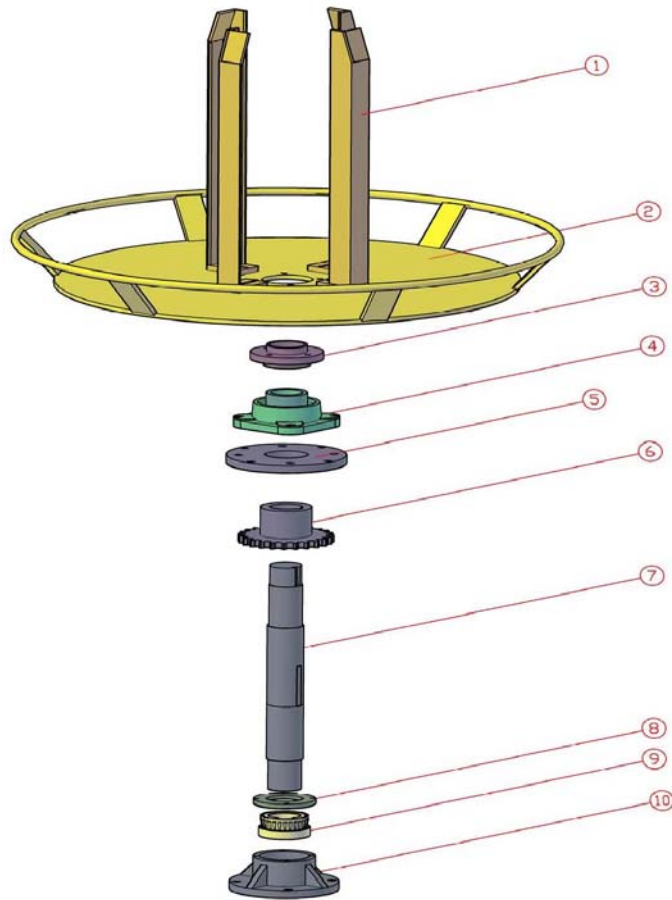
- COUNTER
- TIMER
- TEMPERATURE CONTROLLER
- PANEL METER
- TACHO/LINE SPEED/ PULSE METER
- DISPLAY UNIT
- PROXIMITY SENSOR
- PHOTOELECTRIC SENSOR
- FIBER OPTIC SENSOR
- PRESSURE SENSOR
- ROTARY ENCODER
- SENSOR CONTROLLER
- POWER CONTROLLER
- STEPPING MOTOR & DRIVER & CONTROLLER
- LASER MARKING SYSTEM (CO₂, Nd:YAG)

Autonics Corporation
<http://www.autonics.com>
Satisfiable Partner For Factory Automation
■HEADQUARTERS :
41-5, Yongdang-ri, Ungsang-eup, Yangsan-si, Gyeongnam,
626-847, Korea
■INTERNATIONAL SALES :
Bldg. 402 3rd Fl., Bucheon Techno Park, 193, Yakdae-dong,
Wonmi-gu, Bucheon-si, Gyeonggi-do, 420-734, Korea
TEL:82-32-329-0722 / FAX:82-32-329-0728
■E-mail : sales@autonics.net





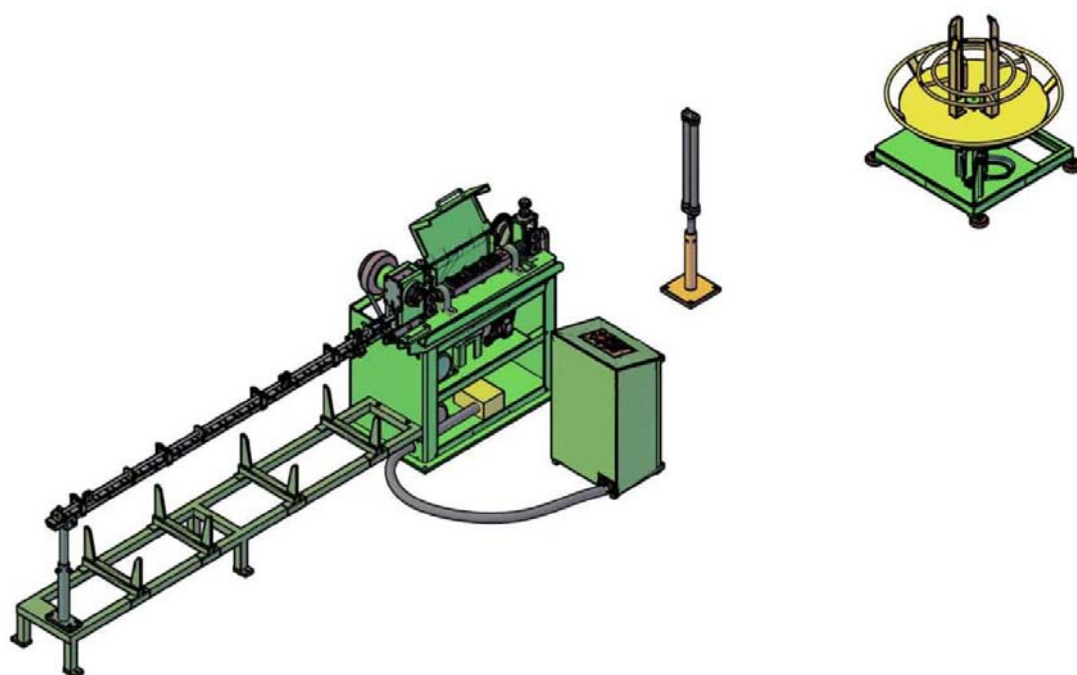
N0	PART NUMBER	PART NAME	REMARK
1	KN-AS-24	LOAD END(PHS14R)	1
2	KN-AS-21	SPEED CONTROL ROD	1
3	KN-AS-24	LOAD END(PHS14L)	1
4	KN-AS-12A	BELT PULLEY(B-5"-Ø28)	1
5		BEARING(6304)	2
6	KN-AS-18	BEARING(E32018J)	1
7	KN-AS-28	POWER SWITCH(KG20B)	1
8	KN-AS-30	PUSH BUTTON S/W(KBL-30MP-L2A)	1
9	KN-AS-29	EMERGENCY STOP S/W(KPB30-ER)	1
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			



N0	PART NUMBER	PART NAME	REMARK
1		WIRE RACK	4
2	KN-AS-16	TABLE PLATE	1
3		TABLE PLATE LOCKER	
4	KN-AS-04	BEARING(UCF218)	1
5		UCF218 BEARING COVER	1
6	KN-AS-05	CHAIN GEAR(RS100-24T-Ø98)	1
7		SHAFT	1
8		BEARING COVER	
9	KN-AS-18	BEARING(E32018J)	1
10	KN-AS-15	SHAFT HOUSING	1
11			
12			
13			
14			
15			
16			
17			
18			
19			

MANUAL OF WIRE CUTTING MACHINE

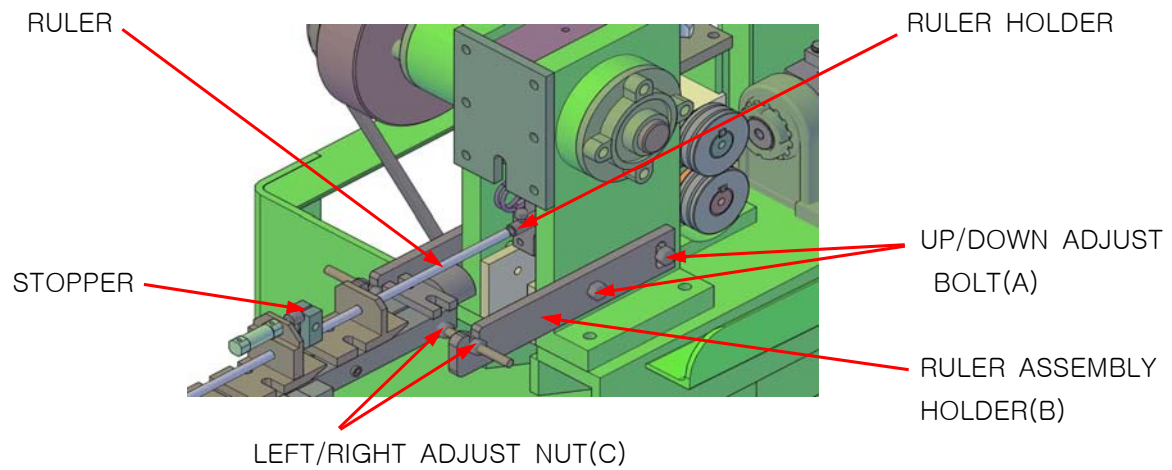
MODEL : KN-2CT



CONTENTS

1. ARRANGEMENT OF RULER AND HOLDER
2. STOPPER ADJUSTMENT
3. SPRING TENSIONING
4. CUTTING LENGTH SET-UP
5. CUTTING TABLE ADJUSTMENT
6. PRECONDITION FOR OPERATION
7. BALANCE ROTORS ADJUSTMENT
8. CUTTING P.X SWITCH ADJUSTMENT
9. SAFETY P.X FOR COVER
10. WIRE CUT OFF INSIDE BALANCE ROTORS
11. LUBRICANT
12. TURN TABLE ADJUSTMENT
13. ELECTRIC WIRE DIAGRAM

1. ARRANGEMENT OF RULER AND HOLDER

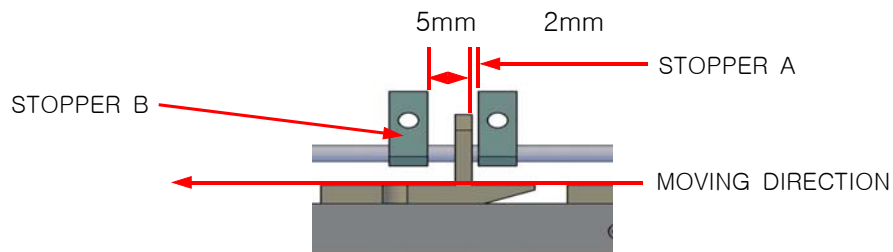


- WHEN THE TIME OF ASSEMBLING CUTTING TABLE, A RULER SHOULD BE CENTERED AGAINST HOLE OF RULER HOLDER.
- HEIGHT ADJUSTMENT : LOOSEN BOTH BOLTS(A) FOR UP/DOWN BY A HAMMER
- LEFT/RIGHT ADJUSTMENT : MOVE CUTTING TABLE LEFT OR RIGHT BY NUTS(C)
- RULER SHOULD BE CENTERED ON HOLE OF RULER HOLDER SMOOTHLY AFTER THEN TIGHTEN FIXING BOLT OF RULER HOLDER.

2. STOPPER ADJUSTMENT



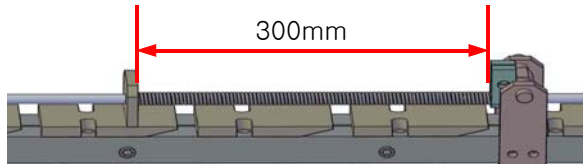
- TURNS CUTTING WHEEL TO BE POSITIONED HAMMER LOWER THAN CUTTING BLADE.
- AT THE TIME OF HAMMER DOWNED, PUSH A RULER TOWARD MOVING DIRECTION UNTIL TOUCH CUTTING BLADE.



- FIX STOPPER(A) 2mm GAP WITH A CALIBRATOR FOR RULER BACKWARD.
- FIX STOPPER(B) 5mm GAP WITH A CALIBRATOR FOR RULER FORWARD.

3. SPRING TENSIONING

- APPROX. 300mm SPRING TENSIONING IS RECOMMENDED.
- IF SPRING TENSION IS TOO MUCH CUTTING IS NOT PERFECT AND CUTTING LENGTH IS DIFFERENT.
- IF SPRING TENSION TOO WEAK, A RULER RETURNS SLOWLY, SO WIRE IS CUT TWICE.



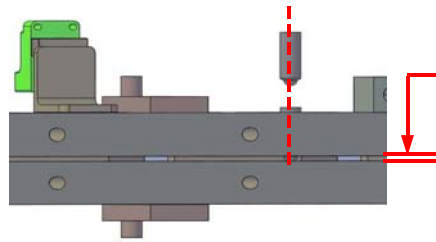
※ Spring can be used in case of damaged air cylinder.

4. CUTTING LENGTH SET-UP

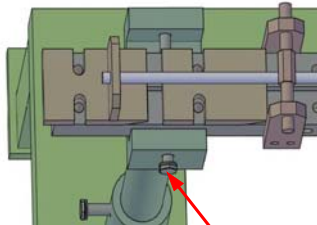


- FIX CUTTING STOPPER AS DESIRED CUTTING LENGTH. MEASURES FROM END OF CUTTING HAMMER(FIG-A) TO FRONT OF CUTTING STOPPER(FIG-B)

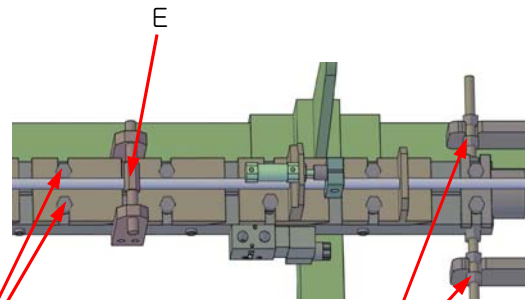
5. CUTTING TABLE ADJUSTMENT



- CUTTING TABLE GAP SHOULD BE 1~1.5mm BIGGER THAN WIRE DIAMETER TO BE CUT.



A

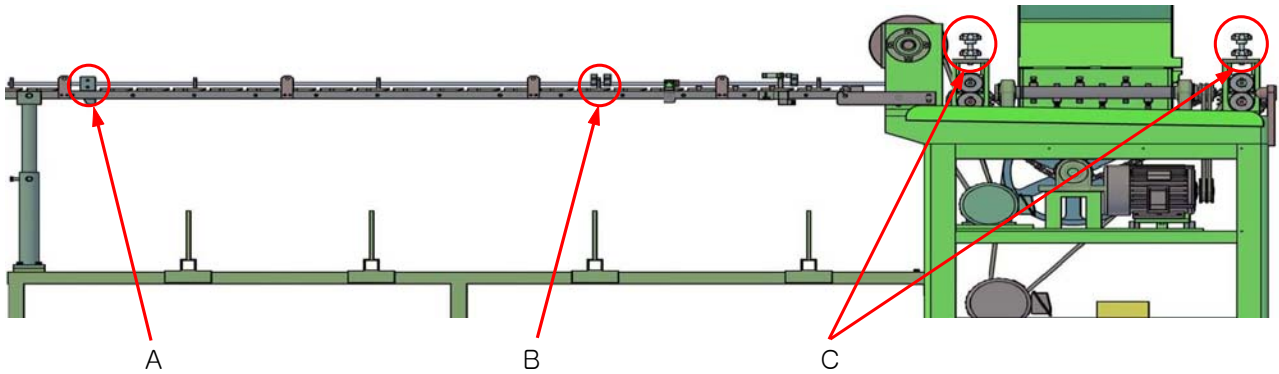


B

C

- FOR SETTING TABLE GAP, LOOSE BOLTS OF A AND C FIRST, AND LOOSE BOLT B AND ADJUST GAP BY TURNING NUT(E) TABLE GAP WIDER 1.5mm THAN WIRE DIAMETER TO BE CUT AND TIGHTEN BOLTS AGAIN.
- 4~5 PIECES OR WIRES CUT AND HOLD INSIDE OF TABLE BY BEARINGS. AND PUSH DOWN ONE BY ONE PIECE. IF FEW WIRES DOWN, GIVE MORE BEARING TENSION BY NUT D.
- IN ORDER TO PUSH DOWN A WIRE SMOOTHLY, LESS BEARING TENSION FRONT 3 NUTS D AND OTHERS SHOULD BE MORE TENSIONING THAN FRONT 3 NUT.

6. PRECONDITION FOR OPERATION

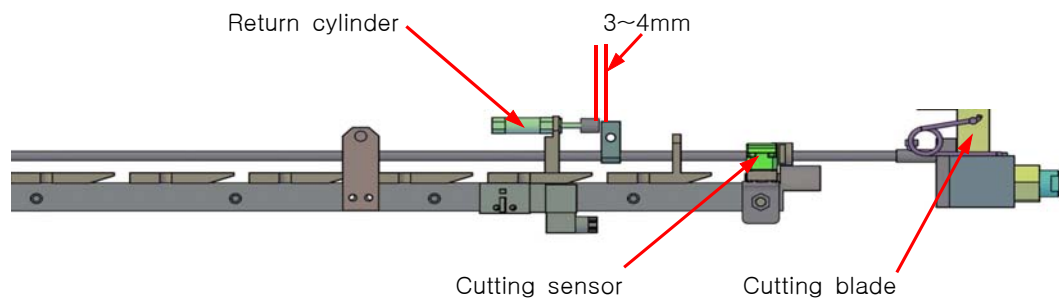


- MAIN POWER "ON" AND PANEL SWITCH "ON"
- OPERATION SWITCH "MANUAL" MODE
- CUT MOTOR "ON" AND TRANSFER F/W "ON"
- PUSH A WIRE INSIDE FEEDING ROLLERS BY A FOOT SWITCH
- CHECK THE WIRE CUT STRAIGHT OR NOT. IF WIRE IS CURVED, ADJUST BALANCE ROTORS MORE ZIG-ZAG (REFER TO CONTENT 13)
- MEASURE CUT LENGTH AND ADJUST CUTTING STOPPER(#1) EXACTLY
- IF CUT WIRE TWICE, ADJUST CUTTING STOPPER(#2) FRONT 2mm BACK SIDE 5mm. ALSO ADJUST SPRINGS FEED ROLLERS BECAUSE ROLLERS SHOULD BE SLIPPED LITTLE BIT IN THE TIME OF CUTTING.
- IF CUTTING LENGTH IS NOT EXACTLY SAME, IT MEANS STRONG TENSION OF FEED ROLLERS. IT SHOULD BE LESS TENSION.
- IF BALANCE ROTORS ARE TOO MUCH ZIG-ZAG, WIRE MIGHT BE CUT INSIDE OF ROTORS. IF ROTORS ARE LESS ZIG-ZAG, WIRE MIGHT BE CURBED.
- IF WIRES ARE CUT STRAIGHT AND EXACT LENGTH 3 OR 4 PCS. KEEPING FOOT SWITCH AND SELECT "AUTO" AND RELEASE FOOT SWITCH.
- CUTTING TIMER IS SET AT 8 SECONDS, SO MACHINE SHUT OFF AUTOMATICALLY IF WIRE IS NOT CUT WITHIN 8 SECONDS

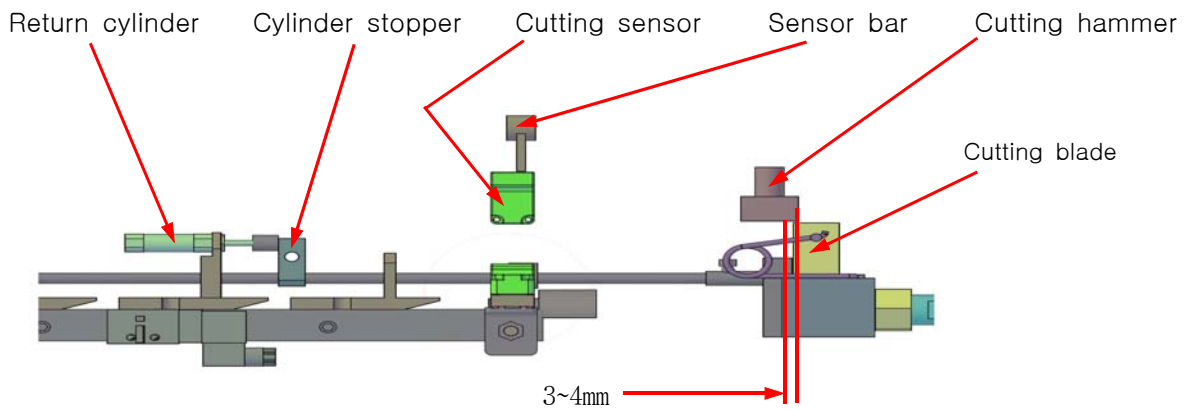
- ※ IF WIRE JUMP OUT FROM THE CUTTING TABLE, MACHINE SHUT OFF AFTER 8 SECONDS
- ※ IF WIRE CUT INSIDE OF BALANCE ROTORS AND IDLE RUNNING, MACHINE SHUT OFF AFTER 8 SECONDS AUTOMATICALLY.
- ※ INCASE OF SHORT LENGTH OF WIRE REMAINED(LAST TIME OF SPOOL). STOP MACHINE AND TAKE OFF A WIRE BY PUSH TRANSFER B/W BUTTON

- IN CASE OF STOPPING, CUT WIRES 3~4 PCS.
MANUALLY AND TURN AUTO FOR SMOOTH TURNING WIRE SPOOL.
- EVERY DAY, LUBRICANT TO ALL OIL CAPS OF MOVING PARTS
- IF OPEN THE COVER, TRANSFER MOTOR AND BALANCE ROTORS SHOULD BE STOPPED AUTOMATICALLY FOR SAFETY.
- FOR CUTTING WIRE MORE THAN 6mm DIAMETER, CUTTING TABLE SHOULD BE CHANGED, AND CHANGE CUTTING HAMMER AND BALANCE ROTORS IN BIGGER SIZES.
- IN CASE OF STOPPING WIRE TRANSFER, TURN TABLE STOP, IMMEDIATELY BY AIR CYLINDER BRAKE AND RELEASED 2 SECONDS LATER, IN ORDER TO PREVENT WIRE SPOOL TURNS TOO MUCH.
- ADJUST BRAKE PAD BY A KNOB TO SUPPLY A WIRE SMOOTHLY TO THE CUTTING MACHINE, NOT LOOSE OR NOT TIGHT WHICH AFFECT IMPROPER CUTTING.

CYLINDER & CUTTING PROXIMITY ADJUSTMENT

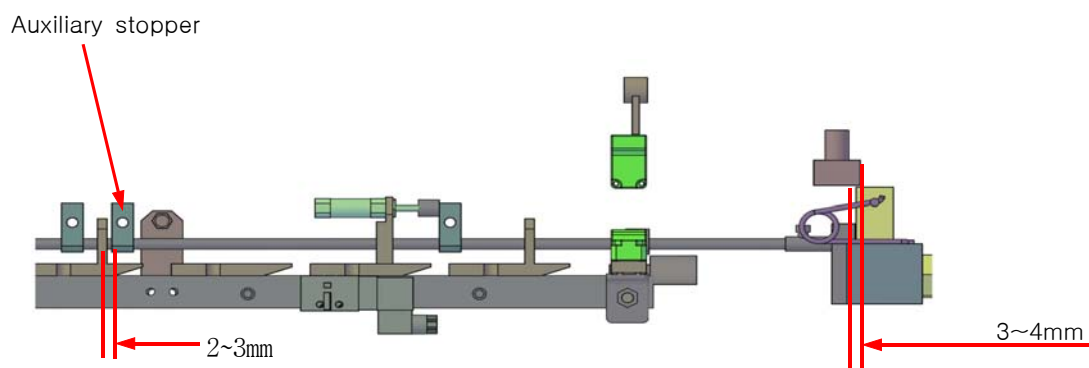


1. Push down cutting hammer, draw cutting blade to touch cutting hammer, and push in cylinder to be 3~4mm gap, and tighten bolts.
--- loose spring tin backside.

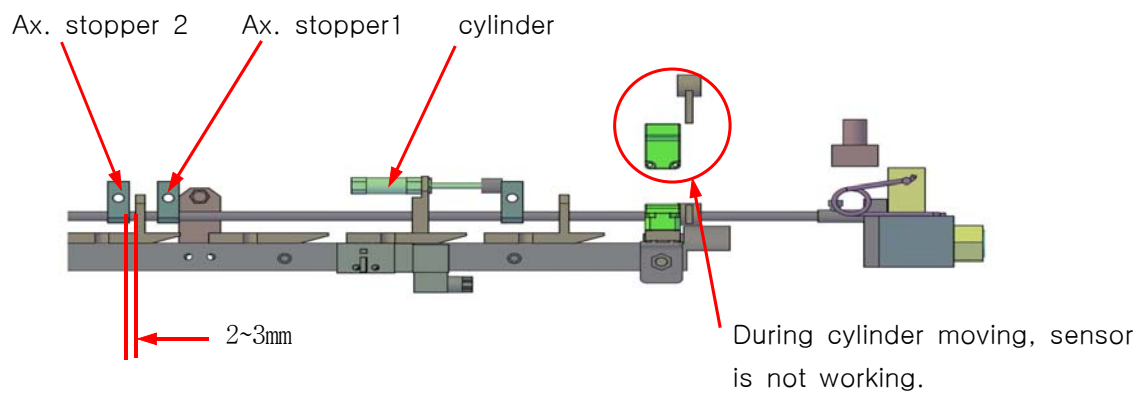


2. Push cylinder stopper to touch cylinder, and move sensor bar to work and fix up.

※ Note; Power "OFF" during adjustment.
If power "ON", cylinder to be work on cutting sensor.

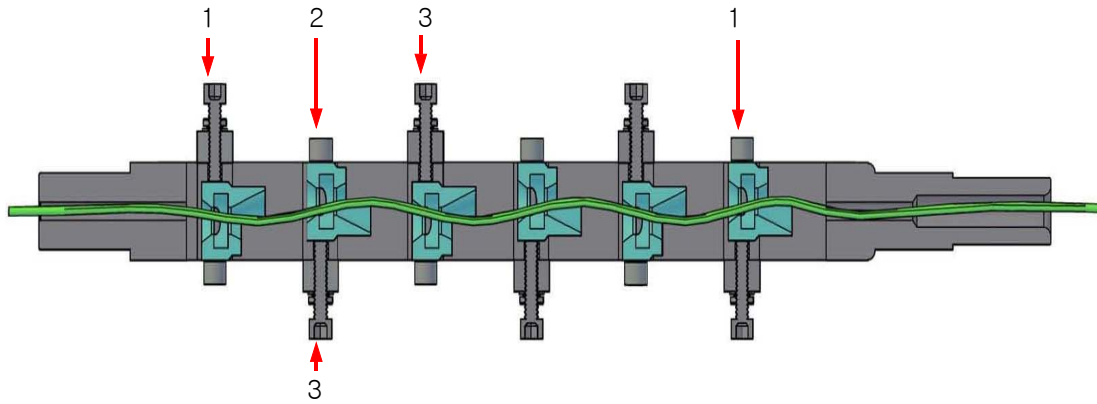


- 3 Auxiliary stopper should be 2~3mm gap between cylinder in.



4. Ax. Stopper 2 should be fixed up on 2~3mm gap against sylinder.

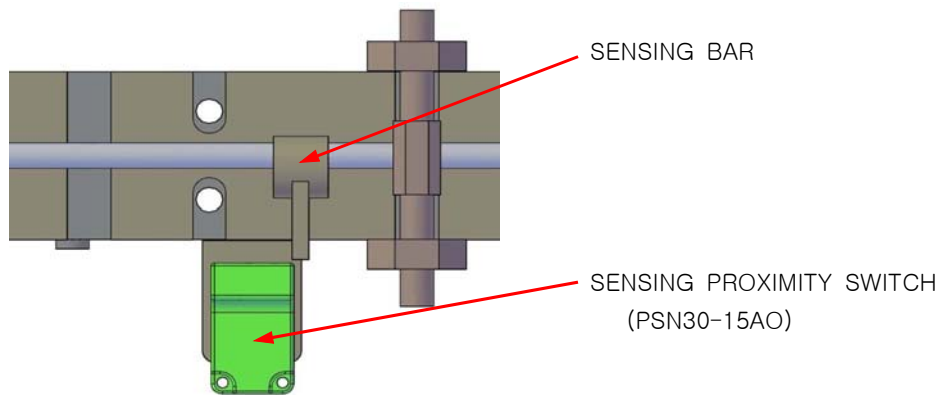
7. BALANCE ROTORS ADJUSTMENT



- PLACE CENTER POSITION FOR ROTOR #1
- MAKE ZIG-ZAG POSITION FOR REST 4 ROTORS
- IN CASE OF CURVED WIRE. GIVE MORE ZIG-ZAG BY BOLT 2 AND 3
- IN CASE OF STRAIGHT WIRE SCRATCHED OR CUT OFF INSIDE ROTORS,
GIVE LESS ZIG-ZAG BY BOLT 2 AND 3
- ROTORS WING SHOULD BE POSITIONED FRONT AGAINST OF WIRE FEEDING

※ NOTE : ALL POWER SHOULD BE "OFF" FOR ADJUSTING ROTORS FOR SAFETY.

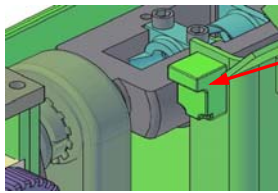
8. CUTTING P/X ADJUSTMENT



- TURNS CUTTING WHEEL TO BE POSITIONED HAMMER HIGHER THAN CUTTING BLADE
- PUSH A SENSING BAR TO PASS SENSING P/X SWITCH TO LIGHT "ON" IN RED
- EVERY CUTTING TIME, THIS P/X SWITCH SHOULD BE RED LAMP "ON"
- IF THIS ELAPSED 8 SECONDS, CUTTING MACHINE SHUT OFF AUTOMATICALLY
- CASES OF STOPPING :
 - 1- WIRE CUT OFF INSIDE OF ROTORS
 - 2- WIRE JUMPED OUT CUTTING TABLE
 - 3- WIRE IS EMPTY FROM THE TURN TABLE

9. SAFETY P/X SWITCH FOR COVER

- ※ IF OPEN THE COVER DURING THE OPERATION, MACHINE SHUT OFF AUTOMATICALLY FOR SAFETY, IF COVER IS OPENED, ALL FUNCTION ARE NOT WORKING
- IF MACHINE IS NOT SHUT OFF IN THE TIME OF OPEN THE COVER, P/X SWITCH SHOULD BE DEFECTED TO REPLACE NEW ONE.



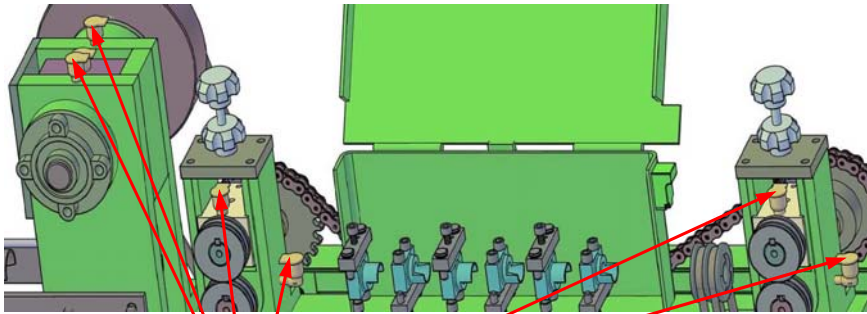
SAFETY P/X SWITCH FOR COVER

10. WIRE CUT OFF INSIDE BALANCE ROTORS

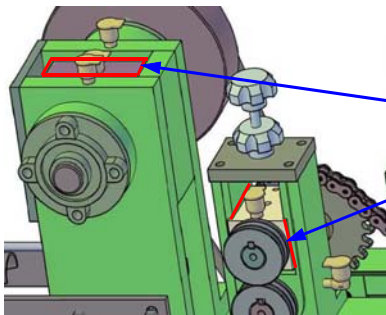
※ WIRE CUT OFF INSIDE OF BALANCE ROTORS DUE TO FOLLOWING CASES

- WIRE IS BENT TO PASS WIRE GUIDE OR TURN TABLE HAS TIGHT BRAKE PAD
- BALANCE ROTORS ARE ADJUSTED TOO MUCH ZIG-ZAG
- SPRINGS OF FEED ROLLERS IS WEAK NOT FEEDING WIRE PROPERLY

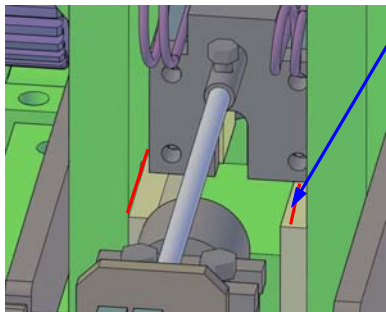
11. LUBRICANT



- LUBRICANT EVERY DAY TO FILL ALL OIL CAP AS PER PICTURE OPEN OIL CAP AND FILL

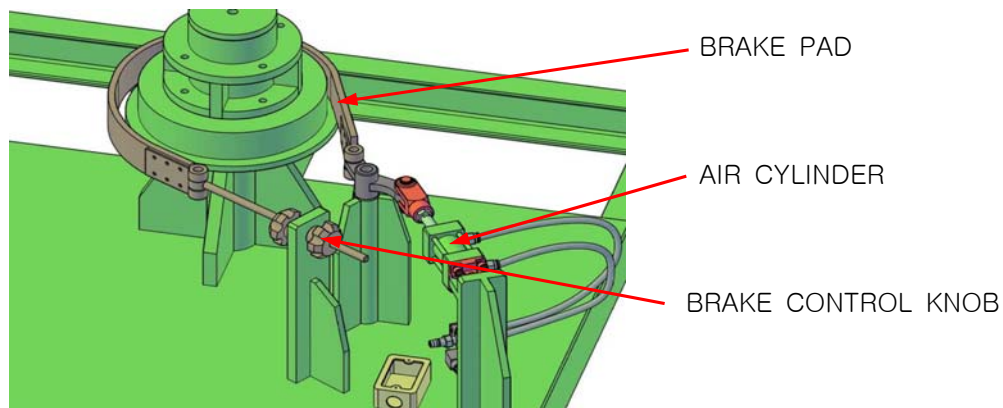


MOVING PARTS



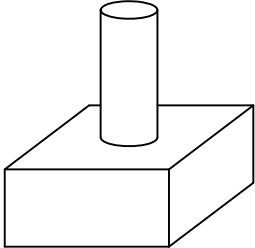
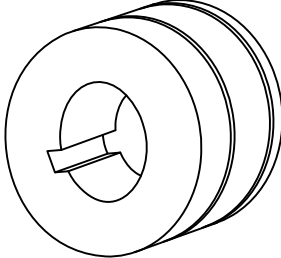
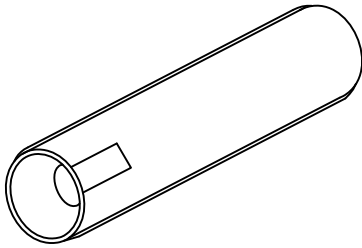
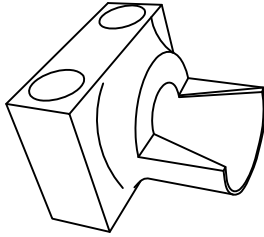
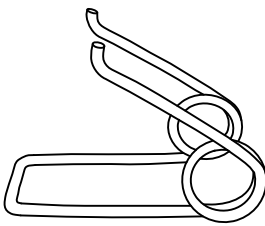
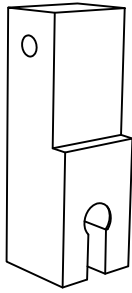
※ TOO MUCH OIL DROP DOWN TO THE CUT WIRE WHICH CAUSE BAD WELDING OR SPATTER TOO MUCH AND SMOKED.

12. TURN TABLE ADJUSTMENT



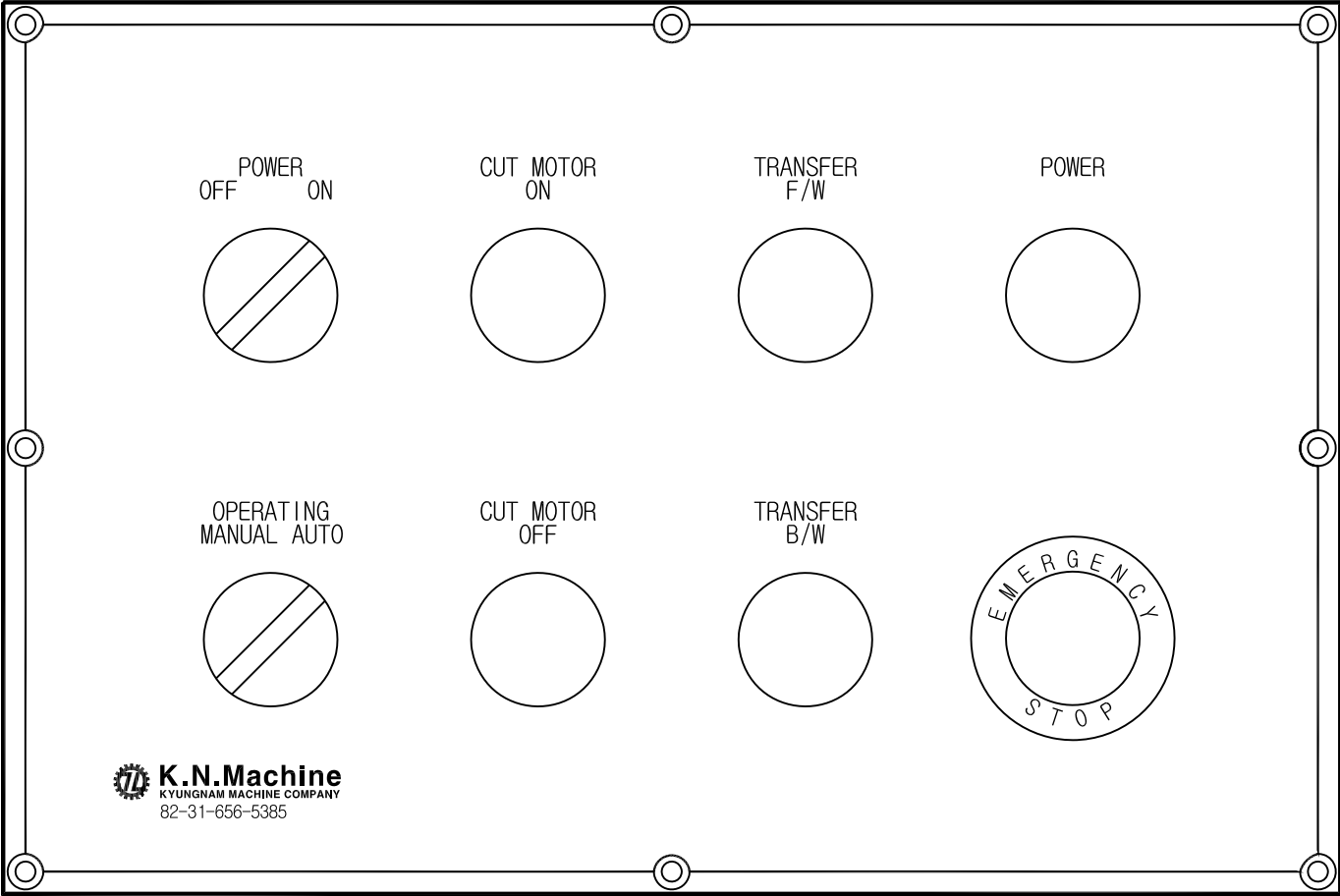
- IN THE TIME OF STOPPING, TURN TABLE IS KEEPING TURNING BY INERTIAL FORCE THEN WIRE BECAME LOOSE TOO MUCH, SO WE ATTACHED AUTOMATIC BRAKE SYSTEM.
- BRAKE IS WORKING BY AIR CYLINDER AUTOMATICALLY
- BRAKE 2 SECONDS AND RELEASED AUTOMATICALLY, IN CASE OF
 - 1) TURN ON/OFF
 - 2) EMERGENCY STOP
 - 3) FOOT SWITCH ON/OFF, OR TRANSFER MOTOR ON/OFF
- ADJUST BRAKE PAD BY A BRAKE CONTROL KNOB FOR PROPER TURNING TURN TABLE
- BRAKE PAD SHOULD BE REPLACED AFTER WORN OUT

SPARE PART (AUTOMATIC WIRE STRAIGHT MACHINE)

CUTTING HAMMER	QTY : 1EA	50,000 * 4 = 200,000EA	FEED ROLLER	QTY : 4EA	100,000EA
					
CUTTING DICE	QTY : 1EA	50,000EA	STRAIGHT DICE	QTY : 6EA	200,000EA
					
CUTTING SPRING	QTY : 1EA	50,000EA	BLADE CASE	QTY : 1EA	50,000EA
					

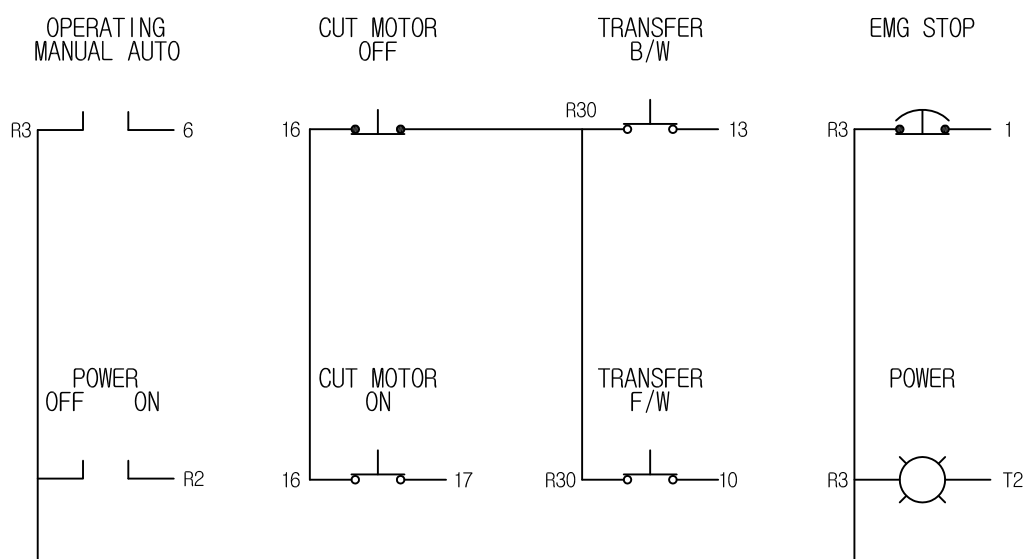
NO	PART NAME	MATERIAL	QTY	NOTE
DATE	04. JUNE. 2009	 K.N.Machine KYUNGNAM MACHINE COMPANY		
SCALE	1:4	UNIT :	m/m	MODEL
DESIGNED	CHECKED	APPROVE	PART NO	CONSUMPTION
			DRAW NO	SPEAR/2CT

WIRE CUTTING MACHINE OPERATING PANEL



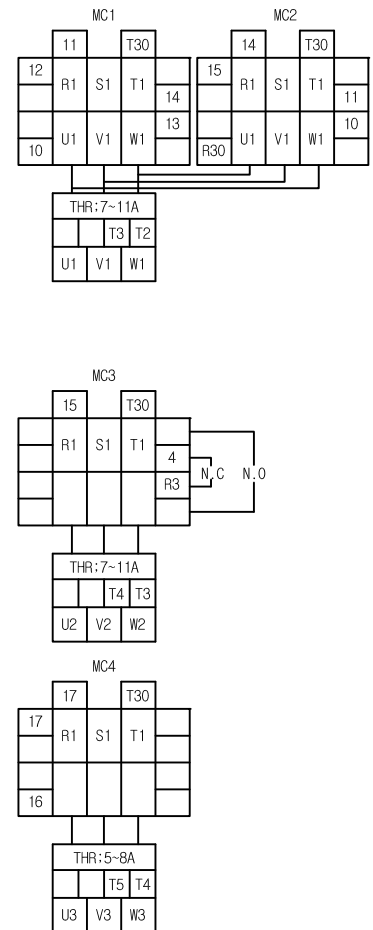
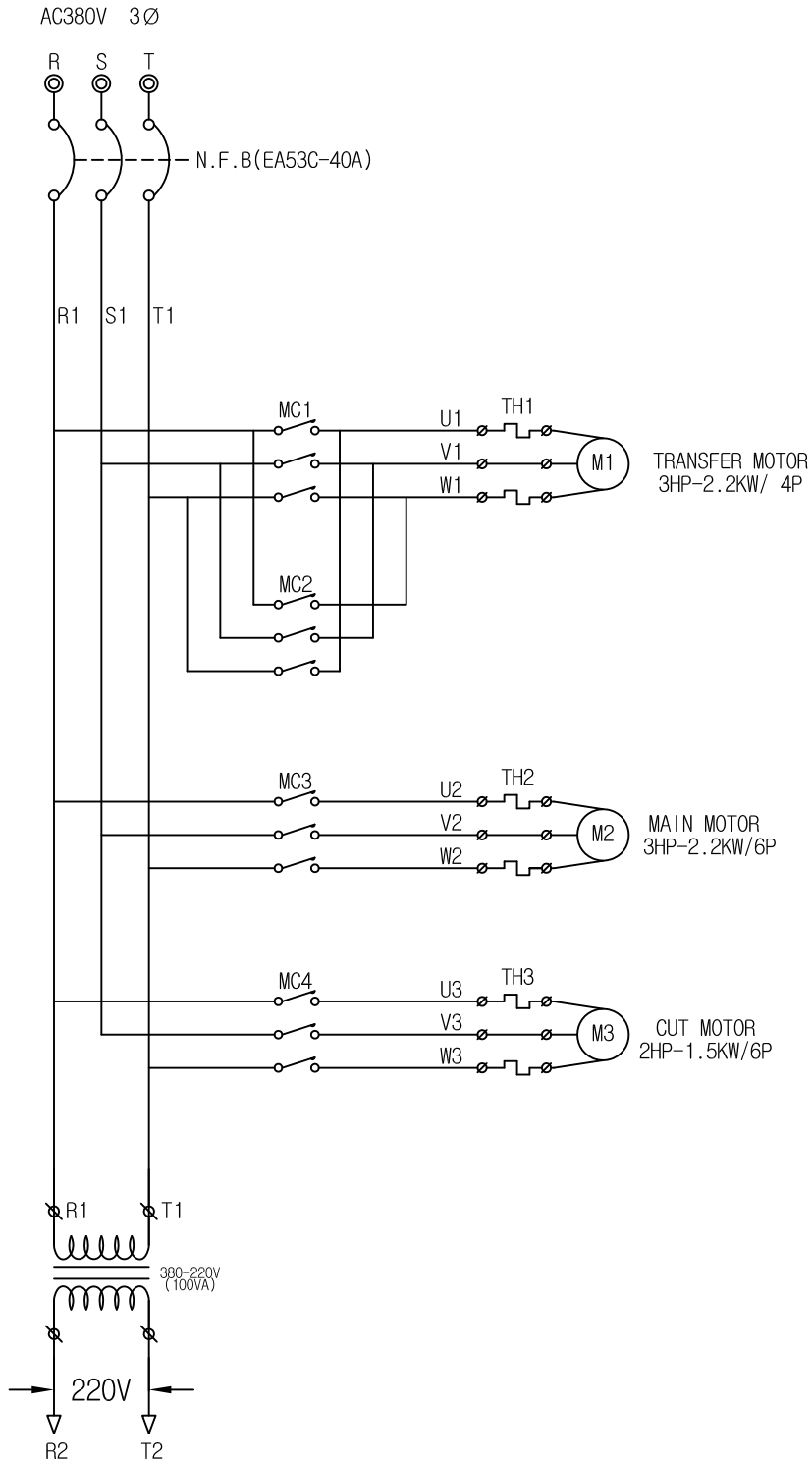
NO	PART NAME		MATERIAL		QTY	NOTE
DATE		04. JULY. 2009		 K.N.Machine KYUNGNAM MACHINE COMPANY		
SCALE 1:4		UNIT : m/m		MODEL	WIRE CUTTING MACHINE	
DESIGNED		CHECKED	APPROVE	PART NO	0P	
				DRAW NO	MOROCCO	

WIRE CUTTING MACHINE OPERATING PANEL BACK WIRING



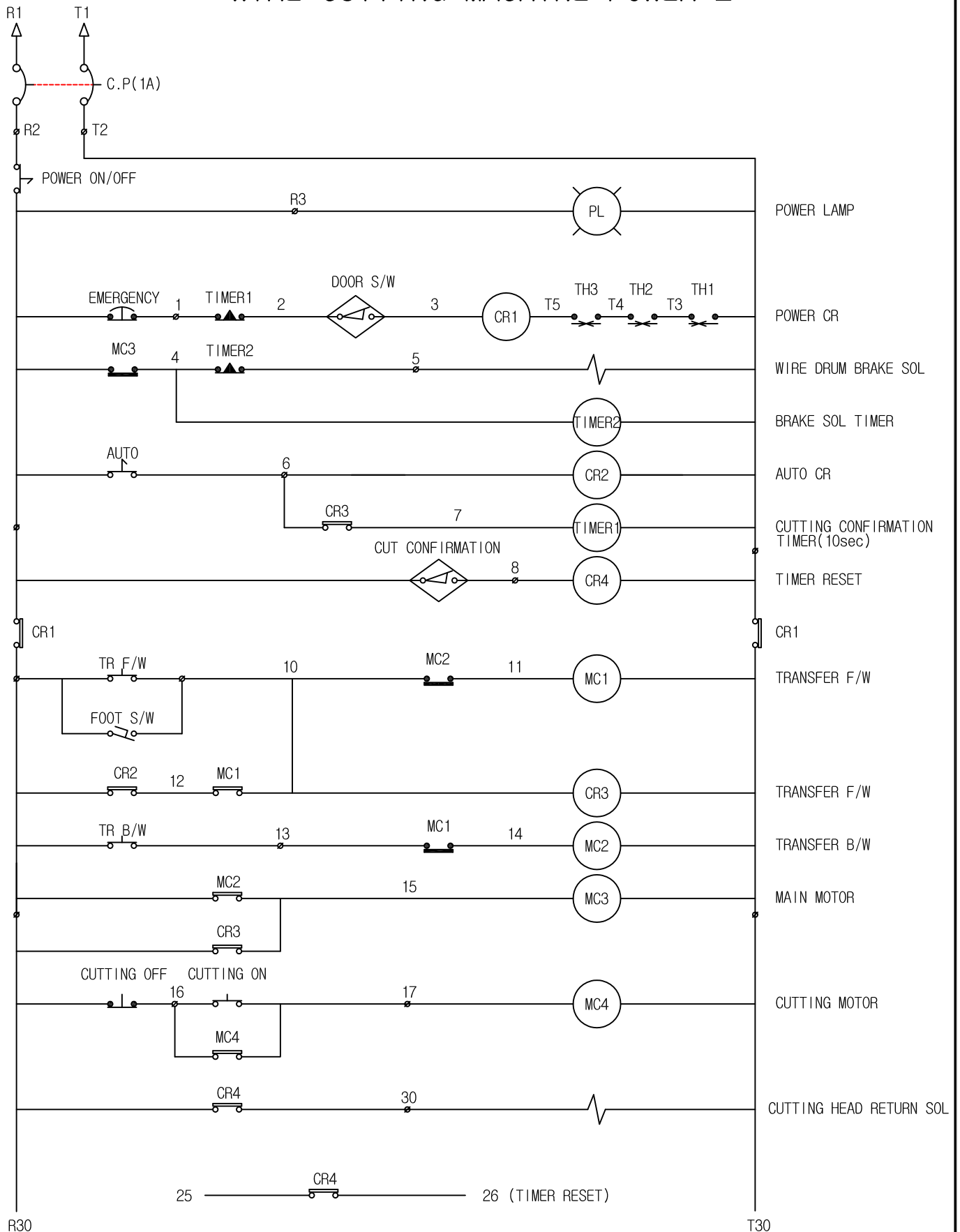
NO	PART NAME	MATERIAL	QTY	NOTE
DATE	04. JUNE. 2009	 K.N.Machine KYUNGNAM MACHINE COMPANY		
SCALE	1:4	UNIT :	m/m	MODEL
DESIGNED	CHECKED	APPROVE	PART NO	B-WIRING
			DRAW NO	MOROCCO

WIRE CUTTING MACHINE POWER WIRING 1



NO	PART NAME	MATERIAL	QTY	NOTE
DATE	04. JUNE. 2009	 K.N.Machine KYUNGNAM MACHINE COMPANY		
SCALE	UNIT :	m/m	MODEL	WIRE CUTTING MACHINE
DESIGNED	CHECKED	APPROVE	PART NO	POWER 1
			DRAW NO	MOROCCO

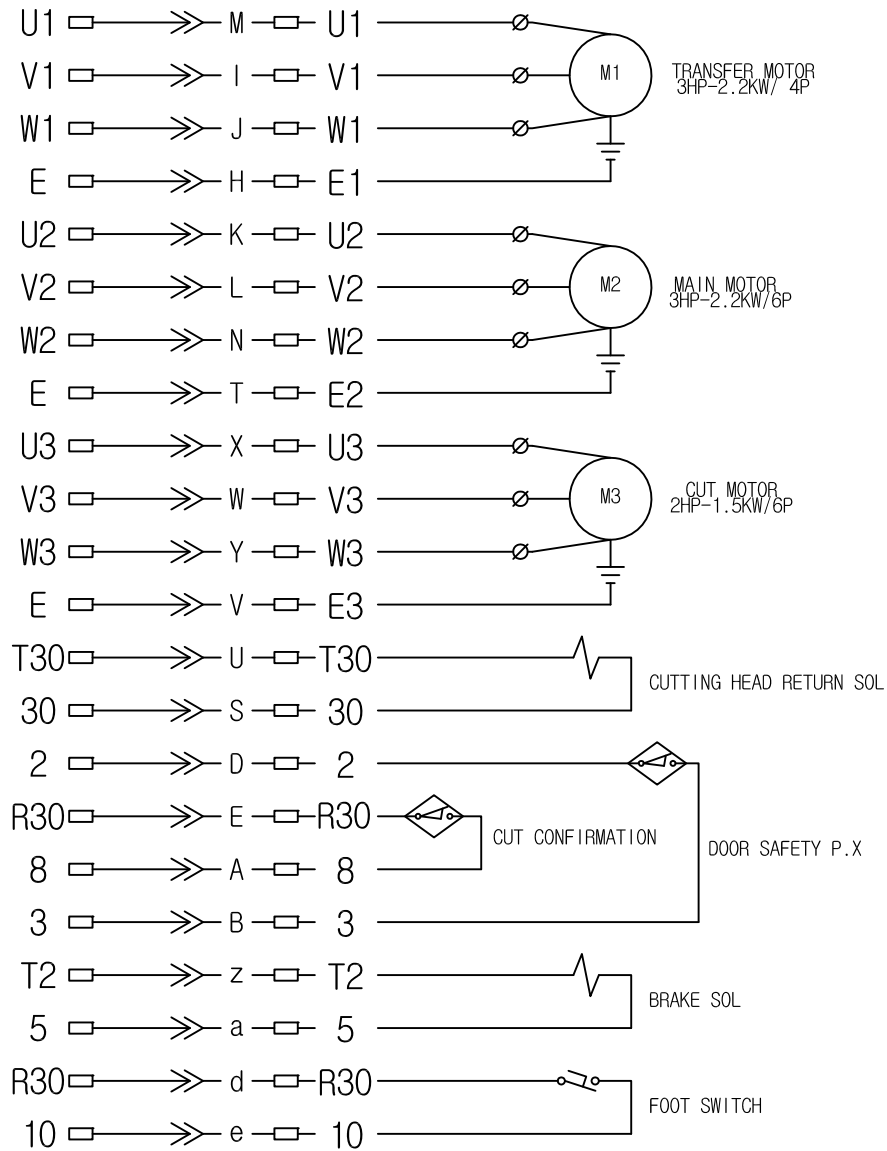
WIRE CUTTING MACHINE POWER 2



NO	PART NAME	MATERIAL	QTY	NOTE
DATE	26. MAY. 2010	 K.N. Machine KYUNGNAM MACHINE COMPANY		
SCALE	UNIT :	m/m	MODEL	WIRE CUTTING MACHINE
DESIGNED	CHECKED	APPROVE	PART NO	ELECTRIC WIRING
			DRAW NO	POW2/2CT

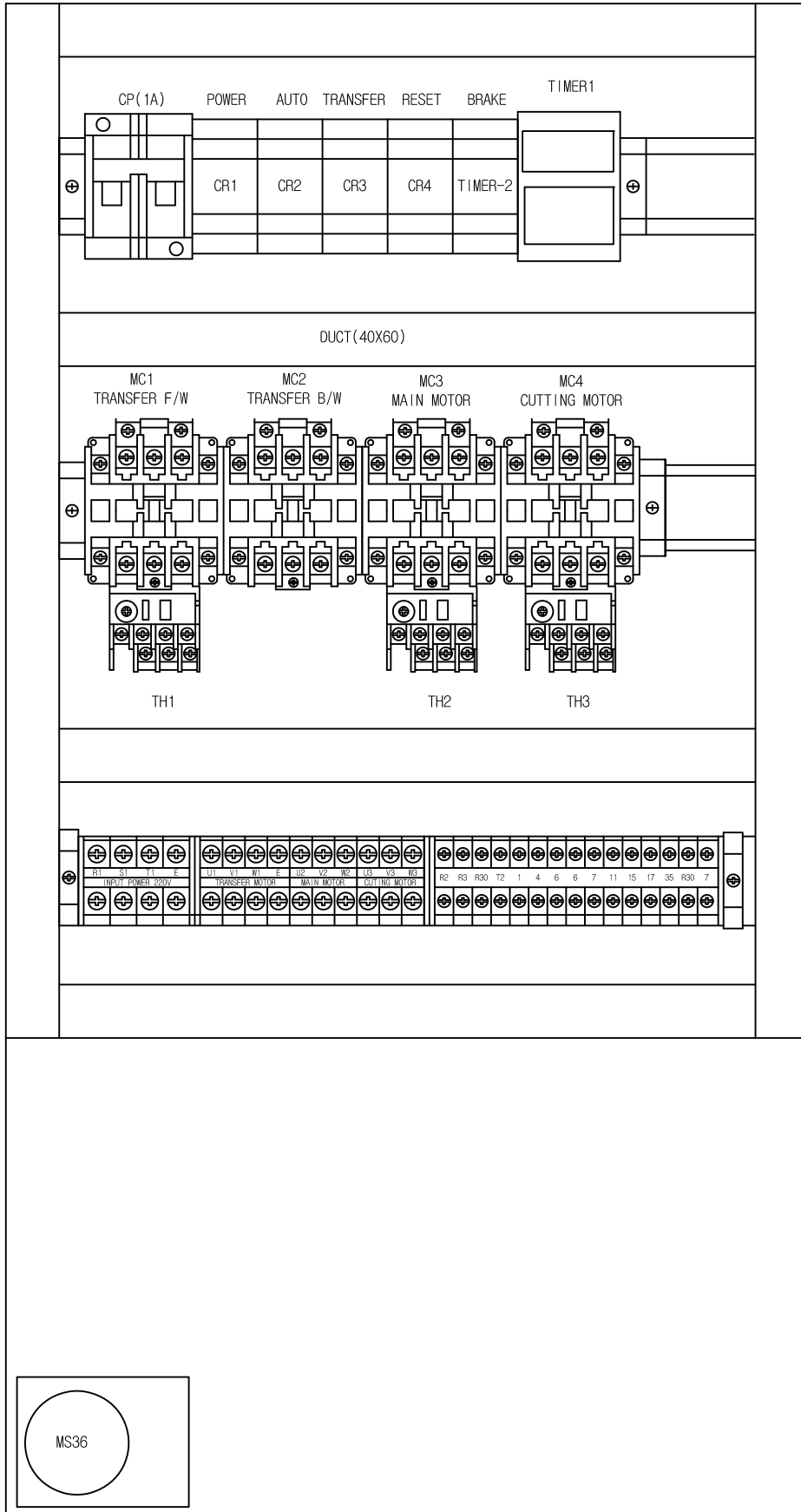
MS CONNECTOR WIRING

MODEL : MS36-9S

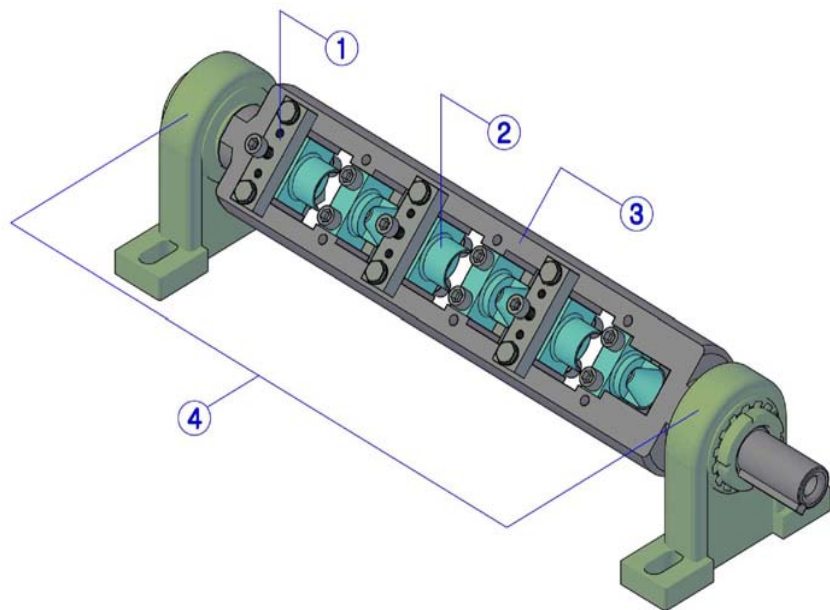


NO	PART NAME	MATERIAL	QTY	NOTE
DATE	31. MAY. 2010	 K.N.Machine KYUNGNAM MACHINE COMPANY		
SCALE	UNIT :	m/m	MODEL	WIRE CUTTING MACHINE
DESIGNED	CHECKED	APPROVE	PART NO	MS CONNECTOR WIRING
			DRAW NO	MS-2CT

WIRE CUTTING MACHINE BASE PANEL

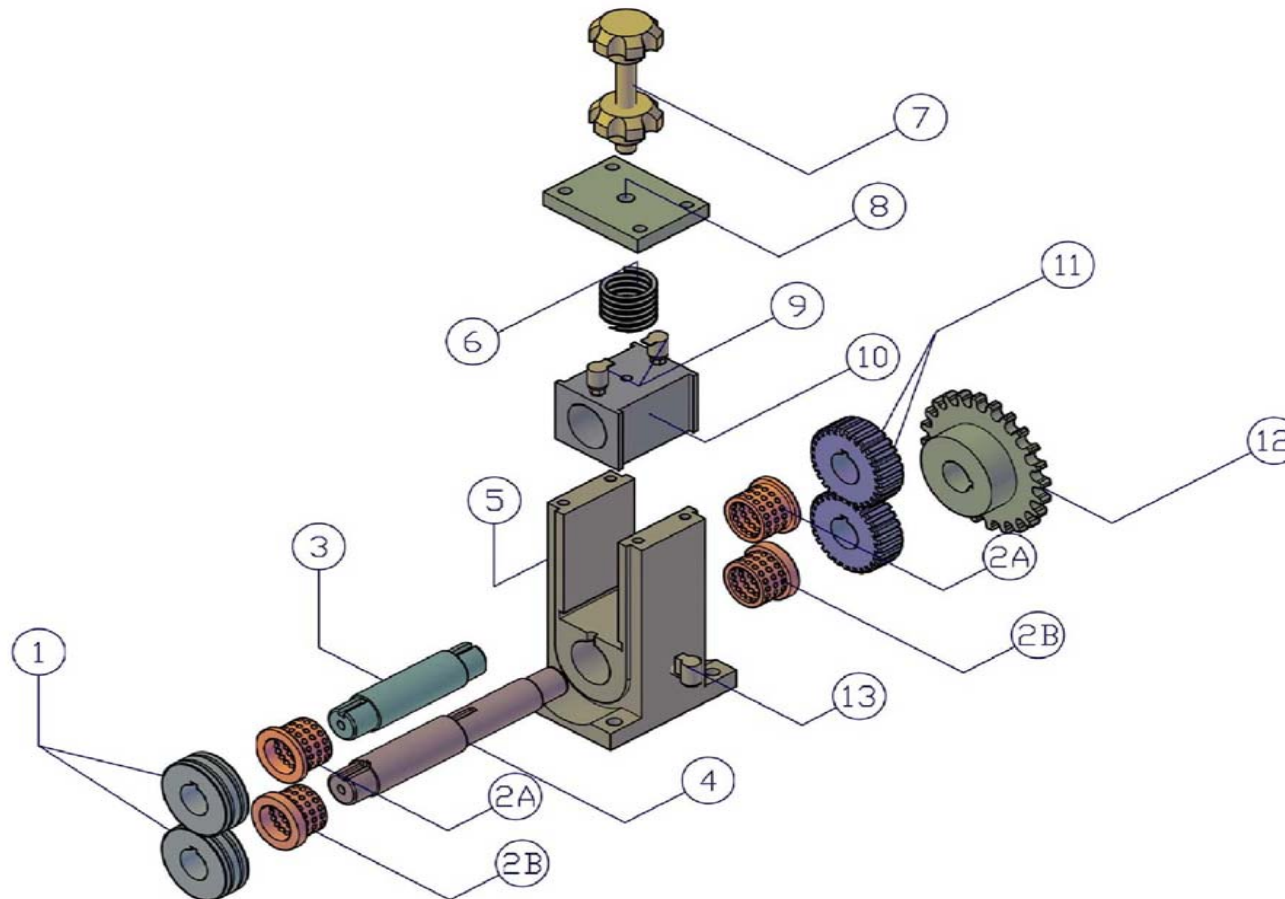


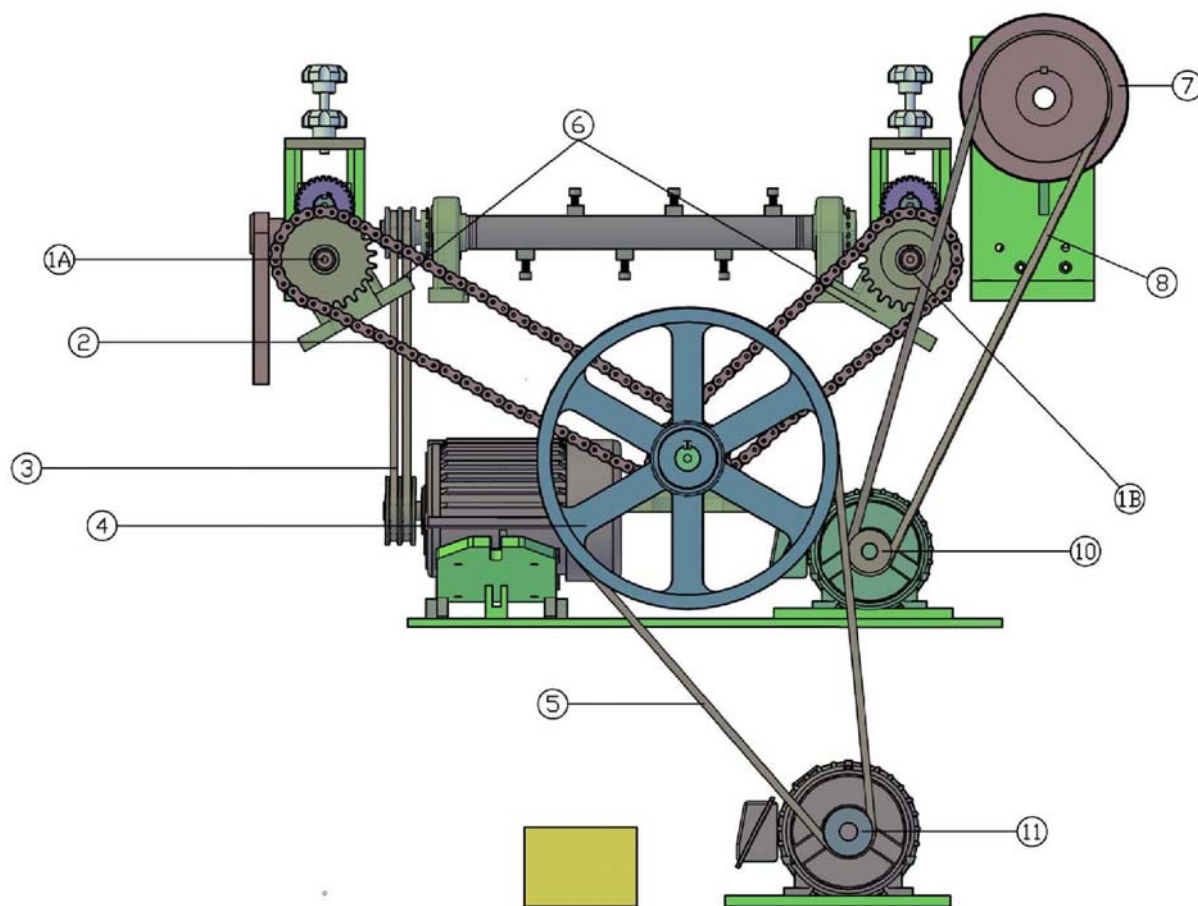
NO	PART NAME	MATERIAL	QTY	NOTE
DATE	24. MAY. 2010	 K.N.Machine KYUNGNAM MACHINE COMPANY		
SCALE	UNIT :	m/m	MODEL	WIRE CUTTING MACHINE
DESIGNED	CHECKED	APPROVE	PART NO	ELECTRIC WIRING
			DRAW NO	BASE-PANEL/CUT



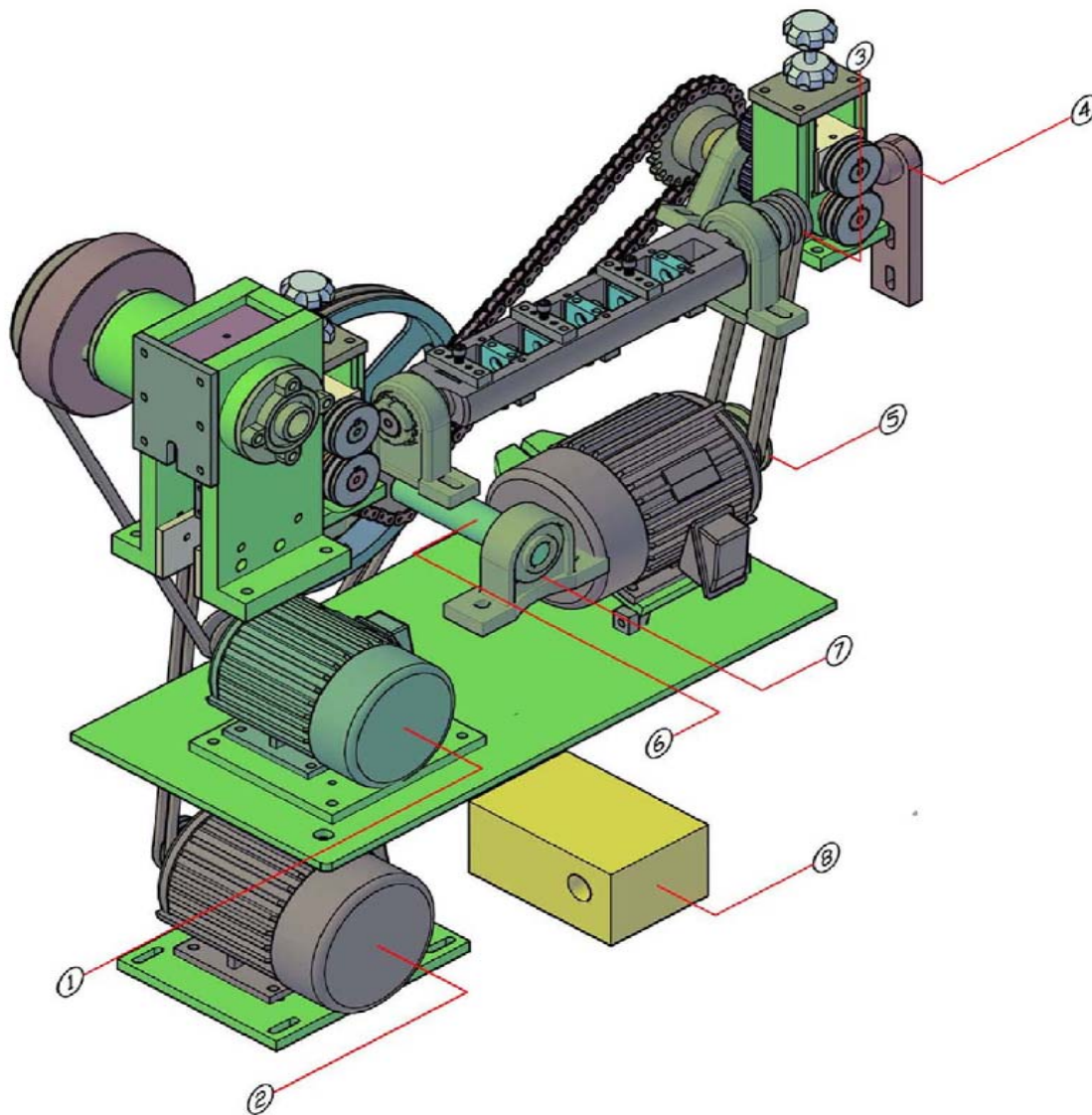
NO	PART NUMBER	PART NAME	QT'Y
1	CT-02-24	BALANCE ROTOR COVERS	6
2	CT-02-23	BALANCE ROTORS ---- SMALL	6
	CT-02-29	BALANCE ROTORS ---- LARGE	6
3	CT-02-22	BALANCE SHAFT	1
4	CT-04-01	BEARING (UKPH209)	2
5			
6			
7			
8			
9			

NO	PART NUMBER	PART NAME	QT' Y
1	CT-02-24	BALANCE ROTOR COVERS	6
2	CT-02-23	BALANCE ROTORS ----- SMALL	6
	CT-02-29	BALANCE ROTORS ----- LARGE	6
3	CT-02-22	BALANCE SHAFT	1
4	CT-04-01	BEARING (UKPH209)	2
5			

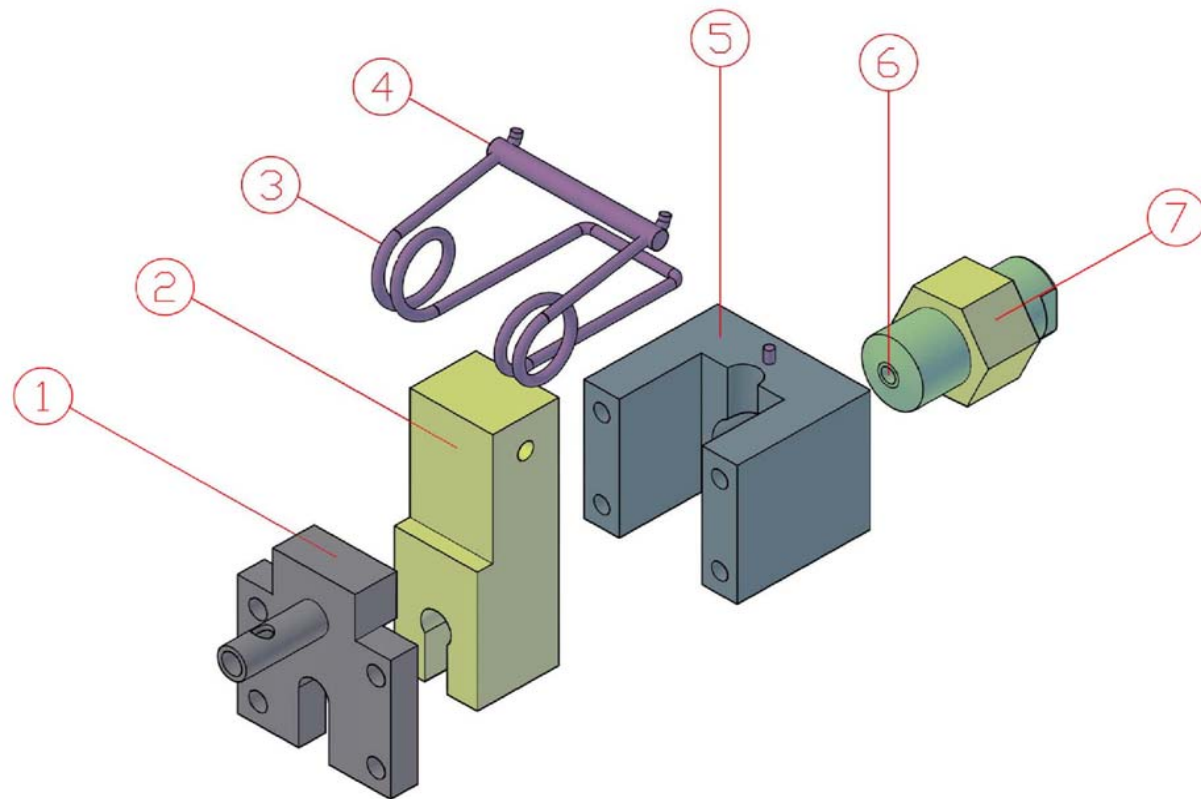




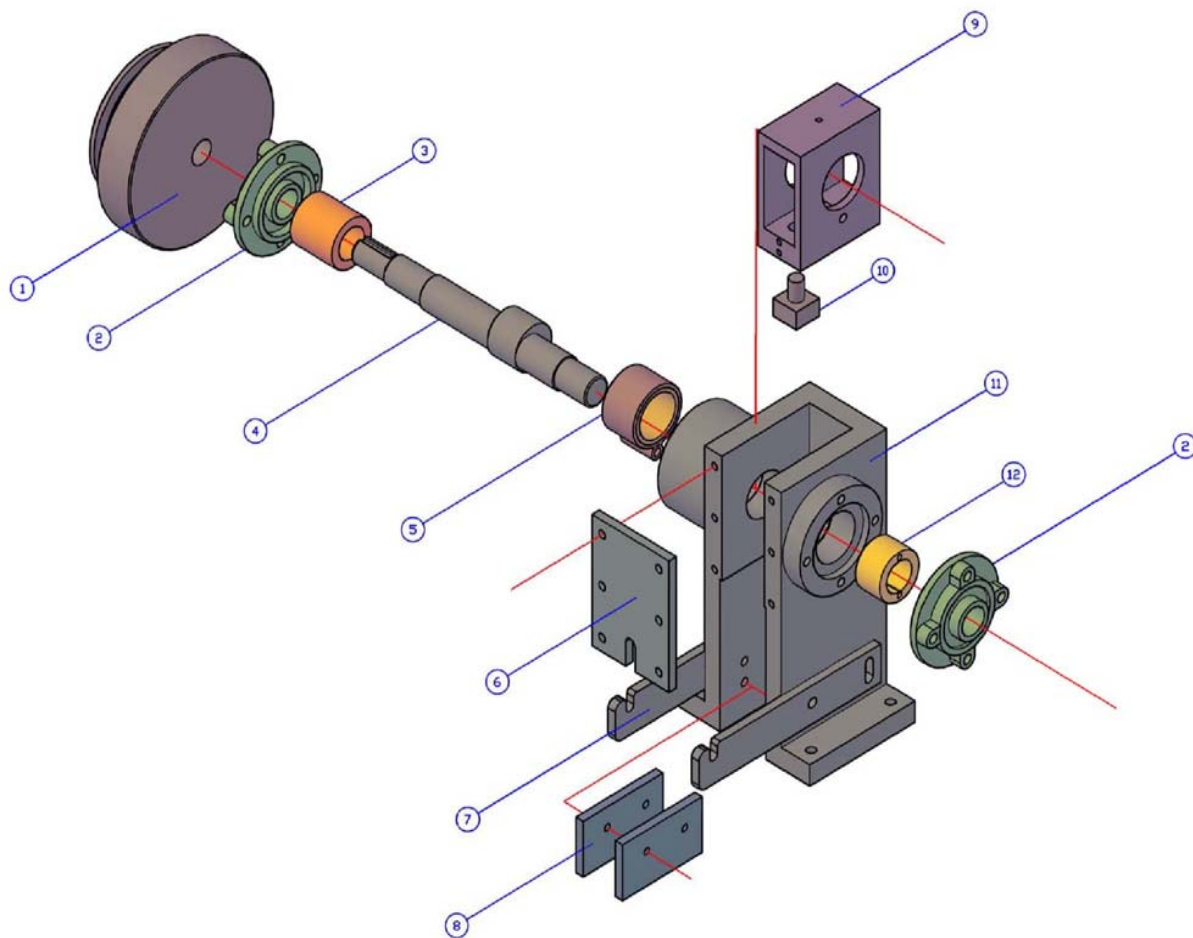
NO	PART NUMBER	PART NAME	QT'Y
1A	CT-03-13A	CHAIN GEAR(RS60-24T-Ø30)	1
1B	CT-03-13B	CHAIN GEAR(RS60-24T-Ø30)	1
2	CT-03-15	CHAIN-RS60	2
3	CT-03-06	BELT(B-45")	2
4	CT-03-09	BELT PULLEY(B2-18"-Ø40)	1
5	CT-03-04	BELT(B-78")	2
6	CT-04-03	BEARING (UCPH207)	2
7	CT-02-27	CUTTING WHEEL	1
8	CT-03-05	BELT(B-71")	1
9			
10	CT-03-07	BELT PULLEY(B1-3"-Ø28)	1
11	CT-03-08	BELT PULLEY(B2-3"-Ø28)	1
12			
13			
14			
15			



NO	PART NUMBER	PART NAME	QTY
1	CT-03-01	CUTTING MOTOR(2HP-6P)	1
2	CT-03-02	TRANSFER MOTOR(3HP-6P)	1
3	CT-03-08	BELT PULLEY(B2-3"-Ø28)	1
4	CT-02-31	WIRE GUIDE	1
5	CT-03-10	BELT PULLEY(B2-5"-Ø28)	1
6	CT-02-02	TRANSFER SHAFT(Ø45-L410)	1
7	CT-04-04	BEARING(UCP208)	2
8		JOINT BOX	1
9			
10			

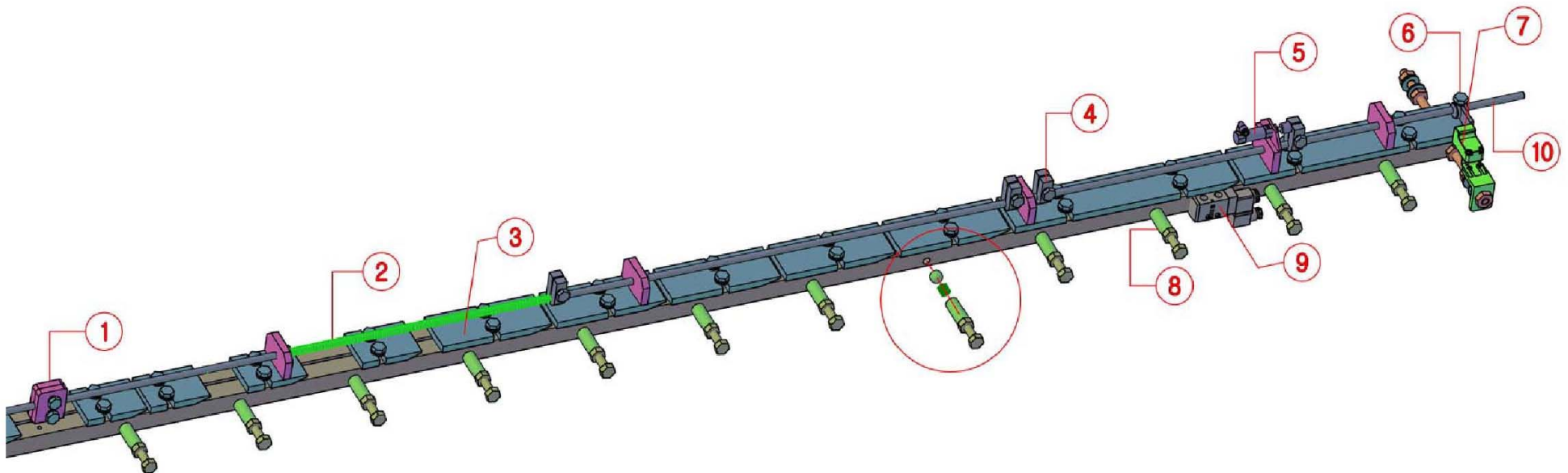


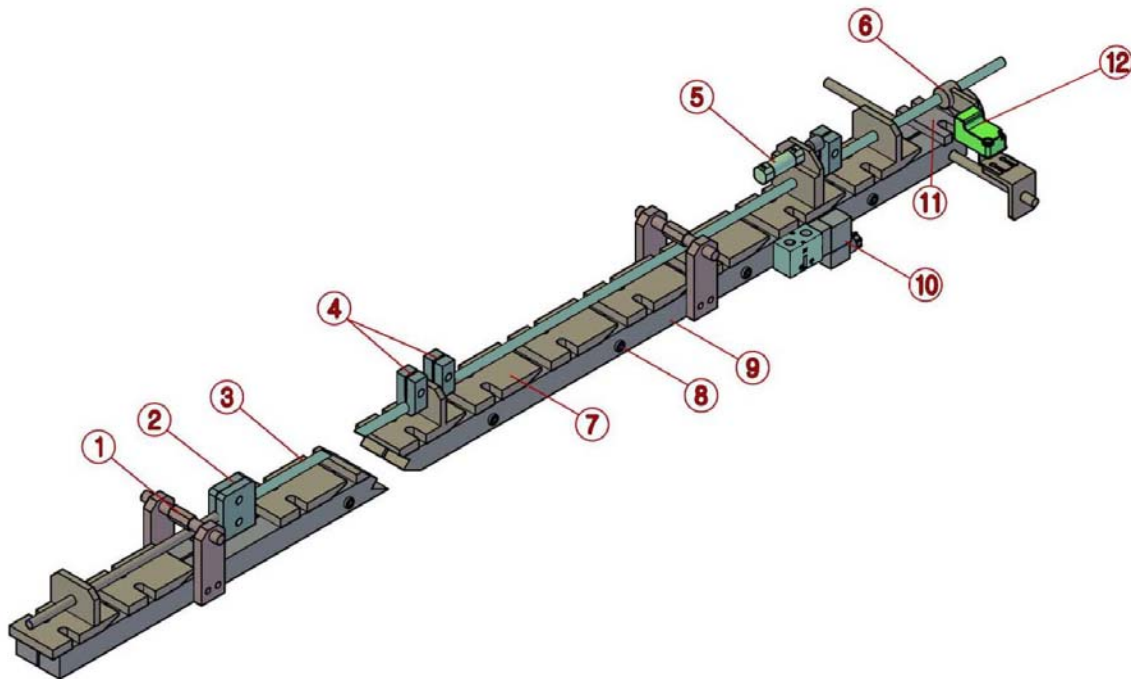
NO	PART NUMBER	PART NAME	QT' Y
1	CT-02-36	RULER HOLDER	1
2	CT-02-10	CUTTING BLADE(SK-11)	1
3	CT-02-14	CUTTING SPRING	1
4	CT-02-52	SPRING PIN	1
5	CT-O2-54	WIRE CUTTING DIE HOLDER	1
6	CT-02-12A	WIRE CUTTING DIE 5mm	1
7	CT-02-	WIRE CUTTING DIE NUT	1
8			
9			
10			



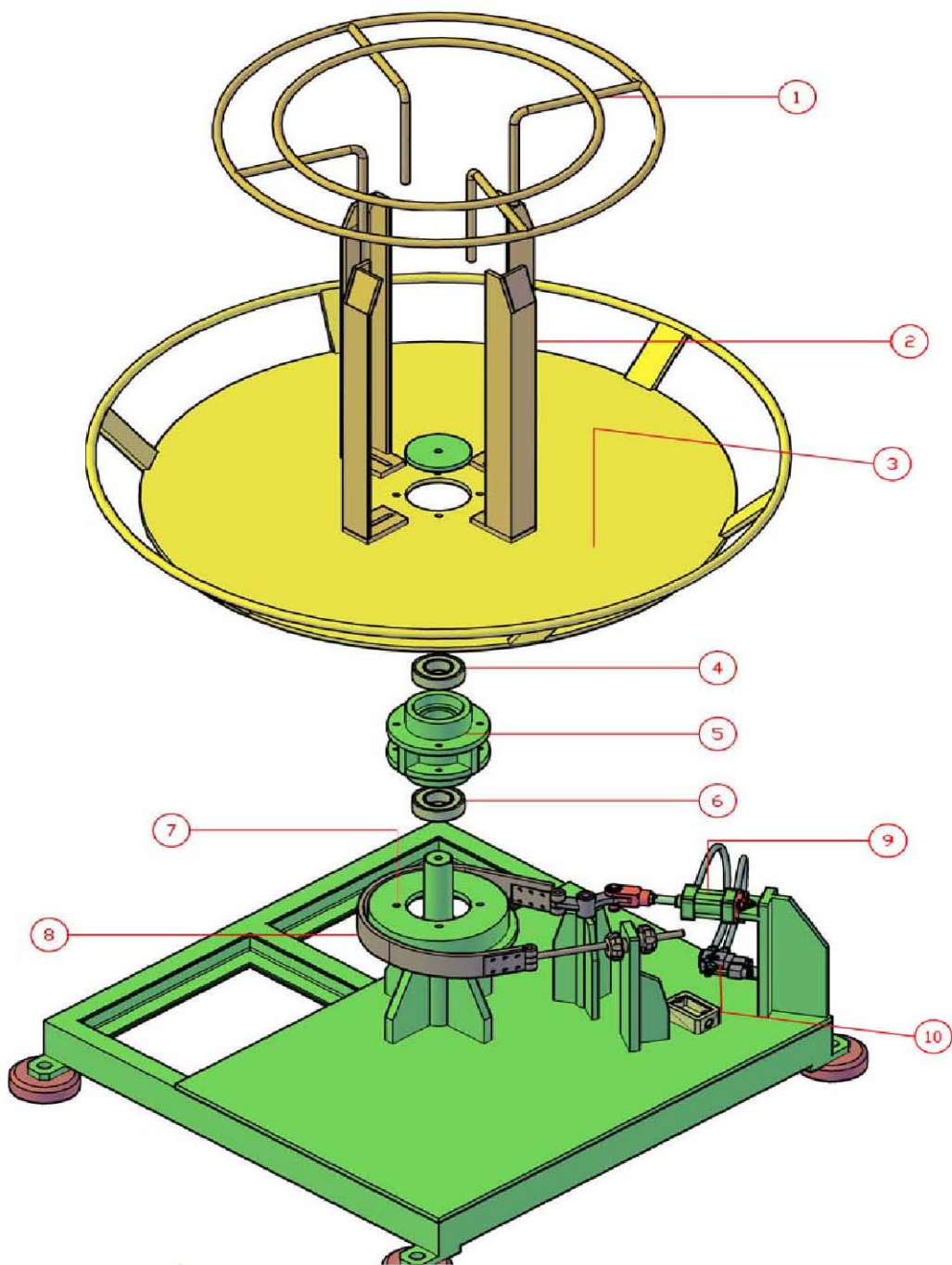
NO	PART NUMBER	PART NAME	QT' Y
1	CT-02-27	CUTTING WHEEL	1
2	CT-04-02	BEARING(UCF208)	2
3	CT-02-41R	CAM BUSHING(R)-Ø70-L72	1
4	CT-02-07	CAM	1
5	CT-02-37,38	HAMMER CONTROL RING,BUSHING	1/1
6	CT-02-08	CAM COVER	1
7		RULER HOLDER	2
8		CUTTING BLADE SLIDER	2
9	CT-02-39	HAMMER CASE	1
10	CT-02-13	CUTTING HAMMER(SKD-11-20200)	1
11	CT-02-01	CUTTING HEAD BODY	1
12	CT-O2-41L	CAM BUSHING(L)-Ø70-L42	1
13			
14			
15			

NO	PART NUMBER	PART NAME	QTY
1	CT-02-51	CUTTING STOPPER	1
2	CT-02-44	RULER TENSION SPRING	1
3	CT-02-52	WIRE COVER PLATES	9
4	CT-02-32	STOPPERS	4
5	CT-02-	RETURN CYLINDER(ACP-B16-10)	1
6	CT-02-34	PROXIMITY SENSING BAR	1
7	CT-05-12B	PROXIMITY SWITCH(PSN30-15AO)	2
8	CT-02-47	TENSION CONTROL BAR	12
9	CT-06-01	SOLENOID VALVE	2
10	CT-02-50	RULER	1
11			
12			





NO	PART NUMBER	PART NAME	QTY
1	CT-02-	WIRE ADJ. SET	1
2	CT-02-51	CUTTING STOPPER	1
3	CT-02-50	RULER	1
4	CT-02-32	STOPPERS	4
5	CT-02-	RETURN CYLINDER(ACP-B16-10)	1
6	CT-02-34	PROXIMITY SENSING BAR	1
7	CT-05-52	WIRE COVER PLATES	16
8	CT-02-	WIRE TENSION BOLT	8
9	CT-06-	RULER BODY	2
10	CT-06-01	SOLENOID VALVE	1
11	CT-02-	WIRE GUIDE-C	1
12	CT-05-12B	PROXIMITY SWITCH(PSN30-15AO)	1



NO	PART NUMBER	PART NAME	QT' Y
1		WIRE COVER	1
2		WIRE GUIDE RACK	4
3	CT-06-08	TABLE PLATE	1
4	CT-06-09	BEARING(#6212)	1
5	CT-06-07	SHAFT HOUSING	1
6	CT-06-06	BEARING((#32212)	1
7		BRAKED RUM	1
8	CT-06-05	BRAKE PAD	1
9	CT-06-01	CYLINDER(50X50)	1
10	CT-06-01	SOLENOID VALVE	2
11			
12			

NO	PART NUMBER	PART NAME	QT' Y
1		WIRE COVER	1
2		WIRE GUIDE RACK	4
3	CT-06-08	TABLE PLATE	1
4	CT-06-09	BEARING(#6212)	1

