

# ***RADIAL DRILLS***



**TRD1230      TRD1230H**

**TRD1600H TRD2000H**

**Operation Manual**

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# **CHAPTR 1**

## **Safety Guidelines**

### **1.1 Please follow the below basic safety principles**

- (1) Have only sophisticated or experienced personal perform the machine operation or maintenance.**
- (2) Please read and understand the operation manual thoroughly before operation.**
- (3) Please place the manual close to the machine for easy access.**
- (4) Please have only authorized person keep the keys to the machine.**
- (5) All operation and maintenance personnel need to know the location of the emergency switch, its function and operation.**

### **1.2 Precautions for the transportation and installation**

- (1) Please make sure that the floor is solid enough to support the machine.**
- (2) Only one person is allowed to lift and move the machine for safety reason.**
- (3) When lifting and moving, Nobody is allowed to be under or near the machine.**
- (4) Please wear protective helmet when moving, installing or clearing the machine.**
- (5) All levers, which tighten, need to be tightened.**
- (6) If the moving object weighs over 25kgs, Please use only proper movement equipment for it.**
- (7) Please make sure that the slings are strong enough to lift the machine or the subjects.**
- (8) Please power off before movement and installation. If necessary to power on, please let other persons know the location of the emergent stop.**
- (9) Please put on leather gloves or similar protective equipments when moving, installing or clearing the machine.**

### **1.3 Precautions for operation**

- (1) Please don't remove any protection guard or any safety installation.**
- (2) Please don't remove or alter any location of the limit switches, restraint blocks or interlocking mechanisms.**
- (3) Don't touch any switch with wet hand.**
- (4) Please don't put any part of your body on the moving parts of the machine or near to them.**
- (5) The operation person have better no long hair, if it is impossible, please have it coiled in a topknot and wear a safety helmet.**
- (6) Please wear no hand ring, watch, pearls or loose clothes. Operation should wear a safety clothes.**
- (7) Please wear no slippery shoes while operating.**
- (8) Wearing gloves is needed when loading and unloading material.**
- (9) Only one person is allowed to operate the machine.**
- (10) While operation, Debris may fly off. So please wear a protective mask to prevent from being injured.**
- (11) Please power off after work.**
- (12) Please wear a gauze mask if you are working, using cutting fluids.**
- (13) Please don't use the machine in a explosive environment.**
- (14) A risk of being squeezed is composed when the gearbox and the arm are descending or the spindle is descending to the worktable. (The arm screw moves at a low speed of 0.8m/min.)**
- (15) Operator should stand in front of the machine. That's the operation position.**
- (16) Please clean with a vacuum sucker.**







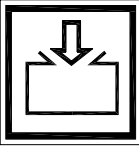
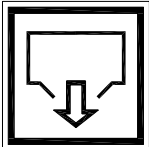
## **1.4 Precautions for checking and maintenance**

- (1) Please power off first before performing maintenance or checking job.**
- (2) Only have authorized electric technician carry out maintenance or checking job when Power-on is needed in it**
- (3) Please power off after work.**
- (4) Adding or replacing hydraulic oil or lubricant, Please use Kent USA recommended oil type or its equivalent. For details, please refer to the chapter 7.**
- (5) Basically, only one person is needed to serve. If more than one person is called for, Good communications is required.**
- (6) Please power off first before getting rid of the iron filings or cleaning the machine.**


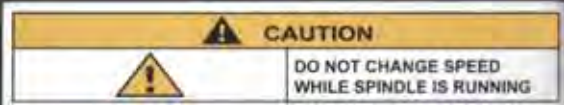



## 1.5 Warning labels and mark on the machine

### 1.5.1 Warning labels and mark introduction

labels	Description
	Please secure the machine with the base fixing bolts, to prevent from any risk.
	Model of a machine.
	Please watch out the running tools.
	Please operators wear protective glasses during work.
	No polishing.
	CE Mark
	Oil filler position.
	Oil drain outlet position.



	<p><b>Risk of high voltage .</b></p>
	<p><b>Do not change speed while spindle is running.</b></p>
	<p><b>Main electrical switch.</b></p>

### 1.5.2 Warning Labels and mark positions

#### a. The front view



**b. The rear view**

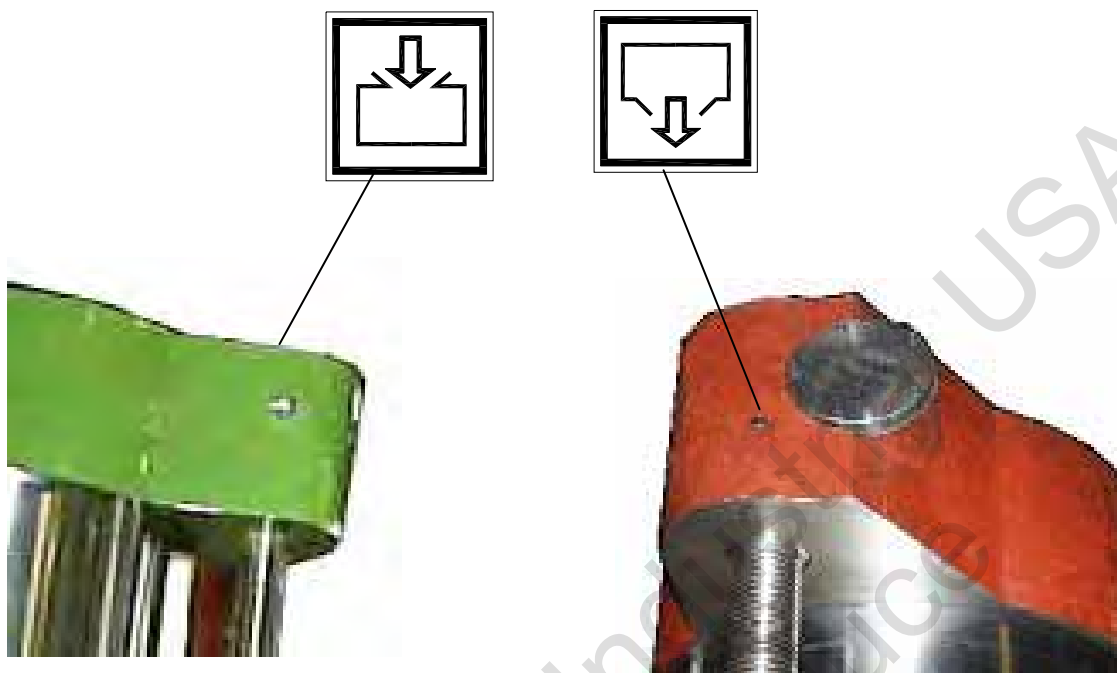


**C. Oil filler position and Oil Drain outlet position**

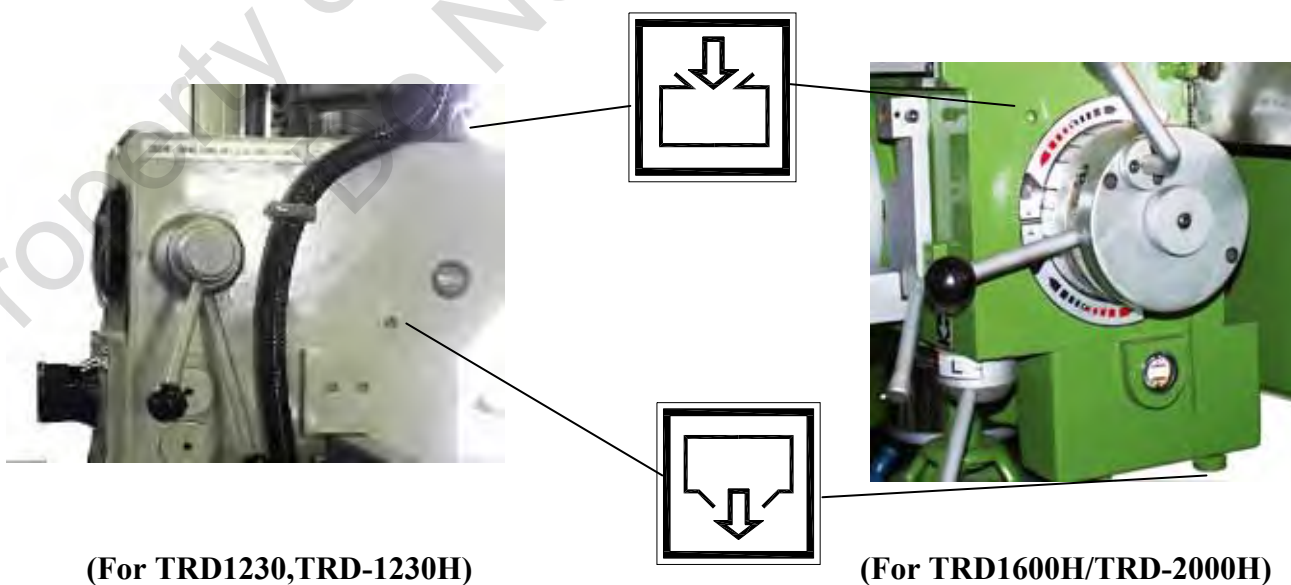
- Arm elevating motor (For TRD-1230, TRD-1230H)



- **Arm elevating motor (For TRD-1600H,TRD-2000H)**



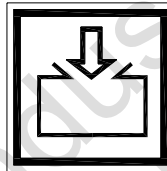
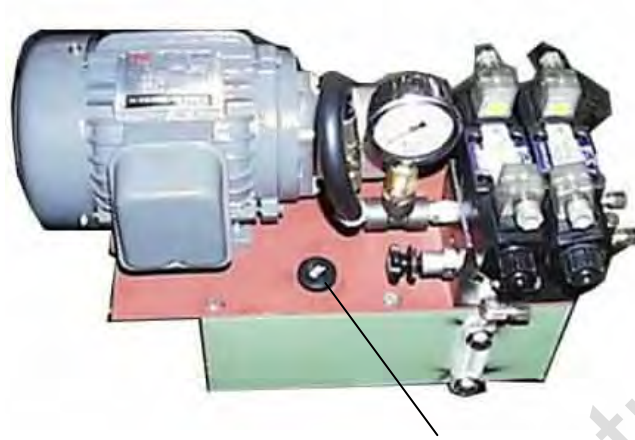
- **Gearbox**



(For TRD1230,TRD-1230H)

(For TRD1600H/TRD-2000H)

- Hydraulic oil pump



## CHAPTER 2

### General Specifications

#### 2.1 The anticipated machine life.

The calculation of the anticipated machine life:

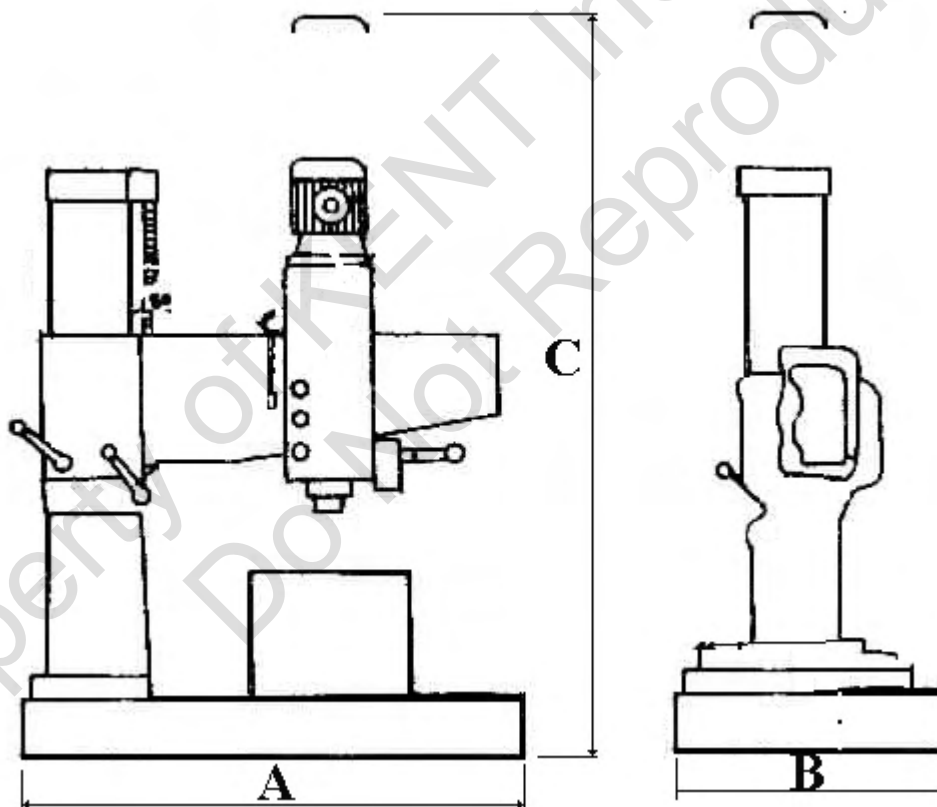
8 hours x 6 days x 50 weeks x 10 years = 24000 hours.

The above calculation is based on a sound maintenance and normal condition, excluding wearing parts.

#### 2.2 Machine dimensions.

The following are the machines' dimensions and its diagrams.

Models	A	B	C
TRD-1230	1710mm	715mm	2780mm
TRD-1230H	1710mm	715mm	2780mm
TRD-1600H	2450mm	1020mm	3170mm
TRD-2000H	2908mm	1102mm	3470mm





## 2.3 The machine

### 2.3.1 Description

Radial drills are purposely designed to process bulky objects. Kent USA has 20 years of history and experience in behind. It knows radial drills certainly very well. Kent USA radial drills will be your best choice. The material that the machine can process on are : mild steel, metal, stainless steel, cast iron, aluminum, copper,,,, etc, except magnesium alloy. (Note 1)

**Note 1:** Processing magnesium alloy may cause fire.

### 2.3.2 Parts

There are six categories of parts on the radial drill: Gearbox, Arm, Column, Top Cover, Box Table and Base. The following are its description and locations.



1. **Base**                      The main aim of the base is to support the whole weight of the machine. In addition, the cutting fluid is contained here and the Box Table is installed on.
2. **Gear box**                It is the core part for the radial drill for all procession is finished here, like speed switch, auto feed, spindle,,, etc. They are inside of the gearbox.
3. **Arm**                      It is to support the gearbox and is connected with the column.
4. **Column**                  It is to support the gearbox and the arm. It connects the base.
5. **Top Cover**              It is at the top end of the Column.
6. **Box table**                Working with clamps, it enables to reach the required accuracy.
7. **The ball screw transmit ion motor and clamping mechanism.**      The motor is to elevate the gearbox. The clamping mechanism is to clamp both the Arm and the Column.

## 2.4 Specifications.

### 2.4.1 TRD-1230H Specification.

<b>TRD-1230H</b>			
Diameter of column	300mm		
Distance from Column surface to Spindle center, max.	1170mm		
Distance from Column surface to Spindle center, min.	340mm		
Travel of Spindle head	890mm		
Distance from Base surface to Spindle end, max.	1370mm		
Distance from Base surface to Spindle end, min.	490mm		
Elevating height of Arm.	630mm		
Effective area of Table.	635mm	520mm	415mm
The dimensions of the Base (L W H)	1710mm	715mm	180mm
Taper hole Spindle.	MT#4		
Stroke of the Spindle.	250mm		
R.P.M. of Spindle. ( R.P.M. step )	44-1500 12 steps		
Feed of Spindle ( REV. step )	0.05,0.09,0.153 steps		
Main motor.	2.25KW(3HP)		
Elevating motor.	0.75KW(1HP)		
Clamping motor.	0.75KW(1HP)		
Coolant pump .	0.1KW(1/8HP)		
Machine height from floor, max.	2780mm		
Height from the Column top to floor	2060mm		
Net weight (approx.)kgs	2100kg		
Shipping Gross weight. (approx.)kgs	2300kg		
Shipping dimensions(L W H )	2035mm	995mm	2240mm

### The max. processing capacity.

Drilling	Steel	Ø42
	Cast iron	Ø55
Taping	Steel	Ø25
	Cast Iron	Ø38



## 2.4.2 TRD-1230 Specification.

TRD-1230			
Diameter of column	300mm		
Distance from Column surface to Spindle center, max.	1170mm		
Distance from Column surface to Spindle center, min.	340mm		
Travel of Spindle head	890mm		
Distance from Base surface to Spindle end, max.	1370mm		
Distance from Base surface to Spindle end, min.	490mm		
Elevating height of Arm.	630mm		
Effective area of Table.	635mm	520mm	415mm
The dimensions of the Base (L      W      H)	1710mm	715mm	180mm
Taper hole Spindle.	MT#4		
Stroke of the Spindle.	250mm		
R.P.M. of Spindle. ( R.P.M.      step )	44-1500	12 steps	
Feed of Spindle ( REV.      step )	0.05,0.09,0.15	3 speeds	
Main motor.	2.25KW(3HP)		
Elevating motor.	0.75KW(1HP)		
Clamping motor.	0.75KW(1HP)		
Coolant pump .	0.1KW(1/8HP)		
Machine height from floor, max.	2780mm		
Height from the Column top to floor	2060mm		
Net weight (approx.) kgs	2100kg		
Shipping Gross weight. (approx.) kgs	2300kg		
Shipping dimensions(L   W   H )	2035mm	995mm	2240mm

## The max. processing capacity.

Drilling	Steel	Ø42
	Cast iron	Ø55
Taping	Steel	Ø25
	Cast Iron	Ø38

### 2.4.3 TRD-1600H Specification.

TRD-1600H			
Diameter of column	432mm		
Distance from Column surface to Spindle center, max.	1580mm		
Distance from Column surface to Spindle center, min.	440mm		
Travel of Spindle head	1140mm		
Distance from Base surface to Spindle end, max.	1600mm		
Distance from Base surface to Spindle end, min.	380mm		
Elevating height of Arm.	850mm		
Effective area of Table.	700mm	500mm	400mm
The dimensions of the Base (L      W      H)	2450mm	1020mm	200mm
Taper hole Spindle.	MT#5		
Stroke of the Spindle.	370mm		
R.P.M. of Spindle. ( R.P.M.      step )	35 – 1890	12 steps	
Feed of Spindle ( REV.      step )	0.07 - 0.96	6 steps	
Main motor.	5.625KW(7.5HP)		
Elevating motor.	1.5KW(2HP)		
Clamping motor.	0.75KW(1HP)		
Coolant pump .	0.1KW(1/8HP)		
Machine height from floor, max.	3170mm		
Height from the Column top to floor	2660mm		
Net weight (approx.) kgs	4600kg		
Shipping Gross weight. (approx.) kgs	4900kg		
Shipping dimensions(L   W   H)	2820mm	1450mm	2920mm

### The max. processing capacity.

<b>Drilling</b>	<b>Steel</b>	<b>Ø65</b>
	<b>Cast iron</b>	<b>Ø70</b>
<b>Taping</b>	<b>Steel</b>	<b>Ø50</b>
	<b>Cast Iron</b>	<b>Ø60</b>

#### 2.4.4 TRD-2000H Specification.

TRD-2000H			
Diameter of column	432mm		
Distance from Column surface to Spindle center, max.	2000mm		
Distance from Column surface to Spindle center, min.	490mm		
Travel of Spindle head	1510mm		
Distance from Base surface to Spindle end, max.	1900mm		
Distance from Base surface to Spindle end, min.	500mm		
Elevating height of Arm.	1100mm		
Effective area of Table.	1000mm	800mm	500mm
The dimensions of the Base (L      W      H)	2908mm	1102mm	250mm
Taper hole Spindle.	MT#5		
Stroke of the Spindle.	370mm		
R.P.M. of Spindle. ( R.P.M.      step )	35 – 1890	12 steps	
Feed of Spindle ( REV.      step )	0.07 - 0.96	6 steps	
Main motor.	5.625KW(7.5HP)		
Elevating motor.	2.25KW(3HP)		
Clamping motor.	0.75KW(1HP)		
Coolant pump .	0.1KW(1/8HP)		
Machine height from floor, max.	3470mm		
Height from the Column top to floor	2960mm		
Net weight (approx.) kgs	6100kg		
Shipping Gross weight. (approx.) kgs	6600kg		
Shipping dimensions(L    W    H)	3105mm	1400mm	3240mm

#### The max. processing capacity.

<b>Drilling</b>	<b>Steel</b>	<b>Ø65</b>
	<b>Cast iron</b>	<b>Ø70</b>
<b>Taping</b>	<b>Steel</b>	<b>Ø50</b>
	<b>Cast Iron</b>	<b>Ø60</b>

## 2.5 Standard and Option Accessories.

### (1) Standard Accessories:

- a. Adjusting tools ( including tool box )
- b. Cooling equipment ( including pump )
- c. Lighting installation ( including fluorescent lamp )
- d. Box table

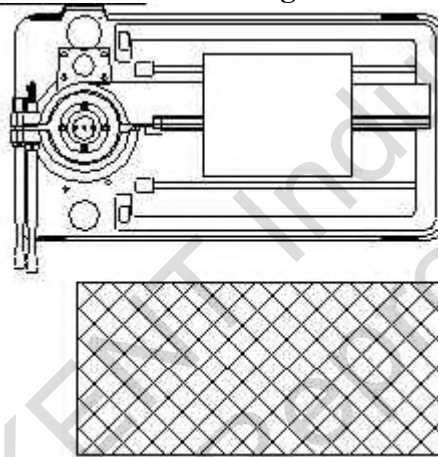
### (2) Option Accessories:

- a. Tilt worktable

## 2.6 Operation position and noise level.

**2.6.1 Operation position:** about 1 meter far from the gearbox surface.

**Height:** 1.6 meter from the ground.



### 2.6.2 The noise level.

#### (1) Before being processed,

When the turning speed is 1500 rpm, the noise level is 70 dB(A).

When the turning speed is 88 rpm, the noise level is 71 dB(A).

(Note :When using drill machine please wear the earmuffs.)

#### (2) When processing with tools,

The test conditions are as follow:

Material : SS41

Thickness : 32mm

The tool diameter :  $\varnothing 32\text{mm}$

When the turning speed is 88rpm and the feed rate is 0.09 mm, the noise level is 82 dB(A).

When the turning speed is 88rpm and the feed rate is 0.05 mm, the noise level is 80 dB(A).

(Note : When using drill machine please wear the earmuffs.)

## CHAPTER 3

### Preparation to Install

#### 3.1 Space and room requirement

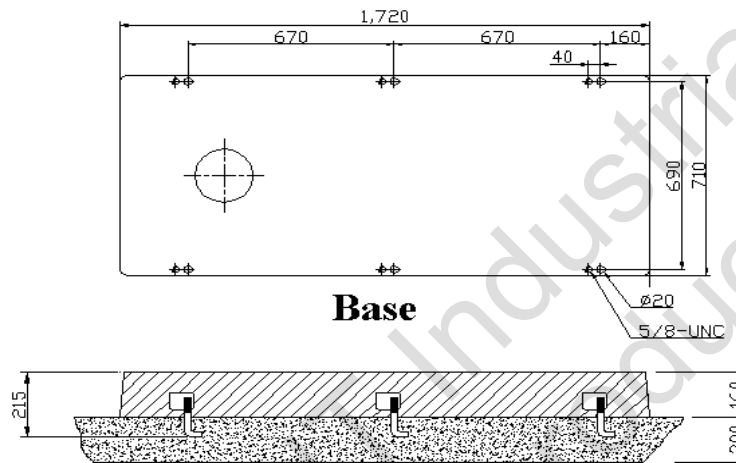
##### 3.1.1 Floor requirement

Using this machine requires solid and well-structured floor and its good level.

Note:

1. For adjusting level, please refer to the chapter 6.
2. Adjusting level is needed before using this machine. The level adjusting tolerance must be within 1 mm/m.

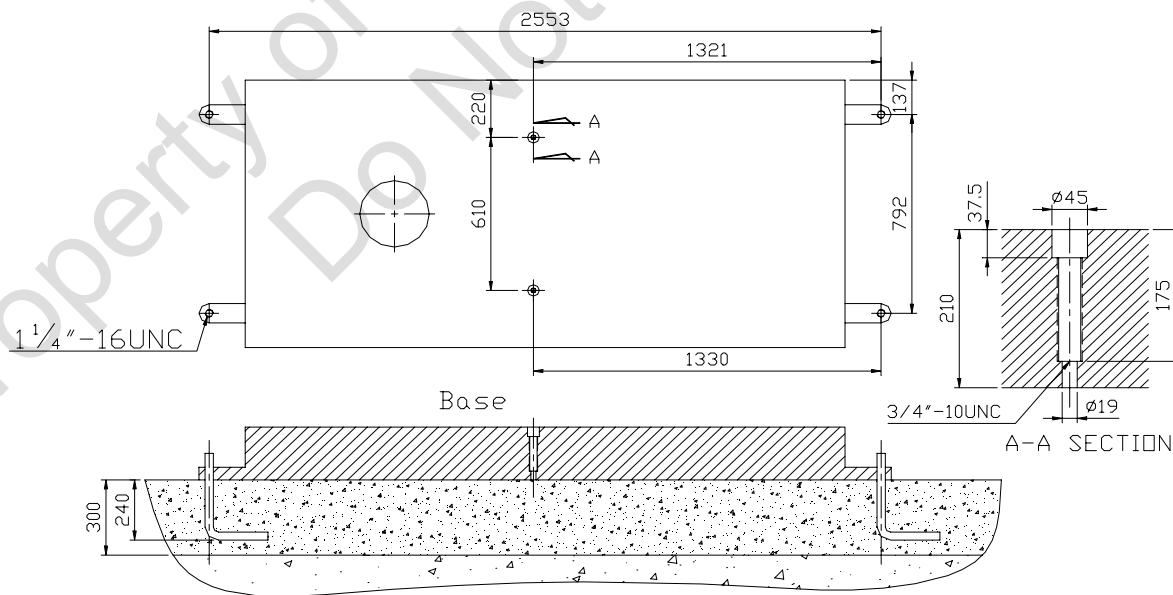
TRD-1230H & TRD 1230 floor diagrams. (Unit : mm)



the Ground Diagram

The above diagrams are for the bases and ground bolts, as well as its relative positions of TRD-1230H & TRD 1230.

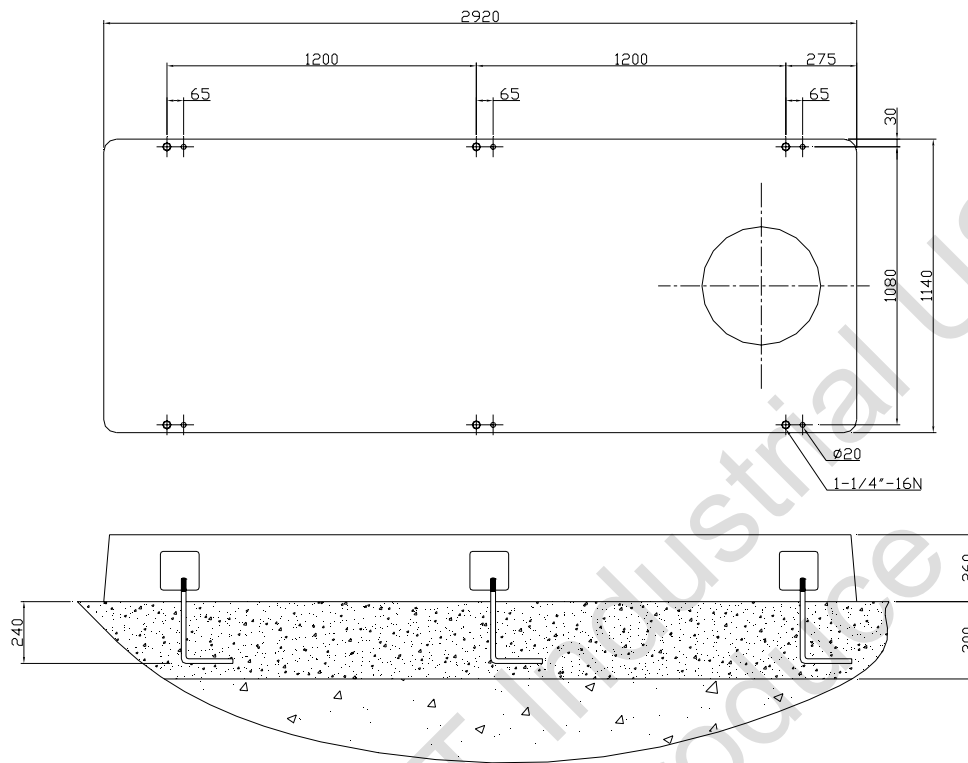
TRD-1600H floor diagrams. (Unit : mm)



The Ground Diagram

The above diagrams are for the bases and ground bolts, as well as its relative positions of TRD-1600H.

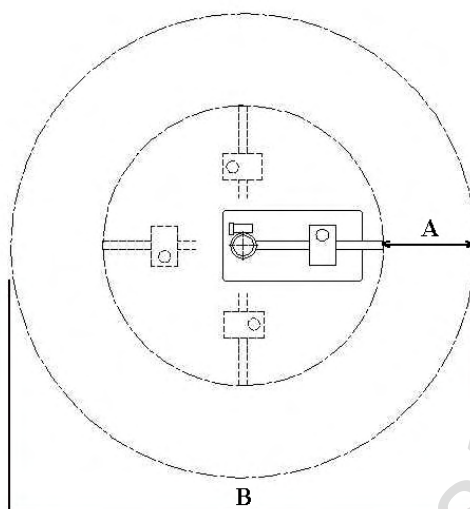
**TRD-2000H floor diagrams. (Unit : mm)**



The above diagrams are for the bases and ground bolts, as well as its relative positions of TRD-2000H.

### 3.1.2 Space requirement

For safety reason, Path must be considered when installing. For space, it requires:



Its calculation is the area of the arm rotating 360 degree, the most outer circle and plus 1000 mm. Different models has different dimensions.

MODEL	The distance from the column center to the arm limit.	Plus maintenance area (A)	Total space requirement (B)
TRD-1230	1546 mm	1000 mm	5092 mm
TRD-1230H	1546 mm	1000 mm	5092 mm
TRD-1600H	2087 mm	1000 mm	6174 mm
TRD-2000H	2537 mm	1000 mm	7074 mm

### 3.2 Environment requirement

- Never put the machine in the places where sun shines directly on it.
- Temperature: normal range is between +5 and 40 .
- Humidity: between 30% and 95%. At the max. temperature 40 , The relative humidity should not be over 50%. And at the relative lower temperature, higher humidity is acceptable I.g. at temperature 20 , humidity 90% is fine.
- Please keep the machine away from gasoline, chemical substances, dust, acid, sulfides, magnetic interference and explosive environment.
- Please keep the machine away from the electrical interference source like welding machine and EDM.
- The installation ground must be flat.
- The illumination of the work area: greater than 500lux.
- Good ventilation.
- Please take care there is no hydraulic splash to prevent from anyone slipping tripping and falling in danger.
- Please take litter to the Recycling Center or any appropriate equipment.



### 3.3 Power supply requirement

- a. Acceptable voltage fluctuation : normally  $\pm 10\%$  vlt.
- b. Acceptable frequency fluctuation :  $\pm 1\text{HZ}$  (50/60HZ)
- c. Acceptable momentary power-off duration: less than 10m.sec
- d. Acceptable voltage impulse  
The Peak value : 200% or less than the line voltage of the actual value(rms. value)  
Duration: 1.5m.sec or less
- e. Acceptable AC voltage of the waveform distortion.
- f. Acceptable imbalance of the line voltage: 5% or less
- g. Power capacity table

TRD-1230H & TRD-1230 Main Motor	
	2.25Kw
Elevating Motor	0.75Kw
Hydraulic Motor	0.75Kw
Coolant Pump Motor	0.1Kw

The total power requirement should be 9.753 KVA

TRD-1600H	
Main Motor	5.625Kw
Elevating Motor	1.5Kw
Hydraulic Motor	0.75Kw
Coolant Pump Motor	0.1Kw

The total power requirement should be 11.95 KVA

TRD-2000H	
Main Motor	5.625Kw
Elevating Motor	2.25Kw
Hydraulic Motor	0.75Kw
Coolant Pump Motor	0.1Kw

The total power requirement should be 13.21 KVA

### 3.4 Electric system alculatation

#### 3.4.1 (For TRD-1230, TRD-1230H)

Motor Part Name	Rated Power Capacity	Maximum Initiate Power
Main Motor	2.25kw	6.3kw
Elevating Motor	0.75kw	2.1kw
Hydraulic Motor	0.75kw	2.1kw
Coolant Pump Motor	0.1kw	0.28kw

**Total Rated Power Capacity:**

$$(2.25\text{kw}+0.75\text{kw}+0.75\text{kw}+0.1\text{kw})=3.85\text{kw}.....(1)$$

**Maximum Total Initiate Power Capacity:**

$$(6.3\text{kw}+2.1\text{kw}+2.1\text{kw}+0.28\text{kw})=10.78\text{kw}.....(2)$$

Transformer Rated Output Power Capacity for Control Circuits

	<b>Model</b>	
<b>Item</b>	<b>100VA</b>	
<b>Power Supply</b>	<b>Input</b>	<b>AC400V±10% 1Ø</b>
	<b>Output</b>	<b>AC240V±10% 1Ø</b>
<b>Ambient Temperature</b>	<b>0°C To 55°C</b>	

$$S=\text{KVA}$$

$$P=\text{KW}$$

$$\text{Pf} \times n = 0.75 \text{ (Correction Factors)}$$

$$S = \frac{\text{KW}}{\text{Pf} \times n (0.75)}$$

$$P = \frac{3.85\text{Kw}}{0.75} = 5.133\text{KVA}.....(1)$$

$$P = \frac{10.78\text{Kw}}{0.75} = 14.373\text{KVA}.....(2)$$

$$\text{Power Equipment Capacity} = \frac{5.133\text{KVA} + 14.373\text{KVA}}{2} = 9.753\text{KVA}$$

### 3.4.2 (For TRD-1600H)

Motor Part Name	Rated Power Capacity	Maximum Initiate Power
Main Motor	5.625kw	15.75kw
Elevating Motor	1.5kw	4.2kw
Hydraulic Motor	0.75kw	2.1kw
Coolant Pump Motor	0.1kw	0.28kw

#### Total Rated Power Capacity:

$$(5.625\text{kw}+1.5\text{kw}+0.75\text{kw}+0.1\text{kw})=7.975\text{kw}.....(1)$$

#### Maximum Total Initiate Power Capacity:

$$(15.75\text{kw}+4.2\text{kw}+2.1\text{kw}+0.28\text{kw})=22.33\text{kw}.....(2)$$

#### Transformer Rated Output Power Capacity for Control Circuits

	Model	
Item	100VA	
Power Supply	Input	AC400V±10% 1Ø
	Output	AC240V±10% 1Ø
Ambient Temperature	0°C To 55°C	

$$S=\text{KVA}$$

$$P=\text{KW}$$

$$\text{Pf} \times n = 0.75 \text{ (Correction Factors)}$$

$$S = \frac{\text{KW}}{\text{Pf} \times n (0.75)}$$

$$P = \frac{7.975\text{KW}}{0.75} = 10.633\text{KVA}..... (1)$$

$$P = \frac{22.33\text{KW}}{0.75} = 29.773\text{KVA}..... (2)$$

$$\text{Power Equipment Capacity} = \frac{10.633\text{KVA} + 29.773\text{KVA}}{2} = 20.203\text{KVA}$$

### 3.4.3 (For TRD-2000H)

Motor Part Name	Rated Power Capacity	Maximum Initiate Power
Main Motor	5.625kw	15.75kw
Elevating Motor	2.25kw	6.3kw
Hydraulic Motor	0.75kw	2.1kw
Coolant Pump Motor	0.1kw	0.28kw

**Total Rated Power Capacity:**

$$(5.625\text{kw}+2.25\text{kw}+0.75\text{kw}+0.1\text{kw})=8.725\text{kw}.....(1)$$

**Maximum Total Initiate Power Capacity:**

$$(15.75\text{kw}+6.3\text{kw}+2.1\text{kw}+0.28\text{kw})=24.43\text{kw}.....(2)$$

**Transformer Rated Output Power Capacity for Control Circuits**

	Model	
Item	100VA	
Power Supply	Input	AC400V±10% 1Ø
	Output	AC240V±10% 1Ø
Ambient Temperature	0°C To 55°C	

$$S=\text{KVA}$$

$$P=\text{KW}$$

$$\text{Pf} \times n = 0.75 \text{ (Correction Factors)}$$

$$S = \frac{\text{KW}}{\text{Pf} \times n (0.75)}$$

$$P = \frac{8.725\text{KW}}{0.75} = 11.633\text{KVA}..... (1)$$

$$P = \frac{24.43\text{KW}}{0.75} = 32.573\text{KVA}..... (2)$$

$$\text{Power Equipment Capacity} = \frac{11.633\text{KVA} + 32.573\text{KVA}}{2} = 22.193\text{KVA}$$

## CHAPTER 4

### Transportation and Installation

#### 4.1 Disassembly and packaging

##### 4.1.1 General

Electrical equipment should be designed to stand transportation and storage under the temperature between -25 and +55 . If this is impossible, proper measurements must be taken to endure the high temperature. The criteria for this measurement is that it can withstand the affection of the high temperature of +70 within 24 hours. Other considerations like to prevent damage from vibration or shock must be also given.

##### 4.1.2 Packaging

When sold and being shipped to customer's plant, The machine needs to be packaged and fastened in place.



- The way to fasten the machine is illustrated as above diagram.
- Press the "LOCK" button to lock 1、 2 & 3 position.
- 4 is a wooden block : Due to its weight, it might lose its accuracy during transportation.  
It is to support the weight of the Arm and prevent from collision each other when test running. (Please don't move it when unpacking.)
- The block is added to help the Column support the Gearbox.
- 5 is a fastening screw. : When being packaged, the machine needs to be fastened with screws. Otherwise, the machine might move during transportation and make the center of the gravity slant, therefore bring the risk that the machine falls.
- 6 is the wooden crate base : It will ease the movement by a forklift.

##### Precaution:

All levers must be tightened. Please refer to the chapter 1, regarding the transportation.

MODEL	LENGTH	WIDTH	HIGHT
TRD-1230	2035mm	995mm	2240mm
TRD-1230H	2035mm	995mm	2240mm
TRD-1600H	2820mm	1450mm	2920mm
TRD-2000H	3105mm	1400mm	3240mm

## 4.2 Transportation

### 4.2.1 The diagram of the machine weight and its gravity center

The weight differ due to the different models. Their data is as blow:

MODEL	TRD-1230	TRD-1230H	TRD-1600H	TRD-2000H
Total Weight	2300 kgw	2300kgw	5100kgw	6600kgw
Required Forklift	2.5 tons	2.5 tons	5 tons	7 tons

Note:

Please make sure that the forklift tonnage is suitable for the machine.



The above arrow pointed place is the machine's gravity center. It is about 200 mm far from the Column, measured from the middle of the wooden crate.

### 4.2.2 The movement of the machine.

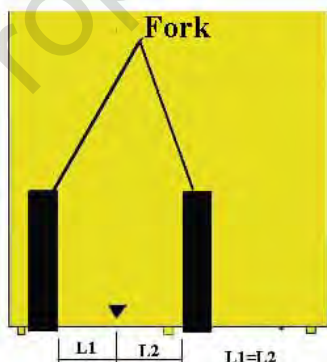
There are using forklift to move the machine.

The following is the procedure, precaution and illustration for moving the machine with forklift.

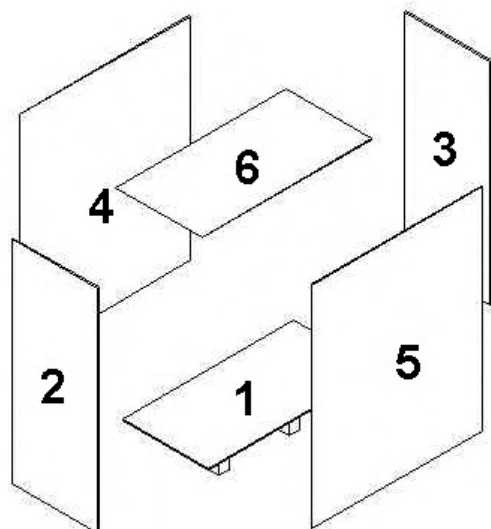
- Have a suitable forklift move to the wooden crate.
- As diagram shown, insert two forks into the underneath of the wooden crate.
- Adjust the distance from the forks to the gravity center till L1 is equal to L2. (L1 & L2=450mm)
- Have forks fully inserted into the underneath of the wooden crate.
- Have the machine fastened to the forks and forklift, using metal chain or wire.

Precaution :

- Forks must be fully inserted.
- L1 must be equal to L2 so that the machine can be in balance.



### 4.2.3 The order to pack



Please pack according the following procedure:

1. Place the base plate 1 under the machine and have both the plate and the machine fastened with bolts.
2. Install the side plate 2.
3. Install the side plate 3.
4. Install the side plate 4.
5. Install the side plate 5.
6. Install the top plate 6 and pack it.

## 4.3 Installation of the machine

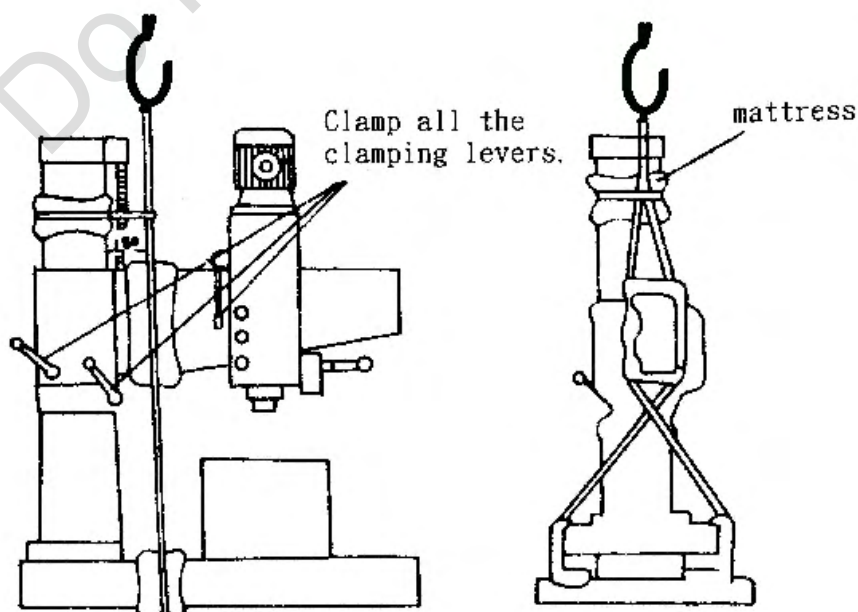
### 4.3.1 Have the machine set onto the fastening bolts of the crate base

#### (1) Tools

Sling, lifting equipment, spanner, movement plate, insertion blocks and level adjusting blocks.

#### (2) Procedure

a.	After dismantling the wooden crate, get the manuals and tool box out.
b.	Remove the fastening bolts.
c.	Hook it using sling, lift it up and move to site for installation.
d.	Align the ground bolts and the base bores and set the later onto them. Meanwhile, have the level adjusting blocks inserted to the underneath of the level adjusting bolts.
e.	Remove the lifting equipment and slings.
f.	Have nuts for the ground bolts mounted.






### 4.3.2 Level adjusting

#### (1) Tools

a.	A level scale, with tolerance within 0.02mm/m
b.	Spanners, Level adjusting blocks.

#### (2) Procedure

	a.	Please adjust the level adjusting bolts to contact the level adjusting blocks.
	b.	Have the level scale put on the worktable.
	c.	Locate the peak point using the level scale and make it as a reference level.
	d.	Adjust the tolerance of the level adjusting bolts to be within one grad using the level adjusting scale.
1.	The level adjusting bolts.	

### 4.3.3 The installation of the electricity

a.	Prepare long enough wire. (about 30 meters). The diameters for all the models are as follows:
b.	Connect L1、 L2 and L3 to the main power switch.
c.	Connect the ground wire to PE base.

Note: The following are the main power switches and its other relating data.

Note: The following are the main power switches and its other relating data.										
		Power supply AC±10%1 50/60HZ±1HZ								Power equipment capacity (KVA)
Item  Type	Cross-sectional area of phase conductors supplying the equipment` (mm <sup>2</sup> )					Rated current (A)				
	220V	380V	415V	440V	PE	220V	380V	415V	440V	
TRD-1230	3.5	3.5	3.5	3.5	3.5	19.3	11.12	10.2	9.7	9.753
TRD-1230H	3.5	3.5	3.5	3.5	3.5	19.7	11.89	11.04	10.33	9.753
TRD-1600H	5.5	5.5	5.5	5.5	5.5	34.8	19.95	18.59	17.38	20.203
TRD-2000H	5.5	5.5	5.5	5.5	5.5	37.8	21.65	21	20	22.193

### 4.4 The test after installation

a.	Have the main power on.
b.	Press the emergent stop button to see whether it stops immediately.
c.	Power on again.
d.	Please check whether the motor is running smoothly. If there is any errors, Please select two of the wires L1, L2 and L3 and change its position.
e.	Check every mechanism to see whether it works normally.

### 4.5 The procedure for dismantling the machine

The dismantling procedure is the reverse of the installation one.

## CHAPTER 5

### Operation

#### 5.1 A brief introduction to the relevant operation hardware

##### 5.1.1 (For TRD-1230, TRD-1230H)



The front view of the machine

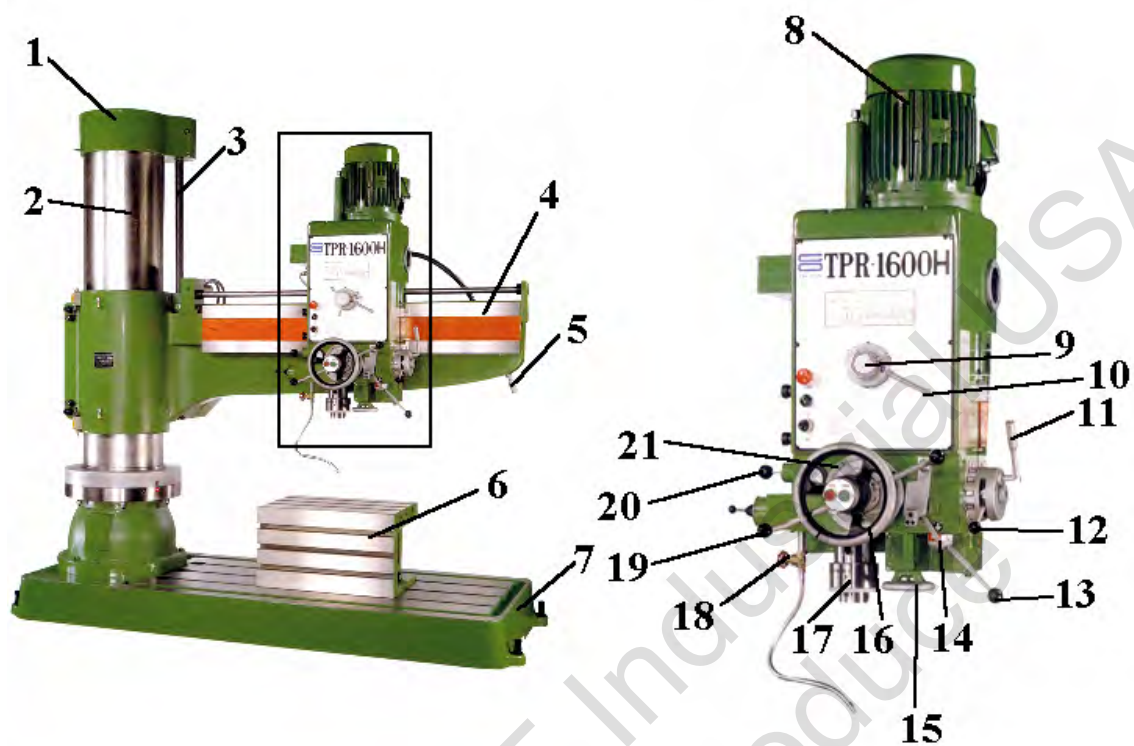


The rear view of the machine

**The relevant terms.**

No.	Term	Description
1	Column	It is to support the Gearbox and Arm. It is connected with the Base.
2	Top Cap	It is on the top of the machine.
3	Electric ball screw	It is the rail of the Arm, which can be lifted or lowered by an elevating motor.
4	Main motor	It is to move the spindle.
5	Three speeds change lever	It is to change the speed of the Spindle. There are three speeds for it.
6	Two speeds change lever	It is to change between the high and low speed. After interconnecting with three speeds change lever, there are six speeds available on the machine.
7	Hand wheel	It is to move the head either to right or to left side.
8	Arm	It is to support the Gearbox, connecting with the Column.
9	Lever, for feed trip.	It is to start or stop the automatic Knives Feeding.
10	Hand wheel, for moving head	It is the indicator for the automatic knife feeding. It runs simultaneously with the feeding knives.
11	Spindle	It is the place where drill bit, threading head, drill clamp are mounted on.
12	Worktable	It features a T shape chamfer, which help clamp and position work piece. In addition, the worktable helps shorten the distance between the work piece and the drill bit.
13	Base	It is the gravity center of the machine. It stores the cutting fluids. When no worktable used, it is used to support the work piece and applied as a base for processing. It features also a T shape chamfer, which is very convenient for clamping.
14	Cutting fluids adjusting knob	It is used to control the floating of the cutting fluids.
15	Feed rate switch	When at boring and automatic feeding needed, the feed rate varies due to the different material and drilling bit used. It is used to adjust the feed rate.
16	Handle, for rotating the Arm.	It requires the smallest strength and it is the safest way to rotate the Arm,
17	Control box	All control elements are mounted here.
18	Counter weight	After feeding knife finished, The spindle will return to its original point due to the counter weight.
19	Metal covering	It covers the internal ball screw and hydraulic pump so that the operator or others can be safely protected.
20	Cutting fluids pump	It is to pump the cutting fluids from the container to lubricate the drilling or boring.
21	Elevating speed reducer	The elevating motor rotates very fast. If the motor drives the ball screw transmission directly, it is very hard to control the elevating position. Therefore an elevating speed reducer is mounted to easily control the elevating positions.
22	Elevating motor	It is to elevate up or down the Arm through ball screw.
23	The solenoid valve	It is to control the open and close of the switch when the Arm is clamped hydraulically.
24	Hydraulic pump motor	It is the source power for the hydraulic pump.
25	Oil tank	It stores the hydraulic oil.
26	Oil pressure gauge	It indicated the oil pressure gauge. The normal pressure is 38bar.

**5.1.2 (For TRD-1600H/ For TRD-2000H)**



**The front view of the machine**



**The rear view of the machine**



### The relevant names :

No	Name	Description
1	Top Cover	It is located on the top of the Column, inside which Elevating Motor and Reducing Speed Motor are installed.
2	Column	It is designed to support the Gearbox and Arms. It connects with the Base.
3	Transmission ball screw.	It is designed to transmit the rotation of the Elevating Motor to the Arm so that it can move up and down.
4	Arm	It is to support the Gearbox. It connects with the Column.
5	Rotating lever	It is designed to move the Arm. It is easy and safe to use.
6	Work table	It shortens the distance between the work piece and drilling bit. The T-shaped surface facilitates the clamping and positioning of the work piece.
7	Base	It serves as a foundation, the gravity center of the machine. It contains cutting fluids inside. It can support the work piece. Its T-shaped surface facilitates the clamping and positioning of the work piece.
8	Spindle Motor	It is the source of the driving for the Spindle.
9	Three steps feeding rate selection ring	It is designed to select the feeding rate. Used together with the two steps feeding rate selection lever, it provides 6 options for the feeding rate.
10	Two steps feeding rate selection ring	It is designed to select the feeding rate. Used together with the three steps feeding rate selection lever, it provides 6 options for the feeding rate.
11	Dual Speed changing lever	It is designed to switch the spindle rotation speed. Used together with the three steps feeding rate selection lever, it provides 6 options for the feeding rate.
12	Triple speed changing lever	It is designed to switch the spindle rotation speed. Used together with the two steps feeding rate selection lever, it provides 6 options for the feeding rate.
13	High-low speed changing lever	It is designed to switch the spindle rotation speed. Used together with the two and three steps feeding rate selection lever, it provides 12 options for the feeding rate.
14	Auto feeding lever	It is used simultaneously with the feeding lever to enable the auto mechanism.
15	Manual feeding wheel	It indicates the scale of the manual feeding. It rotates simultaneously with the auto feeding devices.
16	Hand wheel	It is designed to move the Gearbox. It can move right- or leftward.
17	Spindle	It is the place where the drilling bit, tapper and drill clamp head are installed to.
18	Cutting fluid adjustment switch	While at drilling, cutting fluid might be used. The switch is used to control the passage volume.
19	Feeding Lever	It is to control on and off of the auto feeding mechanism.
20	Bit releasing lever	When releasing the drilling bit, a releasing pin is used. This Bit releasing lever works the same as the releasing pin.
21	Main Scale	It indicates how deep the drilling has reached.
22	Cutting fluid pump	It is designed to extract out the fluid from the container.
23	Column clamping devise	
24	Oil Pressure pump motor	It is the dynamic source of the oil pressure pump.
25	Metal cover	There are the ball screw and oil pressure pump inside. It is designed to protect the operation and staffs' safety.
26	Gearbox clamping devise	It is designed to fasten the gearbox. It is used simultaneously with the ball screw.
27	Counter weight	After feeding finished, the Spindle will return to the original point due to the counter weight.
28	Guide lever	It is designed to guide the gearbox movement and clamp it.
29	Electricity box	Most of the control elements for the radial drill are put in this box.

### 5.1.3 Safty protective device (suit every model)



No.	Term	Description
1	Safety Protective Cover	For to avoid debris fly off. When spindle making the drilling bit,the cover must be close. Another for safety, the spindle must stop rotation, when the cover is open.
2	Limit Switch	The limit switch is controlled by safety protective cover's open or close. If safety protective cover is open,the spindle stop rotation by limit switch' single . Another,if safety protective cover is close,the spindle can rotation.

#### Precaution :

1.	When user close the saftety protective cover(As marked 1) , the limit switch (As marked 2)can message a signal to allow the spindle rotation.Therefore, user can operation the machine.
2.	When user open the saftety protective cover(As marked 1) , the limit switch (As marked 2)can message a signal to stop the spindle rotation immediately.

## 5.2 Instruction to switches

### 5.2.1 (For TRD-1230, TRD-1230H)(Type I)



The front view of the machine



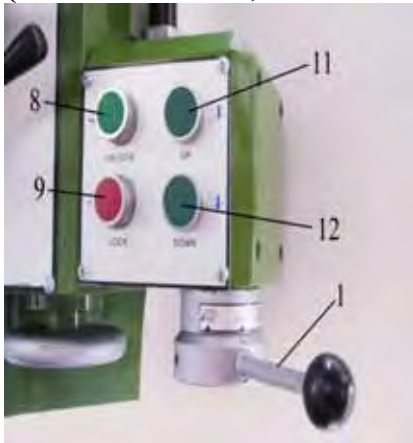
The rear view of the machine

#### Description for Switches.

1.	Cross switch	It is to control the elevating and revolution. There are four sign on it. When switched to "SPDL. FOR.", the spindle revolves clockwise. When switched to "SPDL.REV.", it revolves counter clockwise. When switched to "ARM UP", the Arm lifts. When switched to "ARM DOWN", the arm descends.
2.	Electric current meter	It is for operator's understanding whether the working situation is normal.
3.	Feeding light	It lights when at feeding. After work finished and power off, it turns off .
4.	The cutting fluids switch	It is a switch to start on or off the lubrication when at boring, where the boring or shearing causes high temperature, making the drilling bit easy to wear. The lubrication can reduce the temperature and lengthen the life of the drilling bit. Turn on to start and off to stop the lubrication. The floating capacity is decided by another knob called the cutting fluids adjusting knob.
5.	Emergent stop	It is pressed to stop the machine when at processing and emergence occurs. Pull it again for back to release the stop.
6.	Power light	When the external power and the main machine power switch are on, the power light will be on, indicating to the operator that the power is on.
7.	Pole change switch	The spindle motor is a pole variable one. A regular motor has 4 pole. But this one is changeable between 4 and 8 pole. It can change the spindle rotating speed.
8.	Release switch	It is to release the clamping of the Arm and the Gearbox so that the Gearbox can elevate, move for or backwards, left or rightwards.
9.	Clamping switch	It is used to clamp the Arm and the Gearbox. After the Gearbox, moveable up and down, for and backwards, left and rightwards, is positioned, You can use this switch to fasten the above mechanisms in positions.
10.	Work light switch	It is used to improve lighting where illumination is not enough.



**(For TRD-1230, TRD-1230H) (Type II)**



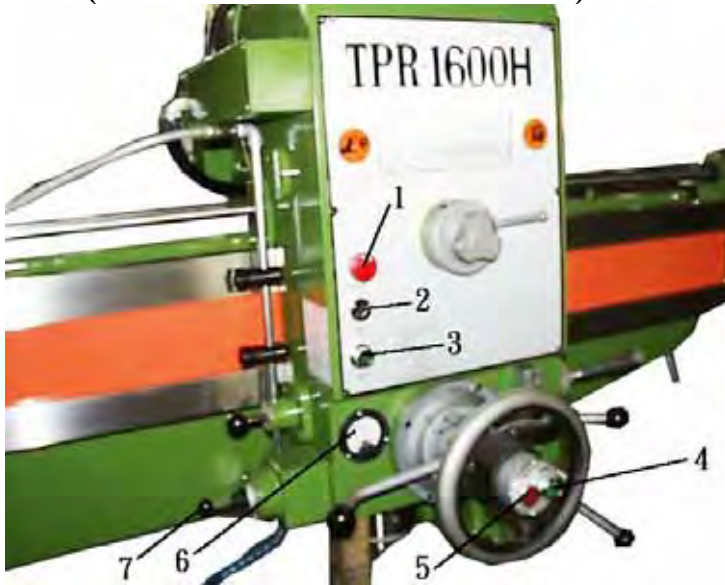
**The front view of the machine(Type II)**

**The rear view of the machine**

**Description for Switches.**

1.	Cross switch	Main Spindle forward-reverse Switch : When Switch to SPDL .For The Spindle will forward . When switch to SPDL.REV, The spindle will reverse.
2.	Electric current meter	It is for operator's understanding whether the working situation is normal.
3.	Feeding light	It lights when at feeding. After work finished and power off, it turns off .
4.	The cutting fluids switch	It is a switch to start on or off the lubrication when at boring, where the boring or shearing causes high temperature, making the drilling bit easy to wear. The lubrication can reduce the temperature and lengthen the life of the drilling bit. Turn on to start and off to stop the lubrication. The floating capacity is decided by another knob called the cutting fluids adjusting knob.
5.	Emergent stop	It is pressed to stop the machine when at processing and emergence occurs. Pull it again for back to release the stop.
6.	Power light	When the external power and the main machine power switch are on, the power light will be on, indicating to the operator that the power is on.
7.	Pole change switch	The spindle motor is a pole variable one. A regular motor has 4 pole. But this one is changeable between 4 and 8 pole. It can change the spindle rotating speed.
8.	Release switch	It is to release the clamping of the Arm and the Gearbox so that the Gearbox can elevate, move for or backwards, left or rightwards.
9.	Clamping switch	It is used to clamp the Arm and the Gearbox. After the Gearbox, moveable up and down, for and backwards, left and rightwards, is positioned, You can use this switch to fasten the above mechanisms in positions.
10.	Work light switch	It is used to improve lighting where illumination is not enough.
11.	Arm uplift switch	The arm will uplift when pushing the"UP" button.
12.	Arm downlift switch	The arm will be lowered down when pushing the"Down" button.

### 5.2.2 (For TRD-1600H/ TRD-2000H)



The front view of the machine

Description for Switches.



The rear view of the machine

1.	Emergent stop	It is pressed to stop the machine when at processing and emergence occurs. Pull it again for back to release the stop.
2.	The cutting fluids switch	It is a switch to start on or off the lubrication when at boring, where the boring or shearing causes high temperature, making the drilling bit easy to wear. The lubrication can reduce the temperature and lengthen the life of the drilling bit. Turn on to start and off to stop the lubrication. The floating capacity is decided by another knob called the cutting fluids adjusting knob.
3.	Power switch (light attached)	When external power and the machine is on, the main power light will be on, to indicate to the operator that the power is on.
4.	Release switch	It is to release the clamping of the Arm and the Gearbox so that the Gearbox can elevate, move for or backwards, left or rightwards.
5.	Clamping switch	It is used to clamp the Arm and the Gearbox. After the Gearbox, moveable up and down, for and backwards, left and rightwards, is positioned, You can use this switch to fasten the above mechanisms in positions.
6.	Electric current meter	It is for operator's understanding whether the working situation is normal.
7.	Cross switch	It is to control the elevating and revolution. There are four sign on it. When switched to "SPDL. FOR.", the spindle revolves clockwise. When switched to "SPDL.REV.", it revolves counter clockwise. When switched to "ARM UP", the Arm lifts. When switched to "ARM DOWN", the arm descends.
8.	Work light switch	It is used to improve lighting where illumination is not enough.

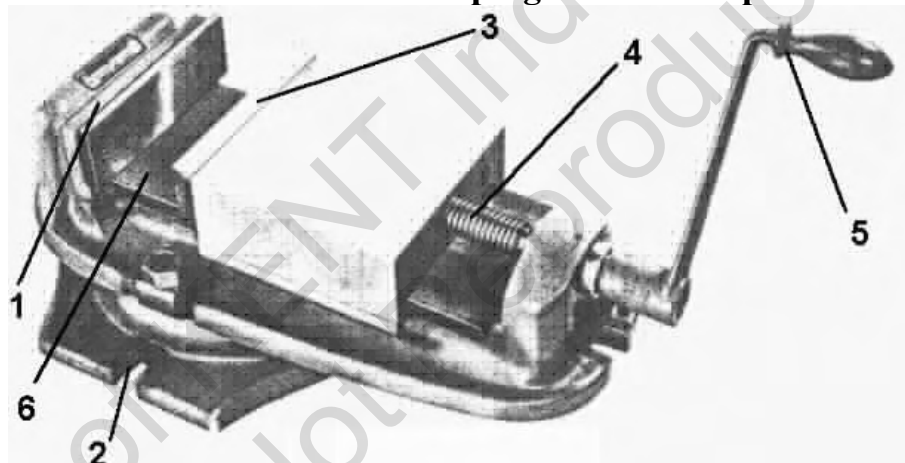
## 5.3 Installation of the clamp ( work piece )

### 5.3.1 General

Work piece must be placed securely and precisely on the radial drill so that precision and safe procession can be achieved. Regularly, a vise is applied. (as shown picture a). Since the vise has its range limit, universal clamp (as shown picture b) is applied for bulky work piece or any work piece which isn't easy to be clamped. The universal clamp includes T shape chamfer bolts, stacking plate, insertion blocks, which makes clamping easier.



### 5.3.2 Introduction of the vise and the clamping of the work piece.

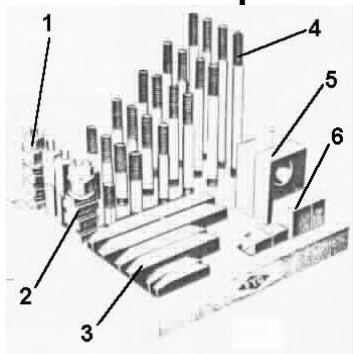


(1)	The fixed side of the vise.
(2)	The fixing side with T shape chamfer bolt and nuts
(3)	The moving side of the vise.
(4)	The screw bar.
(5)	The handle.
(6)	The surface of the vise.

**Clamp work piece as the following :**

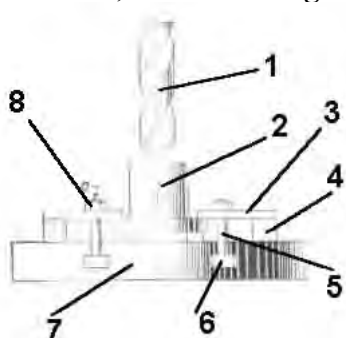
a.	Move away the drilling bit or lift the gearbox to the utmost point.
b.	Using brush, clean the worktable and the vise surface.
c.	Clean the vise surface using clean rag.
d.	Position the work piece on the vise surface. If it is piercing drilling, please insert a block under the work piece so that drilling into vise can be avoided.
e.	Fasten the handle by rotating it clockwise and tighten it. While tightening it, please use plastic hammer or copper bar to hit the work piece till there is no gap between the work piece and the inserted block.

### 5.3.3 Universal clamp and the clamping of the work piece.



- ( 1 ) Hex nuts
- ( 2 ) T shape chamfer nuts
- ( 3 ) Stacking plate
- ( 4 ) Twin head bolts
- ( 5 ) Insertion block
- ( 6 ) Ladder block

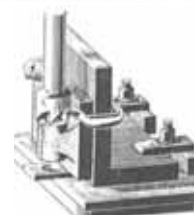
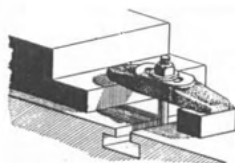
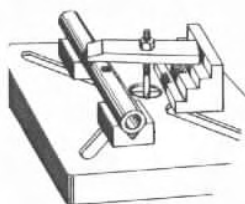
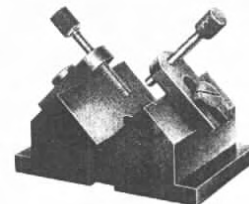
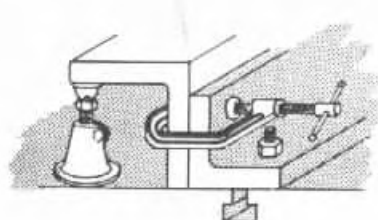
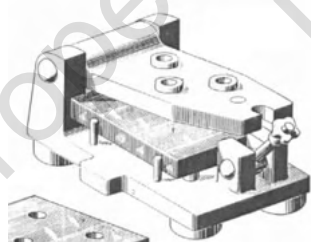
Clamp the work piece as the following : ( Since the combination of the universal clamp is very flexible and abundant, The following diagram is applied as an exemplary description.



- 1. Drilling bit
- 2. Work piece
- 3. Stacking block
- 4. Insertion block
- 5. Twin head bolts
- 6. T shape chamfer bolts
- 7. Worktable
- 8. Hex but

a.	Move away the drilling bit or lift the gearbox to the utmost point.
b.	Using brush, clean the worktable and the vise surface.
c.	Clean the vise surface using clean rag.
d.	Position the work piece on the vise surface. If it is piercing drilling, please insert a block under the work piece so that drilling into vise can be avoided.
e.	After screwing the T shape chamfer nut to the twin head bolts with suitable length, put it into the T shape chamfer of the worktable or the base.
f.	Choose the insertion block or ladder block that is the same high as work flange. Put them in the other side of the bolts.
g.	Using holed stacking block, place them onto the bolts, with one of its side pressing the work flange and another pressing the insertion block or ladder block, then tighten it with hex nuts.

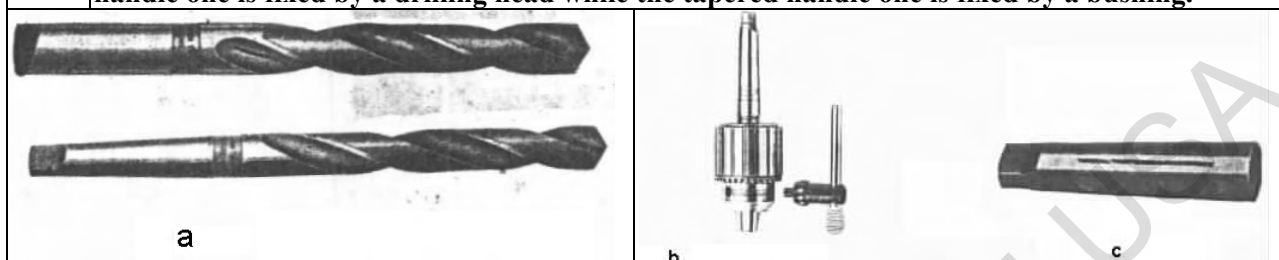
Examples of clamping, using the universal clamp.



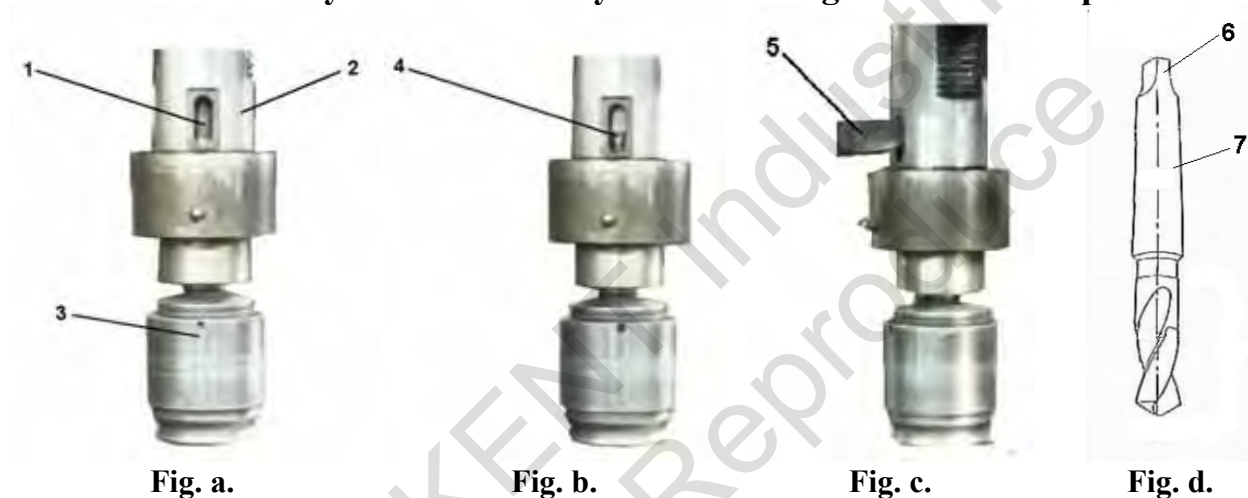


## 5.4 Installation and change of the drilling bit

The radial drill is mainly used in drilling. How to clamp the drilling bit is therefore very important. Generally, drilling bits divide into two kinds, one is straight handle drilling bit, and another is tapered handle one. (as fig. A). Their clamping is very different. The straight handle one is fixed by a drilling head while the tapered handle one is fixed by a bushing.



### 5.4.1 The assembly and disassembly of the drilling head and clamp



No.	Term
(1)	Revolving shaft.
(2)	Shaft bushing
(3)	Speedy drill bit clamp
(4)	The stem for the speedy drill bit clamp

No.	Term
(5)	Pin for releasing drill bit
(6)	Drill shaft end
(7)	Drilling shaft

Disassemble the tapered handle drill bit and the drill head clamp as the following way:

a.	Move away the drilling bit or lift the gearbox to the utmost point.
b.	Power off machine.
c.	Put on gloves.
d.	Insert a thick wood plate into the underneath of the drill bit and the drill bit head.
e.	Rotate the feed trip lever clockwise and have the spindle descend about 150 to 200 mm. As fig. a.
f.	Rotate the revolving shaft from the bushing till that the drill shaft end and drill shaft are visible from the hole of releasing drill bit. as fig. b.
g.	Insert the pin for releasing the drill bit into the hole, as fig. c.
h.	Hit the end of the pin for releasing drill bit, using plastic hammer or copper bar, till the drill bit and the drill bit clamp fall onto the wood plate.

**Precaution :**

The distance between the thick wood plate, drill bit and the end of the drill bit clamp is about 30 mm. Please dismantle the drill bit the following way when the bit releasing devise of the TRD-1600H cannot work.

The way to use the releasing taper handle head and clamping head follows as: ( only applicable for TRD-1600H /TRD-2000H )



1	The lever for releasing the drilling bit.
2	The feeding lever
3	The spindle

To dismantle as follows :



Step 1. Stand at the left side of the machine.



Step 2 Grasp the feeding lever using right hand and release the spindle to its utmost position.



Step 3. Press down the bit releasing lever using left hand.



Step 4. Keep grasping the drilling bit using left hand and rotate the feeding lever counter clockwise until the bit comes out.



Assemble the drill bit head and the drill bit clamp as the following:

a.	Move away the drilling bit or lift the gearbox to the utmost point.
b.	Power off.
c.	Put on gloves.
d.	Insert a thick wood plate into the underneath of the drill bit and the drill bit clamp.
e.	Rotate the feed trip lever clockwise and have the spindle descend about 150 to 200 mm. As fig. a.
f.	Rotate the revolving shaft from the bushing till that thing behind the machine is visible from the hole of releasing drill bit, as fig. b.
g.	Place the drill bit clamp end up, as fig. d.
h.	Place the drill bit and its clamp end into the revolving shaft and have the drill shaft end inserted into the hole for releasing the drill bit, as fig. b.
i.	Rotate the feed trip lever counter clockwise. Make the spindle descend till the drill bit and the bottom end of the drill bit clamp head contact the wood plate. Apply a little bit force and complete it by confirming that the drill bit won't fall.

Precaution :

The distance between the thick wood plate, drill bit and the end of the drill bit clamp is about 30 mm.

## 5.4.2 The assembly and disassembly of the straight handle drill bit



Fig. a.

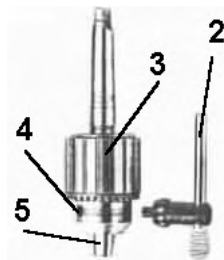


Fig. b.

No.	Term
(1)	Drill bit
(2)	Drill spanner
(3)	Tightening ring
(4)	Hole for drill spanner.
(5)	Drill bit clamp head.

Disassemble the straight drill bit as the following way:

a.	Move away the drilling bit or lift the gearbox to the utmost point.
b.	Power off.
c.	Put on gloves.
d.	Put the drill spanner into the hole for tightening.
e.	Rotate the spanner counter clockwise till the clamp head falls.

Assemble the straight handle drill bit as the following way:

a.	Move away the drilling bit or lift the gearbox to the utmost point.
b.	Power off.
c.	Put on gloves.
d.	Adjust the tightening ring till the drill bit can be inserted.
e.	Insert the drill bit into the clamp head at least 25 mm.
f.	Put the drill spanner into the hole for tightening.
g.	Rotate the spanner clockwise till the drill bit is tightened.

Precaution :

The drill bit must be inserted at least over 25 mm, otherwise the bit get easily broken or can't drill very precisely.

## 5.5 Power on and off.

### 5.5.1 Power on

- Turn outside main switch to "ON" position.
- Turn the machine power switch to "ON" position.

### 5.5.2 Power off

- Turn the machine power switch to "OFF" position.
- Turn outside main switch to "OFF" position.

Precaution :

When at emergency, please press down the emergent stop button to shut down the power supply.

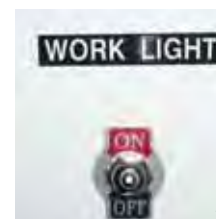
But the emergent stop button can't be used as a switch for normally stopping machine or normal power off.



## 5.6 Work light

Turn on the work light. Switch the work light to "ON" position.

Turn off the work light. Switch the work light to "OFF" position.





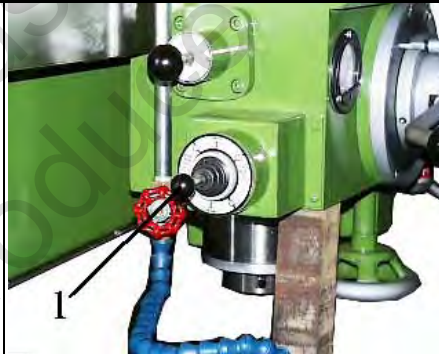
## 5.7 Cutting fluids

Turn on the cutting fluids. Switch the cutting fluids to "ON" position.

Turn off the cutting fluids. Switch the cutting fluids to "OFF" position.



## 5.8 Elevating the arm .

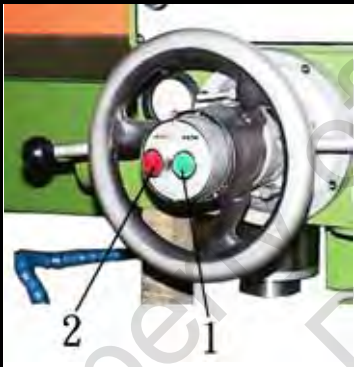

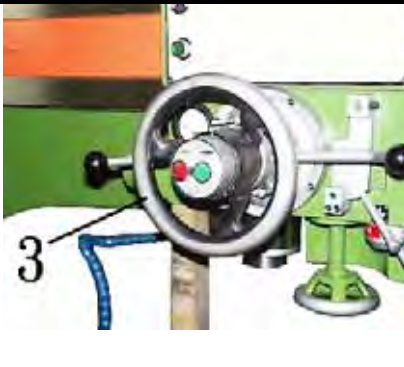
Diagrams			
Description	For TRD-1230, TRD-1230H (Type I)	For TRD-1230, TRD-1230H (Type II)	<sup>1</sup> Cross Switch. For TRD-1600H, TRD-2000H
Steps	Turn the cross switch to "ARM UP" if you want to elevate it up, Turn the cross switch to "ARM DOWN" if you want to elevate it down. Turn the cross switch to the middle after the Arm reaches the required position.		
Precaution	When the Arm is elevating, the clamping device will release itself automatically. When the cross switch is turned to the middle, the clamping device will tighten itself automatically.		

## 5.9 Rotate the Gearbox right or leftwards.

### 5.9.1 ( For TRD-1230,TRD-1230H )

   	
1.	Press the figure1 shown in the bottom left. Referring to the up right picture, release the button after pointing the arrow head to B. The clamping device is released now.
2.	Rotate the hand wheel clockwise to move rightwards and counter clockwise to move leftwards, as shown in up left picture.
3.	Press the figure 2 shown in the bottom left. Referring to the up right picture, release the button after pointing the arrow head to A. The clamping device is tightened now.
<b>Precaution :</b>	
	After UNLOCK pressed, the Arm can move for and backwards in addition to move left and right wards.

### 5.9.2 ( For TRD-1600H/ TRD-2000H )

  	
1.	Press the figure1 shown in the bottom left. Referring to the up right picture, release the button after pointing the arrow head to B. The clamping device is released now.
2.	Rotate the hand wheel clockwise to move rightwards and counter clockwise to move leftwards, as shown in up left picture.
3.	Press the figure 2 shown in the bottom left. Referring to the up right picture, release the button after pointing the arrow head to A. The clamping device is tightened now.
<b>Precaution :</b>	
	After UNLOCK pressed, the Arm can move for and backwards in addition to move left and right wards.

## 5.10 Rotate the arm forward or backwards.

### 5.10.1 (For TRD-1230, TRD-1230H)



1. Press the figure1 shown in the bottom left. Referring to the up right picture, release the button after pointing the arrow head to B. The clamping device is released now.
2. Push the arm moving lever backwards to move the arm backwards, as shown in figure 3. Pull the arm moving lever towards to move the arm towards, as shown in figure 3.
3. Press the figure2 shown in the bottom left. Referring to the up right picture, release the button after pointing the arrowhead to A. The clamping device is tightened now.

#### Precaution :

After UNLOCK pressed, the Arm can move for and backwards in addition to move left and right wards. If 180 degree rotation is needed, the ground needs to be processed according the method in the chapter 3, where the base bolts are required and need to be fastened by nuts.

### 5.10.2 ( FOR TRD-1600H, TRD-2000H )



1. Press the figure1 shown in the bottom left. Referring to the up right picture, release the button after pointing the arrow head to B. The clamping device is released now.
2. Push the arm moving lever backwards to move the arm backwards, as shown in figure 3. Pull the arm moving lever towards to move the arm towards, as shown in figure 3.
3. Press the figure2 shown in the bottom left. Referring to the up right picture, release the button after pointing the arrowhead to A. The clamping device is tightened now.

#### Precaution :

After UNLOCK pressed, the Arm can move for and backwards in addition to move left and right wards. If 180 degree rotation is needed, the ground needs to be processed according the method in the chapter 3, where the base bolts are required and need to be fastened by nuts.

## 5.11 Change the spindle speed.

### Warning :

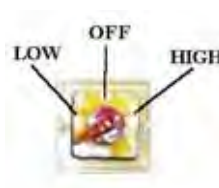
Spindle temperature will go up making operation in trouble when the spindle speed is set at high rotation mode without movement of the quill. So please do not set the spindle speed at high rotation mode when no movement of the quill.

### 5.11.1 ( For TRD-1230,TRD-1230H )

. The speedometer at the time when the pole switch is in high position.

( For TRD-1230,TRD-1230H )

The position for the pole switch. ( For TRD-1230,TRD-1230H )



Two speed change lever ( low speed )												
Speed change levels		1			2			3				
Speed ( rpm )		88			154			282				
Suitable drilling diameter (mm)	Mild steel	Ø25-Ø40			Ø19-Ø25			Ø12-Ø19				
	Cast iron	Ø38-Ø55			Ø28-Ø38			Ø22-Ø28				
Threading (metric)		M16-M20			M6-M16			M3-M6				
Suitable automatic feeding step.		1	2	3	1	2	3	1	2	3		

Two speed change lever ( high speed )												
Speed change levels		4			5			6				
Speed ( rpm )		456			796			1500				
Suitable drilling diameter mm	Mild steel	Ø10-Ø12			Ø6-Ø10			Ø3-Ø6				
	Cast iron	Ø19-Ø22			Ø10-Ø19			Ø3-Ø10				
threading(metric)		Not suggested.			Not suggested.			Not suggested.				
Suitable automatic feeding step.		1	2	3	1	2	3	1	2	3		

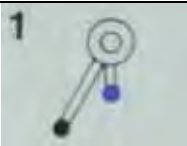
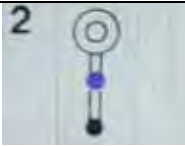
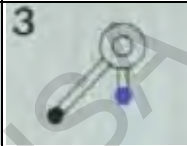


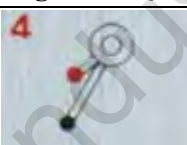

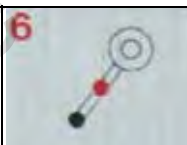
. The speedometer at the time when the pole switch is in low position.

( For TRD-1230,TRD-1230H )

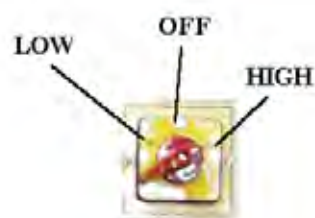
The position for the pole switch. ( For TRD-1230,TRD-1230H )



Two speed change lever ( low speed )												
Speed change levels		1 			2 			3 				
Speed ( rpm )		44			77			141				
Suitable drilling diameter (mm)	Ø25-Ø40	Ø25-Ø40			Ø19-Ø25			Ø12-Ø19				
	Ø38-Ø55	Ø38-Ø55			Ø28-Ø38			Ø22-Ø28				
Threading (metric)		M16-M20			M16-M20			M6-M16				
Suitable automatic feeding step.		1	2	3	1	2	3	1	2	3		

Two speed change lever ( high speed )												
Speed change levels		4 			5 			6 				
Speed ( rpm )		228			398			750				
Suitable drilling diameter mm	Ø12-Ø19	Ø10-Ø12			Ø6-Ø10			Ø3-Ø6				
	Ø22-Ø28	Ø19-Ø22			Ø10-Ø19			Ø3-Ø10				
threading(metric)		M3-M6			Not suggested.			Not suggested.				
Suitable automatic feeding step.		1	2	3	1	2	3	1	2	3		

. Change spindle speed.



Label 6 of detail.	
Low	If the pole switch to high position, its 8 pole.
OFF	If the pole switch to "OFF" position, the motor can't turn run.
High	If the pole switch in high position, its 4 pole. Normal, switch to high position.

Pic. a.

No.	Term	Description
1.	Three speeds change lever	
2.	Two speeds change lever	High and low speeds change lever.
3.	Indicating ring for high and low speed.	It is to indicate the current speed.
4.	Reference point for the three speeds change lever	It refers to the current position of the three speeds change lever.
5.	Reference point for the two speeds change lever	
6.	Pole change switch	

. Change the spindle speed as the following way:

- Have spindle rotate.
- Look up in the speed table and choose a suitable speed rate.
- Turn on the switch for the feed rate.

Precaution when changing speed:

- Spindle rotation must be stopped when at changing speed.
- Please press down the emergent stop button for safety reason.
- Change speed only after the spindle stops completely.

### 5.11.2 ( For TRD-1600H/ TRD-2000H ) Speedometer ( For TRD-1600H/ TRD-2000H )

Two step choice		1			2		
Speed ( rpm )	H (hi-speed)	1890	1010	475	220	115	55
	L (lo-speed)	1330	715	335	155	80	35
Applicable diameter mm	Mild steel	Ø1-Ø6	Ø6-Ø24	Ø14-Ø24	Ø24-Ø36	Ø36-Ø50	Ø50-Ø66
	Cast iron	Ø1-Ø8	Ø8-Ø18	Ø18-Ø30	Ø30-Ø44	Ø44-Ø60	Ø60-Ø78

. speed switch ( For TRD-1600H/ For TRD-2000H )



Fig.1.

The relevant names

a.	Step 1
b.	Step 2
c.	Two speed lever



Fig.2.

The relevant names

d.	Ref. Point for the step 1.
e.	Ref. Point for the step 2.
f.	Three step speed changing lever
g.	Speedometer

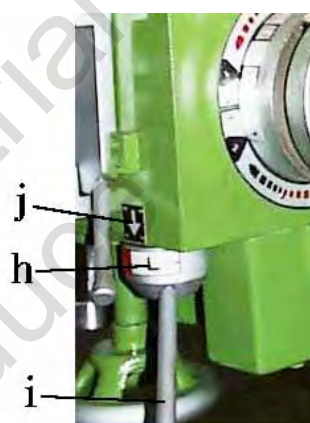


Fig.3.

The relevant names

h.	Hi-lo speed indicator
i.	Hi-lo speed changing lever
j.	Hi-lo speed reference point

( FOR TRD-1600H/  
TRD-2000H ) The way to switch

Step	Description
a.	Stop rotation of the spindle.
b.	Press down the emergency button.
c.	Check the speedometer and select the suitable speed.
d.	Switch the two step speed changing lever (as mark c in the fig. 1.) to the required position. (Select the required step)
e.	Switch the three step speed changing lever to the required position. When the two step speed changing lever is at the step 1, the speed will be based on the reference point of the step 1 (as mark d in the fig. 2). On the contrary, when the two step speed changing lever is at the step 2, the speed will be based on the reference point of the step 2 (as mark e in the fig. 2).
f.	Switch the Hi-lo speed changing lever to the required position.



**Example :** The following is the way to select the spindle speed at 115rpm:

Step	Description
a.	Stop the rotation of the spindle.
b.	Press down the emergency button.
c.	Check the speedometer and select the speed of 115 rpm.
d.	Switch the two step speed changing lever to step 2. That's to align the speed changing lever (as mark c in the fig. 1) to the step 2. (as the mark b in the fig. 1)
e.	Switch the three step speed changing lever to 115 and 80 (as the mark g in the fig. 2) and align it to the reference point of the step 2 (as the mark e in the fig. 2)
f.	Align the H of the Hi-lo speed changing lever to the Hi-lo speed indicator.

. Precaution to switch the rotation speed :

( Application model TRD-1600H/

a.	Rotating Spindle must be stopped when at changing rotation speed.
b.	Please press down the emergency stop for safety.
c.	Start to switch the rotation speed only when the spindle stops running.

. Precaution to switch the rotation speed :

( Application model TRD-1600H/

TRD-2000H )		1			2		
Rotation speed ( rpm )	H(Hi speed)	1890	1010	475	220	115	55
	L(Lo speed)	1330	715	335	155	80	35
Threading (metric)		Not suggested.			M3-M6	M6-M16	M16-M20

## 5.12 Automatic Feed.

### 5.12.1 ( For TRD-1230,

#### TRD-1230H) Automatic feed rate table

Steps	N	1	2	3
Feed rate	No feed rate	0.05mm/Rev	0.09 mm/Rev	0.15 mm/Rev

. Change the feed rate as the following way:

- Stop the spindle.
- Press down the emergent stop button.
- Check the speedometer and choose a suitable rate.
- Switch the feed rate.

Precaution when at changing feed rate:

You can change the feed rate only when the spindle is rotating.

. Suppose that the work piece is by the machine

The way to move(less than 25kgs.)

Suppose that the work piece is by the machine, the way to move it is as follows:

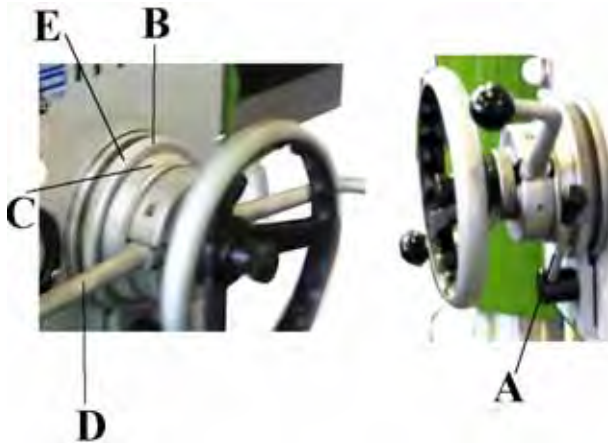
- Power off.
- Put on gloves.
- Squat facing the work piece.
- Lift the work piece with two hands.
- When you are standing up, lift and move the work piece with your feet strength.
- Move the work piece toward the worktable.

The way to move(greater than 25kgs.)

Suppose that the work piece is by the machine, the way to move it is as follows:

- Power off.
- Put on gloves.
- Push the arm backwards.
- Move a lifting devise close to the work piece.
- Place lifting ropes or slings under the work piece, (please use two ropes or slings). If the work piece has holes for lifting ropes or slings, please lock it with ring head pin, then lift and move it with a hook.
- Move the work piece toward the worktable.

## . How to preset the depth of the power-feed?



The relevant terms

Position	Term
A	Depth controlling and fixing lever.
B	Depth reference point.
C	Main dial
D	Feed trip lever
E	Depth-setting ring

### Preset the depth of the power-feed:

a.	Rotate the feed trip lever counter clockwise as shown in label D till The drill bit contact the work piece. (At this moment, label B shown in the pictures move simultaneously. That's the depth is zero when the bit is contacting the work piece and the dial is also at the zero position. )
b.	Release the fixing lever of the main dial. That's to release label A shown in the picture.
c.	Rotate the depth setting ring as shown in label E, referring to the depth point on the ring label B. To set the drilling depth is to adjust and align the gauge on the ring as shown in the label C.
d.	Clamp the fixing lever of the main dial. That's to clamp label A shown in the picture.
e.	Release the feed trip lever as shown in the label D.
f.	Rotate the feed trip lever a little bit counter clockwise, as shown in the label D.
g.	Turn the spindle switch to "SPDL. FOR".
h.	Pull the feed trip lever backwards as shown in the label D, The spindle will feed at the chosen rate and stop

### Example : How to preset a depth of 30mm?

a.	Rotate D as in the picture till it contacts the work piece.
b.	Release A, as shown in the picture.
c.	Rotate E and align C as shown in the picture to the position of 30 mm on the B, as shown in the picture.
d.	Clamp A, as shown in the picture.
e.	Release D, as shown in the picture.
f.	Rotate D in the picture a little bit counter clockwise.
g.	Turn the spindle switch to SPDL. FOR
h.	Pull the feed trip lever as shown in the picture D backwards.

### Precaution

- Auto feed will move only after the feed rate is set up.
- Auto feed is used only in drilling, not in threading.

### 5.12.2 ( For TRD-1600H/ TRD-2000H )

.The auto feeding rate table ( Application model: TRD-1600H/ TRD-2000H )

Two step feeding rate selection	Step 1			Step 2		
Feeding rate mm/Rev	0.96	0.56	0.31	0.21	0.12	0.07

. The way to switch the feeding rate follows as: ( Application model: TRD-1600H/ TRD-2000H )

- Stop the running spindle.
- Check the speedometer and select a suitable speed.
- Turn on the feeding rate switch.

The precaution to switch the feeding rate follows as:

- When you switch the feeding rate, the spindle has to be at running.

. The way to set up the depth of the auto feeding follows as:

( Application model:TRD-1600H /TRD-2000H )



The relevant names

position	name
A	Depth control lever
B	Main scale
C	Depth reference point
D	Feeding lever
E	Auto feeding lever

The way to set up the depth of auto feeding follows as : ( Application model: TRD-1600H/ TRD-2000H )

a.	Rotate the feeding lever (as mark D) counter clockwise until the drilling bit contacts the work piece (at this time, Mark B will be turning also. The depth is zero when the drilling touches the work piece and the main scale is also pointing to 0 position.)
b.	Release those two main scale levers. That's to release the mark A in the fig.
c.	Rotate the main scale (mark B). Using the depth reference point on the depth setup ring (mark C), set up the drilling depth, which is also the main scale ring's reading.
d.	Clamp the main scale ring. That's to clamp the mark A in the fig.
e.	Release the feeding lever (mark D)
f.	Rotate the feeding lever (mark D) a little bit counter clockwise.
g.	Turn the spindle switch to SPDL. FOR.
h.	Pull the feeding lever (mark D) backwards and push the auto feeding lever downwards. Then the spindle will be feeding at the selected rate and stop at the set depth.

Example : To set up a depth of 30 mm.

a.	Rotate the mark D until the drilling bit touches the work piece.
b.	Release the mark A.
c.	Rotate the mark B. Align the mark C to the mark B, at its scale 30.
d.	Clamp the mark A.
e.	Release the mark D.
f.	Rotate the mark D a little bit counter clockwise.
g.	Turn the spindle switch to SPDL. FOR
h.	Pull the feeding lever (mark D) backwards and push downward the auto feeding lever.

Precaution

- The feeding rate must be set up before the auto feeding can move.
- The auto feeding is suitable to be used in threading, but not in boring.

## 5.13 The spindle



**For**  
TPR1230,TPR1230H  
(Type I)



**For**  
TPR1230,TPR1230H  
(Type II)

1.	Please turn on the main switch of The Machine , and then lower down the Quill 5mm, so that the forward /reverse of the main spindle can start.
2.	The main spindle will forward when Switching to SPDL.FOR.
3.	If you want to stop the rotating of the Spindle, Please switch to the middle Position.
4.	The main spindle will reverse when Switching to SPDL.FOR.

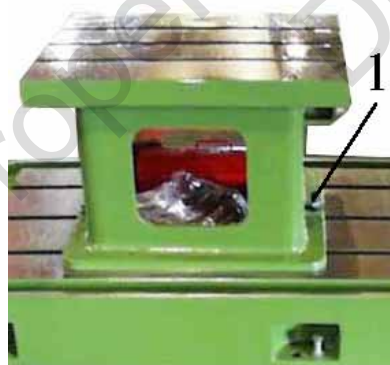
## 5.14 Threading

The way to thread is as follows :

a.	Clamp the screw tap with drilling head.
b.	Move the spindle to the top of the threading.
c.	Set the feed rate at "N".
d.	Rotate the feed trip lever a little bit counter clockwise.
e.	After the cross switch turned to "SPDL.FOR", the spindle spins clockwise.
f.	Rotate the feed trip lever counter clockwise till the threading is finished. (The operator decides the threading depth.)
g.	After the cross switch turned to "SPDL.REV.", let the spindle turn counter clockwise till the screw tap retreats completely.
h.	Turn the cross switch to the middle to stop the spindle.

## 5.15 The assembly and disassembly of the work table.

Disassemble it as follows:



1.	Release 1, as shown in the picture, using a spanner. That's to move the spanner counter clockwise.
2.	Apply the above to the other side.

Assembly it as follows:

1.	Clean the debris from the base with a metal brush.
2.	Clean the worktable and the base with rags.
3.	Place T shape Bolts into the T shape chamfer of the base.
4.	Tighten the nuts.

## 5.16 Cutting fluids for all kinds of material

Soft steel	crude oil、 animal fat
Mild steel	crude oil、 animal fat
High carbon steel	crude oil、 animal fat
Stainless steel	crude oil、 animal fat
Manganese steel	crude oil、 animal fat
Cast iron	Without
Malleable cast iron	Crude oil
Brass, bronze	Kerosene
Aluminum and alloy	Kerosene

When cutting fluids is not applied, Having the turning speed and the feed rate reduced is the only way to extend the tool life.

If cutting fluids leaks or injects to the aisle, please clean it immediately from the floor.



# CHAPTER 6

## Adjustment

### 6.1 General

Adjustment is needed after the machine has been used a period of time for its parts will get loose or worn out, In the radial drill, there are three parts needed to be adjusted. One is the arm clamping lever, another the gap between the gearbox and the arm rail, finally the engagement between the feed trip lever and the clutch.

### 6.2 The arm clamping lever

After the machine has been used for about 3-5 years, the position of the arm clamping lever will be descending. It is the time to adjust the position of the adjusting nut.

#### 6.2.1(For TRD-1230, TRD-1230H)



Fig. a.



Fig. a-1



Fig. b.



Fig. c.

#### The relevant names

No.	name
1.	Release switch
2.	Clamping switch

#### The relevant names

No.	name
3.	Adjusting nut
4.	Fastening nut

Adjust the arm clamping lever as follows:

a.	Press the figure1 shown in the bottom. Referring to the up right picture, release the button after pointing the arrow head to b. The clamping device is released now.
b.	Release the fastening nuts, totally 5 pieces, in the figure c and mark 4.
c.	Using a wrench, adjust the nuts counter clockwise about 180°. (totally 5 pieces bolts)
d.	Fasten the nuts, marked 4 in the figure c. (totally 5 pieces bolts)
e.	Press the figure2 shown in the bottom left picture 1. Referring to the up right picture, release the button after pointing the arrowhead to A. The clamping device is tightened now.



## 6.2.2(For TRD-1600H/ TRD-2000H)

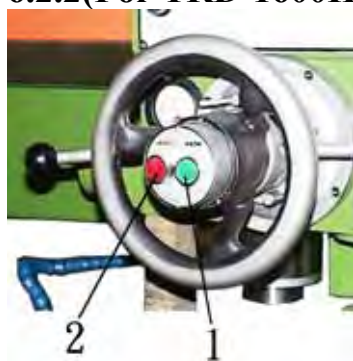


Fig. a.



Fig. b.



Fig. c.

### The relevant names

No.	name
1.	Release switch
2.	Clamping switch

### The relevant names

No.	name
3.	Adjusting nut
4.	Fastening nut

Adjust the arm clamping lever as follows:

a.	Press the figure1 shown in the bottom. Referring to the up right picture, release the button after pointing the arrow head to b. The clamping device is released now.
b.	Release the fastening nuts, totally 5 pieces, in the figure c and mark 4.
c.	Using a wrench, adjust the nuts counter clockwise about 180°. (totally 5 pieces bolts)
d.	Fasten the nuts, marked 4 in the figure c. (totally 5 pieces bolts)
e.	Press the figure2 shown in the bottom left picture 1. Referring to the up right picture, release the button after pointing the arrowhead to A. The clamping device is tightened now.

## 6.3 Adjust tighten the clamping device

After the machine has been used a period of time, the tighten the clamping device. It is the time to adjust its tightness clamping device of adjusting nut.

### 6.3.1(For TRD-1230, TRD-1230H)



Part	Name
1.	clamping device of adjusting nut

Adjust tighten the clamping device lever as follows:

a.	Switch the cross switch to ARM UP .
b.	Press the emergent stop button after the Arm elevates a little bit.
c.	Release the clamping device and adjust the bolts and nuts.
d.	Adjust the nut one notch clockwise.
e.	Switch the cross switch to the middle.
f.	Reset the emergent stop button.

### 6.3.2 (Application model: TRD-1600H, TRD-2000H)



position	Name
1	Adjust the nut.
2	Fasten the nut.

The way to clamp the arm follows as:

a.	Turn the cross switch to ARM UP .
b.	After the arm lifts a little bit, press down the emergency stop.
c.	Release the fastening nut.
d.	Rotate the adjustment nut half circle clockwise.
e.	Clamp the fastening nut.
f.	Turn the cross switch to the middle.
g.	Reset the emergency stop.

## 6.4 Adjust tighten the clamping device

After the machine has been used a period of time, the tighten the clamping device. It is the time to adjust its tightness clamping device of adjusting nut.

### 6.4.1(For TRD-1230, TRD-1230H)



**Fig a-1**  
The relevant  
names

No.	Name
1.	Release switch
2.	Clamping switch



**Fig a-2**



**Fig b**



**Fig c.**

The relevant names

No.	Name
3.	Adjusting nut
4.	Fastening nut

Adjust tighten the clamping device lever as follows:

a.	Press the button marked 1 in the below figure. Release the button only after you turn the arrowhead to the point B, referring to the figure b. After the button released, the claming device can be released.
b.	Release the fastening nuts marked 3 in the figure 3.
c.	Turn the adjusting bolts about 180° clockwise, using a spanner.
d.	Tighten the fastening nuts marked 3 in the figure c.
e.	Press the button marked 2 in the below figure a. Release the button only after you turn the arrowhead to the point A, referring to the figure b. After the button released, the claming device can be tightened.

#### 6.4.2(For TRD-1600H/ TRD-2000H)

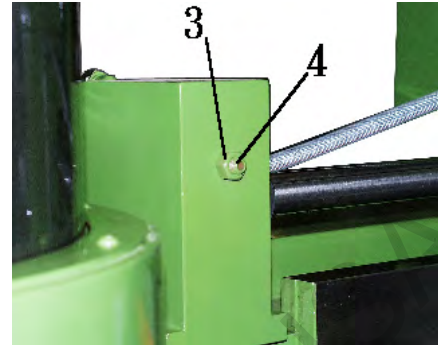


**Fig a.**  
**The relevant names**

No.	Name
1.	Release switch
2.	Clamping switch



**Fig b.**



**Fig c.**  
**The relevant names**

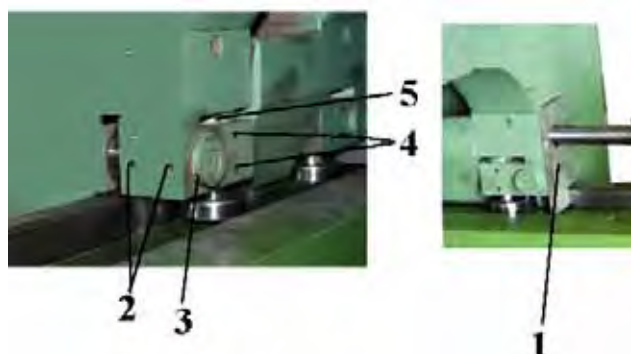
No.	Name
3.	Adjusting nut
4.	Fastening nut

**Adjust tighten the clamping device lever as follows:**

a.	Press the button marked 1 in the below figure. Release the button only after you turn the arrowhead to the point B, referring to the figure b. After the button released, the clamping device can be released.
b.	Release the fastening nuts marked 3 in the figure 3.
c.	Turn the adjusting bolts about 180° clockwise, using a spanner.
d.	Tighten the fastening nuts marked 3 in the figure c.
e.	Press the button marked 2 in the below figure a. Release the button only after you turn the arrowhead to the point A, referring to the figure b. After the button released, the clamping device can be tightened.

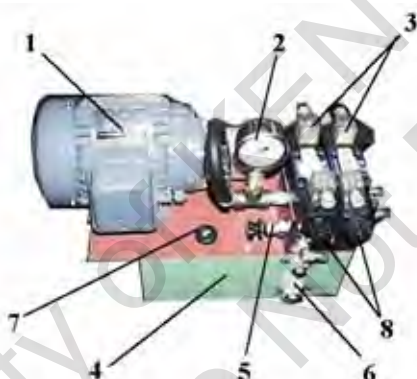
## 6.5 Adjustment of the backlash between the Gearbox and the Arm rail.

The backlash appears after the machine has been used for a period of time. It is necessary to adjust the tightness between the Arm rail and crankshaft bearing.



a.	Remove the side plate as the above figure 1.
b.	Release the bolts as the above figure 2. Using socket wrench, insert it into the holes as shown in the above figure 3 and rotate them. Apply the tightness as the hand wheel of the Gearbox can be turned easily but not too easily. Apply the same to the counter side.
c.	Release the bolts as shown in the right figure 4.
d.	Using socket wrench, insert it into the holes as shown in the above figure 5 and rotate them. Apply the tightness as the hand wheel of the Gearbox can be turned easily but not too easily. Apply the same to the counter side.
e.	Screw up the side plate of the above figure 1.

## 6.6 Adjustment of the hydraulic pressure.



Parts	Name
1.	Hydraulic motor
2.	Oil pressure gauge
3.	Solenoid valve
4.	Oil tank
5.	Pressure adjusting valve
6.	Oil gauge
7.	Oil inlet
8.	Forcible switch of the solenoid valve.

a.	Please check that whether the hydraulic oil is sufficient?
b.	Power on.
c.	There is no pressure under the normal condition. If adjustment needed, please insert a small screwdriver into the forcible switch of the solenoid valve, as shown in figure 8, to do the adjustment.
d.	Rotate the pressure adjusting valve, as shown in the figure 5, (clockwise to high and counter clockwise to low pressure) The default pressure is 38bar(kg/cm <sup>2</sup> ).
e.	Take out the screwdriver.

### Precaution

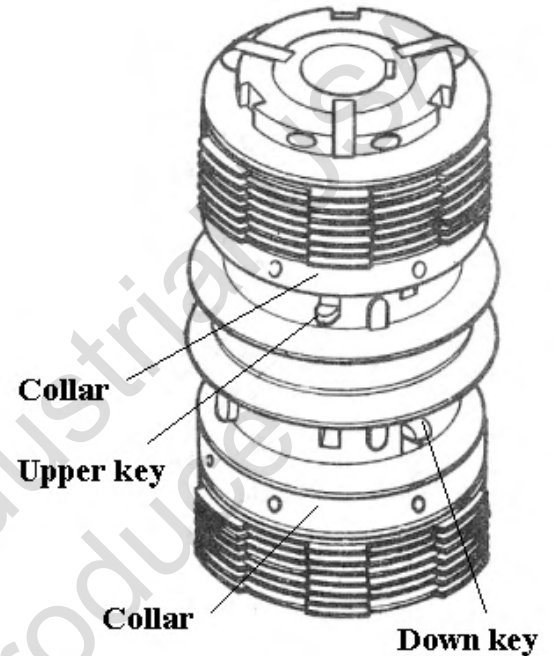
When adjusting the hydraulic pressure, please keep pressing the forcible switch of the solenoid valve continuously, as shown in the figure 8.



## 6.7 Adjustment of the clutch(for TRD-1600H/TRD-2000H)

While the spindle can't rotate fully to drill, the clutch is wear to drill, the clutch is wear to drill, the clutch is worn, you can adjust device, as following.

a.	Change gear speed to the highest speed, turn off power.
b.	Remove oil sight glass.
c.	Rotate spindle by your left-hand until clutch turns to the best position for adjustment, clutch's key faces outside.
d.	Push upper key(down key) out, turn collar right(left) a little for adjustment, until the key comes back notch automatically. * If clutch "L"("H") speed can't rotate fully while drilling, you should adjust upper key (down key)
e.	Put oil sight glass.
f.	Operate spindle to drill, check if spindle can rotate while drilling.





# CHAPTER 7

## Maintenance

### 7.1 General

Whether the machine is maintained well or not will lead to its long or short life. If well served, the machine lasts long and is easy to maintain.

### 7.2 Daily Maintenance.

#### 7.2.1 Clearing

Only one person is allowed to do the clearing. Before clearing, please power off.

7.2.2 Please clean every parts using a metal brush and a rag, dipped with oil, to rub them. ( Please use CC68 ) After every day's work, please proceed the following maintenance..

( For TRD-1230,



The relevant names

No.	Parts
1.	Column
2.	The arm rail
3.	Spindle
4.	Work table
5.	The base
6.	The ball screw
7.	The counter weight guide rail

( For TRD-1600H/ TRD-2000H )



The relevant names

No.	Parts
1.	Column
2.	The arm rail
3.	Spindle
4.	Work table
5.	The base
6.	The ball screw
7.	The counter weight guide rail

### 7.2.3 The way to clean iron filings:

1. Power off.
2. Put on gloves.
3. Clean from upside down using a brush.
4. When the iron filings comes down to the base, please collect it and put it at the right side of the operation position.
5. Find a dustpan and place it under the machine.
6. Sweep it to the dustpan using the brush.
7. Rub every part of the machine with rags, particularly the parts where is contaminated with the cutting fluids.
8. Rub every metal part of the machine using a oil-dipped rags.

### 7.2.4 Lubrication

Before every day's work, please proceed the following maintenance. ( For TRD-1230, TRD-1230H )



No.	Part	Oil type	Volume
1.	Oil filler points of the column	CC68	Full
2.	Oil filler points on top of the gearbox.	CC68	Full
3.	Oil filler points in the right side of the gearbox.	CC68	Full
4.	Oil filler points of the spindle.	CC68	Full

( For TRD-1600H/ TRD-2000H )



No.	Part	Oil type	Volume
1.	Column oil filler	CC68	Full
2.	Top gearbox oil filler	CC68	Full
3.	Left gearbox oil filler	CC68	Full
4.	Spindle oil filler	XM2	Full
5.	Clamping devise oil filler	CC68	Full

## 7.2.5 Change oil inside of the speed reduction of the arm elevating motor.

It requires only one person to do it. Please press down the emergent stop button and power off before proceeding the job.

( For TRD-1230, TRD-1230H )



A. Instruction to the relevant parts.

1.	Oil filler points
2.	Oil gauge
3.	Drain outlet

B. The following is the tools to replace the oil.

Oil (CC68) 2 L

Container and spanner.

The steps:

1.	Power off.
2.	Press down the emergent stop button.
3.	Place the container under the drain outlet.
4.	Release the drain plug using a spanner.
5.	After draining, tape the plug with a sheet of band and tighten it back to the drain outlet.
6.	Release the oil filler plug.
7.	Add oil to the upper limit of the oil gauge.
8.	Tighten the oil filler plug.

( For TRD-1600H/ TRD-2000H )



Instruction to the relevant parts.

No.	Parts
1.	Oil filler points
2.	Oil gauge
3.	Drain outlet

The following is the tools to replace the oil.

Oil (CC68)1 L

Container and spanner.

The steps:

1.	Power off.
2.	Press down the emergent stop button.
3.	Place the container under the drain outlet.
4.	Release the drain plug using a spanner.
5.	After draining, tape the plug with a sheet of band and tighten it back to the drain outlet.
6.	Release the oil filler plug.
7.	Add oil to the upper limit of the oil gauge.
8.	Tighten the oil filler plug.

## 7.2.6 Chang the oil inside the gearbox.

It calls for only one person to do it. Please power off and press down the emergent stop button before carrying out the job.

( For TRD-1230, TRD-1230H )



### A. Instruction to the relevant parts.

1.	Oil filler points
2.	Oil gauge
3.	Drain outlet

### B. The following is the tools to replace the oil.

Oil(CC68) 4.5 L

Container and spanner.

The steps:

1.	Power off.
2.	Press down the emergent stop button.
3.	Place a container under the oil drain outlet.
4.	Release the drain plug using a spanner.
5.	After draining, tape the plug with a sheet of band and tighten it back to the drain outlet.
6.	Release the oil filler plug.
7.	Add oil to the upper limit of the oil gauge.
8.	Tighten the oil filler plug.

( For TRD-1600H/ TRD-2000H )



### A. Instruction to the relevant parts.

1.	Oil filler points
2.	Oil gauge
3.	Drain outlet

### B. The following is the tools to replace the oil.

Oil (CC68)3L

Container and spanner.

The steps:

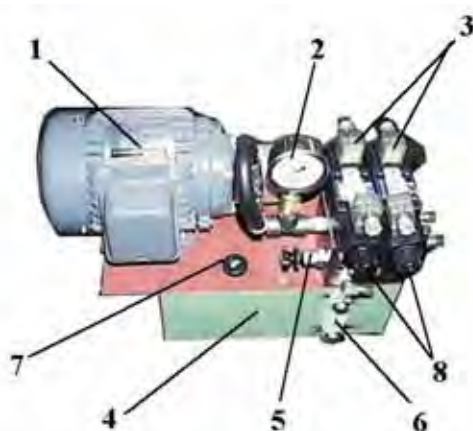
1.	Power off.
2.	Press down the emergent stop button.
3.	Place a container under the oil drain outlet.
4.	Release the drain plug using a spanner.
5.	After draining, tape the plug with a sheet of band and tighten it back to the drain outlet.
6.	Release the oil filler plug.
7.	Add oil to the upper limit of the oil gauge.
8.	Tighten the oil filler plug.



### 7.2.7 Changing hydraulic oil in the hydraulic oil pump.

( For TRD-1600H, TRD-1230H )

It requires only one person to operate it. Please power off and press down the emergent stop before changing.



No	Name
1.	Hydraulic motor
2.	Oil pressure gauge
3.	Solenoid valve
4.	Oil tank
5.	Pressure adjusting valve
6.	Oil gauge
7.	Oil inlet
8.	Forcible switch of the solenoid valve.

The following is the tools to replace the oil.

Oil (CB32)4.5L
Container and spanner.

The steps to drain the oil follows as:

1.	Power off.
2.	Press down the emergent stop button.
3.	Place the used oil container on the ground. Insert the outlet port of the oil-sucking machine into the used oil container.
4.	Turn off the inlet cover.
5.	Insert the inlet port of the oil-sucking machine into the oil tank, to its bottom as possible.
6.	Power the oil-sucking machine on. After oil sucked completely, power the oil-sucking machine off.

The steps to add oil follows as:

1.	Power off.
2.	Press down the emergent stop button.
3.	Place the hydraulic oil container on the ground. Insert the inlet port of the oil-sucking machine into the hydraulic oil container.
4.	Insert the outlet port of the oil-sucking machine into the inlet port of the hydraulic oil tank, about 50 mm deep.
5.	Power the oil-sucking machine on. Power it off when the oil gauge reaches its upper limit level.

### 7.3 Replace the cutting fluids.

It requires only one person to do it. Please power off and press down the emergent stop power button before carrying out the job.



A. Instruction to the relevant parts.

1. Oil filler points
2. Oil drain outlet

B. The following is the tools to replace the cutting fluids.

The cutting fluids 30L

Container and spanner

The steps :

1.	Power off.
2.	Press down the emergent stop button.
3.	Place a container under the oil drain outlet.
4.	Release the drain plug using a spanner.
5.	After draining, tape the plug with a sheet of band and tighten it back to the drain outlet.
6.	Refill the cutting fluids through the oil filler inlet to the level under 5 mm under the oil filter.

### 7.4 Maintenance and replacement period.

No.	Position	Items.	Period
1.	Oil filler points of the column	CC68	once per day.
2.	Oil filler points on top of the gearbox	CC68	once per day.
3.	Oil filler points in the right side of the gearbox.	CC68	once per day.
4.	Oil filler points in the left side of the gearbox.	CC68	once per day.
5.	Oil filler points of the spindle	XM2	once per day.
6.	Replace oil for the speed reduction of the arm elevating motor.	CC68	once per year.
7.	Change oil inside of the gearbox.	CC68	once per year.
8.	Change the cutting fluids.	The cutting fluids	Once per month
9.	The arm transmit ion ball screw	XM2	Once per week
10.	Replace the hydraulic oil	CB32	once per year.

A suitable Oil Type comparison:

ISO DIS-3498	SHELL	MOBIL	ESSO	CHINA
CB32	TELLUS C32	DTE OLL LIGHT	TERESSO 32	R32
CC68	OMALA 68	MOBILGEAR 620	SPARTAN EP68	HD68
XM2	ALVANIA R2	MOBILUX 2	BEACON 2	#2

### 7.5 Waste disposition.

Please proceed waste disposition such as machine oil, iron filings, old machine or replaced parts according to your country's relevant legal regulation.



## CHAPTER 8

### Troubleshooting

#### 8.1 The spindle overloads and the relay jumps.

##### 8.1.1 The cause.

- a. The drill bit is too big.
- b. The feed rate is too fast.
- c. Operation not in compliance with speedometer and the automatic feed rate table.
- d. The fuse burned out.
- e. The voltage is too low.

##### 8.1.2 The solution



a.	Power off.
b.	Open the control box.
c.	Press the relay switch to open, as shown in the right picture, three minutes after the spindle stops. (blue Button)
d.	Close the control box.
e.	Power on.

#### 8.2 The spindle overloads and the fuse burns out.

##### 8.2.1 The cause

- a. The drill bit is too big.
- b. The feed rate is too fast.
- c. Operation not in compliance with speedometer and the automatic feed rate table.

##### 8.2.2 The solution.



a	Power on.
b	Open the control box.
c	Replace the fuse as shown in the picture A.
d	Close the control box.
e	Power on.

### **8.3 What if the drill bit get broken ?**

- a. Stop the spindle.
- b. Press down the emergent stop button.
- c. Push the gearbox backwards.
- d. Pinch the end of the broken bit with a pliers.
- e. Rotate counter clockwise and pull it out upwards.

### **8.4 What if the screw tap get broken?**

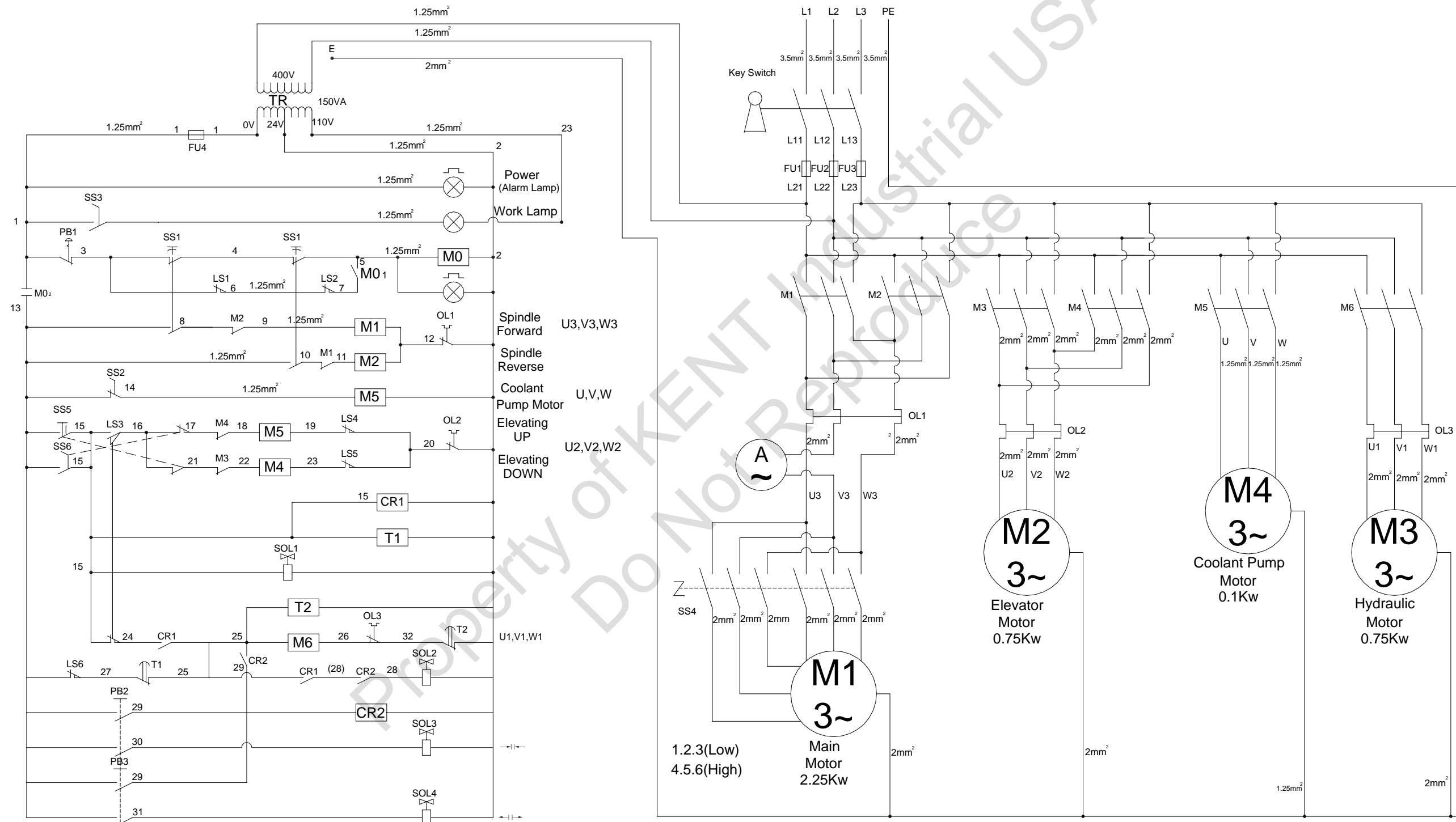
- a. Stop the spindle.
- b. Press down the emergent stop button.
- c. Using thread releaser, rotate the screw tap counter clockwise till it comes out. If it is impossible to pull it out, you may think to melt it out with EDM or declare it unusable.

### **8.5 How if a person is entangled?**

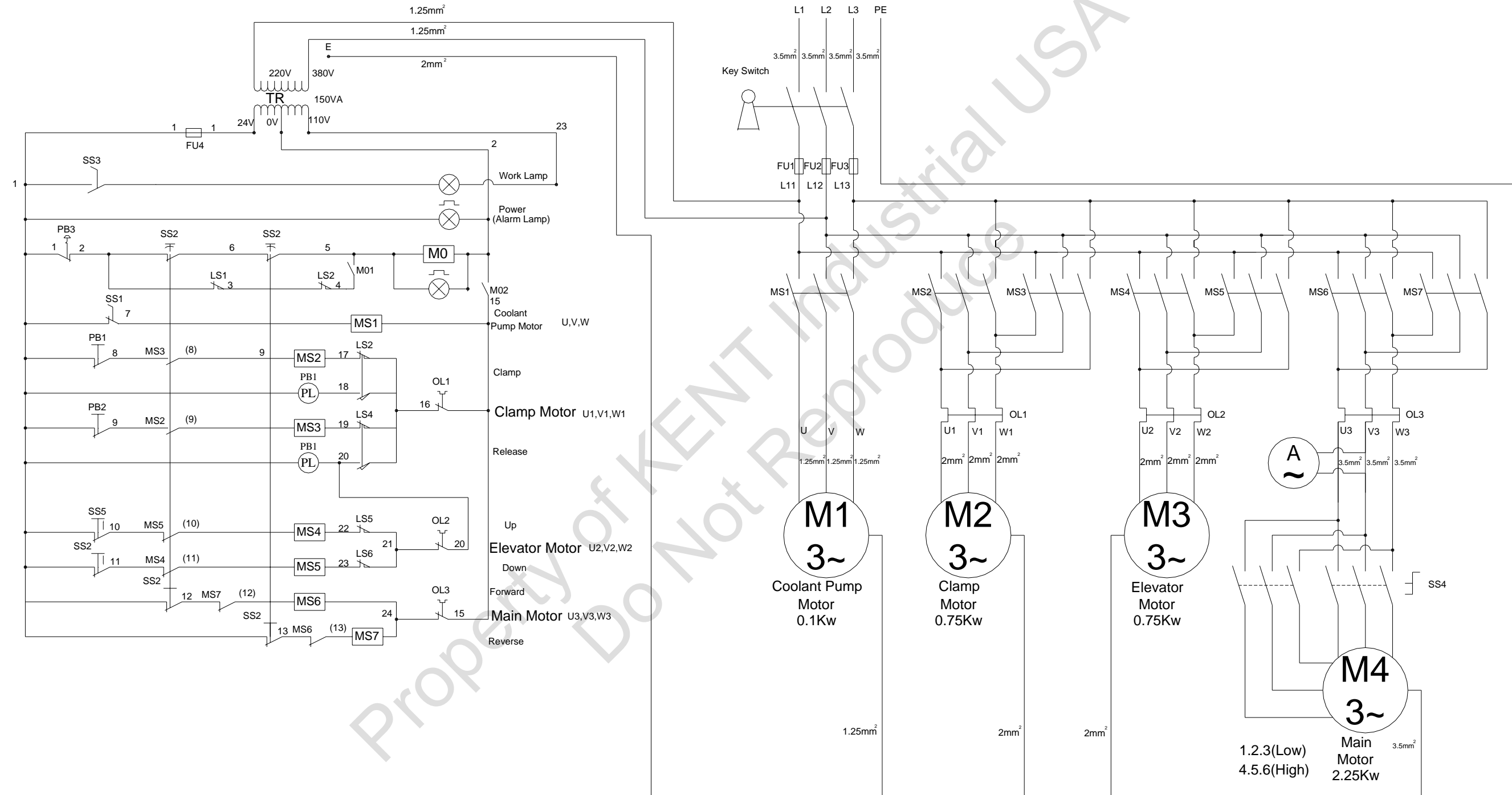
- a. Press down the emergent stop button.
- b. Power off.
- c. Switch the speed change lever to the highest gear.
- d. Rotate the spindle with hands counter clockwise (if the spindle moved clockwise before, then its reverse direction is counter clockwise now) till that the person is free from the machine.

## CHAPTR 9 Annex

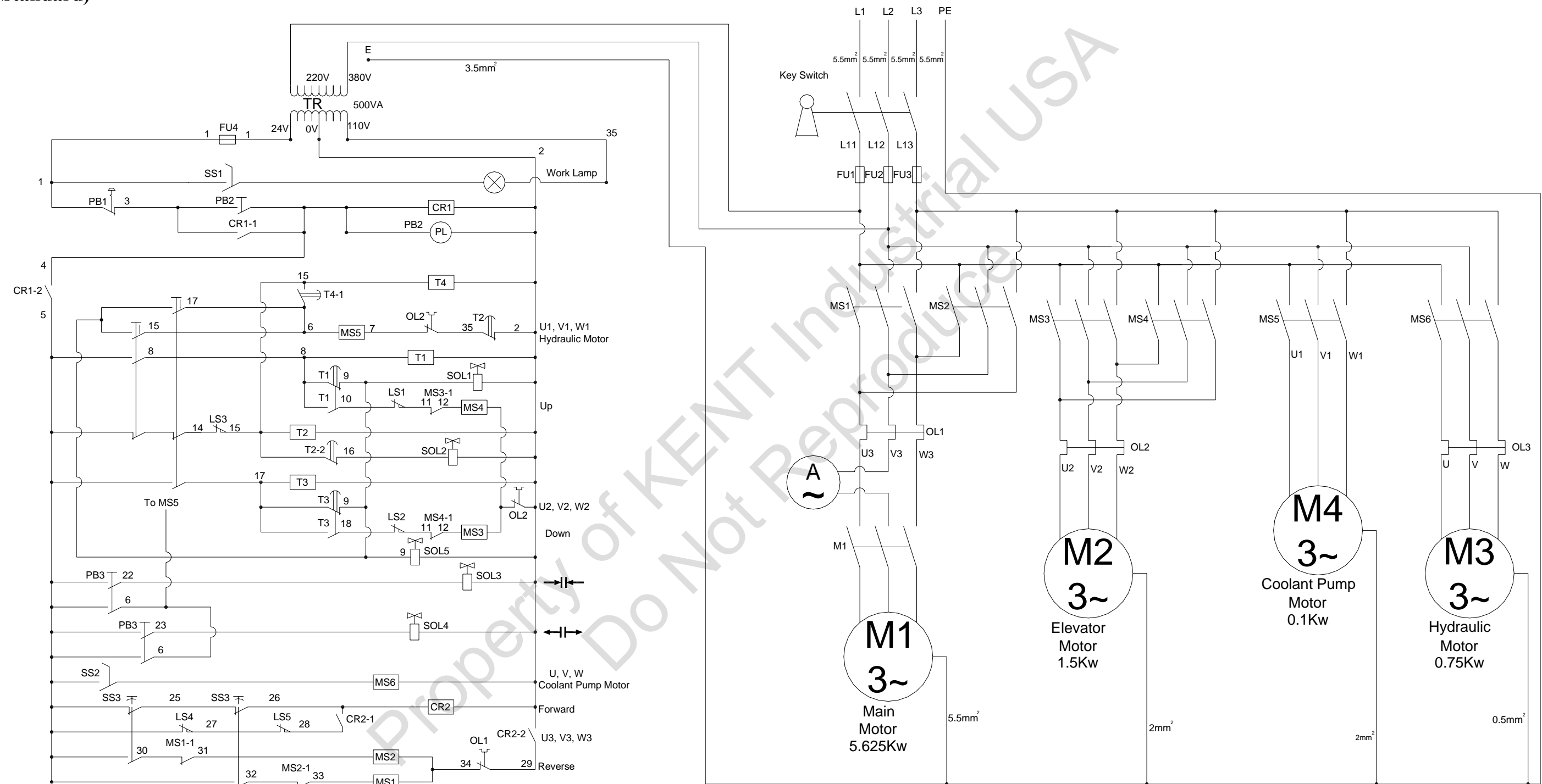
### 9.1 Electrical circuit diagram (For TRD-1230H CE Standard)



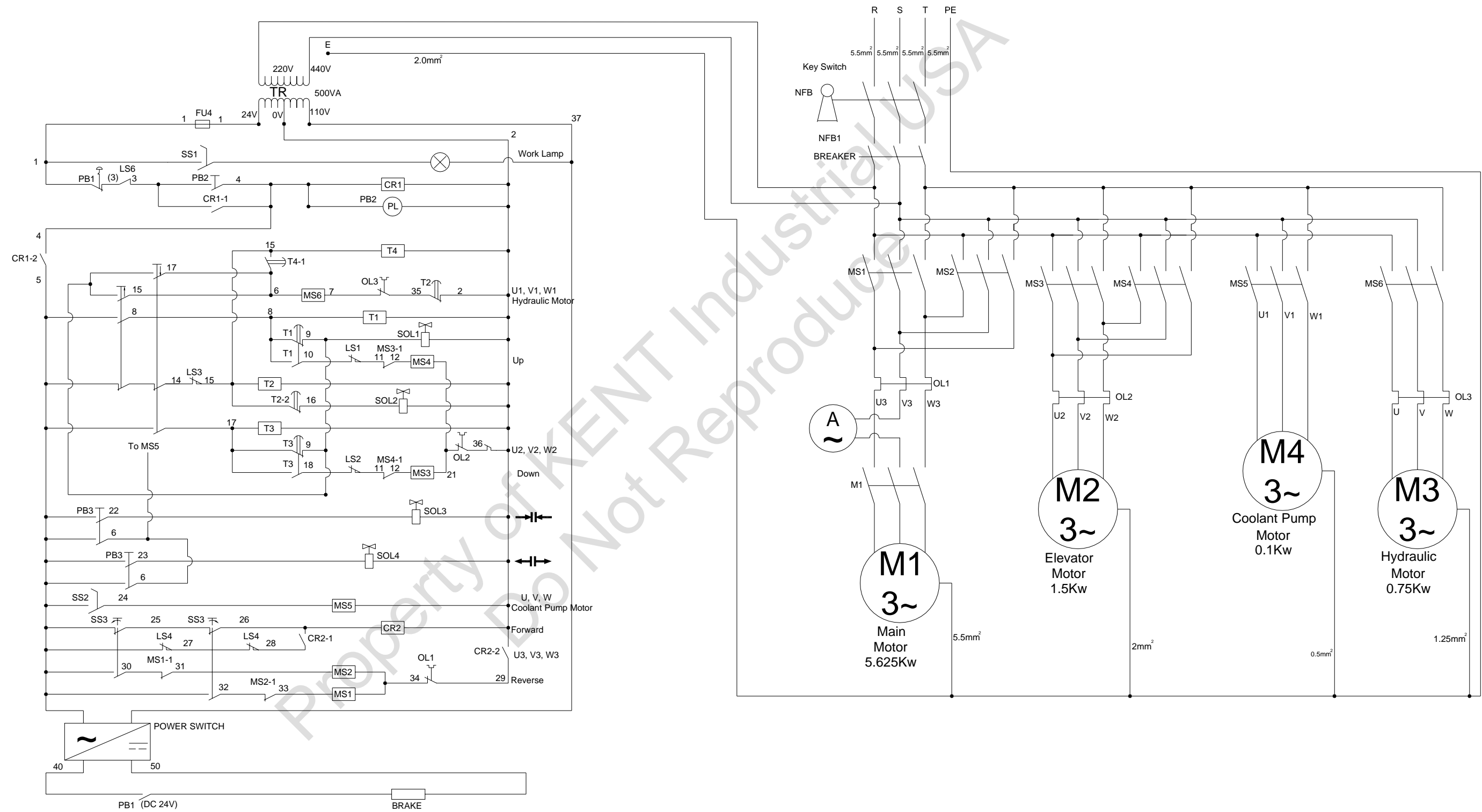
## 9.2 Electrical circuit diagram (For TRD-1230 CE Standard)



### 9.3 Electrical circuit diagram (For TRD-1600H CE Standard)
















## 9.4 Electrical circuit diagram (For TRD-2000H CE Standard)














## 9.5 Electrical main parts list (for TRD-1230H CE Standard)

Part No.	Symbol	Name	Specification	Q'ty	Remark
E1602001		Key Switch	XF163B	1	
E0703002	M1	Magnetic Contact	CN18 24V	1	
E0703002	M2	Magnetic Contact	CN18 24V	1	
E0703001	M3	Magnetic Contact	CN11 3a1b 24V	1	
E0703001	M4	Magnetic Contact	CN11 3a1b 24V	1	
E0703001	M5	Magnetic Contact	CN11 3a1b 24V	1	
E0703001	M6	Magnetic Contact	CN11 3a1b 24V	1	
E0703001	M0	Magnetic Contact	CN11 3a1b 24V	1	
E3101027	FU1	Fuse	10*38*20A	1	
E3101027	FU2	Fuse	10*38*20A	1	
E3101027	FU3	Fuse	10*38*20A	1	
E3101025	FU4	Fuse	10*38*6A	1	
E0211001	CR1	Control Relay	MK-2P 24V	1	
E0211001	CR2	Control Relay	MK-2P 24V	1	
E0208001	T1	Timer Relay	ASTP-N 24V 6S	1	
E0208001	T2	Timer Relay	ASTP-N 24V 6S	1	
M0302019		SOL1	DSG-3C2-02-24V	1	
M0302019		SOL2	DSG-3C2-02-24V	1	
M0302019		SOL3	DSG-3C2-02-24V	1	
M0302019		SOL4	DSG-3C2-02-24V		
E0207017	OL1	Overload relay	RHN 10/5.5~8.5	1	
E0207014	OL2	Overload relay	RHN 10/1.4~2.1	1	
E0207014	OL3	Overload relay	RHN 10/1.4~2.1	1	
E0901021	SS1	Limit Switch	V-15-1E5	4	
E1303002	SS2	Selector Switch	YKØ30 1A1B (B)	1	
E1604001	SS3	Selector Switch	SN1021	1	
E1603001	SS4	Pole change Switch	A441 CA10	1	
B100012	SS5	Push Button	ZB4-BA2 ZB4-BZ101 ZBE-102	1	
B100012	SS6	Push Button	ZB4-BA2 ZB4-BZ101 ZBE-102	1	
E1203001	PB1	Emg. Push Button	YKØ30 1A1B	1	
E1202012	PB2	Push Button	YKØ22 2A (B)	1	
E1202012	PB3	Push Button	YKØ22 2A (B)	1	
E0901006	LS1	Limit Switch	MJ2-1308R	1	





Part No.	Symbol	Name	Specification	Q'ty	Remark
E0901008	LS2	Limit Switch	TZ 8104	1	
E0901009	LS3	Limit Switch	MN 5311	1	
E0901011	LS4	Limit Switch	AZ 7121	1	
E0901010	LS5	Limit Switch	WLD2	1	
E0901009	LS6	Limit Switch	MN 5311	1	
E1701002		Work Lamp	FS 51441 110V	1	
E2305001		Power (Alarm Lamp)	YKØ30 24V(W)	1	
E2305001		Power (Alarm Lamp)	YKØ30 24V(W)	1	
E1801020	TR	Transformer	150VA 1:0,220,380 2:0,24,110	1	
E3602002		AMP Meter	S065 20A	1	
		Main Motor	2.25KW/1.5Kw 200/400V/4P/8P/3PH	1	
		Elevating Motor	0.75KW 200/400V/4P/3PH	1	
		Hydraulic Motor	0.75KW 200/400V/4P/3PH	1	
		Coolant Pump Motor	0.75KW 200/400V/2P/3PH	1	






## 9.6 Electrical main parts list (for TRD-1230 CE Standard)

Part No.	Symbol	Name	Specification	Q'ty	Remark
E1602001		Key Switch	XF163B	1	
E0703001	M0	Magnetic Contact	CN11 3a1b 24V	1	
E0703002	MS1	Magnetic Contact	CN18 24V	1	
E0703001	MS2	Magnetic Contact	CN11 3a1b 24V	1	
E0703001	MS3	Magnetic Contact	CN11 3a1b 24V	1	
E0703001	MS4	Magnetic Contact	CN11 3a1b 24V	1	
E0703001	MS5	Magnetic Contact	CN11 3a1b 24V	1	
E0703002	MS6	Magnetic Contact	CN18 24V	1	
E0703002	MS7	Magnetic Contact	CN18 24V	1	
E3101027	FU1	Fuse	10*38*20A	1	
E3101027	FU2	Fuse	10*38*20A	1	
E3101027	FU3	Fuse	10*38*20A	1	
E3101025	FU4	Fuse	10*38*6A	1	
E1801020	TR	Transformer	150VA 1:0,220,380 2:0,24,110	1	
E0207014	OL1	Overload relay	RHN 10/1.4~2.1	1	
E0207014	OL2	Overload relay	RHN 10/1.4~2.1	1	
E0207017	OL3	Overload relay	RHN 10/5.5~8.5	1	
E1303002	SS1	Selector Switch	YKØ30 1A1B(B)	1	
E0901021	SS2	Limit Switch	V-15-1E5	4	
E1604001	SS3	Selector Switch	SN1021	1	
E1603001	SS4	Pole change Switch	A441 CA10	1	
B100012	SS5	Push Button	ZB4-BA2 ZB4-BZ101 ZBE-102	1	
B100012	SS6	Push Button	ZB4-BA2 ZB4-BZ101 ZBE-102	1	
E2305001		Pilot	YKØ30 24V(W)	1	
E2305001		Power (Alarm Lamp)	YKØ30 24V(W)	1	
E1701002		Work Lamp	FS 51441 110V	1	
E0901006	LS1	Limit Switch	MJ2-1308R	1	
E0901008	LS2	Limit Switch	TZ 8104	1	
E0901007	LS3	Limit Switch	MJ2-1704	1	
E0901007	LS4	Limit Switch	MJ2-1704	1	

Part No.	Symbol	Name	Specification	Q'ty	Remark
E0901007	LS5	Limit Switch	MJ2-1704	1	
E0901007	LS6	Limit Switch	MJ2-1704	1	
E1202002	PB1	Push Button	YKØ22 24V (R)	1	
E1202001	PB2	Push Button	YKØ22 24V (G)	1	
E1618003	PB3	Emg. Push Button	YKØ30 1B	1	
E3602002		AMP Meter	S065 20A	1	
		Main Motor	2.25KW/1.5Kw 200/400V/4P/8P/3PH	1	
		Elevating Motor	0.75KW 200/400V/4P/3PH	1	
		Hydraulic Motor	0.75KW 200/400V/4P/3PH	1	
		Coolant Pump Motor	0.75KW 200/400V/2P/3PH	1	





## 9.7 Electrical main parts List (for TRD-1600H CE Standard)






Part No.	Symbol	Name	Specification	Q'ty	Remark
E1602001		Key Switch	XF163B	1	
E3101023	FU4	Fuse	10*38*6A	1	
E0703003	MS1	Magnetic Contact	CN25 24V	1	
E0703003	MS2	Magnetic Contact	CN25 24V	1	
E0703001	MS3	Magnetic Contact	CN11 3a1b 24V	1	
E0703001	MS4	Magnetic Contact	CN11 3a1b 24V	1	
E0703001	MS5	Magnetic Contact	CN11 3a1b 24V	1	
E0703001	MS6	Magnetic Contact	CN11 3a1b 24V	1	
E3101027	FU1	Fuse	10*38*20A	1	
E3101027	FU2	Fuse	10*38*20A	1	
E3101027	FU3	Fuse	10*38*20A	1	
E1801030	TR	Transformer	500VA 1:0,220,380,415,440v 2:0,24,110V	1	
E1202013		Pilot	YKØ30 24V(G)	1	
E1202013		Power (Alarm Lamp)	YKØ30 24V(G)	1	
E1701002		Work Lamp	FS 51441 110V	1	
E0207022	OL1	Overload relay	RHN 18/12.5	1	
E0207016	OL2	Overload relay	RHN 10/3.5~5	1	
E0207014	OL3	Overload relay	RHN 10/1.4~2.1	1	
E0703001	CR1	Magnetic Contact	CN11 3a1b 24V	1	
E0703001	CR2	Magnetic Contact	CN11 3a1b 24V	1	
E1604001	SS1	Selector Switch	SN1021	1	
E1303002	SS2	Selector Switch	YKØ30 1A1B	1	
E1605008	SS3	Cross Switch	TMR-305	1	
E1203001	PB1	Emg. Push Button	YKØ30 1A1B (R)	1	
E1202013	PB2	Push Button	YKØ30 1A1B 24V(G)	1	
E1202012	PB3	Push Button	YKØ22 2A (B)	1	
E1202012	PB4	Push Button	YKØ22 2A (B)	1	
E0901013	LS1	Limit Switch	WLD	1	
E0901010	LS2	Limit Switch	WLD2	1	
E0901010	LS3	Limit Switch	WLD2	1	
E0901008	LS4	Limit Switch	TZ8104	1	
E0901008	LS5	Limit Switch	TZ8104	1	
E0208001	T1	Timer Relay	ASTP-N 24V 6S	1	

Part No.	Symbol	Name	Specification	Q'ty	Remark
E0208002	T2	Timer Relay	AH3-2 24V 6S	1	
E0208001	T3	Timer Relay	ASTP-N 24V 6S	1	
E0208001	T4	Timer Relay	ASTP-N 24V 6S	1	
E3602001		AMP Meter	S065 30A	1	
		Main Motor	5.625KW 220/380V/4P	1	
		Elevating Motor	1.5KW 220/380V/4P	1	
		Hydraulic Motor	0.75KW 220/380V/4P	1	
		Coolant Pump Motor	0.1KW 220/380V/2P	1	

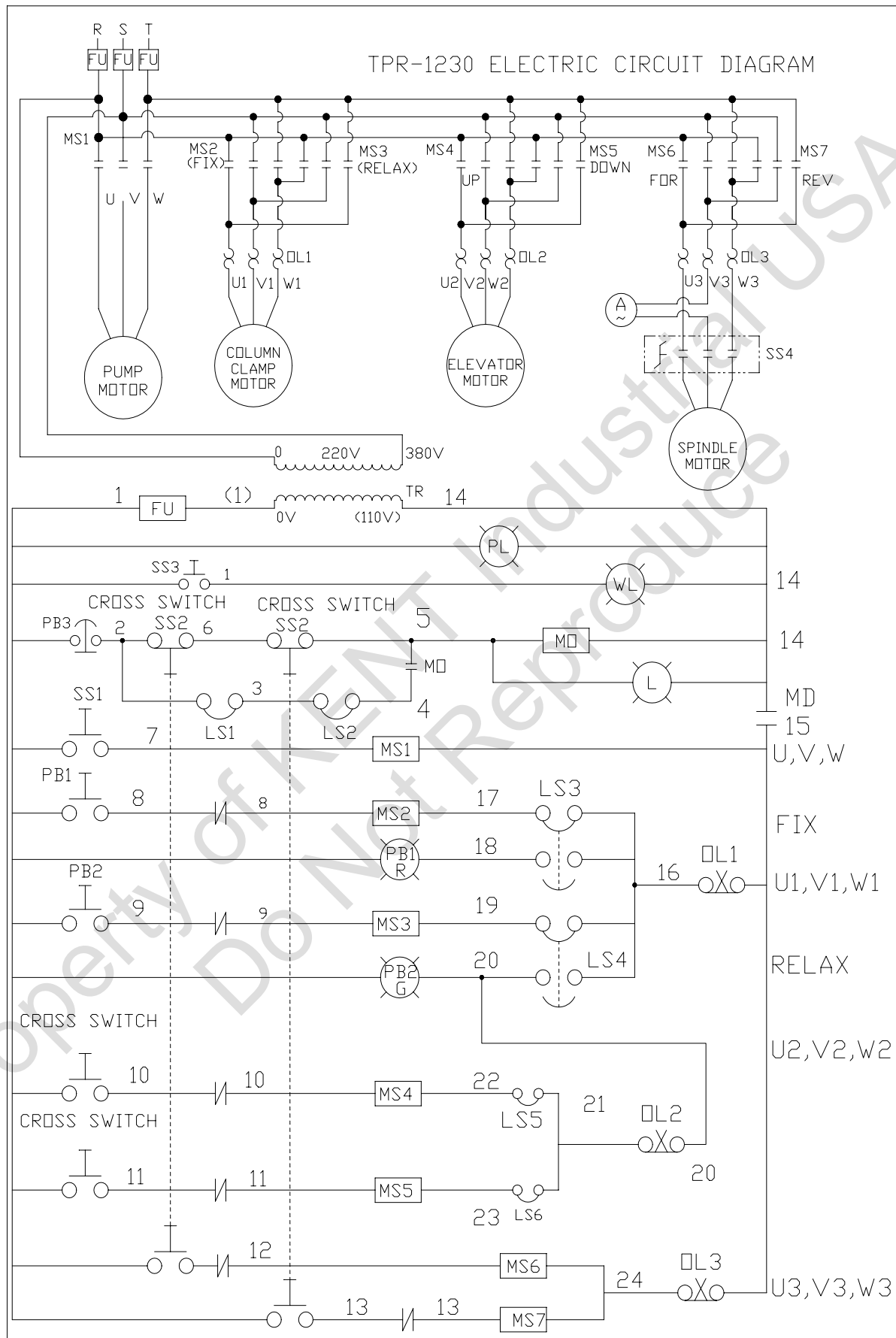


## 9.8 Electrical main parts List (for TRD-2000H CE Standard)

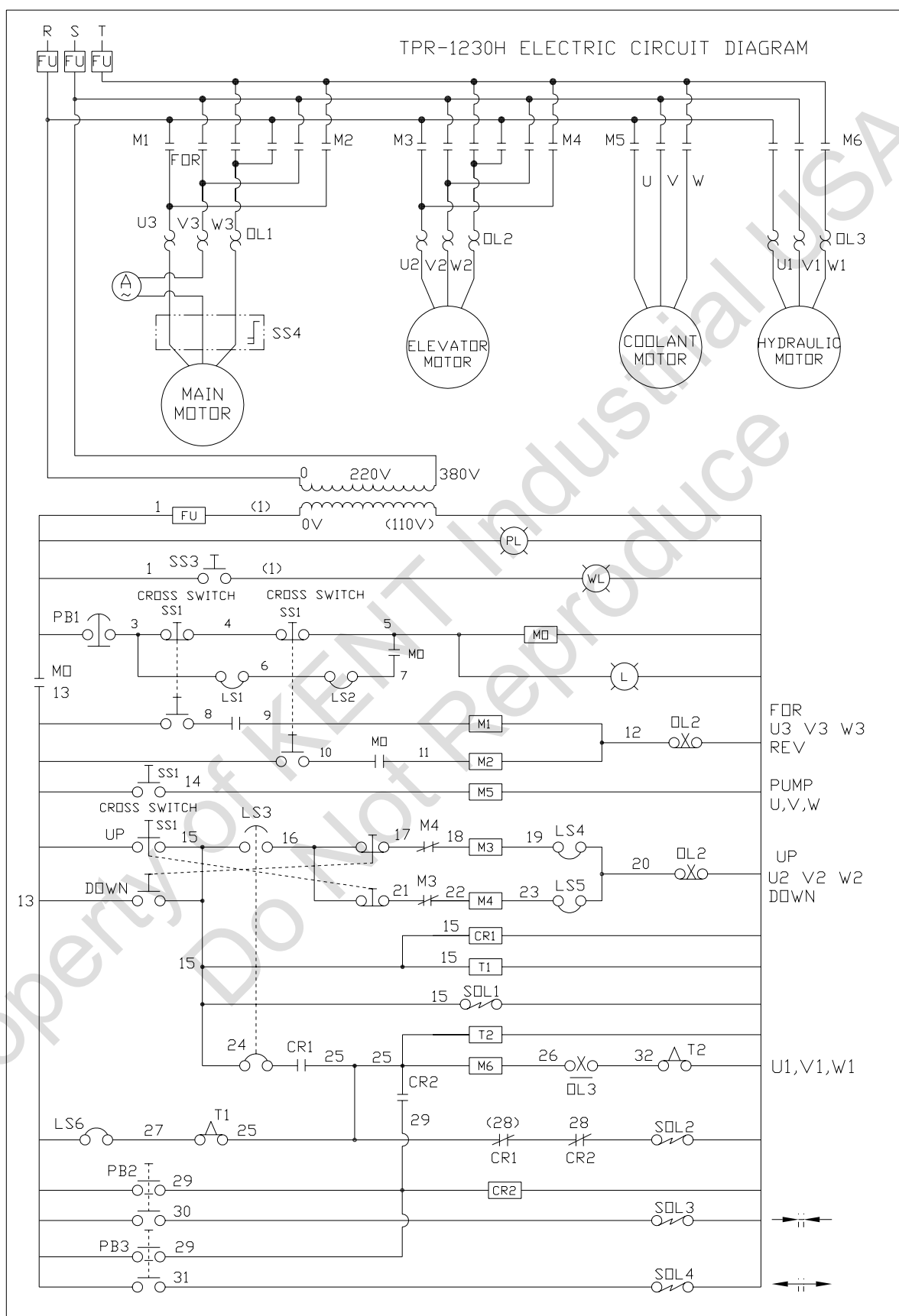
Part No.	Symbol	Name	Specification	Q'ty	Remark
E1602001		Key Switch	XF163B	1	
E3101023	FU4	Fuse	10*38*6A	1	
E0703003	MS1	Magnetic Contact	CN25 24V	1	
E0703003	MS2	Magnetic Contact	CN25 24V	1	
E0703001	MS3	Magnetic Contact	CN11 3a1b 24V	1	
E0703001	MS4	Magnetic Contact	CN11 3a1b 24V	1	
E0703001	MS5	Magnetic Contact	CN11 3a1b 24V	1	
E0703001	MS6	Magnetic Contact	CN11 3a1b 24V	1	
E3101027	FU1	Fuse	10*38*20A	1	
E3101027	FU2	Fuse	10*38*20A	1	
E3101027	FU3	Fuse	10*38*20A	1	
E1801030	TR	Transformer	500VA 1:0,220,380,415,440v 2:0,24,110V	1	
E1202013		Pilot	YKØ30 24V(G)	1	
E1202013		Power (Alarm Lamp)	YKØ30 24V(G)	1	
E1701002		Work Lamp	FS 51441 110V	1	
E0207022	OL1	Overload relay	RHN 18/12.5	1	
E0207016	OL2	Overload relay	RHN 10/3.5~3.5	1	
E0207014	OL3	Overload relay	RHN 10/1.6~2.1	1	
E0703001	CR1	Magnetic Contact	CN11 3a1b 24V	1	
E0703001	CR2	Magnetic Contact	CN11 3a1b 24V	1	
E1604001	SS1	Selector Switch	SN1021	1	
E1303002	SS2	Selector Switch	YKØ30 1A1B	1	
E1605008	SS3	Cross Switch	TMR-305	1	
E1203001	PB1	Emg. Push Button	YKØ30 1A1B (R)	1	
E1202013	PB2	Push Button	YKØ30 1A1B 24V(G)	1	
E1202012	PB3	Push Button	YKØ22 2A (B)	1	
E1202012	PB4	Push Button	YKØ22 2A (B)	1	
E0901013	LS1	Limit Switch	WLD	1	
E0901010	LS2	Limit Switch	WLD2	1	
E0901010	LS3	Limit Switch	WLD2	1	
E0901008	LS4	Limit Switch	TZ8104	1	
E0901008	LS5	Limit Switch	TZ8104	1	
E0208001	T1	Timer Relay	ASTP-N 24V 6S	1	

Part No.	Symbol	Name	Specification	Q'ty	Remark
E0208002	T2	Timer Relay	AH3-2 24V 6S	1	
E0208001	T3	Timer Relay	ASTP-N 24V 6S	1	
E0208001	T4	Timer Relay	ASTP-N 24V 6S	1	
E3602001		AMP Meter	S065 30A	1	
		Main Motor	5.625KW 220/380V/4P	1	
		Elevating Motor	2.25KW 220/380V/4P	1	
		Hydraulic Motor	0.75KW 220/380V/4P	1	
		Coolant Pump Motor	0.1KW 220/380V/2P	1	

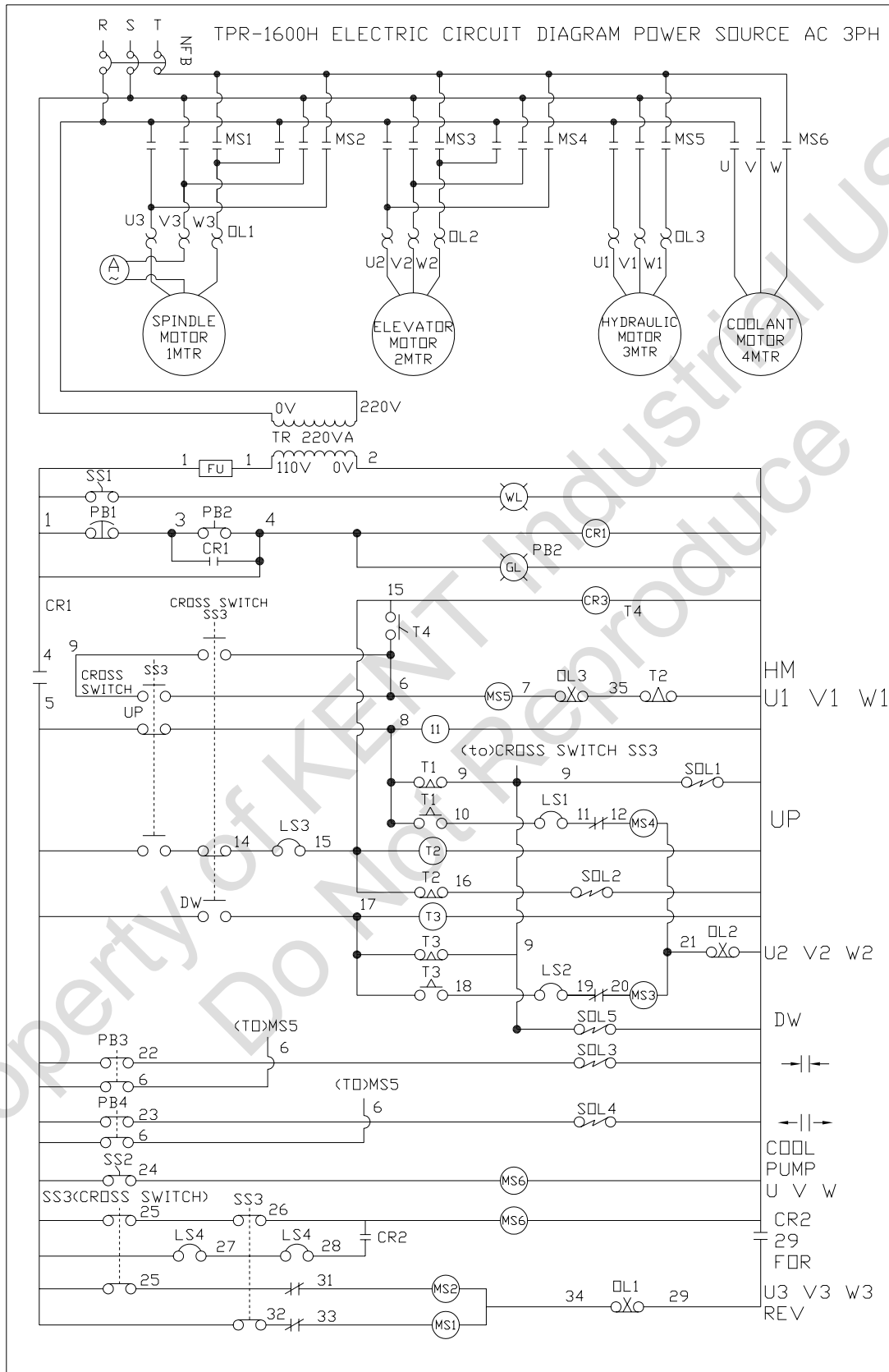
## 9.9 Electrical circuit diagram (For TRD-1230 Standard)



## 9.10 Electrical circuit diagram (For TRD-1230H Standard)



## 9.11 Electrical circuit diagram (For TRD-1600H, TRD-2000H Standard)



## 9.12 Electrical main parts list (for TRD-1230 Standard)

Part No.	Symbol	Description	Specification	Q'Ty	Remarks
E0701006	MS1	Magnetic Contactor	CN11,3a1b,110V	1	Standard
E0701006	MS2	Magnetic Contactor	CN11,3a1b,110V	1	Standard
E0701006	MS3	Magnetic Contactor	CN11,3a1b,110V	1	Standard
E0701006	MS4	Magnetic Contactor	CN11,3a1b,110V	1	Standard
E0701006	MS5	Magnetic Contactor	CN11,3a1b,110V	1	Standard
E0701007	MS6	Magnetic Contactor	CN18,110V	1	Standard
E0701007	MS7	Magnetic Contactor	CN18,110V	1	Standard
E0701006	MO	Magnetic Contactor	CN11,3a1b,110V	1	Standard
E0703001	MS1	Magnetic Contactor	CN11,3a1b,24V	1	Optional
E0703001	MS2	Magnetic Contactor	CN11,3a1b,24V	1	Optional
E0703001	MS3	Magnetic Contactor	CN11,3a1b,24V	1	Optional
E0703001	MS4	Magnetic Contactor	CN11,3a1b,24V	1	Optional
E0703001	MS5	Magnetic Contactor	CN11,3a1b,24V	1	Optional
E0703002	MS6	Magnetic Contactor	CN18,24V	1	Optional
E0703002	MS7	Magnetic Contactor	CN18,24V	1	Optional
E0703001	MO	Magnetic Contactor	CN11,3a1b,24V	1	Optional
E2802003	Fu	Fuse Seat	3P(14*51)	1	For U.S.A
E2802013	Fu	Fuse Seat	1P(14*51)	1	For U.S.A
E3101012	Fu	Fuse	40A(14*51)	1	For U.S.A
E3101016	Fu	Fuse	5A(14*51)	1	For U.S.A
E3101009	Fu	Fuse Seat	E-16	1	For Asia
E3101010	Fu	Fuse	E16 30A	1	For Asia
E3101013	Fu	Fuse	E16 6A	1	For Asia
E3101019	Fu	Fuse Seat	10*38	1	For Europe
E3101027	Fu	Fuse	10*38*20A	1	For Europe
E3101024	Fu	Fuse	10*38*4A	1	For Europe
E1801005	TR	Transformer	PT40	1	Standard
E1602001		Safety Switch	XF163B	1	Optional
E1303001	SS1	Selector Switch	ST-302	1	Standard
E1605001	SS2	Cross Switch	3Joint (L)1a1b (R)1a1b UP 1a Down 1a	1	Optional
E0901021	SS2	Limit Switch	V-15-1E5	1	Optional



Part No.	Symbol	Description	Specification	Q'Ty	Remarks
E1604001	SS3	Selector Switch	SN 1021	1	Standard
E1603001	SS4	Switch for Change Speed	A441.CA10	1	Standard
B100006	SS5	Push Button	ZB4-BA2+ ZB4-BZ101	1	Standard
B100006	SS6	Push Button	ZB4-BA2+ ZB4-BZ101	1	Standard
E1701002	WL	Work Lamp	FS 51441	1	Standard
E1202011	PB1	Photo Buckle	YK $\phi$ 22,110V,1a1b (R)	1	Standard
E1202003	PB2	Photo Buckle	YK $\phi$ 22,110V,1a1b (G)	1	Standard
E1618001 E1618003	PB3	Emg Pash Button Switch	SBT-307 or YK30 $\Phi$ 1B	1	Standard
E1202002	PB1	Photo Buckle	YK $\Phi$ 22 24V 1a1b (Red)	1	Optional
E1202001	PB2	Photo Buckle	YK $\Phi$ 22 24V 1a1b (Green)	1	Optional
E2303003	PL	Pilot Light	SP301 110V (Red)	1	Standard
E2305003	PL	Pilot Light	YK30 $\Phi$ 24V (Red)	1	Optional
E2305001	L	Control Light	YK $\Phi$ 30 24V(White)	1	Optional
E2303004	L	Control Light	SP301 110V (White)	1	Standard
E0207007	OL1	Overload Relav	RH 18/4	1	For 200~230V
E0207007	OL2	Overload Relav	RH 18/4	1	For 200~230V
E0207010	OL3	Overload Relav	RH 18/15	1	For 200~230V
E0207008 E0207014	OL1	Overload Relay	RH 18/1.7 or RHN 10/1.4~2.1	1	For 380~460V
E0207008 E0207014	OL2	Overload Relay	RH18/1.7 or RHN 10/1.4~2.1	1	For 380~460V
E0207003 E0207017	OL3	Overload Relay	RH 18/10 or RHN10/5.5~8.5	1	For 380~460V
E0901006	LS1	Micro Switch	MJ2-1308R	1	Standard
E0901008	LS2	Micro Switch	TZ-8104	1	Standard
E0901007	LS3	Micro Switch	MJ2-1704	1	Standard
E0901007	LS4	Micro Switch	MJ2-1704	1	Standard
E0901007	LS5	Micro Switch	MJ2-1704	1	Standard
E0901007	LS6	Micro Switch	MJ2-1704	1	Standard
E3602001		Amp Meter	SO65,30A	1	Standard
		Coolant Pump Motor	1/8HP 2P 3HP L:130mm		
		Column Clamping Motor	Vertical 1HP,4P,3PH		
		Elevating Motor	Horizontal 1HP,4P,3PH		
		Main Motor	Vertical 3HP/1.5HP		

### 9.13 Electrical main parts list (for TRD-1230H Standard)

Part No.	Symbol	Description	Specification	Q'Ty	Remarks
E0701007	M1	Magnetic	CN18 110V	1	Standard
E0701007	M2	Magnetic	CN18 110V	1	Standard
E0701006	M3	Magnetic	CN11 , 3a1b , 110V	1	Standard
E0701006	M4	Magnetic	CN11 , 3a1b , 110V	1	Standard
E0701006	M5	Magnetic	CN11 , 3a1b , 110V	1	Standard
E0701006	M6	Magnetic	CN11 , 3a1b , 110V	1	Standard
E0701006	M0	Magnetic	CN11 , 3a1b , 110V	1	Standard
E0703002	M1	Magnetic	CN18 24V	1	Optional
E0703002	M2	Magnetic	CN18 24V	1	Optional
E0703001	M3	Magnetic	CN11 , 3a1b , 24V	1	Optional
E0703001	M4	Magnetic	CN11 , 3a1b , 24V	1	Optional
E0703001	M5	Magnetic	CN11 , 3a1b , 24V	1	Optional
E0703001	M6	Magnetic	CN11 , 3a1b , 24V	1	Optional
E0703001	M0	Magnetic	CN11 , 3a1b , 24V	1	Optional
E0211002	CR1	Control Relay	MK3P 110V	1	Standard
E0211002	CR2	Control Relay	MK3P 110V	1	Standard
E0211012	CR1	Control Relay	MK3P 24V	1	Optional
E0211012	CR2	Control Relay	MK3P 24V	1	Optional
E2802003	Fu	Fuse Seat	3P(14*51)	1	For U.S.A
E2802013	Fu	Fuse Seat	1P(14*51)	1	For U.S.A
E3101012	Fu	Fuse	40A(14*51)	1	For U.S.A
E3101016	Fu	Fuse	5A(14*51)	1	For U.S.A
E3101009	Fu	Fuse Seat	E-16	1	For Asia
E3101010	Fu	Fuse	E16 30A	1	For Asia
E3101013	Fu	Fuse	E16 6A	1	For Asia
E3101019	Fu	Fuse Seat	10*38	4	For Europe
E3101027	Fu	Fuse	10*38*20A	3	For Europe
E3101024	Fu	Fuse	10*38*4A	1	For Europe

Part No.	Symbol	Description	Specification	Q'Ty	Remarks
E1801005	TR	Transformer	PT40	1	Standard
E1602001		Safety Switch	XF 163B	1	Optional
E0901021	SS1	Limit Switch	V-15-1E5	1	Optional
E1303001	SS2	Selector Switch	ST-302	1	Standard
E1604001	SS3	Selector Switch	SN 1021	1	Standard
E1603001	SS4	Switch for Change Speed	A441 CA10	1	Standard
B100006	SS5	Push Button	ZB4-BA2 ZB4-BZ101 ZBE-102	1	Standard
B100006	SS6	Push Button	ZB4-BA2 ZB4-BZ101 ZBE-102	1	Standard
E1701002	WL	Work Lamp	FS 51441	1	Standard
E2303003	PL	Pilot Light	SP301 110V (Red)	1	Standard
E2305003	PL	Pilot Light	YK30Φ 24V (Red)	1	Optional
E2303004	L	Control Light	SP301 110V (White)	1	Standard
E2305001	L	Control Light	YK30Φ 24V (White)	1	Optional
E1618001 E1618003	PB1	Emg Push Button Switch	SBT-307 or YK 30Φ 1B	1	Standard
E1202004	PB2	Push Button Switch	YK22Φ 2A (Red)	1	Standard
E1202005	PB3	Push Button Switch	YK22Φ 2A (Green)	1	Standard
E0901006	LS1	Micro Switch	MJ2-1308R	1	Standard
E0901008	LS2	Micro Switch	TZ-8104	1	Standard
E0901034	LS3	Micro Switch	MN-5311	1	Standard
E0901011	LS4	Micro Switch	AZ 7121	1	Standard
E0901010	LS5	Micro Switch	WLD2	1	Standard
E0901034	LS6	Micro Switch	MN-5311	1	Standard
E0207010	OL1	Overload Relay	RH 18/15	1	For 200~230V
E0207007	OL2	Overload Relay	RH 18/4	1	For 200~230V
E0207007	OL3	Overload Relay	RH 18/4	1	For 200~230V


Part No.	Symbol	Description	Specification	Q'Ty	Remarks
E0207017 E0207003	OL1	Overload Relay	RHN 10/5.5~8.5 or RH18/10	1	For 380~460V
E0207014 E0207008	OL2	Overload Relay	RHN 10/1.4~2.1 or RH18/1.7	1	For 380~460V
E0207014 E0207008	OL3	Overload Relay	RHN 10/1.4~2.1 or RH18/1.7	1	For 380~460V
E0208004	T1	Timer Relay	ASTP-N6S 110V	1	Standard
E0208004	T2	Timer Relay	ASTP-N6S 110V	1	Standard
E0208001	T1	Timer Relay	ASTP-N6S 24V	1	Optional
E0208001	T2	Timer Relay	ASTP-N6S 24V	1	Optional
E3602001	○	Amp Meter	S065 30A	1	Standard
M0302018	SOL1, SOL2	Solenoid Valve	DSG-3 C2-02 110V	1	Standard
M0302018	SOL3, SOL4	Solenoid Valve	DSG-3 C2-02 110V	1	Standard
M0302019	SOL1, SOL2	Solenoid Valve	DSG-3 C2-02 24V	1	Optional
M0302019	SOL3, SOL4	Solenoid Valve	DSG-3 C2-02 24V	1	Optional
		Coolant Pump Motor	1/8HP 2P 3PH L:130mm	1	
		Elevating Motor	Horizontal 1HP 4P 3PH	1	
		Main Motor	3HP/1.5HP 4P/8P 3PH	1	
		Hydraulic Motor	Horizontal 1HP 4P 3PH	1	

## 9.14 Electrical main parts list (for TRD-1600H Standard)

Part No.	Symbol	Description	Specification	Q'Ty	Remarks
E0701008	MS1	Magnetic Contactor	CN25 , 110V	1	Standard
E0701008	MS2	Magnetic Contactor	CN25 , 110V	1	Standard
E0701006	MS3	Magnetic Contactor	CN11 , 3a1b , 110V	1	Standard
E0701006	MS4	Magnetic Contactor	CN11 , 3a1b , 110V	1	Standard
E0701006	MS5	Magnetic Contactor	CN11 , 3a1b , 110V	1	Standard
E0701006	MS6	Magnetic Contactor	CN11 , 3a1b , 110V	1	Standard
E0701006	CR1	Magnetic Contactor	CN11 , 3a1b , 110V	1	Standard
E0701006	CR2	Magnetic Contactor	CN11 , 3a1b , 110V	1	Standard
E0208004	T1	Timer Relay	ASTP-N , 6S , 110V	1	Standard
E0208005	T2	Timer Relay	AH3-2 , 6S , 110V	1	Standard
E0208004	T3	Timer Relay	ASTP-N , 6S , 110V	1	Standard
E0703003	MS1	Magnetic Contactor	CN25 , 24V	1	Optional
E0703003	MS2	Magnetic Contactor	CN25 , 24V	1	Optional
E0703001	MS3	Magnetic Contactor	CN11 , 3a1b , 24V	1	Optional
E0703001	MS4	Magnetic Contactor	CN11 , 3a1b , 24V	1	Optional
E0703001	MS5	Magnetic Contactor	CN11 , 3a1b , 24V	1	Optional
E0703001	MS6	Magnetic Contactor	CN11 , 3a1b , 24V	1	Optional
E0703001	CR1	Magnetic Contactor	CN11 , 3a1b , 24V	1	Optional
E0703001	CR2	Magnetic Contactor	CN11 , 3a1b , 24V	1	Optional
E0208001	T1	Timer Relay	ASTP-N , 6S , 24V	1	Optional
E0208002	T2	Timer Relay	AH3-2 , 6S , 24V	1	Optional
E0208001	T3	Timer Relay	ASTP-N , 6S , 24V	1	Optional
E0403003	NFB	Circuit breaker	3P , 30A , 220V or 3P , 20A , 440V	1	Standard
E1602002		Safety Switch	XF323B	1	Optional
		Main Motor	Vertical 7.5HP/4P/3PH	1	Standard
		Elveating Motor	Horizontal 2HP/4P/3PH	1	Standard
		Hydraulic Motor	Horizontal 1HP/4P/3PH	1	Standard

Part No.	Symbol	Description	Specification	Q'Ty	Remarks
M0302020	SOL1 , SOL2	Solenoid Valve	DSG-3C4-02 110V	1	Standard
E0208004	T4	Timer Relay	ASTP-N,6S,110V	1	Standard
E0208001	T4	Timer Relay	ASTPN,6S,24V	1	Optional
M0302018	SOL3 , SOL4	Solenoid Valve	DSG-3C2-02 110V	1	Standard
M0302016	SOL5	Solenoid Valve	V2071-A11 110V	1	Standard
M0302021	SOL1 , SOL2	Solenoid Valve	DSG-02-3C4 24V	1	Optional
M0302019	SOL3 , SOL4	Solenoid Valve	DSG-02-3C2 24V	1	Optional
M0302017	SOL5	Solenoid Valve	V2071-A11 24V	1	Optional
E1801029	TR	Transformer	250VA (1:0,220,380,415,440V 2:0,24,110V)	1	
E3101009	Fu	Fuse Seat	E-16	1	For Asia
E2802013	Fu	Fuse Seat	1P(14*51)	1	For U.S.A
E3101019	Fu	Fuse Seat	10*38	1	For Europe
E3101013	Fu	Fuse	E16 , 6A	1	For Asia
E3101016	Fu	Fuse	5A(14*51)	1	For U.S.A
E3101024	Fu	Fuse	10*38 , 4A	1	For Europe
E0207012 E0207022	OL1	Overload Relay	RH 18MP/15 or RHN-18/5.5~8.5~12.5	1	For 380V~460V
E0207009 E0207015	OL1	Overload Relay	RH18MP/26 or RHN-18/32	1	For 200V~230V
E0207011 E0207017	OL2	Overload Relay	RH18/7 or RHN-10/5.5~8.5	1	For 200V~230V
E0207007 E0207016	OL2	Overload Relay	RH18/4 or RHN-10/3.5~5	1	For 380V~460V
E0207007 E0207016	OL3	Overload Relay	RH18/4 or RHN-10/3.5~5	1	For 200V~230V
E0207008 E0207014	OL3	Overload Relay	RH18/1.7 or RHN-10/1.4~2.1	1	For 380V~460V
E1604001	SS1	Selector Switch	SN1021	1	Standard
E1303001	SS2	Selector Switch	ST302	1	Standard




Part No.	Symbol	Description	Specification	Q'Ty	Remarks
E1605002	SS3	Cross Switch	5Joint, UP 2a1b, Down 2a1b (L)1a1b, (R)1a1b	1	Standard
E1701002	WL	Work Lmap	FS51441	1	Standard
E1618001 E1618003	PB1	Emg Push Button Switch	SBT-307 or YK30Φ1B	1	Standard
E1203003	PB2	Photo Buckle	YK30Φ , 110V (Green)	1	Standard
E1202013	PB2	Photo Buckle	YK30Φ , 24V (Green)	1	Optional
E0901013	LS1	Micro Switch	WLD	1	Standard
E0901010	LS2	Micro Switch	WLD2	1	Standard
E0901009	LS3	Micro Switch	MN5311	1	Standard
E0901008	LS4	Micro Switch	TZ-8104	1	Standard
E0901008	LS5	Micro Switch	TZ-8104	1	Standard
E1202004	PB3	Push Button	YK22Φ , 2A (Red)	1	Standard
E1202005	PB4	Push Button	YK22Φ , 2A (Green)	1	Standard
E3602004		Amp Meter	S065(50A)	1	Standard
E0303002		Terminal block	20P 20A	1	
E0303004		Terminal block	TS015 28P	1	
E0303001		Terminal block	12P*20A	1	
E0303003		Terminal block	3P*30A	1	

## 9.15 Electrical main parts list (for TRD-2000H Standard)

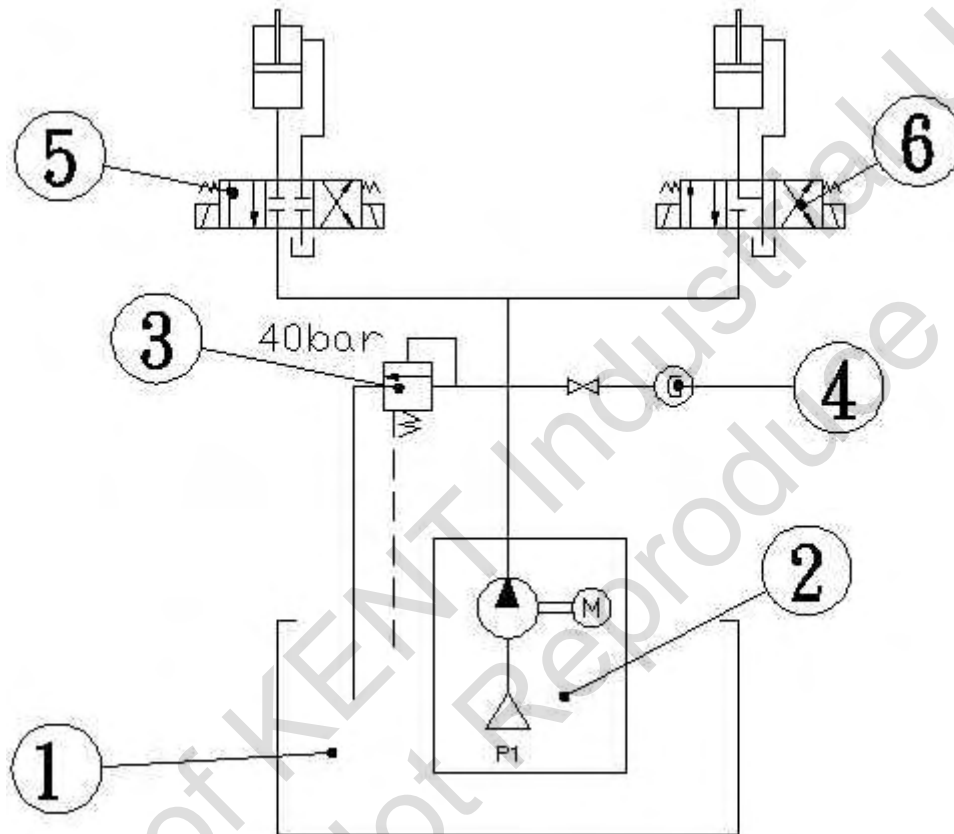
Part No.	Symbo	Description	Specification	Q'Ty	Remarks
E0701008	MS1	Magnetic Contactor	CN25 , 110V	1	Standard
E0701008	MS2	Magnetic Contactor	CN25 , 110V	1	Standard
E0701006	MS3	Magnetic Contactor	CN11 , 3a1b , 110V	1	Standard
E0701006	MS4	Magnetic Contactor	CN11 , 3a1b , 110V	1	Standard
E0701006	MS5	Magnetic Contactor	CN11 , 3a1b , 110V	1	Standard
E0701006	MS6	Magnetic Contactor	CN11 , 3a1b , 110V	1	Standard
E0701006	CR1	Magnetic Contactor	CN11 , 3a1b , 110V	1	Standard
E0701006	CR2	Magnetic Contactor	CN11 , 3a1b , 110V	1	Standard
E0208004	T1	Timer Relay	ASTP-N , 6S , 110V	1	Standard
E0208005	T2	Timer Relay	AH3-2 , 6S , 110V	1	Standard
E0208004	T3	Timer Relay	ASTP-N , 6S , 110V	1	Standard
E0703003	MS1	Magnetic Contactor	CN25 , 24V	1	Optional
E0703003	MS2	Magnetic Contactor	CN25 , 24V	1	Optional
E0703001	MS3	Magnetic Contactor	CN11 , 3a1b , 24V	1	Optional
E0703001	MS4	Magnetic Contactor	CN11 , 3a1b , 24V	1	Optional
E0703001	MS5	Magnetic Contactor	CN11 , 3a1b , 24V	1	Optional
E0703001	MS6	Magnetic Contactor	CN11 , 3a1b , 24V	1	Optional
E0703001	CR1	Magnetic Contactor	CN11 , 3a1b , 24V	1	Optional
E0703001	CR2	Magnetic Contactor	CN11 , 3a1b , 24V	1	Optional
E0208001	T1	Timer Relay	ASTP-N , 6S , 24V	1	Optional
E0208002	T2	Timer Relay	AH3-2 , 6S , 24V	1	Optional
E0208001	T3	Timer Relay	ASTP-N , 6S , 24V	1	Optional
E0403003	NFB	Circuit breaker	3P , 30A , 220V or 3P , 20A , 440V	1	Standard
E1602002		Safty Switch	XF323B	1	Optional
		Main Motor	Vertical 7.5HP/4P/3PH	1	Standard
		Elveating Motor	Horizontal 3HP/4P/3PH	1	Standard
		Hydraulic Motor	Horizontal 1HP/4P/3PH	1	Standard

Part No.	Symbo	Description	Specification	Q'Ty	Remarks
M0302020	SOL1 ,	Solenoid Valve	DSG-3C4-02 110V	1	Standard
E0208004	T4	Timer Relay	ASTP-N,6S,110V	1	Standard
E0208001	T4	Timer Relay	ASTPN,6S,24V	1	Optional
M0302018	SOL3 ,	Solenoid Valve	DSG-3C2-02 110V	1	Standard
M0302016	SOL5	Solenoid Valve	V2071-A11 110V	1	Standard
M0302021	SOL1 ,	Solenoid Valve	DSG-02-3C4 24V	1	Optional
M0302019	SOL3 ,	Solenoid Valve	DSG-02-3C2 24V	1	Optional
M0302017	SOL5	Solenoid Valve	V2071-A11 24V	1	Optional
E1801029	TR	Transformer	250VA (1:0,220,380,415,440V 2:0,24,110V)	1	
E3101009	Fu	Fuse Seat	E-16	1	For Asia
E2802013	Fu	Fuse Seat	1P(14*51)	1	For U.S.A
E3101019	Fu	Fuse Seat	10*38	1	For Europe
E3101013	Fu	Fuse	E16 , 6A	1	For Asia
E3101016	Fu	Fuse	5A(14*51)	1	For U.S.A
E3101024	Fu	Fuse	10*38 , 4A	1	For Europe
E0207012 E0207022	OL1	Overload Relay	RH 18MP/15 or RHN-18/8.5~12.5	1	For 380V~460V
E0207009 E0207015	OL1	Overload Relay	RH18MP/26 or RHN-18/32	1	For 200V~230V
E0207011 E0207017	OL2	Overload Relay	RH18/7 or RHN-10/5.5~8.5	1	For 200V~230V
E0207007 E0207016	OL2	Overload Relay	RH18/4 or RHN-10/3.5~5	1	For 380V~460V
E0207007 E0207016	OL3	Overload Relay	RH18/4 or RHN-10/3.5~5	1	For 200V~230V
E0207008 E0207014	OL3	Overload Relay	RH18/1.7 or RHN-10/1.4~2.1	1	For 380V~460V
E1604001	SS1	Selector Switch	SN1021	1	Standard
E1303001	SS2	Selector Switch	ST302	1	Standard

Part No.	Symbol	Description	Specification	Q'Ty	Remarks
E1605002	SS3	Cross Switch	5Joint, UP 2a1b, Down 2a1b (L)1a1b, (R)1a1b	1	Standard
E1701002	WL	Work Lmap	FS51441	1	Standard
E1618001 E1618003	PB1	Emg Push Button Switch	SBT-307 or YK30Φ1B	1	Standard
E1203003	PB2	Photo Buckle	YK30Φ , 110V (Green)	1	Standard
E1202013	PB2	Photo Buckle	YK30Φ , 24V (Green)	1	Optional
E0901013	LS1	Micro Switch	WLD	1	Standard
E0901010	LS2	Micro Switch	WLD2	1	Standard
E0901009	LS3	Micro Switch	MN5311	1	Standard
E0901008	LS4	Micro Switch	TZ-8104	1	Standard
E0901008	LS5	Micro Switch	TZ-8104	1	Standard
E1202004	PB3	Push Button	YK22Φ , 2A (Red)	1	Standard
E1202005	PB4	Push Button	YK22Φ , 2A (Green)	1	Standard
E3602004		Amp Meter	S065(50A)	1	Standard
E0303002		Terminal block	20P 20A	1	
E0303004		Terminal block	TS015 28P	1	
E0303001		Terminal block	12P*20A	1	
E0303003		Terminal block	3P*30A	1	

## 9.16 Diagram for hydraulic system (only for TRD-1230H)

P1: The pressure set to 38 bar.



### Hydraulic of unload equipment

The operated pressure requires 38bar. When the pressure system can be maintained to 38bar. But pipe has clog, furthermore hydraulic of pressure continue to rise. To further ensure safety, the unloading valve(part 3.) is employed to unload the motion if the pressure is over the setting of 40bar.

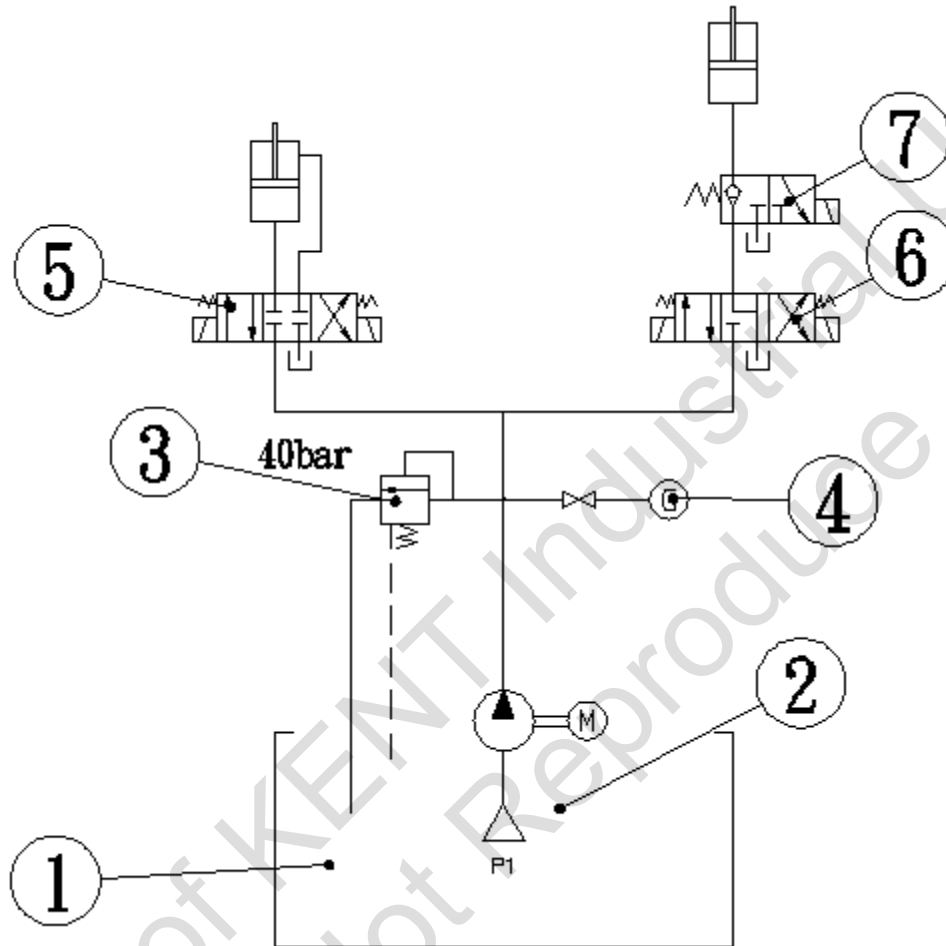
### 9.17 Hydraulic system main parts list (only for TRD-1230H)

NO	Name	Specification	Q'ty
1	Tank		1
2	Hydraulic Pump	HGP-1A-F6R	1
3	Release Valve	DG-02-L	1
4	Pressure Gauge	$2\frac{1}{2}$ " $\times$ 70bar	1
5	Solenoid Valve	DSG-02-3C2	1
6	Solenoid Valve	DSG-02-3C4	1



## 9.18 Diagram for hydraulic system (only for TRD-1600H/ TRD-2000H)

P1: The pressure set to 38 bar.



### Hydraulic of unload equipment

The operated pressure requires 38bar. When the pressure system can be maintained to 38bar. But pipe has clog, furthermore hydraulic of pressure continue to rise. To further ensure safety, the unloading valve(part 3.) is employed to unload the motion if the pressure is over the setting of 40bar.

## 9.19 Hydraulic system main parts list (only for TRD-1600H/ TRD-2000H)

NO	Name	Specification	Q'ty
1	Tank		1
2	Hydraulic Pump	HGP-1A-F6R	1
3	Release Valve	DG-02-L	1
4	Pressure Gauge	$2\frac{1}{2}$ " $\times$ 70bar	1
5	Solenoid Valve	DSG-02-3C2	1
6	Solenoid Valve	DSG-02-3C4	1
7	Solenoid Valve	V2071-A11	1