

D&B - 120W

Hydraulic Drilling Rig

OPERATION AND MAINTENANCE MANUAL



DO NOT OPERATE THE MACHINE BEFORE READING
AND UNDERSTANDING THE INSTRUCTIONS OF THIS MANUAL

HANJIN D&B CO., LTD.

HEAD OFFICE

49, Hanamsandan 10beon-ro, Gwangsan-gu, Gwangju-city, Korea

Telephone +82-62-9534510 Telefax +82-62-9534520

Web : <http://www.hanjindnb.com> E-mail : mail@hanjindnb.com

This manual images may be different from the real machine and the specifications and features may be changed without prior notice in order to improve the products.

IMPORTANT SAFETY NOTICE

Most accidents which occur while operating or maintaining operation machines or job site equipment are caused by not complying with or neglecting the basic safety precautions and the potential dangerousness of a specific situation before the accident occurs.

The operators charged with machines or equipment must pay steady attention to any potential hazards.

They must be skilled and have both ability and tools to carry out the different operations in the most proper way.

Operating, lubricating, maintaining or repairing the machine in an improper way may be highly dangerous and result in serious personal injury or even death.

Do not use the machine nor carry out any lubrication, maintenance or repair works before reading and understanding any information about how to use, lubricate, maintain or repair the machine.

The basic precautions to be taken are detailed in section B "Safety" of this manual. When a particular operation may involve specific hazards, additional safety notices are added to the description of the same operation.

In this manual, the **SAFETY NOTICES** start with five different kinds of signal word.

DANGER

The word "DANGER" indicates an imminently hazardous situation which, if not avoided, can result in serious injury or death.

WARNING

The word "WARNING" indicates a potentially hazardous situation which, if not avoided, can result in serious injury or death.

CAUTION

The word "CAUTION" indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

IMPORTANT

The word "IMPORTANT" indicates emphasis on notable characteristics of working procedures, and information about technology for easier operation.

NOTE

The word "NOTE" indicates that interesting or helpful information is being provided.

In the handbook, the message following the signal words may be either written or illustrated.

Special labels or warning plates are also applied to the machine.

They provide instructions on how to identify the hazards which, if under-estimated, may result in serious injury or death.

The manufacturer **HANJIN D&B** cannot foresee all possible circumstances which may result in hazardous situations when using and operating the machine.

For this reason, the safety notices, contained in this manual or applied on the machine, cannot include all possible situations of potential danger.

When, during work, you follow procedures, equipment or methods other than those expressly recommended by **HANJIN D&B**, it is of the utmost importance that you do your job taking into account the safety limits for your own as well as for everybody else's safety.

Additionally, you must be sure that the machine does not suffer from damage or become unsafe due to operation, lubrication, maintenance or repair works you decide to carry out.

INTRODUCTION

This manual is intended to provide you with all the information you need to use the machine correctly and to carry out the principal maintenance operations.

IMPORTANT

- It is essential that you read and understand this manual before using or operating the machine and prior to carrying out any operations.

The manual is divided into four section:

Section A GENERAL INFORMATION

Section B SAFETY

Section C OPERATOR MANUALS

Section D MAINTENANCE

Section E TROUBLESHOOTING

Section F SPARE PARTS

Section A contains general information which is very important for understanding the machine and its main parts.

Exact identification data, specifications, etc. are also provided.

Section B is intended for the personnel who will operate the machine, as well as for repair and maintenance personnel and site safety staff.

This section also contains machine personnel requirements and important safety information which must be read carefully and fully understood.

Section C is intended mainly for the personnel who will operate the machine. All the operation and control devices are explained in this section.

Section D is specifically intended for the maintenance department and maintenance personnel. It contains information on the periodic maintenance jobs and schedules, as well as useful reference tables and specifications for servicing.

Section E provides procedures for troubleshooting the most common problems encountered when operating the machine.

Section F contains information about the spare parts of the equipment. See this section to obtain the spare parts in advance.

The sections are divided into chapters and paragraphs numbered in sequence.

However, the information you require can also be located by means of the key words used in the title of the individual chapters.

IMPORTANT

- The quickest way to locate the information you require is to consult the general table of contents. After reading this manual, personnel must ensure that it is always within reach when needed.
- Should you have any doubts or difficulty in understanding this manual or any part of it, we strongly recommend you contact the **HANJIN D&B** customer service.
- Addresses, telephone and fax numbers are provided on the cover page of this manual.

SECTION A

GENERAL INFORMATION



DO NOT OPERATE THE MACHINE BEFORE READING
AND UNDERSTANDING THE INSTRUCTIONS OF THIS MANUAL

HANJIN D&B CO., LTD.

A-1. IDENTIFICATION

A-1-1. MANUFACTURED

HANJIN D&B CO., LTD.

49, Hanamsandan 10beon-ro, Gwangsan-gu, Gwangju-city, Korea

Telephone +82-62-9534510 - Telefax +82-62-9534520

A-1-2. MODEL AND TYPE

D&B-120W with HYUNDAI D6HA Engine.

D&B-120W is installed HJGB1000 drill head gearbox.

A-1-3. MACHINE IDENTIFICATION PLATE

The identification plate is located on the rear of machine.

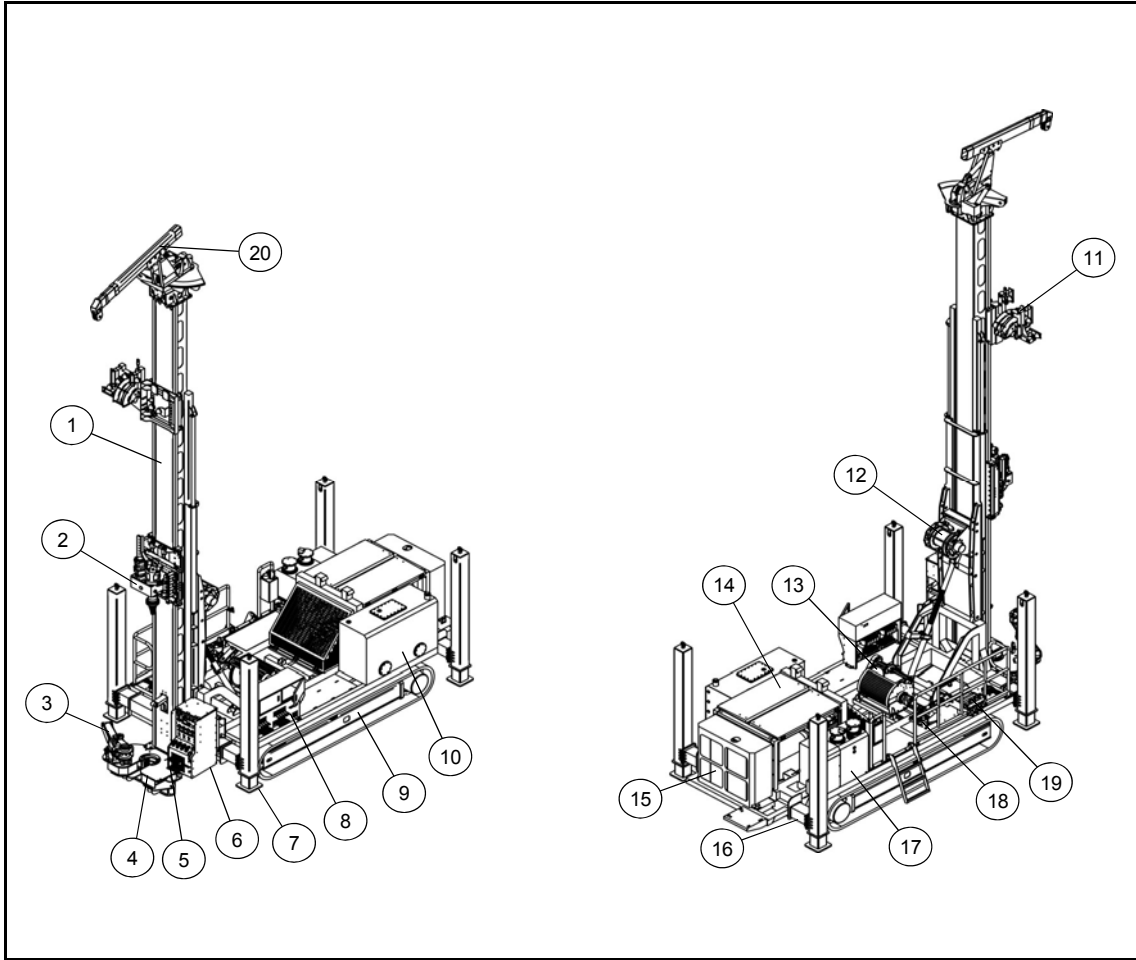
The identification plate is showed model & type, engine maker & no., Serial no., etc.

			API Spec Q1 Registere
Model	D&B-120W		
Serial No.			
Engine Model	HYUNDAI D6HA		
Engine No.			
Engine Type	Turbo Charger		
Power	420PS / 2000RPM		
Contact No.	82-62-953-4510(T), 4520(F)		
Web-site	www.hanjindnb.com		
E-mail	mail@hanjindnb.com		

A-1-4. IDENTIFICATION PLATE OF MAIN COMPONENT PARTS

The plates of all the main components not built by HANJIN D&B (Pump, Motor, etc.) are located on the components themselves at the point where the manufacturers originally placed them.

A-1-5. NAMES OF COMPONENTS - A



No.	NAME	No.	NAME
1	Mast	17	Hydraulic oil tank
2	Drill head	18	Water injection (option)
3	Rod handler (option)	19	Water pump (option)
4	Clamp unit	20	Top crane
5	Rod wrench		
6	Operation panel		
7	Leveling jack		
8	Auxiliary operation panel		
9	Undercarriage		
10	Fuel tank		
11	Hydraulic hose guide		
12	Main winch		
13	Wire line winch		
14	Engine room		
15	Radiator		
16	Rigger		

A-1-6. NAMES OF COMPONENTS - B



No.	NAME	No.	NAME
1	Engine control box	15	Valve uint 7
2	Fuel gauge	16	Toggle switch
3	Emergency stop button	17	Valve uint 8
4	Rod weight gauge	18	Valve uint 9
5	Pressure gauge	19	Valve uint 10
6	Relief valve 1	20	Water heater
7	Valve uint 1	21	Main power switch
8	Valve uint 2		
9	Valve uint 3		
10	Valve uint 4		
11	Relief valve 2		
12	Water pressure gauge		
13	Valve uint 5		
14	Valve uint 6		

A-2. GENERAL SPECIFICATION

A-2-1. ENGINE

• Model	HYUNDAI D6HA 6 Cylinder diesel engine (Turbo intercooler)
• Rated power	420PS/2000RPM
• Fuel capacity	Appr. 520ℓ
• Cooling system	Water cooling

A-2-2. DRILL HEAD ROTATION

• Reduction	Super gear - 5.1 to 1
• Performance	Two motor(Std)
• Max . RPM	1st 0 - 150 rpm 2nd 0 - 200 rpm
• Max . Torque	1st 2600kg-M 2nd 1300kg-M

A-2-3. FEED SYSTEM

• Head travel	1st : 11M 2nd Up : 1.4M, Down : 1.8M
• Pull-up capacity	120ton
• Pull-down capacity	9ton

A-2-4. MAIN FEED WINCH

• Spool capacity	30M of 19mm cable
• Line pull	17 tons

A-2-5. SUB FEED WINCH

• Spool capacity	25M of 16mm cable
• Line pull	9 tons

A-2-6. WINCH

• Spool capacity	27M of 12mm cable
• Line pull	3 tons

A-2-7. MAIN HYDRAULIC SYSTEM

• General	3pump open loop system
• Tank capacity	Appr. 330ℓ
• Filtration	10 micron
• Pump discharge rate	H3V280DT (P1:280cc, P2:280cc) + Gear Pump(P3:10cc)
• Cooling system	Air cooling
• Operating pressure	H3V280DTH (P1:280bar, P2:280bar), Gear Pump (P3:210bar)

A-2-8. SUB HYDRAULIC SYSTEM

• General	4pump open loop system
• Tank capacity	Appr. 330ℓ
• Filtration	10 micron
• Pump discharge rate	H3V63DT (P1:63cc, P2:63cc) + HSF30D (P3:30cc, P4:30cc)
• Cooling system	Air cooling
• Operating pressure	H3V63DT (P1:280bar, P2:280bar), HSF30D (P3:210bar, P4:40bar)

A-2-6. WORKING TABLE

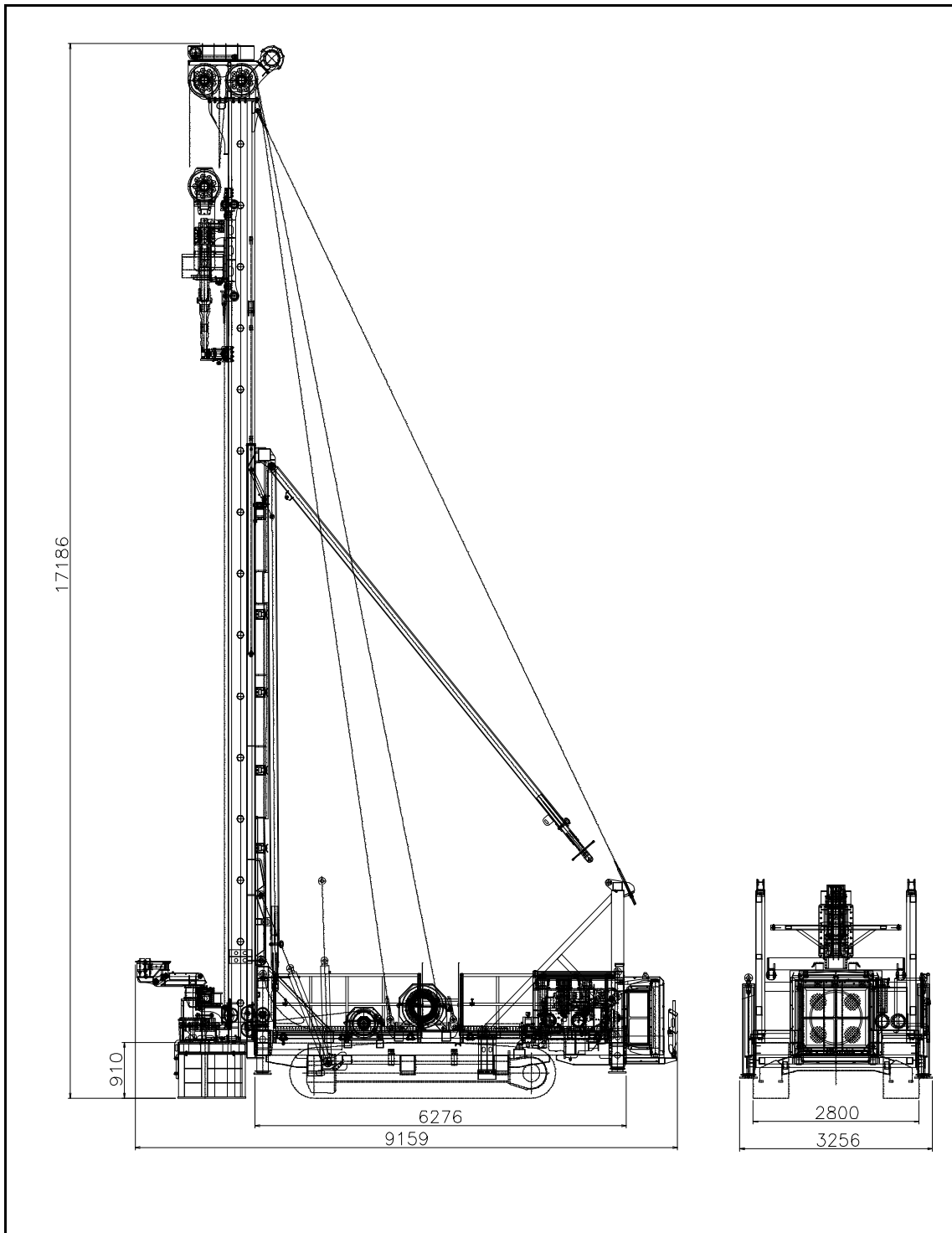
• Max. Casing diameter	12"
• Lod Handler Tilting Degree	90°
• Lod Handler Clamp Size	Max 127mm

A-2-7. CRAWLER BASE

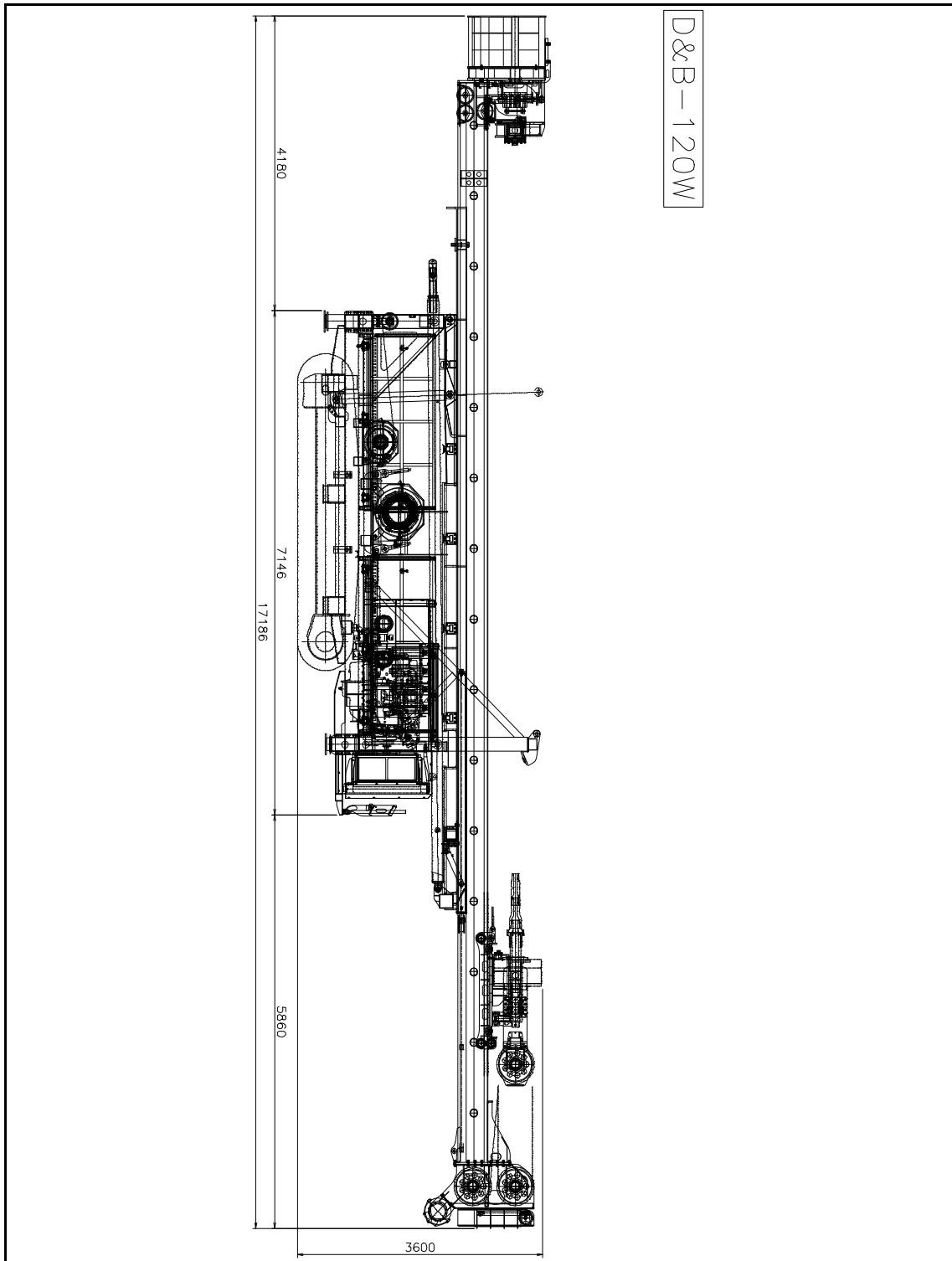
• Crawler type	Solar 220 (Motor : Solar 220)
• Crawler speed	2.5km/hr
• Ground pressure	0.5kg/cm ²

A-3. MAIN DIMENSIONS

A-3-1. SET-UP DIMENSIONS

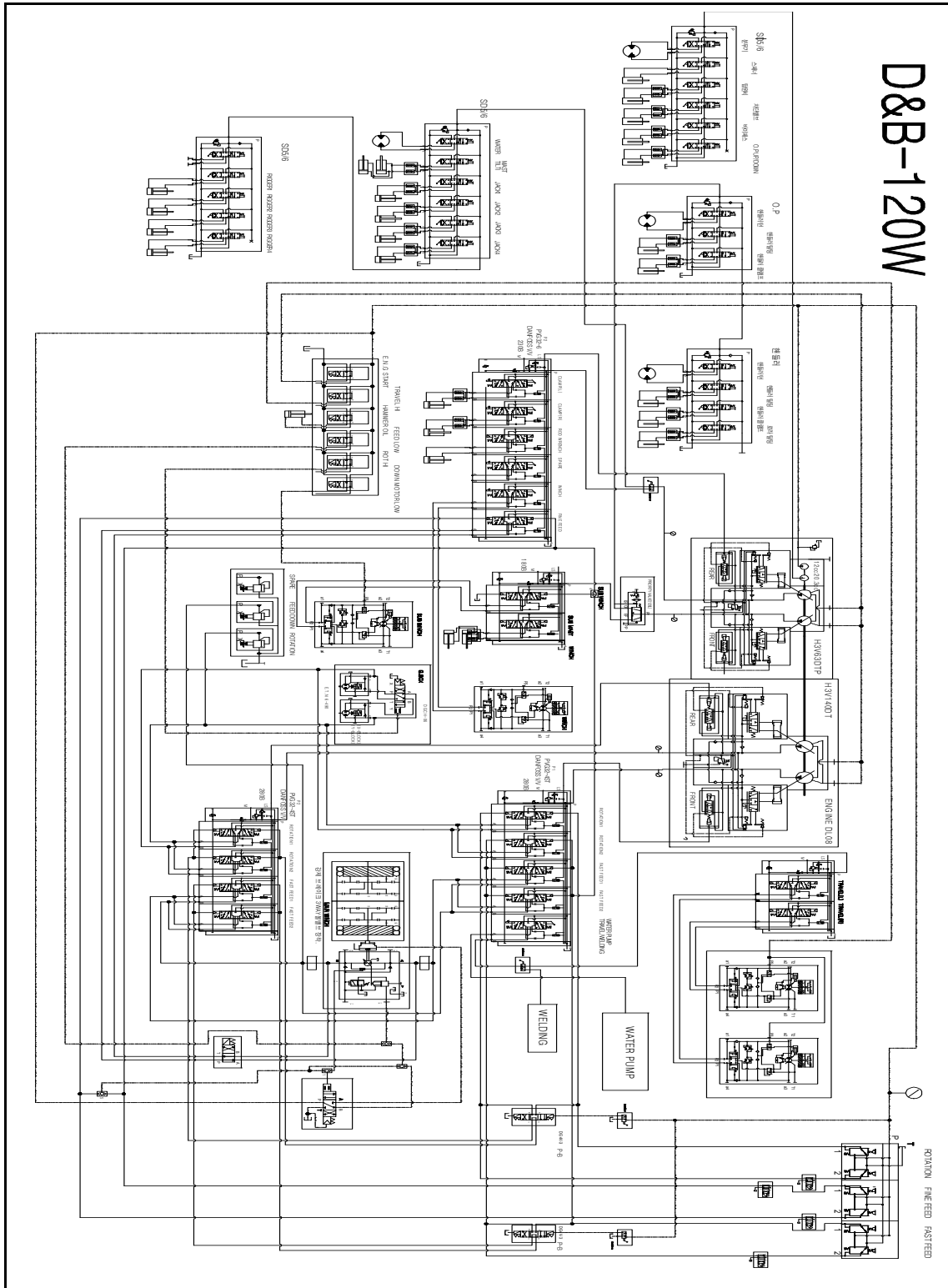


A-3-2. TRAVEL DIMENSIONS



A-4. CIRCUIT DIAGRAM

A-4-1. HYDRAULIC CIRCUIT DIAGRAM



SECTION B

SAFETY



DO NOT OPERATE THE MACHINE BEFORE READING
AND UNDERSTANDING THE INSTRUCTIONS OF THIS MANUAL

HANJIN D&B CO., LTD.

B-1. GENERAL

Most of the accidents that occur when working with machines and during their maintenance and repair are caused by the failure to observe basic safety precautions.

You must therefore be fully aware of potential hazards and must pay constant attention to the consequences do what you are doing.

IMPORTANT

- If you recognise potentially dangerous situations, accidents can be avoided!

In this manual, for example, a special set of "safety warning symbols" has been used to highlight potentially dangerous situations.

Naturally, most of the safety rules contained in this section refer specifically to machines designed for drilling, soil consolidation, etc.

WARNING

The instructions contained in this manual are those envisaged by **HANJIN D&B**.

It is possible that there are more convenient and equally safe ways to set up and operate the machine and perform maintenance on it, especially when account is taken of space requirements and auxiliary equipment available.

If, however, you intend to adopt procedures different from the ones set out in this manual, it is essential that you:

- Make sure that the methods you intend to use are not prohibited.
- Make sure that the methods are safe and that they comply with the rules set out in Section B.
- Make sure that the methods do not cause direct or indirect damage to the machine or render it unsafe.
- Contact the **HANJIN D&B** technical department for suggestions and the necessary approval.

IMPORTANT

- Remember that, if in doubt, it is always better to ask! Contact **HANJIN D&B**:
- The company's Customer Service is there to help you in this respect too.
- Addresses, telephone and fax numbers are given on the cover and on page 1 of this manual.

B-2. PERSONNEL REQUIREMENTS

B-2-1. FITNESS

The personnel using or operating the machine must be competent to do so, and must satisfy the following requirements:

Physical	Good eyesight, hearing, coordination, and the ability to perform safely all the tasks needed to operate the machine.
Mental	Ability to understand and apply the regulations, rules and safety precautions. You must be alert and must use your judgement to ensure your own safety and that of others. You must want to carry out your job correctly and responsibly.
Emotional	You must be calm and able to withstand stress, and you must be able to use your judgement to assess your physical and mental condition.
Training	You must have read and studied this manual, as well as any associated graphs and diagrams and the warning and danger plates. You must be skilled and qualified in all aspects of machine use and maintenance.
Licence	If required by law.

B-2-2. WORK CLOTHING

When working or carrying out repairs or maintenance jobs, you must use the clothing and accident-prevention material listed below:

- Work overalls or other comfortable garments: these must not be too big and must be made in such a way that they will not get caught in the machine's moving parts.
- Safety helmet
- Protective gloves
- Safety shoes

IMPORTANT

- Use only type-approved accident-prevention material in good condition.

B-2-3. SAFETY EQUIPMENT

You must also have the following equipment ready for use if necessary:

- Respirators (or dust masks)
- Ear plugs or headsets
- Goggles or masks to protect the eyes

IMPORTANT

- Use only type-approved accident-prevention material in good condition.

B-3. DANGER SITUATIONS

Generally speaking, the dangers that might arise when using machines and equipment are connected with the mechanical, hydraulic and electrical power transmissions.

There are also a series of specific hazards connected with the job technology and area of application.

For example : use of pressurised drilling fluids; particular excavation tools or methods, etc.

LIST OF HAZARDS

- A** TRANSPORT (to and from site)
- B** SETTING UP/ASSEMBLY AND DISASSEMBLY (on site)
- C** JOB PERFORMANCE (on site)
- D** POSITIONING (from one job to another on site)
- E** PARKING OR OFF-DUTY (on site or in warehouse)

Type of danger	Situations				
Oil leaks	A	B	C	D	E
Mechanical component failure		B	C	D	
Accidental dropping of drilling equipment	A	B	C	D	
Risks connected with lifting and lowering of mechanical parts (e.g.mast, rods)		B	C	D	
Contact with hot or cold components		B	C	D	E
Contact with dangerous substances		B	C	D	
Pressure drops in the hydraulic system		B	C	D	
High pressure fluids and gases		B	C	D	
Electric shocks : • from contact with electric power lines • from contact with underground cables		B	C	D	
Falls from high positions	A	B	C	D	E
Overturning or slipping of the machine		B	C	D	E
Cuttings thrown up by drilling tool			C	D	
Whiplashing of hoses or ropes		B	C	D	

B-4. SAFETY RULES

B-4-1. WORK AREA

Always take account of the characteristics of the area in which you have to operate :

- Study the plans and, if necessary, the cross-sections of the work area and compare them with the machine dimensions in its various configurations.
Pay particular attention if you are working near gas pipelines or other underground lines, or close to overhead power lines.
- If you have to assemble all or part of the machine on site, prepare an area of sufficient size with a firm, level surface and suitable equipment.
- Study, if necessary, the best access route to the work area.
- Mark off the work area, even if you are working on an already staked out job site.
- When the machine is in operation, only skilled personnel may come within its operating range, and only when strictly necessary.
- During jobs keep the work area in order and carry out regular cleaning: do not let mounds of soil or drilling mud prevent or make movements of personnel and machines hazardous.

B-4-2. PREPARING FOR WORK

DANGER

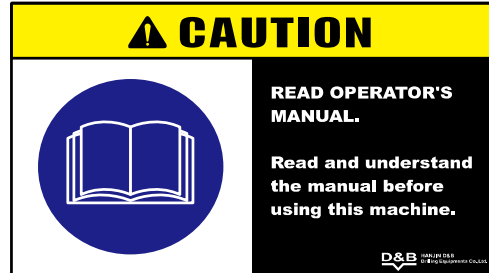
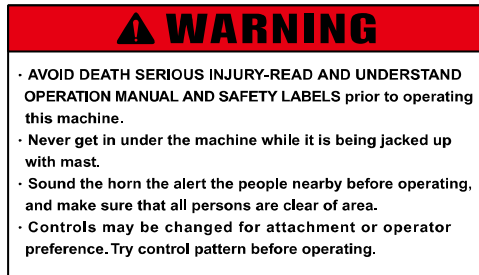
- Before and during a job do not take alcohol, medicines or any other substance that may impair your ability to operate machines.

You must be properly prepared prior to starting work :

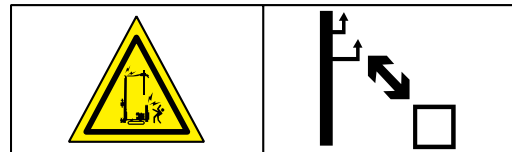
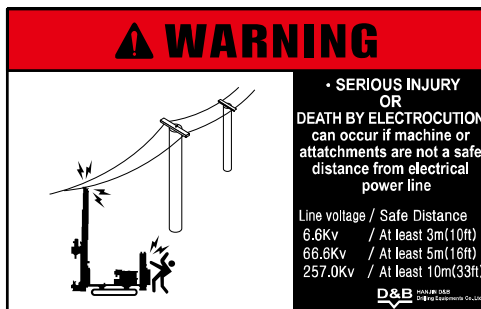
- First of all make sure that the maintenance jobs have been performed with the proper care and attention and at the established maintenance times. **(Section D MAINTENANCE)**
- Make sure that you have sufficient operating autonomy so as to avoid the risk of forced machine stop, perhaps during a critical manoeuvre.
- Thoroughly clean the instruments, the plates, the work lights and the cab windows.
(where fitted)
- Check that all the safety devices on the machine and in the work area are functioning correctly.
- If there are problems of any kind, inform your superior immediately and do not start work unless the necessary safety conditions are in place.
- It is forbidden to make emergency repairs simply in order to start work!

B-5. SAFETY LABELS

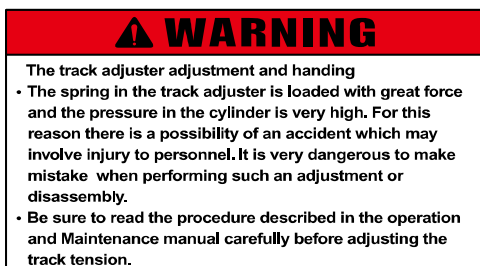
B-5-1. WARNINGS FOR OPERATION



B-5-2. WARNINGS FOR HIGH VOLTAGE



B-5-3. WARNINGS WHEN ADJUSTING TRACK TENSION



B-5-4. WARNINGS FOR BATTERIES MAINTENANCE

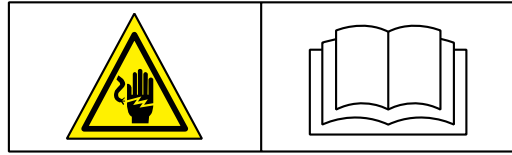
⚠ WARNING

- Battery fumes can explode. Keep sparks and flames away from batteries.
- Always avoid storing metals like tool for flammable materials around or on the batteries. Explosion or fire can be caused by short circuiting batteries.
- Sulfuric acid in battery is poisonous. It is strong enough burn skin, eat holes in clothing, and cause blindness if splashed eyes.

If you spill acid on yourself:

1. Flush your skin with water
2. Apply baking soda or lime to help neutralize the acid
3. Flush your eyes with water for 10~15 minutes.

Get medical attention immediately.



B-5-5. WARNINGS FOR HOT COOLANT

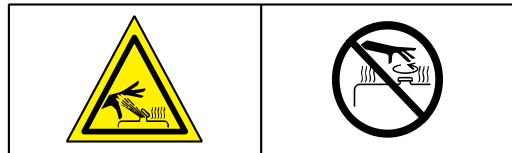
⚠ WARNING

HOT COOLANT CAN CAUSE INJURY OR BLINDNESS.

TO PREVENT HOT OIL FROM SQUIRTING OUT

- Turn engine off
- Allow oil to cool
- Slowly loosen cap to relieve pressure

D&B HANDBOOK
FOR ENGINEERS & TECHNICIANS



B-5-6. WARNING FOR ROTATION PARTS

⚠ WARNING

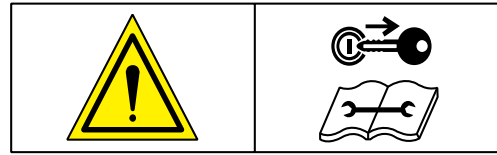
Rotating parts can cause personal injury

Keep away from fan and belt when engine is running

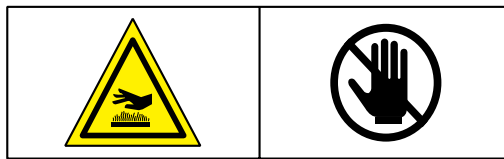
Stop engine before servicing

D&B HANDBOOK
FOR ENGINEERS & TECHNICIANS

B-5-7. STOP THE ENGINE AND READ THE MANUAL



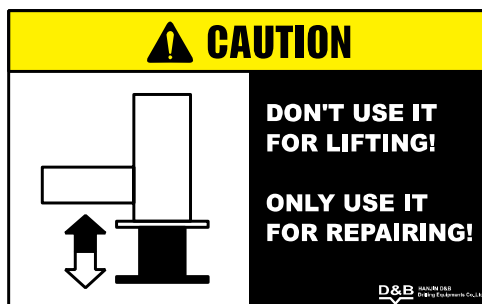
B-5-8. HOT SURFACE



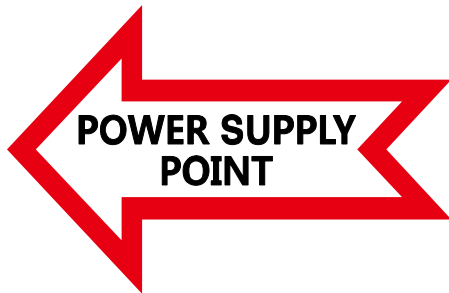
B-5-9. KEEP OFF MOVING AREA



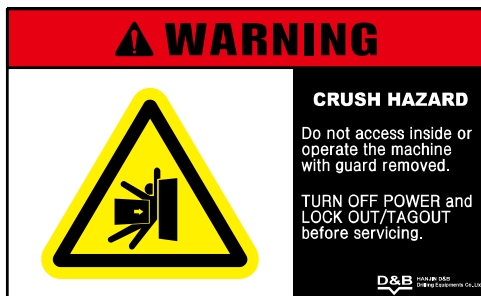
B-5-10. JACK CYLINDER USE



B-5-11. POWER SUPPLY POINT



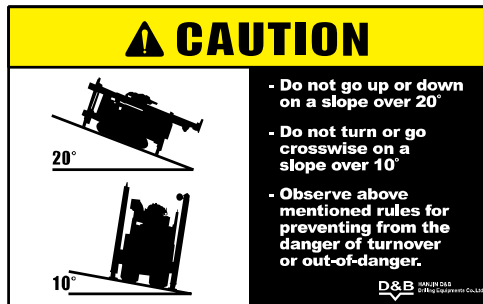
B-5-12. CRUSH HAZARD



B-5-13. WEAR PROTECTIVE EQUIPMENT



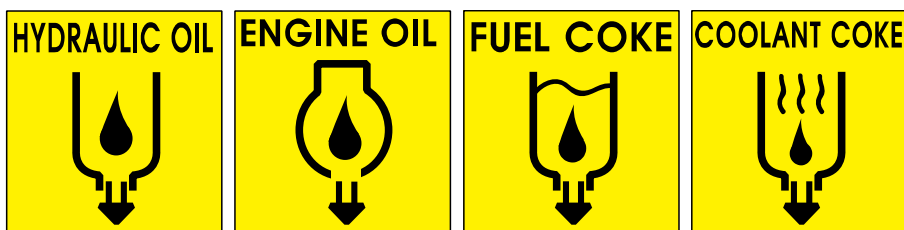
B-5-14. RISK OF SLOPE



B-5-15. CHECK THE BUTTERFLY VALVE



B-5-16. DRAIN COKE



B-5-17. EMERGENCY STOP BUTTON



B-5-18. APPROPRIATE LEVEL OF HYD. OIL



SECTION C

OPERATOR MANUALS



DO NOT OPERATE THE MACHINE BEFORE READING
AND UNDERSTANDING THE INSTRUCTIONS OF THIS MANUAL

HANJIN D&B CO., LTD.

C-1. PERMITTED USE

C-1-1. TYPES OF PERMITTED USE

The **D&B - 120W** is a hydraulic drilling rig designed for use in water well applications including foundations, soil consolidation and special works.

The jobs that the machine can perform are drilling operations using modern technologies, according to the geological characteristics of the soil.

Specifically :

- Rotation drilling with drilling Tri-cone bit and non-core bits with mud pump.
- Percussion drilling with rotary and down-the-hole(DTH) hammer with compressor.
- Percussion drilling with TOP-HAMMER (with hydraulic drifter)
- Percussion drilling with DTH-HAMMER (for drilling hole) and TOP-HAMMER
- This model has self-loading system

IMPORTANT

- These jobs may only be performed if the instructions and limitations set out in this manual are observed. It is strictly forbidden to attempt to perform jobs for which the machine has not been designed; to do so would constitute improper use and the consequences deriving therefrom.

C-1-2. IMPROPER USE

Any use of the machine following procedures prohibited or not expressly envisaged in this manual constitutes improper use.

Specifically:

- The **D&B - 120W** is not a transport vehicle for persons or materials.
- The **D&B - 120W** is not an elevator for lifting persons or materials and, even when it is fitted with a which, it must in no event be regarded as a lifting device.

DANGER

- Using and operating the machine or carrying out operations on it following procedures in conflict with those specified in this manual will be regarded as improper use and may cause damage or death.

IMPORTANT

- Improper use automatically annuls the guarantee and HANJIN D&B disclaims all liability for any damage that may ensue.

C-2. PRELIMINARY CHECKS

C-2-1. CHECKS BEFORE STARTING THE ENGINE

- Electric system - Check for damaged electric cables, loose or mission connectors.
- Fuel system - Drain water and sediment in fuel tank and water separator.
- Hyd. system - Check for hyd. oil leaks, any damaged tube and hoses, any interference points for each components.
- Visually inspect the various levels. (rotary, engine oil, hydraulic oil, lubricator, etc.)
- Lubrication - Perform all daily and periodic maintenance services.
(perform services according to running hour meter)
- Assembly and wear of the winch rope and correct assembly of the clamps on the rope
- Check that no parts is physically damaged.
- Safety - Perform a machine walk-around. Make sure that no one is under the machine or performing any maintenance on it, before starting engine.

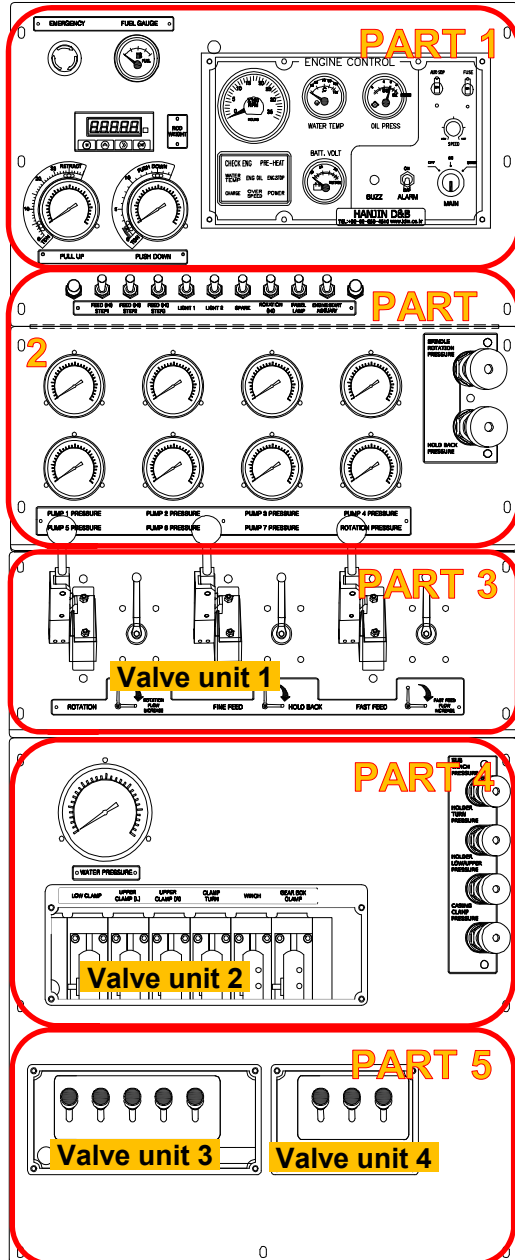
C-2-2. CHECKS AFTER STARTING THE ENGINE

Check the proper operation, under load-free conditions, of the remaining movements .

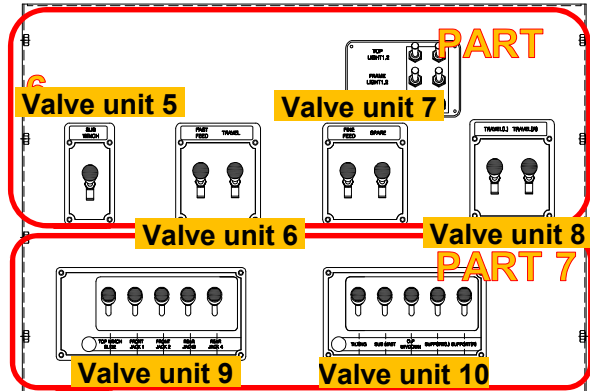
- Crawler track oscillation
- Boom tilting (if applicable)
- Boom side movements (if applicable)
- Mast slide / tilting
- Winch rope pay out / draw in
- Drill head side shift
- Drill head feed (fast)
- Drill head feed (fine)
- Drill head rotation
- Drill head rotation speed-change
- Bottom clamp (if applicable)
- Upper clamp and break-out wrench
- Rod handler rotation / tilting / clamp (if applicable)
- Operating efficiency of the emergency stop controls

On the successful completion of these operations the rig will be fully operational.
Remove the defect before work if you find the defect.

C-3. CONTROLS & INSTRUMENTS



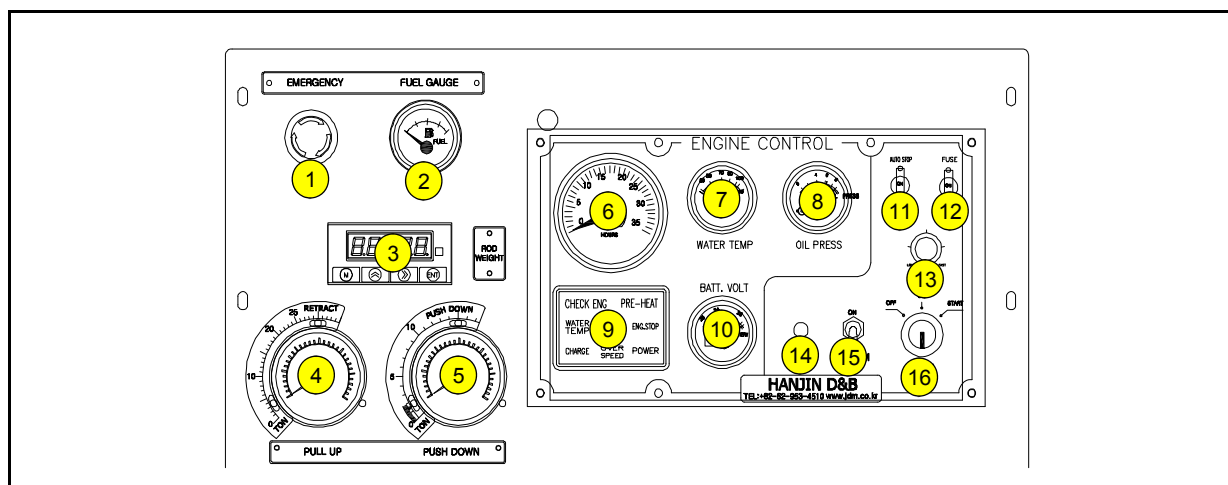
a. Main operating control panel



b. Side operating control panel

※ This image may be different from the real operating control panel.

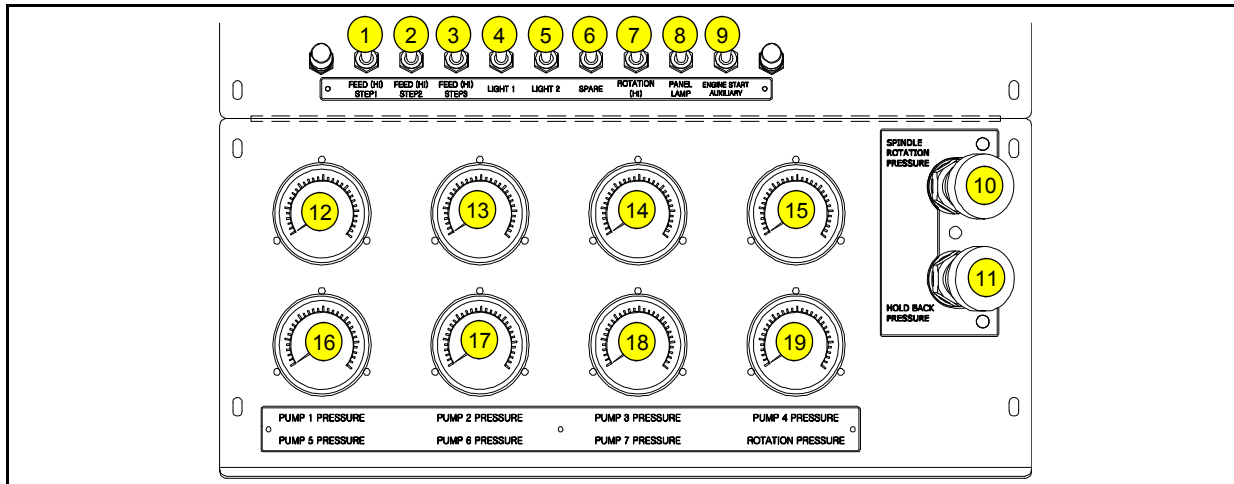
C-3-1. PART 1



No.	NAME	DESCRIPTION
1	Emergency stop switch	When the button is pressed, the machine will be emergency stop.
2	Fuel guage	This gauge displays fuel level in tank.
3	Rod weight gauge	This gauge displays rod weight.
4	Pressure gauge	Drill head pull-up pressure
5	Pressure gauge	Drill head pull-down pressure
6	Engine rpm guage	This gauge displays engine rpm. At full load, reading should be 2200-2400rpm. Full-load reading of less than 2100 rpm can cause overheating.
7	Coolant temp. guage	This gauge displays engine coolant temperature. Check to ensure that the coolant temperature is 75 °C to 95 °C or green zone.
8	Engine oil pressure guage	This gauge displays engine oil pressure. At full load, reading should be 3 to 5kgf/cm ² . At idle, reading should not drop below 1.5kgf/cm ² .
9	Indicate lamp	When engine, battery and coolant is abnormal, the lamp is turned on.
10	Voltage guage	This gauge measures voltage in electric system. Reading should be 3 to 5kgf/cm ² . At idle, reading should not drop below 1.5kgf/cm ² .
11	Engine auto stop	When the pressure of the engine oil is high abnormally, engine is stopped
12	Power switch	Engine control panel power switch
13	Engine RPM Volume	Engine rpm control
14	Buzz	The buzz notify the level of engine oil.
15	Alarm	Alarm on/off (Alarms related to the main key switch)
16	Main key switch	HEAT - Engine preheat. OFF - All electronic system is not work. ON - All electronic system is work (include Engine stop). Start - Starting engine.

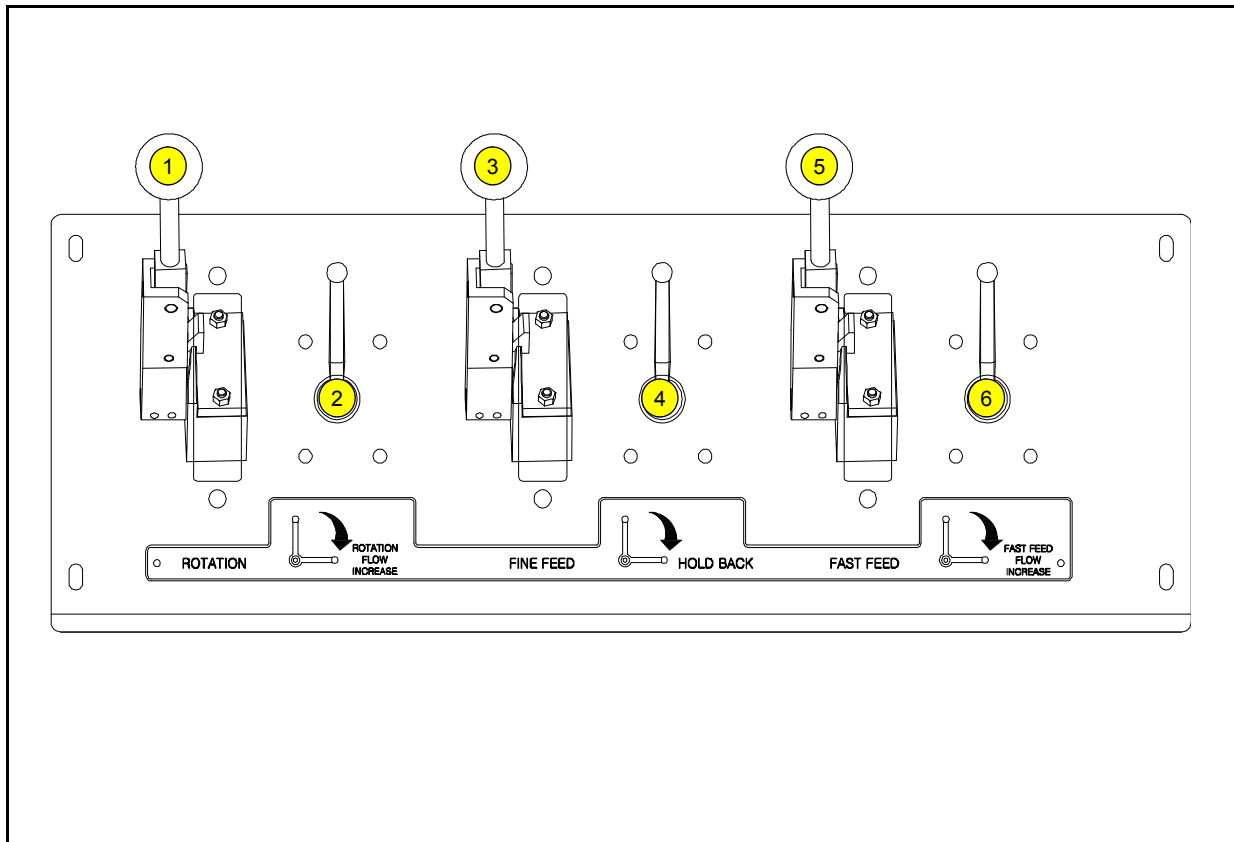
SECTION C OPERATOR MANUALS

C-3-2. PART 2



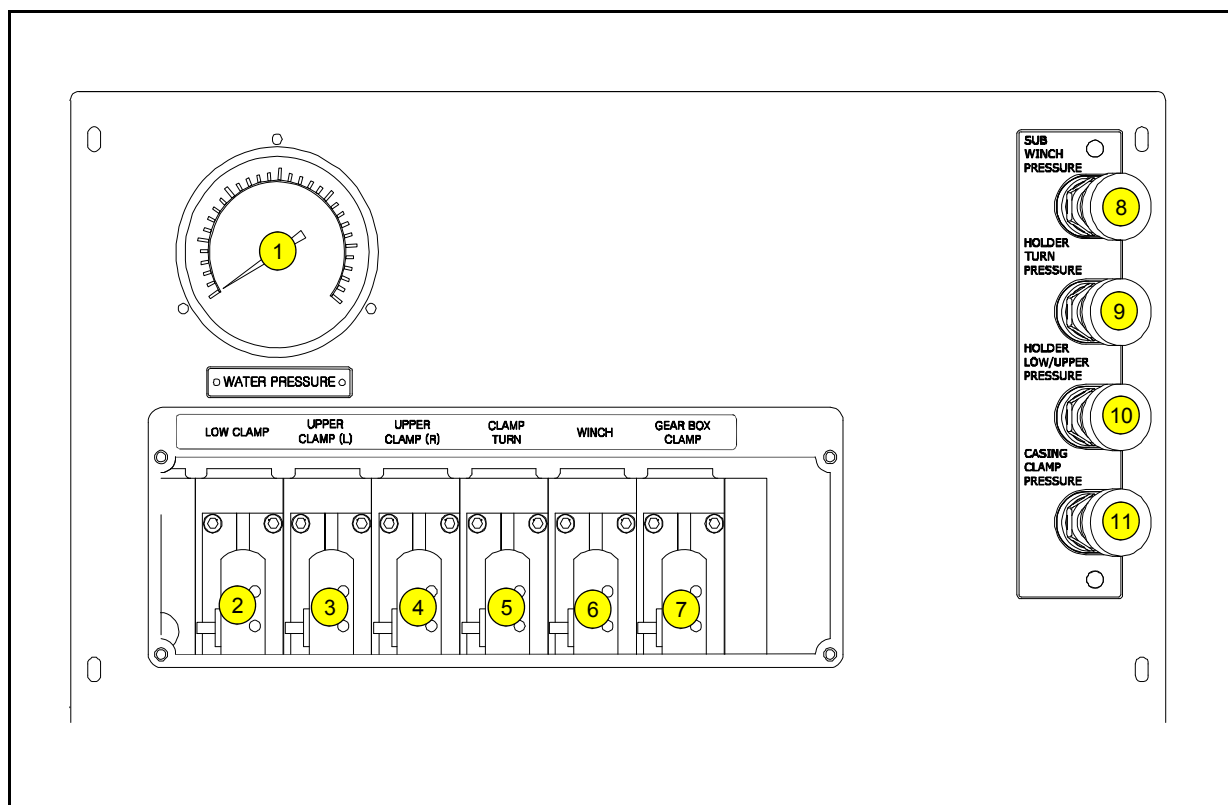
No.	NAME	DESCRIPTION
1	Toggle switch	Feed (HI) Step 1
2	Toggle switch	Feed (HI) Step 2
3	Toggle switch	Feed (HI) Step 3
4	Toggle switch	Light 1
5	Toggle switch	Light 2
6	Toggle switch	Spare
7	Toggle switch	Rotation (HI)
8	Toggle switch	Panel lamp
9	Toggle switch	Engine start auxiliary
10	Relief valve	Spindle rotation pressure
11	Relief valve	Hold back pressure
12	Pressure guage	This gauge displays the operating pressure of pump1
13	Pressure guage	This gauge displays the operating pressure of pump2
14	Pressure guage	This gauge displays the operating pressure of pump3
15	Pressure guage	This gauge displays the operating pressure of pump4
16	Pressure guage	This gauge displays the operating pressure of pump5
17	Pressure guage	This gauge displays the operating pressure of pump6
18	Pressure guage	This gauge displays the operating pressure of pump7
19	Pressure guage	This gauge displays the operating pressure of spindle rotation.

C-3-3. PART 3



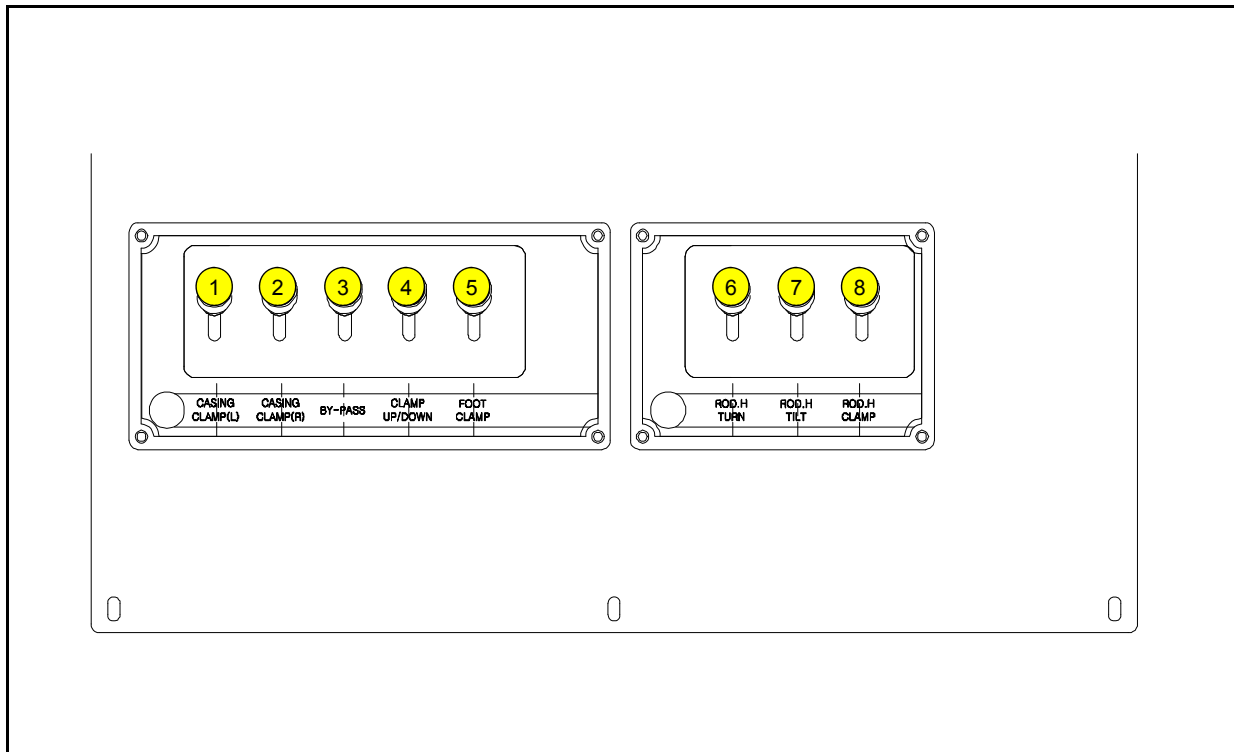
No.	NAME	DESCRIPTION
1	Lever 1 / Valve unit 1	Drill head rotation
2	Lever 2 / Valve unit 1	Rotation flow increase
3	Lever 3 / Valve unit 1	Fine feed
4	Lever 4 / Valve unit 1	Hold back
5	Lever 5 / Valve unit 1	Fast feed
6	Lever 6 / Valve unit 1	Fast feed flow increase

C-3-4. PART 4



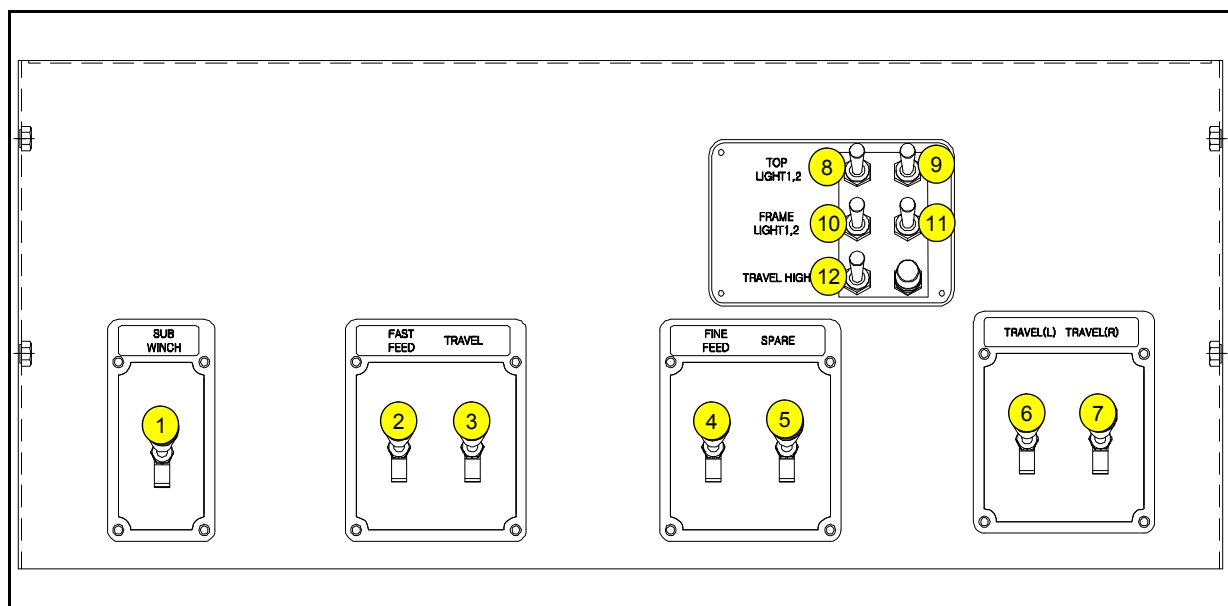
No.	NAME	DESCRIPTION
1	Pressure guage	Water pressure gauge
2	Lever 1 / Valve unit 2	Low clamp
3	Lever 2 / Valve unit 2	Upper clamp (L)
4	Lever 3 / Valve unit 2	Upper clamp (R)
5	Lever 4 / Valve unit 2	Clamp turn
6	Lever 5 / Valve unit 2	Winch
7	Lever 6 / Valve unit 2	Gearbox clamp
8	Relief valve	Sub winch pressure
9	Relief valve	Holder turn pressure
10	Relief valve	Holder low/upper clamp pressure
11	Relief valve	Casing clamp pressure

C-3-5. PART 5



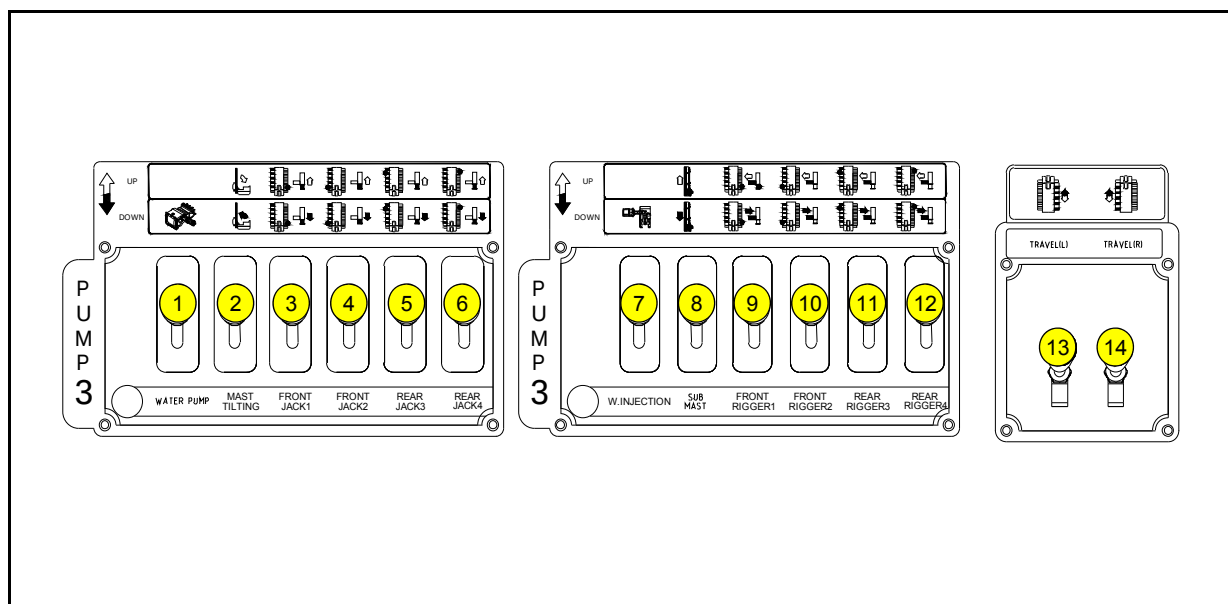
No.	NAME	DESCRIPTION
1	Lever 1 / Valve unit 3	Casing clamp (L)
2	Lever 2 / Valve unit 3	Casing clamp (R)
3	Lever 3 / Valve unit 3	By - pass
4	Lever 4 / Valve unit 3	Clamp up/down
5	Lever 5 / Valve unit 3	Foot clamp
6	Lever 1 / Valve unit 4	Rod handler turn
7	Lever 2 / Valve unit 4	Rod handler tilt
8	Lever 3 / Valve unit 4	Rod handler clamp

C-3-6. PART 6



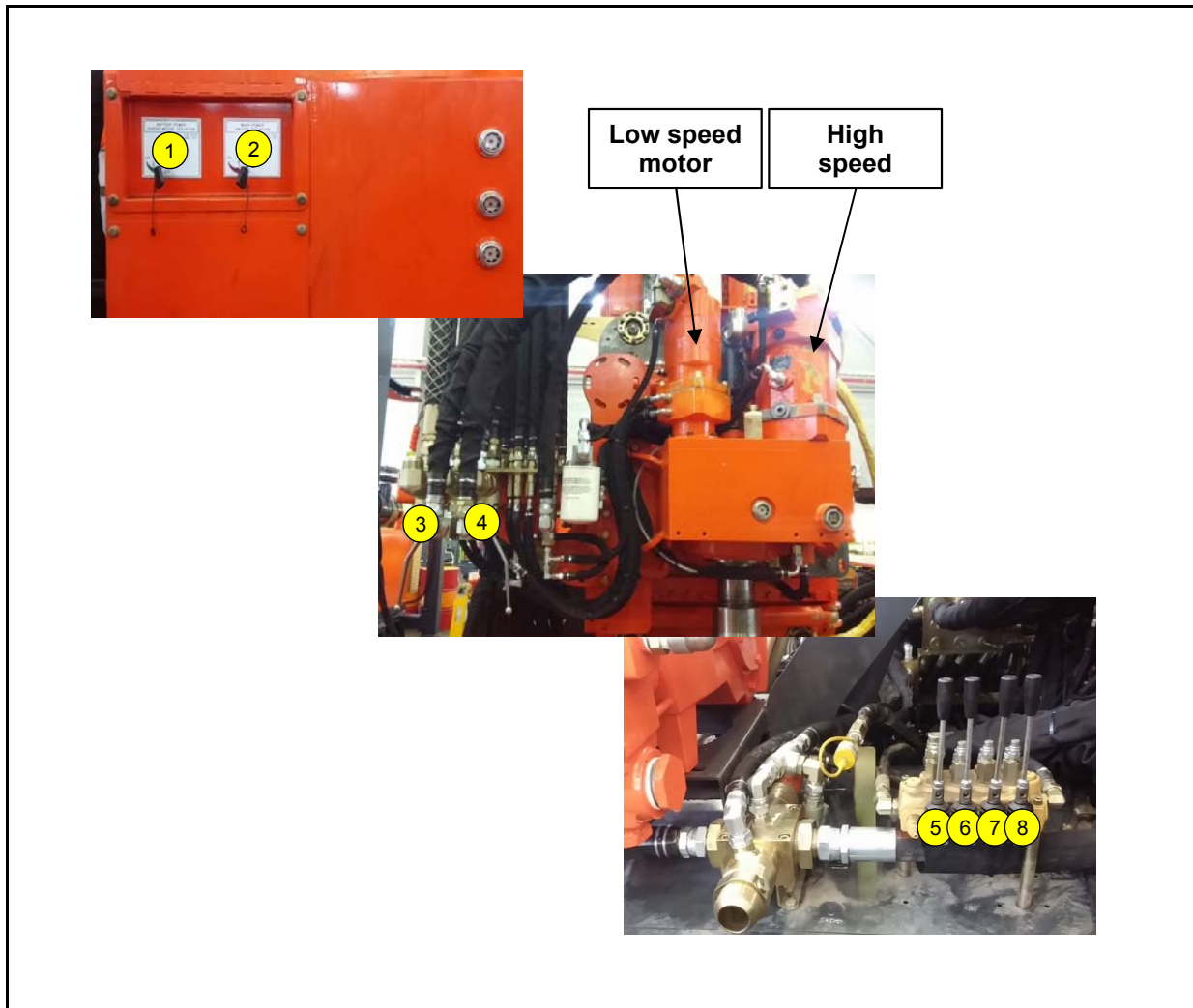
No.	NAME	DESCRIPTION
1	Lever 1 / Valve unit 5	Fast feed
2	Lever 2 / Valve unit 5	Rotation
3	Lever 3 / Valve unit 5	Winch
4	Lever 4 / Valve unit 5	Wire line winch
5	Lever 1 / Valve unit 6	Winch
6	Lever 2 / Valve unit 6	Fast feed
7	Lever 3 / Valve unit 6	Rotation
8	Lever 4 / Valve unit 6	Water pump
9	Toggle switch	High speed travel on/off
10	Toggle switch	Light 1
11	Toggle switch	Light 2
12	Toggle switch	Light 3

C-3-7. PART 7



No.	NAME	DESCRIPTION
1	Lever 1 / Valve unit 7	Water pump
2	Lever 2 / Valve unit 7	Mast tilt
3	Lever 3 / Valve unit 7	Front jack 1
4	Lever 4 / Valve unit 7	Front jack 2
5	Lever 5 / Valve unit 7	Rear jack 1
6	Lever 6 / Valve unit 7	Rear jack 2
7	Lever 1 / Valve unit 8	Water injection
8	Lever 2 / Valve unit 8	Submast slide
9	Lever 3 / Valve unit 8	Front rigger 1
10	Lever 4 / Valve unit 8	Front rigger 2
11	Lever 5 / Valve unit 8	Rear rigger 3
12	Lever 6 / Valve unit 8	Rear rigger 4
13	Lever 1 / Valve unit 9	Travel(L)
14	Lever 2 / Valve unit 9	Travel(R)

C-3-6. OTHER



No.	NAME	DESCRIPTION
1	Main power switch	Main power on/off
2	Ball valve	The valve related to the operation control of low speed motor.
3	Ball valve	The valve related to the operation control of low speed motor.
4	Ball valve	The valve related to the operation control of low speed motor.
5	Lever 1 / Valve unit 11	Spare
6	Lever 2 / Valve unit 11	Spare
7	Lever 3 / Valve unit 11	Spare
8	Lever 4 / Valve unit 11	Spare

C-4. STARTING AND STOPPING THE ENGINE

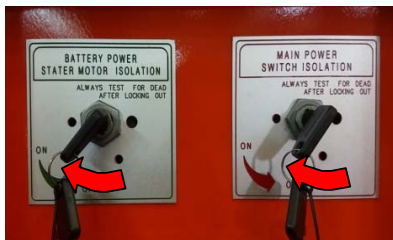
C-4-1. ENGINE STARTING

WARNING

- Prior to starting engine, make sure that nobody & nothing is in near operating area.

The correct engine start-up procedure is as follows

1. Main electric power switch - ON



2. Leave control volume for engine R.P.M. at low speed position.



3. Engine control box power switch - ON



4. Insert the key into the starter switch.

5. Engine preheat



Turn key to "HEAT" position. Keep for a few seconds in that state.

⊕ IMPORTANT

- The engine may be started without preheat in normal temperature (above 15°C), but with preheat for 15 or 10 seconds in cold temperature (-23°C).

6. Turn the key to the "START" position to engage the starter motor.
Release the key immediately as the engine starts.



7. Run engine under idle position for approximately 5 min.
8. Follow procedures in "Hydraulic system warm-up (C-5-2)"

⊕ IMPORTANT

- The engine speed control system had been set at the factory and should not require adjustment as part of routine maintenance. If the engine rpm is being manually adjusted, the equipment can not function in its optimum capacity.
- Please contact a HANJIN D&B distributor or service center for repairs.

C-4-2. CHECKING POINT AFTER START

After "Hydraulic system Warm-up" procedures, check all operating indicators to make sure that all engine systems (oil pressure, coolant, etc.) are in the normal operating range.
If any problems are noticed, stop the engine.

Normal checking points are :

TEMP. OF ENGINE COOLANT	GREEN ZONE
QUANT. OF FUEL	SEE AND RE-FILL
CHARGING VOLTAGE	GREEN ZONE
VIBRATION / NOISE	USUAL
COLOR OF EXHAUST SMOKE	
NO COLOR	IN GOOD CONDITION
LIGHT BLUE	IN GOOD CONDITION
BLACK	INCOMPLETE COMBUSTION
WHITE	ENGINE OIL IS BURNED
DARK BLUE	ENGINE OIL IS BURNED

C-4-3. ENGINE STOPPING

⚠ WARNING

- Run engine under idle position for 3~5 min. prior to stop the engine. If not allowed to idle, heat surge may develop which will damage the engine. Allow the engine to idle .

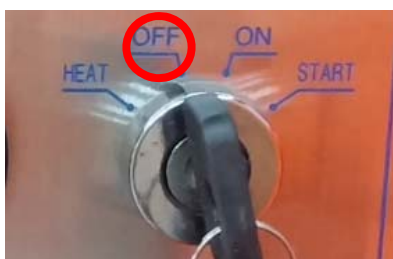
1. Set engine speed control volume to low speed.



2. Push the engine stop switch until the engine is stopped.
Release the switch when the engine is stopped.



3. Turning key to OFF position.



4. Remove key from starter switch

C-4-4. CHECKING POINT AFTER STOP

After operating procedures , check all as possible as you can. If any problems are noticed, repair that.

LEAK. OF ENGINE COOLANT	CHECK
QUANT. OF FUEL	SEE AND RE-FILL
LEAK. OF ENGINE OIL	CHECK
FRONT ATTACHMENT	ANY ABNORMAL APPEARANCES?
UNDERCARRIAGE	SEE AND RE-FILL
ENGINE COMPARTMENT	CLEAN / ANY FLAMMABLE MATERIAL?
OPERATOR'S COMPARTMENT	CLEAN / ANY MUD, OIL?

C-5. HYDRAULIC SYSTEM WARM-UP

C-5-1. HYDRAULIC SYSTEM WARM-UP (NORMAL WEATHER)

⚠ WARNING

- When any problem or abnormal operation occurs, do stop the engine immediately. Do operate drill rig after reaching normal operating temp. prior to start work. Especially in cold weather.

The correct operating temperature of the hydraulic oil is **50°C~80°C** (120°F~175°F).

The procedures for hydraulic fluid warm-up is as follows.

1. Run engine for approximately 5 minutes at the middle of engine rpm volume without loading.



2. Slowly do g.box up/down, mast slide and tilt about five times without a load to circulate the oil through the system. Do this for 5 minutes.



1. Mast tilt 2. Submast slide 3. Fine feed 4. Fast feed

3. Travel forward and reverse at low speed.



1. Travel (L)
2. Travel (R)

C-5-2. HYDRAULIC SYSTEM WARM-UP (COLD WEATHER)

1. Run engine for approximately 5 minutes at the middle of engine rpm volume without loading.



2. Slowly do g.box up/down, mast slide and tilt about five times without a load to circulate the oil through the system. Do this for 5 minutes.



1. Mast tilt 2. Submast slide 3. Fine feed 4. Fast feed

3. Set engine rpm lever to high speed .
4. Repeat step the above operations. If working speeds continue to be slow, do continue to operate several times. But carefully test them because the machine function may be erratic.
5. Travel forward and reverse at low speed.



1. Travel (L)
2. Travel (R)

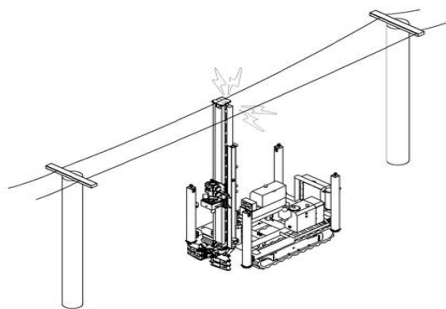
C-6. OPERATING INSTRUCTIONS

IMPORTANT

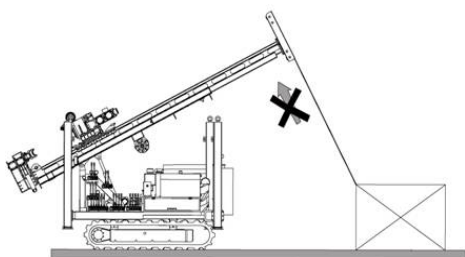
- The identification position of control device is referred in the section C-2

C-6-1. OPERATING PRECAUTIONS

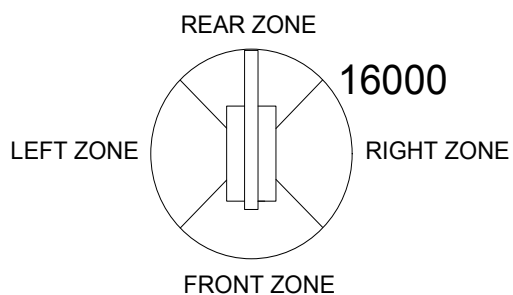
- Do not work under power electric supply line.



- When work to drill near edge, the machine must be set on the hard ground and keep the travel motor to rear.
- When rig move & rotate, must remove any obstacle. If not so, Serious problem can happen.
- Do not operate drill rig in water of over 200mm depth.
- Do not lift heavy weight from rear direction.



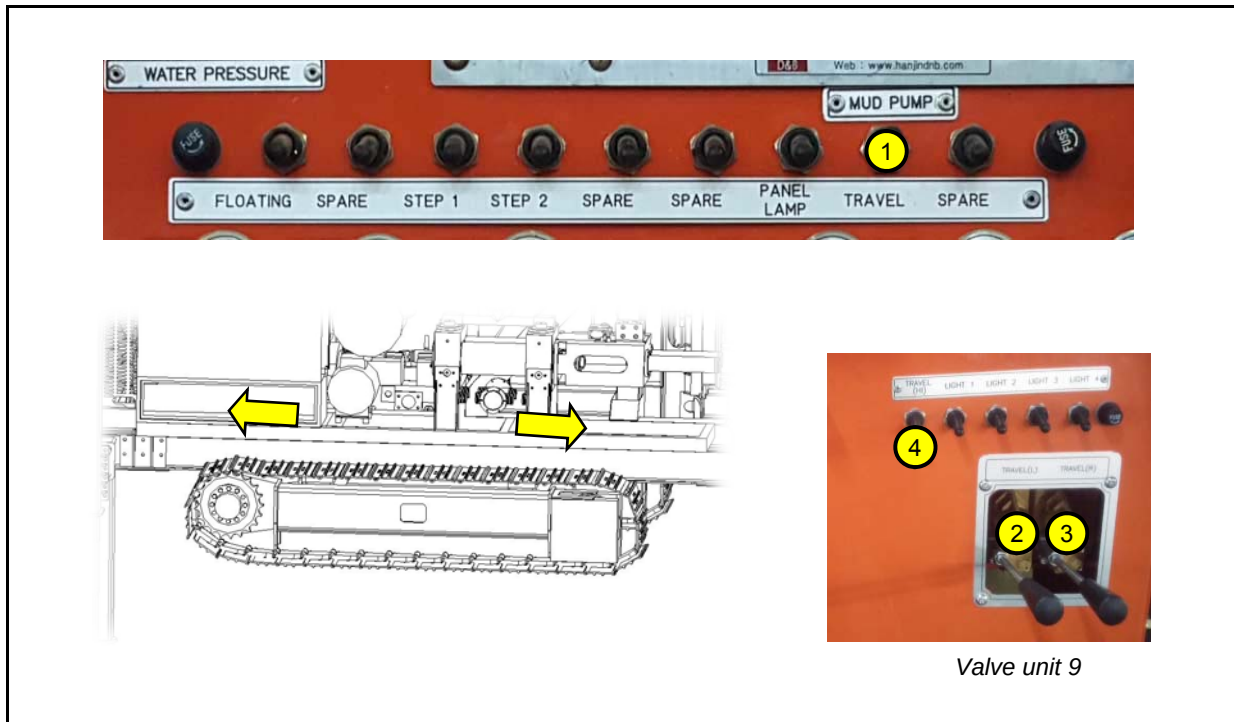
- Machine rotating information.



C-6-2. TRAVEL CONTROL

⚠ WARNING

- Prior to operate the travel levers, do fully aware of direction for machine's travel.
- Prior to move, do fully check any obstacle and personnel and then remove them on the direction of travel.
- Extreme caution when reversing travel. Be sure there is a clear anythings behind the machine.
- Do operate the travel control levers smoothly and do avoid sudden start or stop.

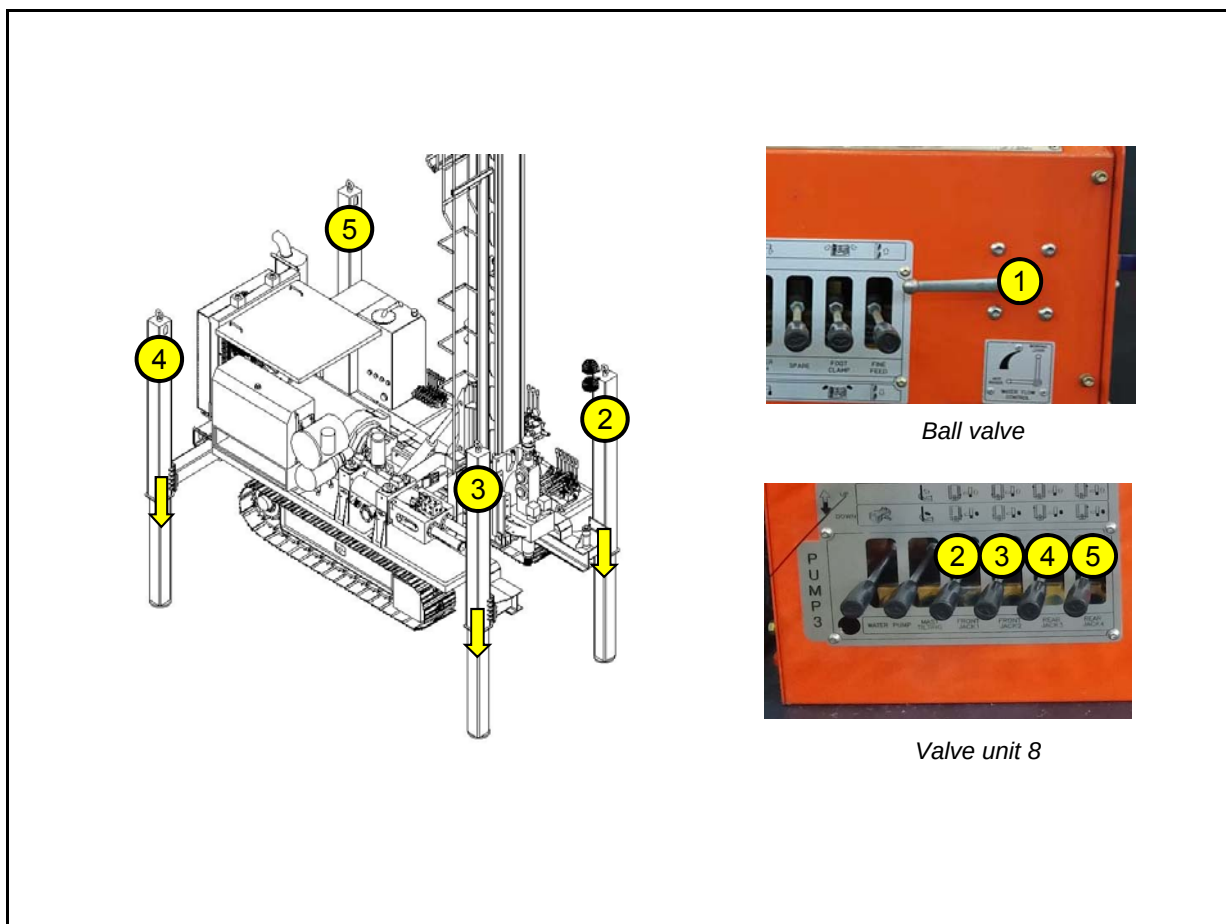


DESCRIPTION	CONDITION	LEVER CONTROL	
Left track	Forward	① Down	② Up
	Backward		② Down
Right track	Forward		③ Up
	Backward		③ Down
Speed up	ON	④ Up	
	OFF	④ Down	

⚠ WARNING

- Do not travel backward on a slope.
- Never turn or travel crosswise on a slope.
- Do find safe route before climbing a slope.
- Do not travel on slope over 30 degree due to turnover danger.

C-6-3. HYDRAULIC JACK CONTROLS

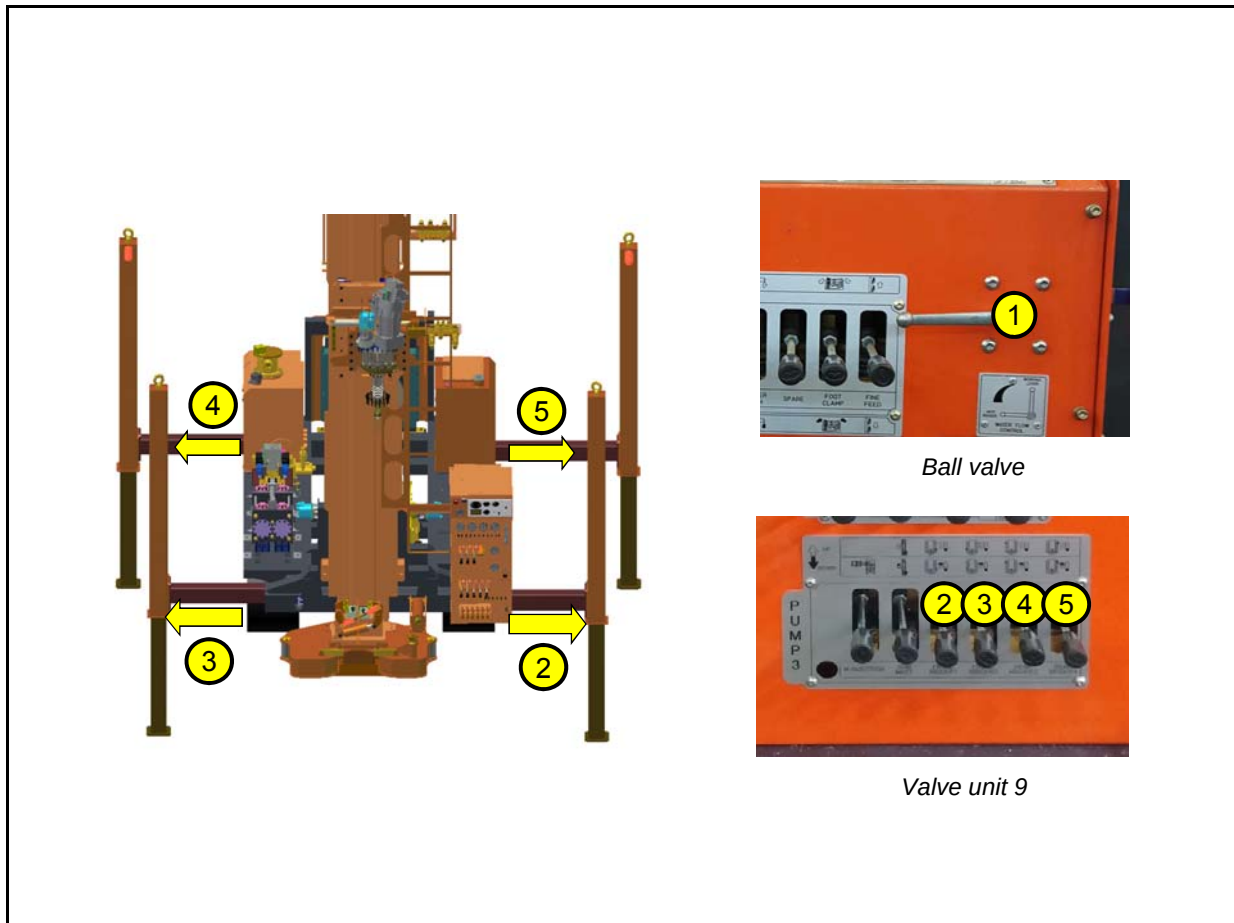


DESCRIPTION	CONDITION	LEVER CONTROL	
Front-Left Jack	Extend	① Vertical direction	② Down
	Retract		② Up
Front-Right Jack	Extend		③ Down
	Retract		③ Up
Rear-Right Jack	Extend		④ Down
	Retract		④ Up
Rear-Left Jack	Extend		⑤ Down
	Retract		⑤ Up

WARNING

- Keep feet clear of the jack pads whenever operating the hydraulic jacks!
- Do not operate the jack control levers smoothly and avoid sudden start or stop.

C-6-4. HYDRAULIC RIGGER CONTROLS

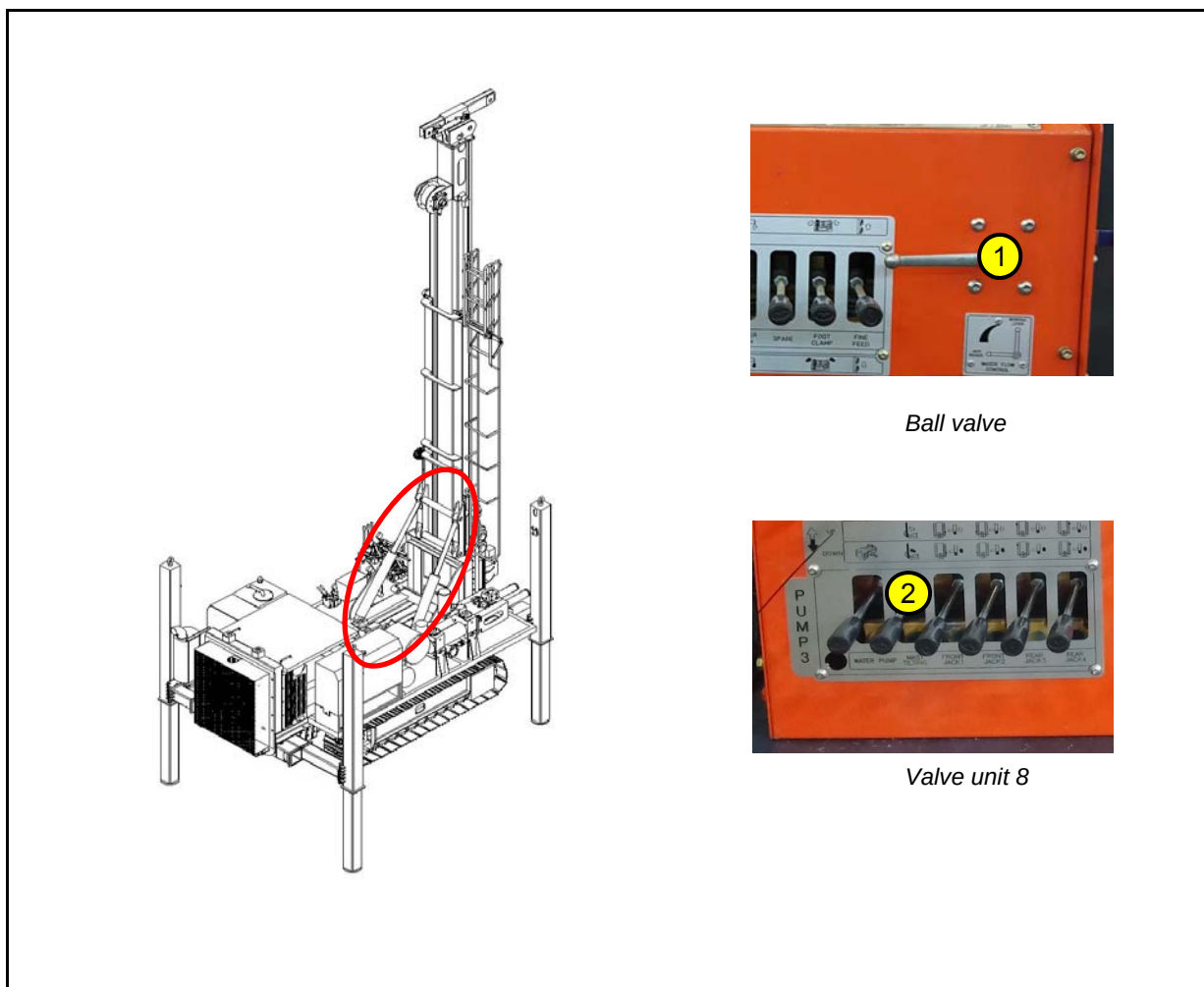


DESCRIPTION	CONDITION	LEVER CONTROL	
Front-Left Jack	Extend	① Vertical direction	② Down
	Retract		② Up
Front-Right Jack	Extend		③ Down
	Retract		③ Up
Rear-Right Jack	Extend		④ Down
	Retract		④ Up
Rear-Left Jack	Extend		⑤ Down
	Retract		⑤ Up

⚠ WARNING

- Keep feet clear of the jack pads whenever operating the hydraulic jacks!
- Do not operate the jack control levers smoothly and avoid sudden start or stop.

C-6-5. MAST TILTING CONTROL

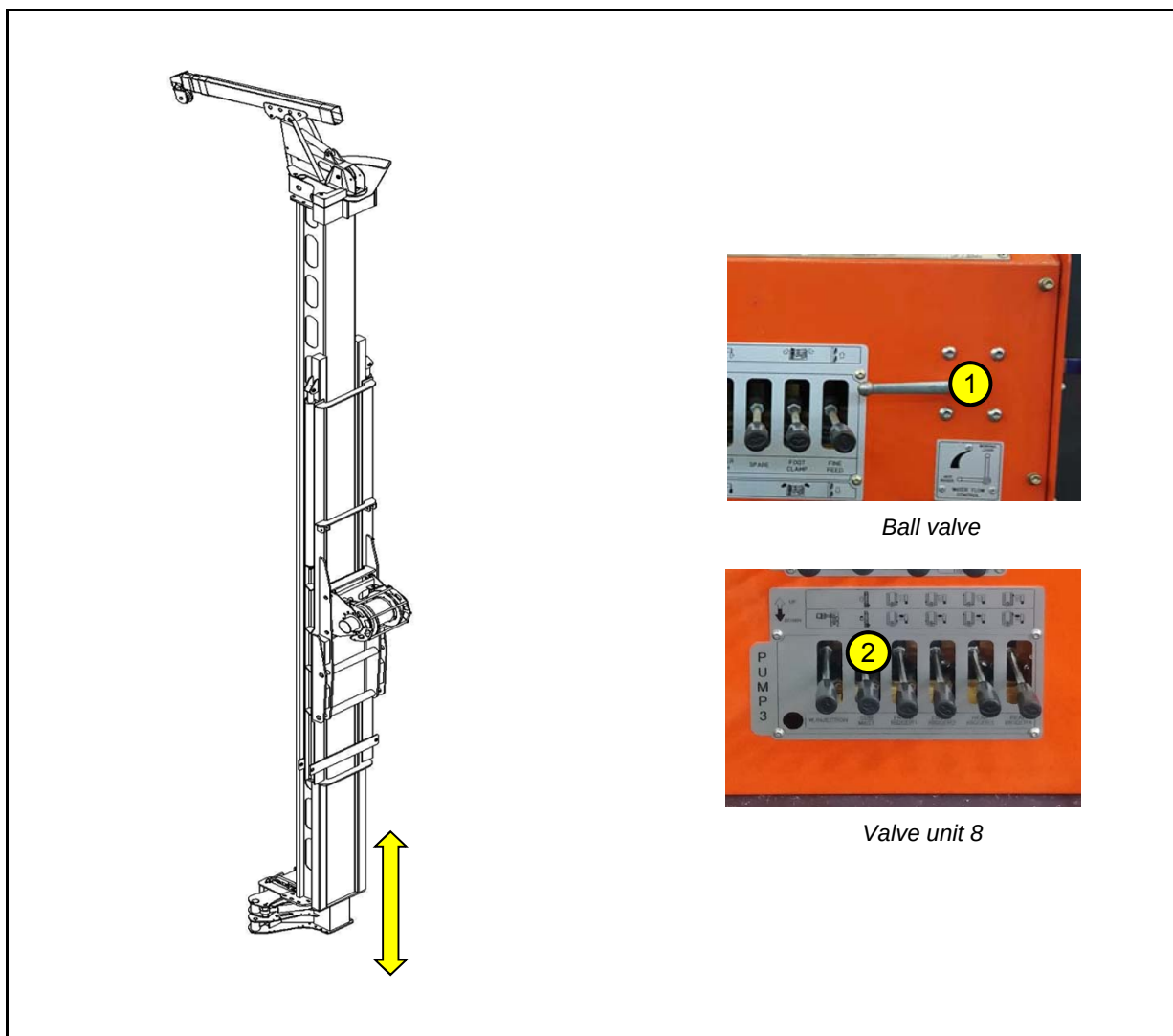


DESCRIPTION	CONDITION	LEVER CONTROL	
Mast tilting	Raising	① Vertical direction	② Down
	Lowering		② Up

⚠ WARNING

- Always support and level the machine using the hydraulic leveling jacks before raising the mast.
- Always lower the mast before moving or transporting the machine.

C-6-6. SUB MAST SLIDE CONTROL

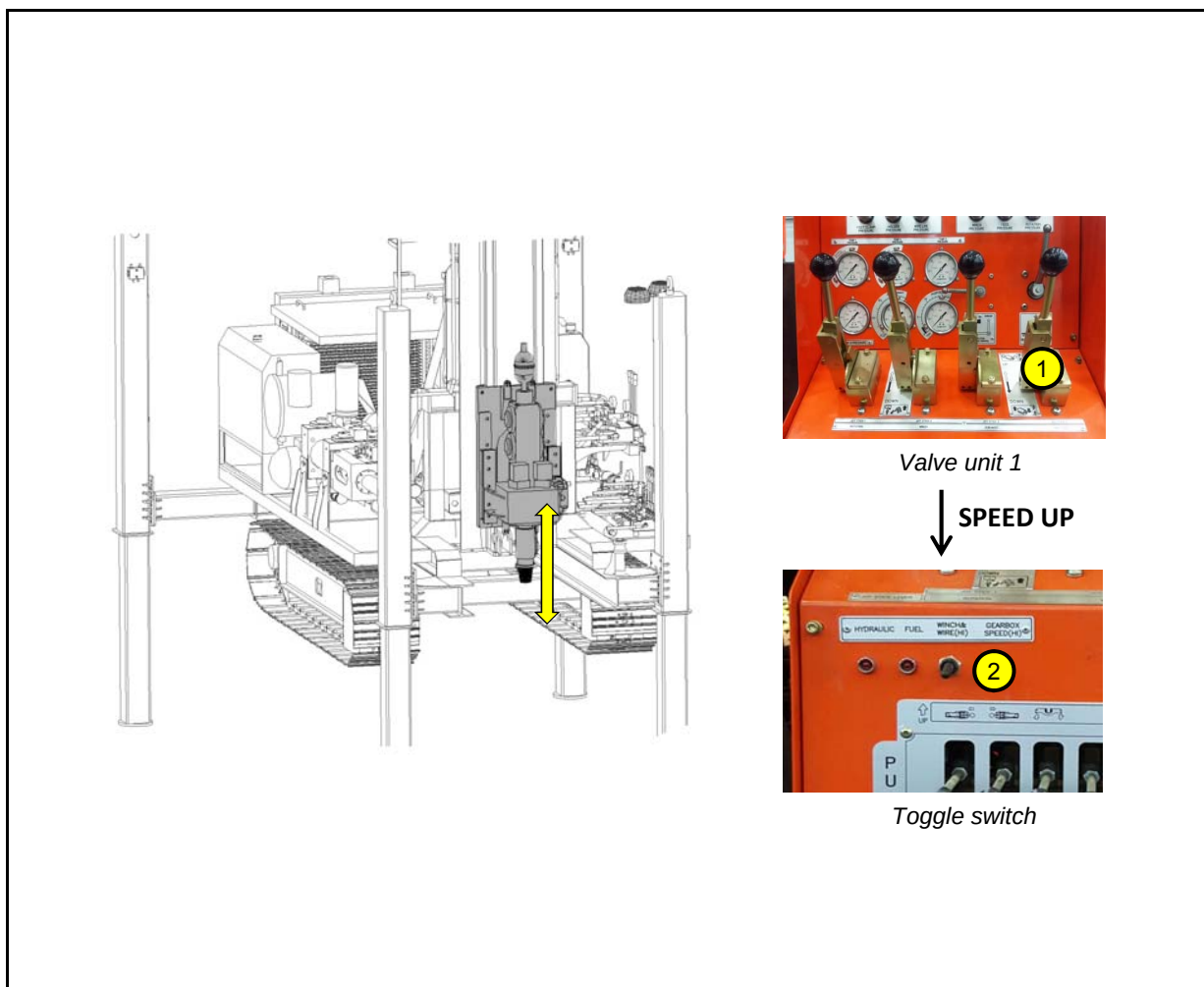


DESCRIPTION	CONDITION	LEVER CONTROL	
Submast slide	Mast up	① Vertical direction	② Up
	Mast down		② Down

⚠ WARNING

- Before raising the submast, sufficiently pay out the wire line of the main winch. Otherwise, it may damage the mast head, wire line and main winch.

C-6-7. DRILL HEAD FEED CONTROL (FAST FEED)

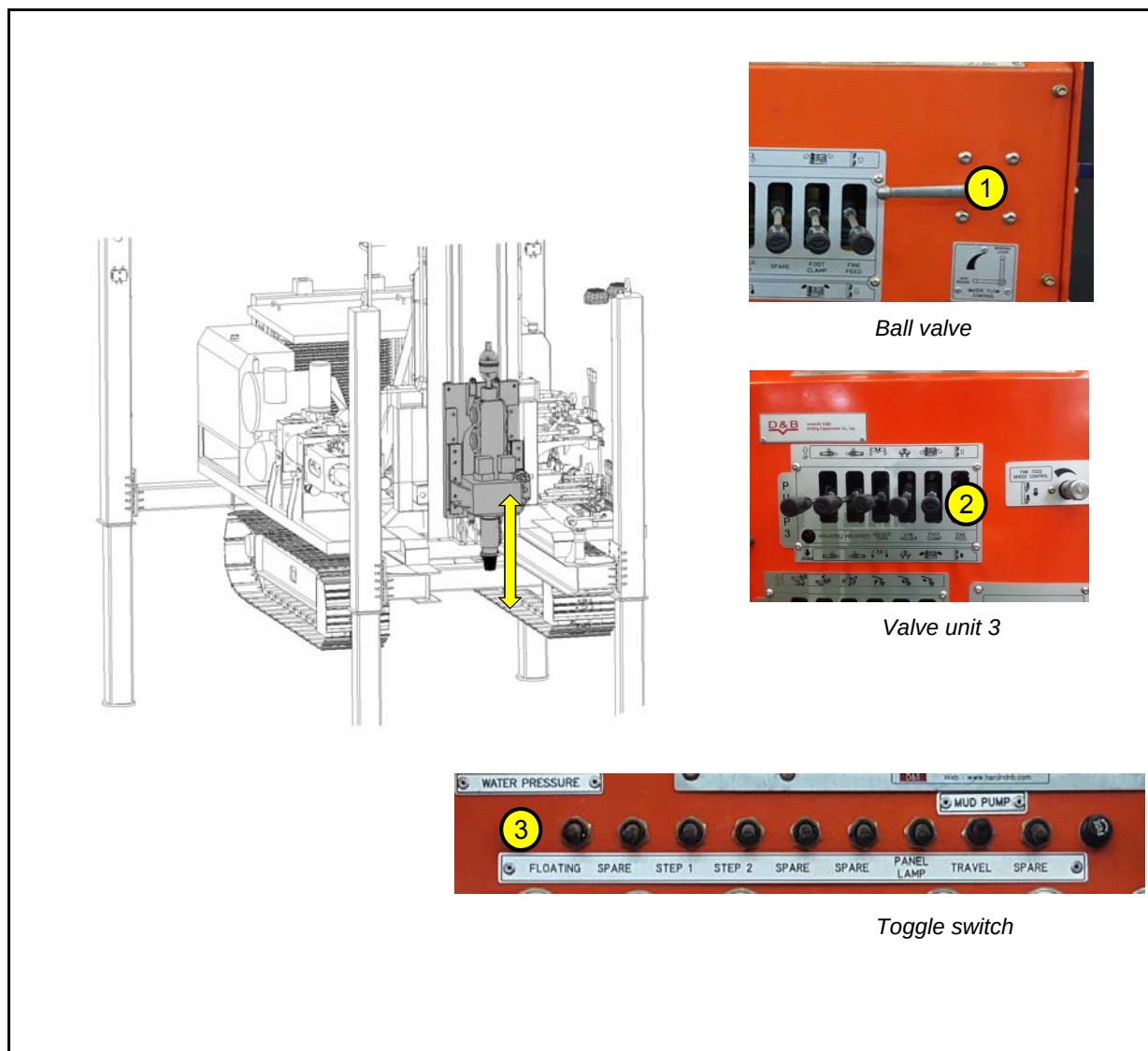


DESCRIPTION	CONDITION	LEVER CONTROL
Fast feed	Drill head down	① Up
	Drill head up	① Down
Speed up	ON	② Up
	OFF	② Down

⊕ IMPORTANT

- This lever is using when load and unload the drill rod.

C-6-8. DRILL HEAD FEED CONTROL (FINE FEED) & HOLD BACK



DESCRIPTION	CONDITION	LEVER CONTROL	
Fine feed	Drill head down	① Horizontal direction	② Up
	Drill head up		② Down
Hold back	ON	③ Up	
	OFF	③ Down	

⊕ IMPORTANT

- This lever is using during the drilling operation.

C-6-10. FINE FEED SPEED CONTROL



Fine feed throttle valve

DESCRIPTION	CONDITION	LEVER CONTROL
Fine feed speed	Increase	① C.clockwise
	Decrease	① Clockwise

C-6-11. DRILL HEAD ROTATION CONTROL (0-120rpm)

CAUTION

- Do not control in a rotation status.

1. VALVE SETTING

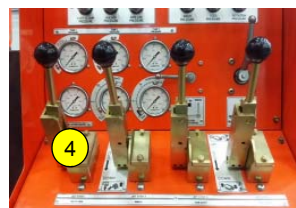
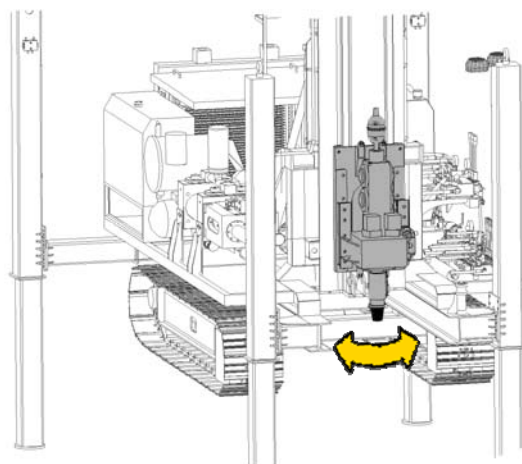


VALVE CONTROL FOR SETTING

Using a low speed motor .

①,② Horizontality → ③ Horizontality

2. ROTATION CONTROL



Valve unit 1

↓ SPEED UP



Ball valve

DESCRIPTION	CONDITION	LEVER CONTROL
Drill head rotation (Valve unit 1)	Clockwise rotation	④ Down
	C.clockwise rotation	④ Up
Speed up	ON	⑤ Verticality
	OFF	⑤ Horizontality

C-6-12. DRILL HEAD ROTATION CONTROL(0-470rpm)

CAUTION

- Always the ③ valve should be Vertical when ① and ② valve is Vertical. Otherwise, the low-speed motor may be damaged.
- Do not control in a rotation status.

1. VALVE SETTING

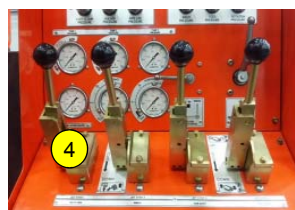
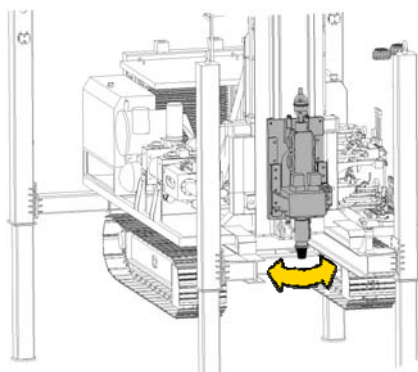


VALVE SETTING

Using a High speed motor.

③ Verticality → ①, ② Verticality

2. ROTATION CONTROL



Valve unit 1

DESCRIPTION	CONDITION	LEVER CONTROL
Drill head rotation (Valve unit 1)	Clockwise rotation	④ Down
	C.clockwise rotation	④ Up

C-6-13. DRILL HEAD ROTATION CONTROL(0-700rpm)

⚠ CAUTION

- Always the ③ valve should be vertical when ① and ② valve is vertical. Otherwise, the low-speed motor may be damaged.
- Do not control in a rotation status.

1. VALVE SETTING

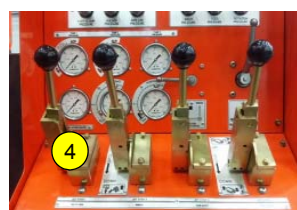
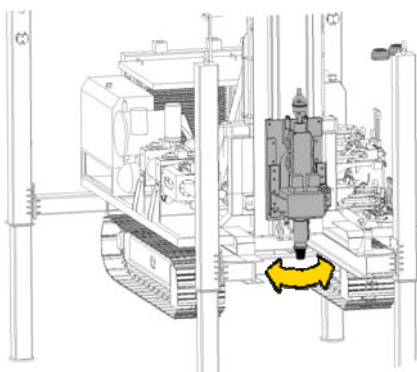


VALVE SETTING

Using a High speed motor.

③ Verticality → ①, ② Verticality

2. ROTATION CONTROL



Valve unit 1

↓ SPEED UP



Ball valve

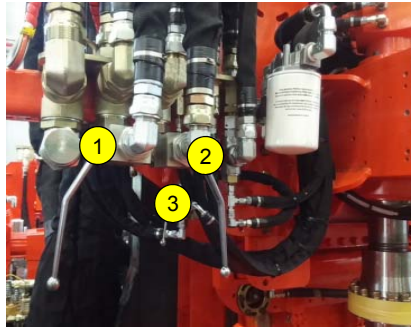
DESCRIPTION	CONDITION	LEVER CONTROL
Drill head rotation (Valve unit 1)	Clockwise rotation	④ Down
	C.clockwise rotation	④ Up
Speed up	ON	⑤ Verticality
	OFF	⑤ Horizontality

C-6-14. DRILL HEAD ROTATION CONTROL(0-1100rpm)

⚠ CAUTION

- Always the ③ valve should be vertical when ① and ② valve is vertical. Otherwise, the low-speed motor may be damaged.
- Do not control in a rotation status.

1. VALVE SETTING

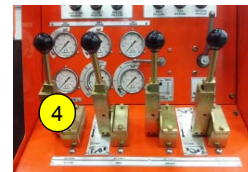
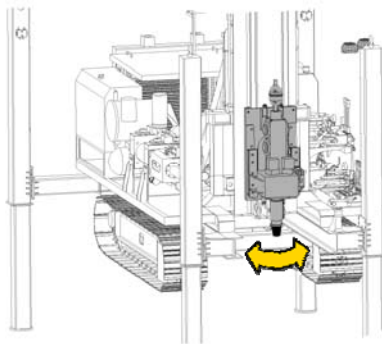


VALVE CONTROL FOR SETTING

Using a High speed motor.

③ Verticality → ①, ② Verticality

2. ROTATION CONTROL



Valve unit 1

↓ SPEED UP 1



Ball valve



Toggle Switch

← SPEED UP 2

DESCRIPTION	CONDITION	LEVER CONTROL
Drill head rotation (Pump2 valve unit)	Clockwise rotation	⑤ Down
	C.clockwise rotation	⑤ Up
Speed up 1	ON	⑤ Verticality
	OFF	⑤ Horizontality
Speed up 2	ON	⑥, ⑦ Up
	OFF	⑥, ⑦ Down

C-6-15. ROTATION PRESSURE CONTROL

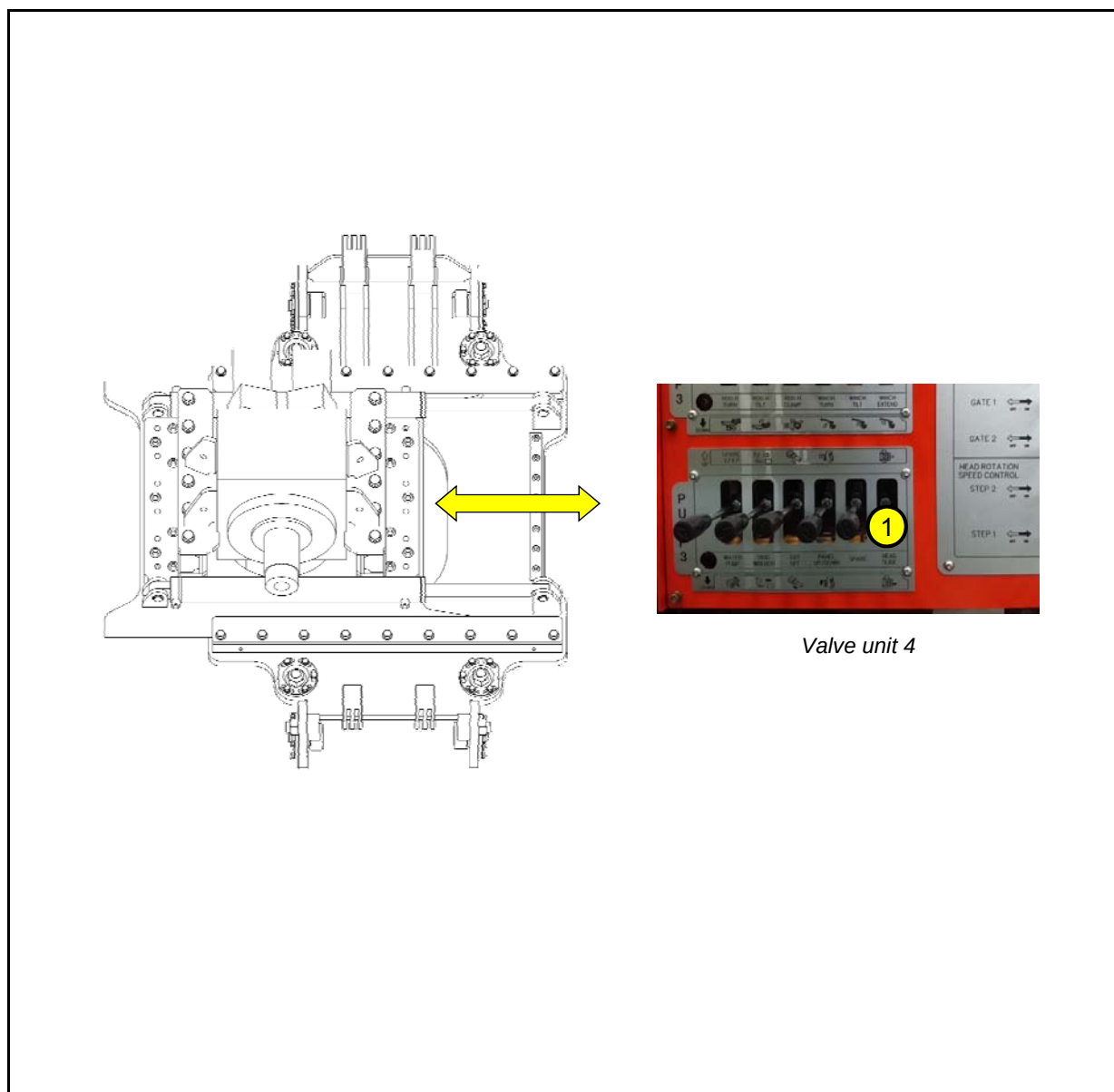
SECTION C OPERATOR MANUALS



Relief valve

DESCRIPTION	CONDITION	LEVER CONTROL
Rotation pressure	Increase	① Clockwise
	Decrease	① C.clockwise

C-6-16. SLIDING DRILL HEAD CONTROL



DESCRIPTION	CONDITION	LEVER CONTROL
Drill head slide	Retract	① Up
	Extend	① Down

⚠ CAUTION

- Care should be taken to ensure that the drill head is properly centered with respect to the mast during drilling operations.
- Never attempt to drill with the drill head in the far-right or far-left position.

C-6-17. MAIN WINCH CONTROL

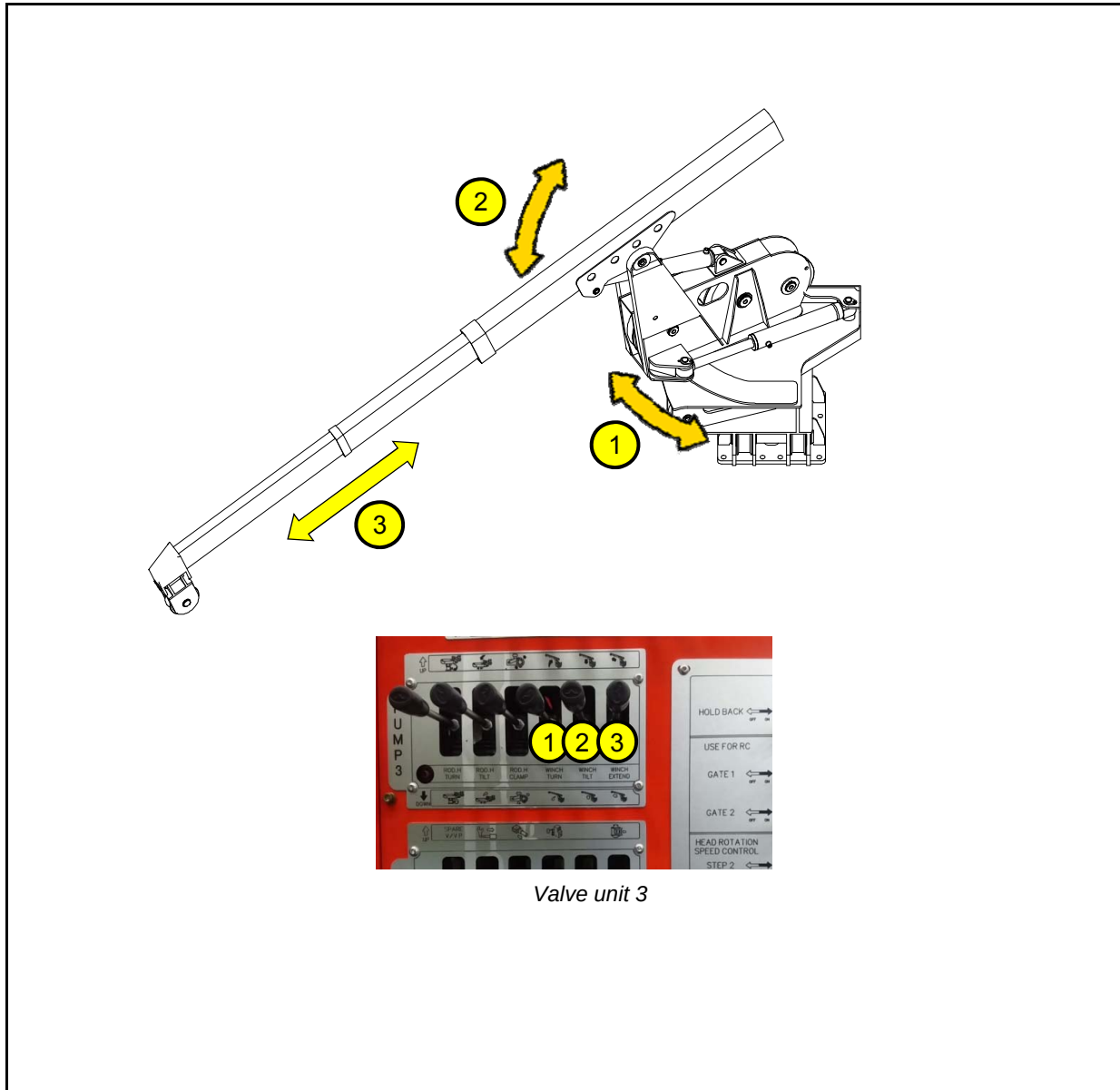


DESCRIPTION	CONDITION	LEVER CONTROL
Main winch	Pay out	① Down
	Draw in	① Up
Speed up	ON	② Up
	OFF	② Down

⚠ WARNING

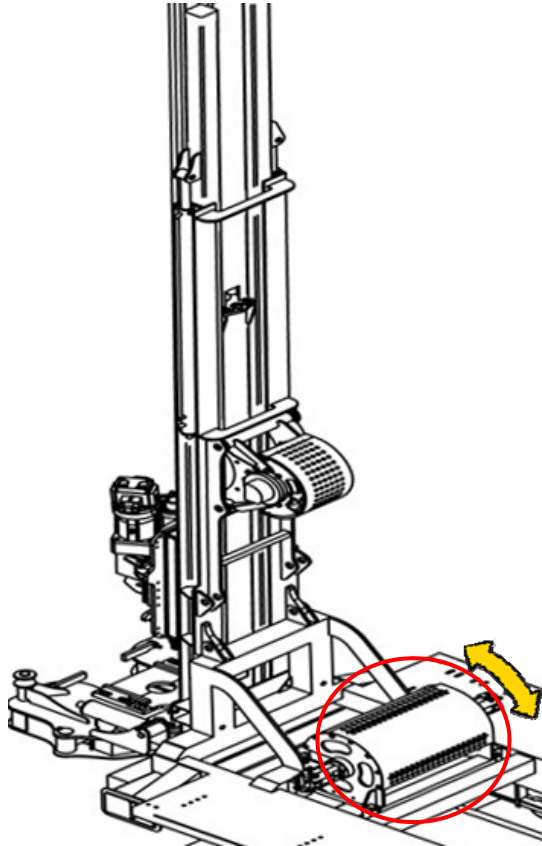
- As the capacity is max. 17tons, do not load total weight of over 17tons on the winch.

C-6-18. TOP CRANE CONTROL



DESCRIPTION	CONDITION	LEVER CONTROL
Top crane turn	Turn	① Down
	Return	① Up
Top crane tilt	Extend	② Down
	Retract	② Up
Top crane extension	Raising	③ Down
	Lowering	③ Up

C-6-19. WIRE LINE WINCH CONTROL



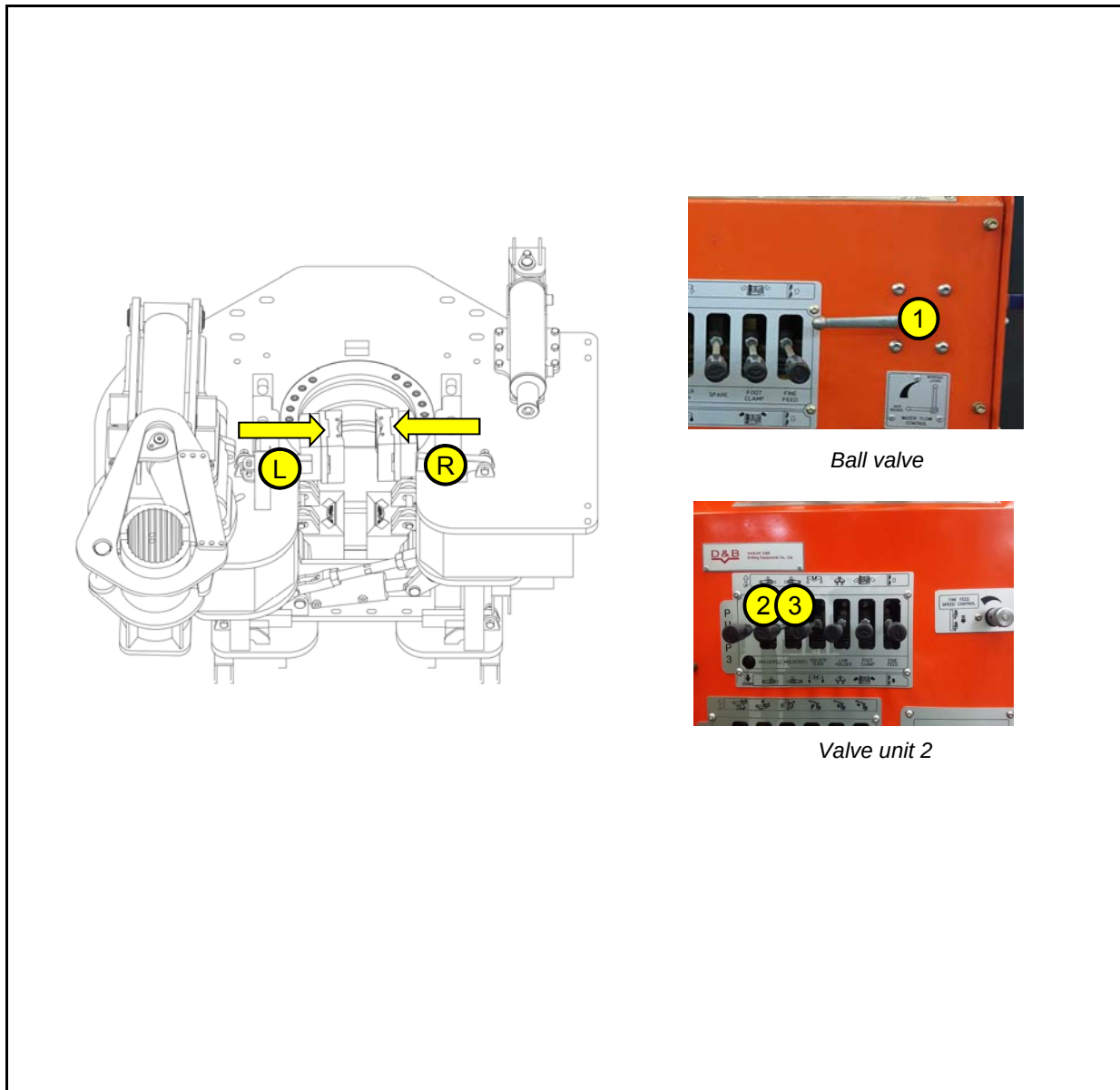
Valve unit 1



Toggle switch

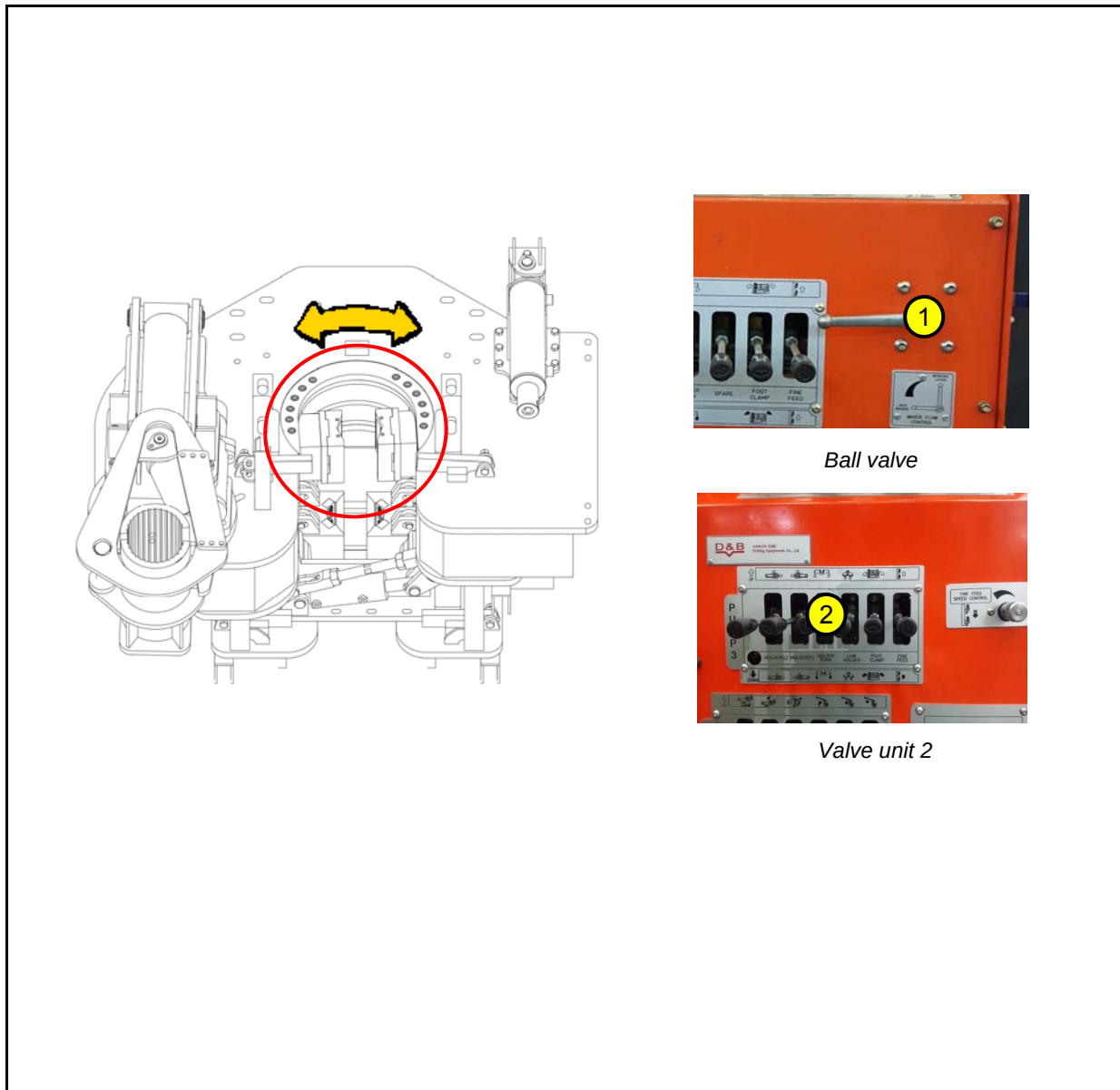
DESCRIPTION	CONDITION	LEVER CONTROL
Wire line winch	Pay out	① Down
	Draw in	① Up
Speed up	ON	② Up
	OFF	② Down

C-6-20. HYDRAULIC HOLDER CONTROL



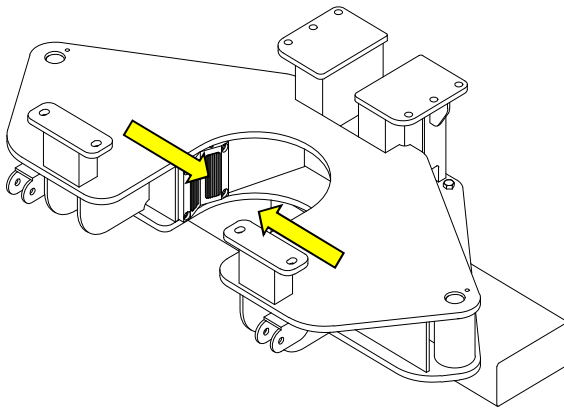
DESCRIPTION	CONDITION	LEVER CONTROL	
Holder (L)	Clamp	① Horizontality	② Down
	Release		② Up
Holder (R)	Clamp		③ Down
	Release		③ Up

C-6-21. HOLDER TURN CONTROL



DESCRIPTION	CONDITION	LEVER CONTROL	
Holder turn	Turn	① Horizontality	② Down
	Return		② Up

C-6-22. LOW HOLDER CONTROL



Ball valve

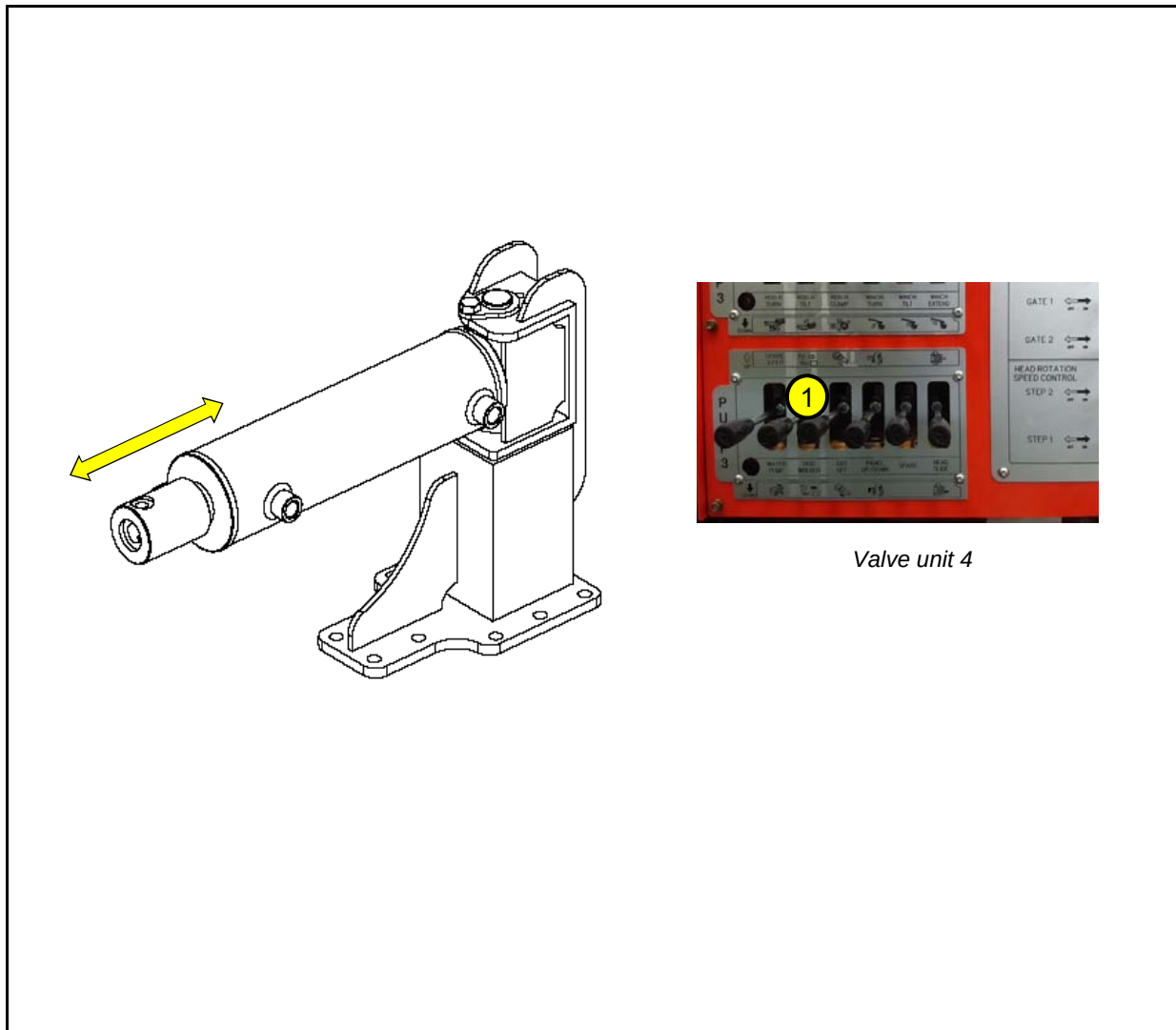


Valve unit 2

DESCRIPTION	CONDITION	LEVER CONTROL	
Low holder clamp	Clamp	① Horizontality	② Down
	Release		② Up

C-6-23. ROD WRENCH CONTROL

SECTION C OPERATOR MANUALS

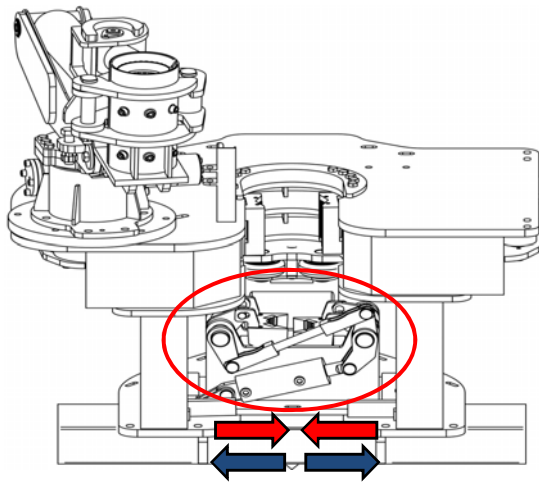


Valve unit 4

DESCRIPTION	CONDITION	LEVER CONTROL
Rod wrench cylinder	Extend	① Down
	Retract	① Up

C-6-24. FOOT CLAMP CONTROL

SECTION C OPERATOR MANUALS



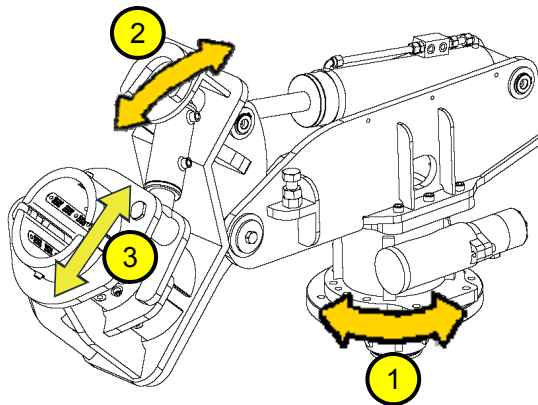
Ball valve



Valve unit 3

DESCRIPTION	CONDITION	LEVER CONTROL	
Foot clamp	Clamp	① Horizontality	② Down
	Release		② Up

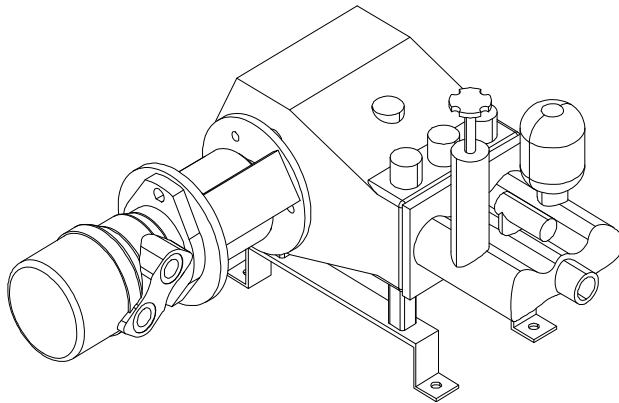
C-6-25. ROD HANDLER TURN/TILT/CLAMP



Valve unit 3

DESCRIPTION	CONDITION	LEVER CONTROL
Rod handler turn	Turn	① Down
	Return	① Up
Rod handler tilt	Lowering	② Down
	Raising	② Up
Rod handler clamp	Clamp	③ Down
	Release	③ Up

C-6-26. WATER INJECTION CONTROL



Water Injection



Ball valve

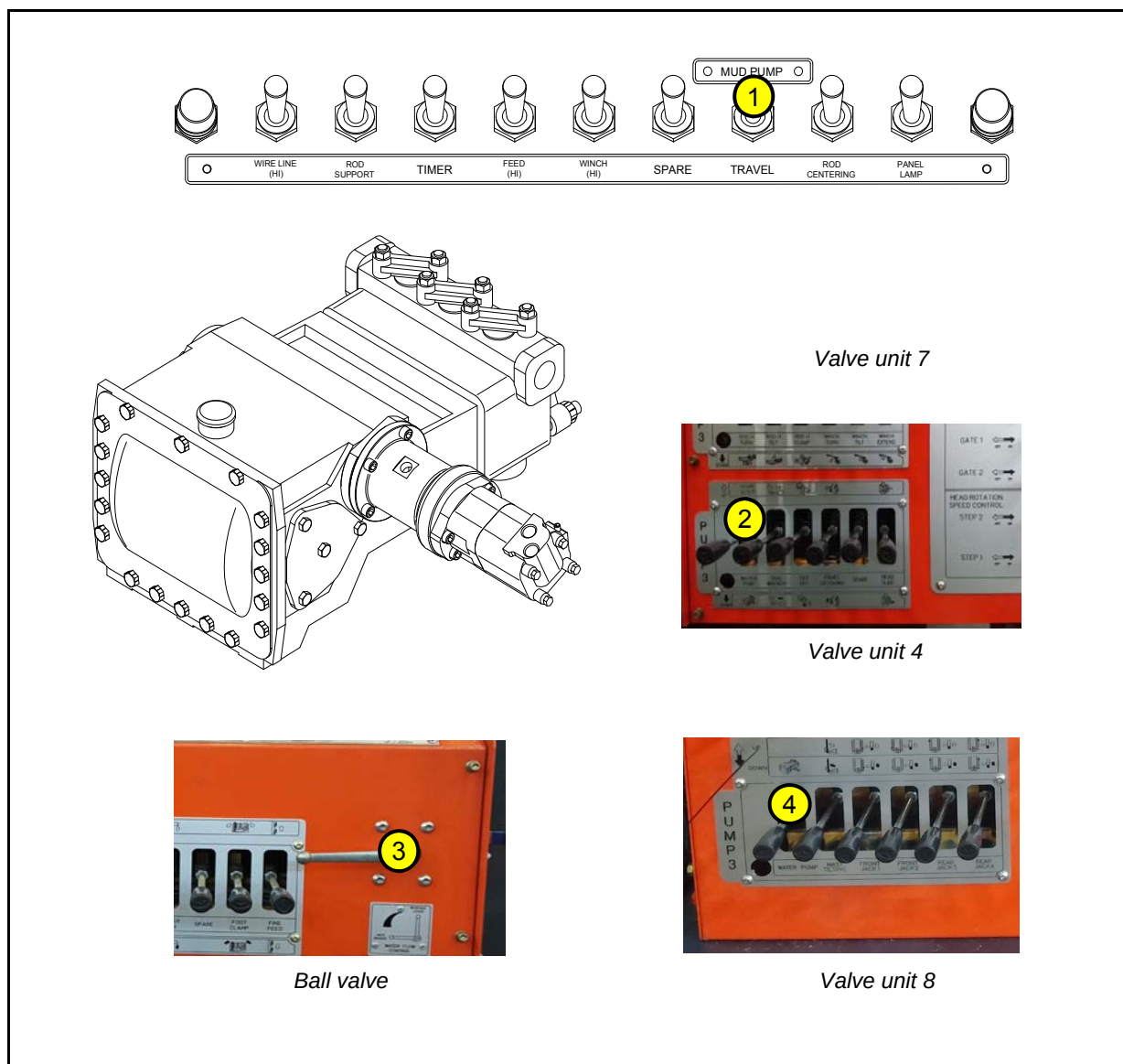


Valve unit 9

DESCRIPTION	CONDITION	LEVER CONTROL	
Water injection	Run	① Verticality	② Down
	Stop		② Neutrality

C-6-27. WATER PUMP CONTROL

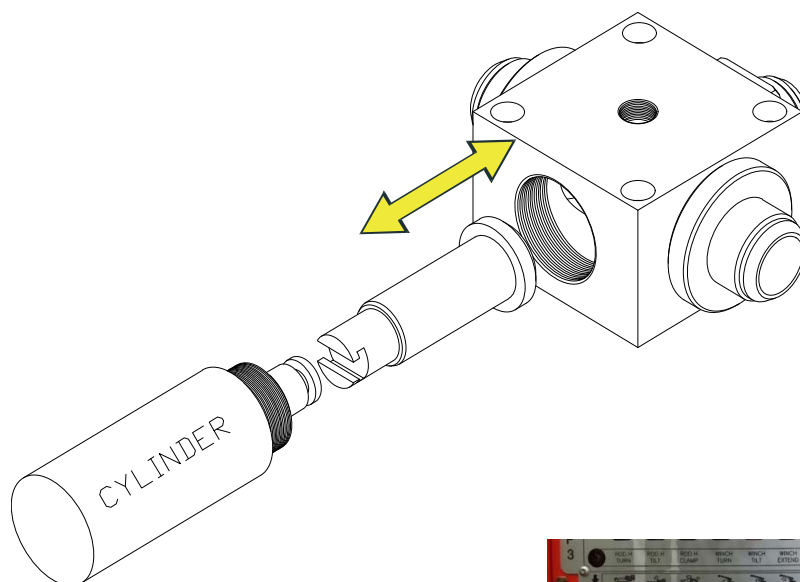
SECTION C OPERATOR MANUALS



DESCRIPTION	CONDITION	LEVER CONTROL	
Water pump (Toggle switch)	Run	① Up	
	Stop	① Neutrality	
Water pump (Valve unit 4)	Run	② Down	
	Stop	② Neutrality	
Water pump (Valve unit 8)	Run	③ Verticality	④ Down
	Stop		④ Neutrality

C-6-28. CUT-OFF CONTROL

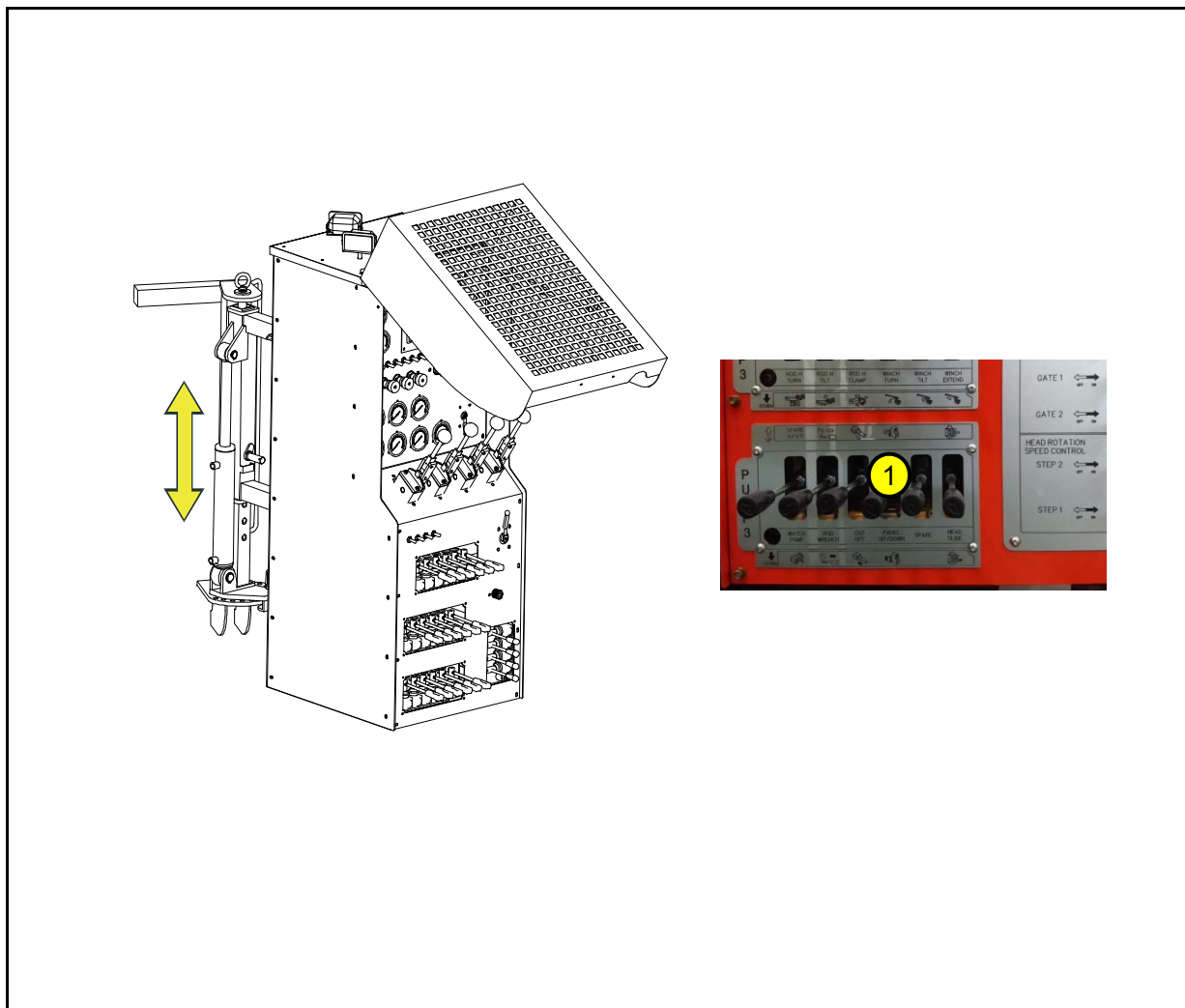
SECTION C OPERATOR MANUALS



Valve unit 4

DESCRIPTION	CONDITION	LEVER CONTROL
Cut-off	Open	① Up
	Close	① Down

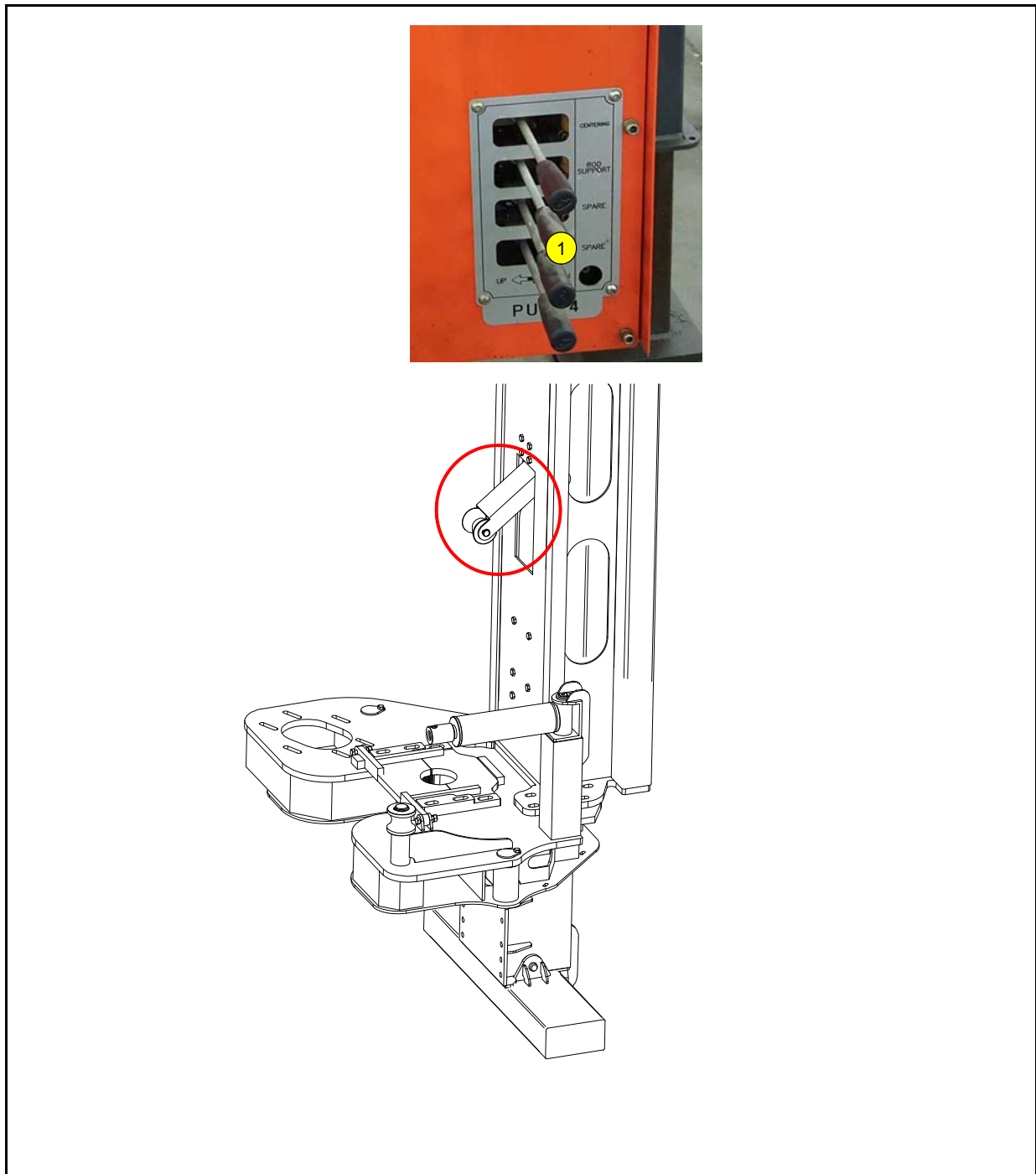
C-6-29. OPERATION PANEL UP/DOWN CONTROL



DESCRIPTION	CONDITION	LEVER CONTROL
Op panel up/down	Rising	① Down
	Lowering	① Up

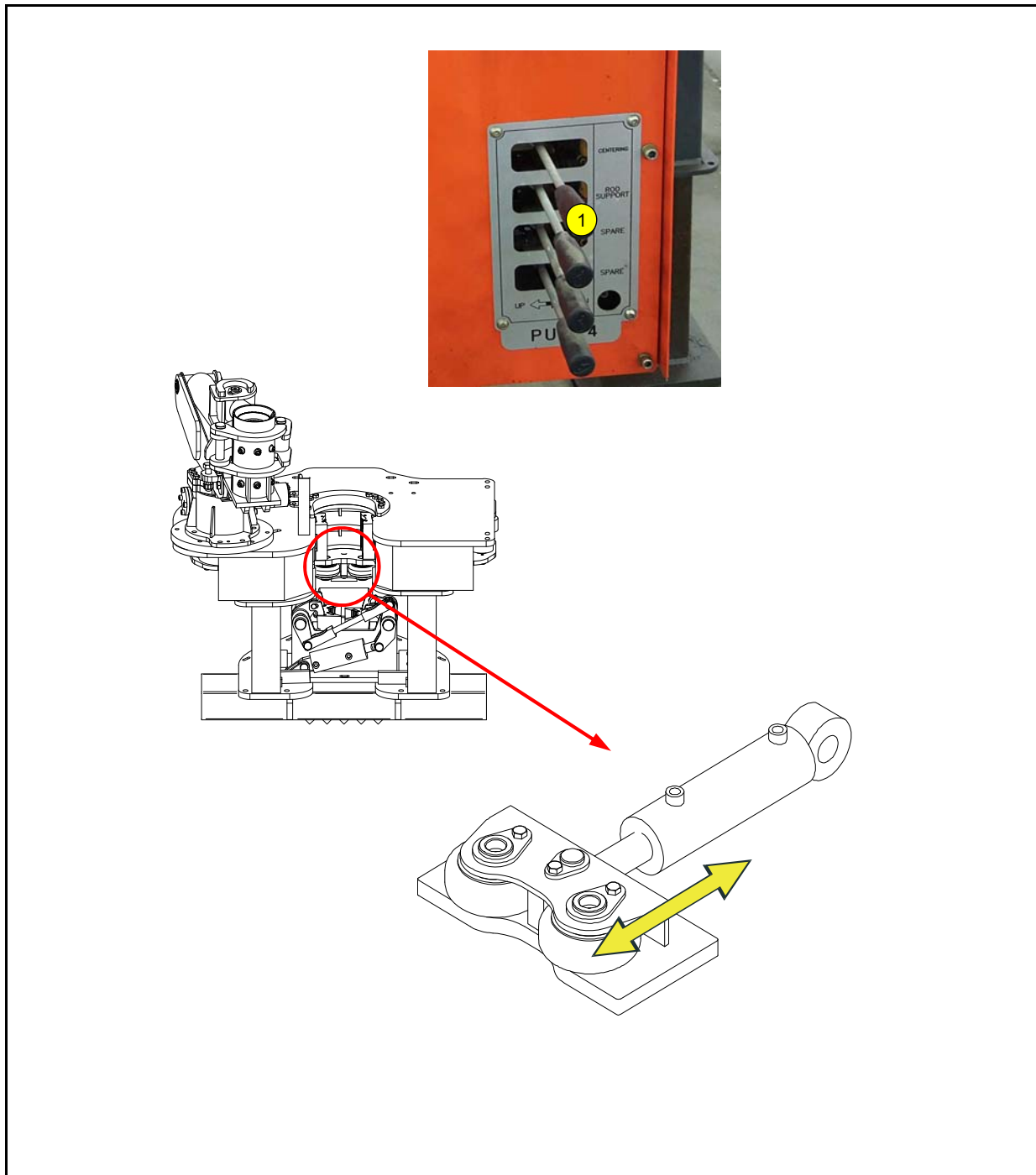
C-6-30. ROD SUPPORT CONTROL

SECTION C OPERATOR MANUALS



DESCRIPTION	CONDITION	LEVER CONTROL
Rod support	ON	① Right
	OFF	① Left

C-6-31. ROD CENTERING



DESCRIPTION	CONDITION	LEVER CONTROL
Rod centering	ON	① Right
	OFF	① Left

C-6-32. PANEL LAMP

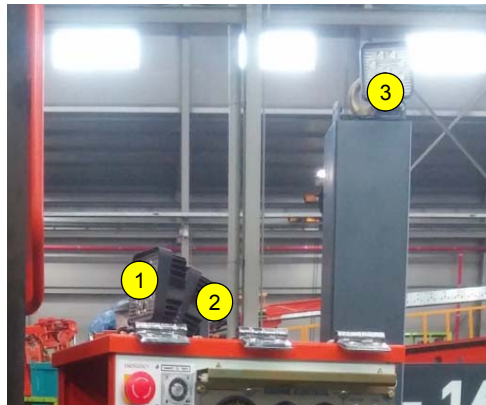
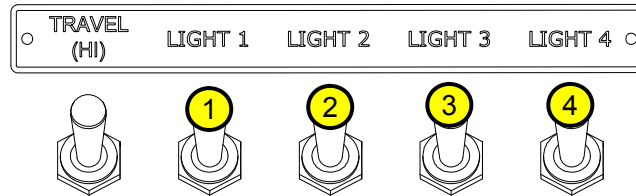
SECTION C OPERATOR MANUALS



DESCRIPTION	CONDITION	LEVER CONTROL
Panel lamp	ON	① Up
	OFF	① Down

C-6-33. LIGHT 1/2/3/4

SECTION C OPERATOR MANUALS



Operation panel & Right jack



Left jack

DESCRIPTION	CONDITION	LEVER CONTROL
Light 1/2/3/4	ON	Up
	OFF	Down

C-7. PARKING INSTRUCTIONS

WARNING

- Prior to beginning any operation procedure described in this chapter you must be aware of the safety rules and information contained in **Section B**.
- If in doubt, read this section again; start work only when you have fully assimilated its contents.

C-7-1. BRIEF HALTS

At the end of a day's work (or shift) and during overnight halts, you must park the rig in such a way that it does not constitute a hazard.

You must therefore take due precautions to avoid the risk of injury to persons approaching the machine when it is not in use;

- Anchor the winch rope or arrange it so that it is not a hazard and is always easy to identify.
- Do not leave any element suspended from the winch rope or in such a way that it is free to swing.
- Always release the pressure from the drilling fluid lines.
- Make sure that the ground on which the machines is resting is sufficiently firm; if this is not the case, move the machine to safe ground.
- Position the mast vertically, resting on its base.
- Make sure that the exhaust pipe butterfly valve is closed.
- Fit the protective cover to the drilling control board.
- Always disassemble the drilling string and never leave it in the hole.

WARNING

- If you are performing vertical drilling it is not strictly forbidden to leave the drilling string in the hole; if is necessary to do so, the decision must be taken on the basis of experience, according to the type of technology used and the type of soil involved.
- However, in certain conditions there is the risk that the drilling string will remain stuck in the hole, making it impossible to retrieve.
- In the event of landslips, a plug is formed which either prevents extraction altogether or at best, permits retrieval only with hoist force values incompatible with the machine's characteristics.

- It is forbidden to leave the drilling string in the hole when drilling in any position other than the vertical, since in this case it would obviously be impossible to stand the mast vertically on its support base.
- Always remove the lockout key from the control panel.

DANGER

- When the machine is parked the lockout key must always be removed from the panel.
- Leaving the key in the panel would create a serious potential risk; anyone could start up the machine, carry out dangerous manoeuvres or tamper with the rig.

C-7-2. PARKING FOR LONG PERIODS/STORAGE

When the machine remains idle for long periods of time (weeks or months), in addition to taking the same precautions as apply to short halts, you must also take the following steps;

- It is forbidden to leave the drilling string in the hole; it must be dismantled whatever the circumstance.
- Park the machine on a firm, dry surface (on asphalt or wooden planks). If possible store the machine in a covered structure periodically and operate all the relevant parts. (Hyd. motor, jack, articulated joints, reduction gears, etc.)

WARNING

- Remember that periodic maintenance must be carried out even when the machine remains idle for long periods; specifically, you must change the fluids and replace all the parts subject to aging.
- In all cases, special maintenance must be carried out and the mechanical; hydraulic and electrical parts of the machine must be checked prior to putting the rig back into service.

- Also remember to observe the storage recommendation provided by the diesel engine manufacture in the relevant operation and maintenance manual.

SECTION D

MAINTENANCE



DO NOT OPERATE THE MACHINE BEFORE READING
AND UNDERSTANDING THE INSTRUCTIONS OF THIS MANUAL

HANJIN D&B CO., LTD.

D-1. GENERAL

D-1-1. MAINTENANCE DESCRIPTION

For long-term use of the machine under good conditions, perform the inspection and maintenance procedures properly and safely as recommended in this manual.

The inspection and maintenance items are divided according to the machine's total operating time. Refer to the hour meter to determine when it is time to perform inspection and maintenance. Items for which it is not possible to determine the inspection and maintenance interval are included under "When required".

When operating the machine in extremely harsh environments (with high levels or high temperatures), inspection and maintenance should be performed earlier than the times indicated on the maintenance chart.

IMPORTANT

- Failure to observe the maintenance schedule automatically annuls the HANJIN D&B guarantee. HANJIN D&B disclaims all liability for any damage that may ensue.
- Before maintenance work, always checked turning off the main switch.

IMPORTANT

- Preventative maintenance is very important. It includes lubrication, checks and adjustments which the operator can perform. Scheduled services are to be performed by HANJIN D&B Product Support.
- Most of these service measures are simple to carry out and do not need any detailed explanation. The instructions which require specific procedures are detailed in maintenance guide of this manual.

WARNING

Prior to beginning any operation or procedure described in this chapter you must be aware of the safety rules and information contained in Section B. If in doubt, read this section again; start work only when you have fully assimilated its contents.

D-1-2. CAUTIONS ON MAINTENANCE

Do not perform inspection and maintenance procedures not prescribed in this manual.
Inspection and maintenance procedures not prescribed in this manual consult your dealer.

ALWAYS KEEP THE MACHINE CLEAN

- Always keep the machine clean, and wash it before performing inspection and maintenance.
- When washing the machine with water, stop the engine and cover the electrical system with plastic to protect it from water. Exposing the electrical system to water is dangerous and could result in shortcircuits or malfunction. Do not wash the battery, sensors, connectors or the inside of the cabin with water or steam.

FUEL, LUBRICANT AND GREASE

- For fuels, lubricant and grease, follow the instructions on the "Fuel and Lubricant Chart".
- Use pure fuels, lubricants and greases which do not contain water, and be careful to keep dirt out when changing or replenishing fuel, lubricant or grease.
- Store fuels, lubricants and greases in the prescribed places and in such a way that no water or dirt can get in them.

CAUTIONS ON FUELING

- If the port includes a strainer, do not remove the strainer when fueling.
- After fueling, be sure to securely tighten the cap, etc.
- Do not add more than the prescribed amount of fuel.

DO NOT CLEAN PARTS WITH FUEL

- Do not use fuel to clean parts. Use a noncombustible cleaning agent.

KEEP DIRT OUT

- When mounting and removing parts, do so in a place where there is no dust, clean the working area and the part, and keep dirt out.

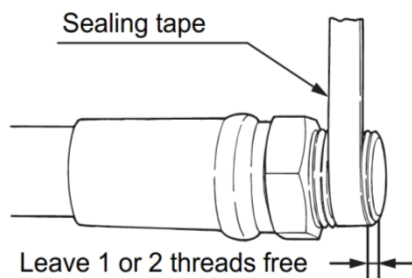
CLEAN MOUNTING SURFACES

- When mounting and removing parts, be sure that the surfaces of contact of the parts are clean. If the sealing grooves of the surface of contact are damaged, consult your dealer.

SEALS AND SPLIT PINS

- Replace removed seals and split pins with new ones.
- When mounting, be careful not to damage or twist the seal.

SEALING TAPE



- When wrapping sealing tape around plugs, etc., remove any old sealing tape from the threads and clean the threads.
- Wrap the sealing tape tight, leaving 1 or 2 threads at the tip free.

DISPOSING OF WASTES

- Collect spent fluids from the machine in containers. Disposing of wastes irresponsibly damages the environment.
- Dispose of oil, fuel, cooling water, coolant, filters, batteries and other harmful substances as prescribed by law.

CHECK AFTER MAINTENANCE

- Gradually increase the engine speed from a low idle to maximum speed and check that there is no oil or water leaking from serviced parts.
- Operate all the operating levers and check that the machine is operating properly.

CAUTIONS ON HANDLING OF BATTERY CABLES

- Disconnect the battery cables (+,-) before working on the electrical system or doing any welding. Remove the negative (-) battery cable first. When reconnecting the battery, connect the negative (-) battery cable last.
- Do not disconnect the battery cables while the engine is running. Doing so could damage the electronic circuitry of the alternator and other parts.

D-2. SERVICE DATA

D-2-1. FUEL AND LUBRICANT CHART

Use different fuels, lubricants and greases according to the temperature, referring to the chart below.

- Change the lubricant earlier than as shown in the table if it is extremely dirty or its performance has deteriorated severely.
- Whenever possible, use the same brand of lubricant as before. If changing with a different brand, replace the entire quantity - do not mix different brands.

Item	Type	Type by temperature								Replacement interval	Capacity (L)
		-30	-20	-10	0	10	20	30	40 °C		
Engine oil pan	Diesel engine oil, API CI-4		SAE 5W-20							After first 50 hrs. Every 250 hrs.	12ℓ - 15ℓ (oil pan)
			SAE 10W-30								
			SAE 15W-40								
Hydraulic oil tank	Antiwear hydraulic oil		ISO VG32							Every 1000 hrs.	Appr. 250ℓ
			ISO VG46								
			ISO VG68								
Fuel tank	Diesel fuel	Use a clean, Quality fuel for good performance and optimum engine life. • To prevent fuel flow problem in cold weather, use diesel fuel with a pour point of at least -12℃ below the low est expected ambient temperature. • Minimum cetane number is 45. Low temperature or high altitude operation amy require the use of fuel with a higher cetane number.									Appr. 550ℓ
Engine cooling system	Coolant (water* + coolant**)		50% coolant mixture							Every 1000 hrs.	Supply up to the upper limit.
			30% coolant mixture								
Drill head gear box	Diesel engine oil, API CI-4	SAE 5W-20 (-30℃ ~ 20℃) SAE 10W-30 (-20℃ ~ 40℃) SAE 15W-40 (-15℃ ~ 50℃)							After first 50 hrs. Every 250 hrs.	Supply up to the center of the gauge.	
Engine gearbox (option)											
Travel reduction gear	Gear oil, API GL-4	SAE 90							After first 50 hrs. Every 1000 hrs.	Supply up to the specified oil level.	
winch reduction gear											
Screw compressor (option)	Compressor oil, Non-detergent	ISO VG 46							Every 1000 hrs.	Supply up to the center of the gauge.	
Piston compressor (option)									After first 50 hrs. Every 1000 hrs.	Supply up to the center of the gauge.	
FMC water pump (option)	Diesel engine oil, API CI-4	SAE 05W-20 (-30℃ ~ 20℃) SAE 10W-30 (-20℃ ~ 40℃) SAE 15W-40 (-15℃ ~ 50℃)							After first 50 hrs. Every 1000 hrs.	Supply up to the specified oil level.	
Water injection pump (option)									After first 50 hrs. Every 1000 hrs.	Supply up to the center of the gauge.	
HANJIN mud pump & Water injection pump (option)	Multipurpose (Extreme), NLGI No.2								Refer to "LUBRICATION SCHEDULE"	As required	
Working equipment		—									
Sliding surface	Multipurpose (Extreme), NLGI No.1										
Wire rope											

* For water, use tap water (soft). Do not use well or river water.

** When the ambient temperature drops below 0°C, add coolant (antifreeze). Follow the coolant manufacturer's instructions to determine the mixture ratio.

D-2-2. EXPENDABLES

Replace expendables such as filters and elements periodically, referring to the table below.

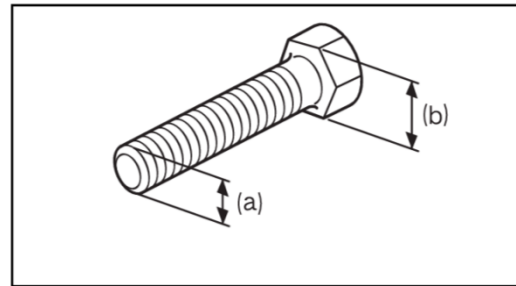
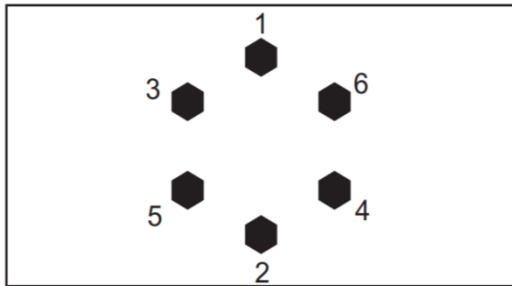
Item	Part name	Replacement interval	Part No.
Hydraulic oil return filter	Element	After first 50 hrs. Every 250 hrs.	HYUNDAI 26300-7H000
Hydraulic oil drain filter	Cartridge	After first 50 hrs. Every 250 hrs.	PARKER 925023 25C
Water separator filter	Cartridge	Every 500 hrs.	HYUNDAI 31945-7L002
Engine oil filter	Cartridge	After first 50 hrs. Every 250 hrs.	DOOSAN 400508-00093
Fuel filter	Cartridge	Every 500 hrs.	DOOSAN 65.12503-5018A
Air cleaner	Element	Every 500 hrs.	HYUNDAI 28130-7H500
Drill head gear box oil filter	Cartridge	After first 50 hrs. Every 250 hrs.	PARKER 925023 25C

D-2-3. TIGHTENING TORQUES

NUTS AND BOLTS (FOR ISO STRENGTH CATEGORY 10.9)

Tighten nuts and bolts at the torques shown on the table below, unless otherwise specified in the text.

- When replacing nuts and bolts, replace them with nuts and bolts of the same size and standards.
- Tighten nuts and bolts alternately (top, bottom, left then right) or in 2 or 3 times so that they are tightened uniformly.



Thread	Head width (b)	Size (a) X Pitch	Torque	
			General connection points	
			Nm	ft-lb
Coarse	10	M6 X 1.0	9.8 ± 0.5	7.2 ± 0.4
	13	M8 X 1.25	22.6 ± 1.1	16.6 ± 0.8
	17	M10 X 1.5	47.1 ± 2.4	34.7 ± 1.7
	19	M12 X 1.75	83.4 ± 4.1	61.5 ± 3.0
	22	M14 X 2.0	134.4 ± 6.7	99.1 ± 4.9
	24	M16 X 2.0	207.9 ± 10.4	153.3 ± 7.7
	27	M18 X 2.5	288.1 ± 14.4	212.5 ± 10.6
	30	M20 X 2.5	410.9 ± 20.5	303.1 ± 15.1
	32	M22 X 2.5	556.1 ± 27.8	410.2 ± 20.5
	36	M24 X 3.0	706.9 ± 35.3	521.4 ± 26
	41	M27 X 3.0	1033.8 ± 51.7	762.5 ± 38.1
	46	M30 X 3.5	1403.7 ± 70.2	1035.3 ± 51.8
Fine	13	M8 X 1.0	24.5 ± 1.2	18.1 ± 0.9
	17	M10 X 1.25	50 ± 2.5	36.9 ± 1.8
	19	M12 X 1.25	87.3 ± 4.3	64.4 ± 3.2
	22	M14 X 1.5	135.3 ± 6.8	99.8 ± 5.0
	24	M16 X 1.5	220.6 ± 11	162.7 ± 8.1
	27	M18 X 1.5	324.3 ± 16.2	239.2 ± 11.9
	30	M20 X 1.5	452.1 ± 22.6	333.4 ± 16.6
	32	M22 X 1.5	611 ± 30.6	450.6 ± 22.6
	36	M24 X 2.0	768.5 ± 38.4	566.8 ± 28.3
	41	M27 X 2.0	1116.9 ± 55.8	823.8 ± 41.2
	46	M30 X 2.0	1553.7 ± 77.7	1145.9 ± 57.3

D-3. IMPORTANT PARTS

For safe use, the machine must be serviced periodically. To increase safety, periodically replace the parts listed in the following table of important parts.

Serious injury or a fire could result if they deteriorate or are damaged.

Table of important parts

Unit		Important parts to be replaced periodically	Replacement interval
Fuel system		Fuel hoses	
		Packing in fuel filler cap	
Hydraulic system	Machines body	Hydraulic hoses (Pump - delivery)	Every 2 years
		Hydraulic hoses (Pump - suction)	
		Hydraulic hoses (Drill head rotation motor)	
		Hydraulic hoses (Wire rope winch motor)	
		Hydraulic hoses (Travel motor)	
		Hydraulic hoses (Rod handler (option) slew motor)	
	Working equipment	Hydraulic hoses (Mast tilting cylinder lines)	Every 3 years
		Hydraulic hoses (Main mast sliding cylinder lines)	
		Hydraulic hoses (Clamp unit cylinder lines)	
		Hydraulic hoses (Rod wrench cylinder lines)	
		Hydraulic hoses (Rod rack (option) cylinder lines)	
		Hydraulic hoses (Jack cylinder lines)	
		Hydraulic hoses (Pilot valve)	
		Hydraulic hoses (Auxiliary lines)	

Above important parts are vulnerable to aging and wear or deterioration and it is difficult to determine the degree to which they have deteriorated on the occasion of periodic service. To maintain their proper function at all times, therefore, replace them with new ones after using them for a specific period of time even if no abnormality is found with the parts. If you find abnormalities in these parts before their scheduled replacement time is reached, repair or replace them immediately. If a hose clamp is deformed or cracked, replace it immediately. When replacing the important parts, please contact your dealer.

Also check the hydraulic hoses other than the above important parts. If any abnormality is found in them, retighten them or replace them immediately.

When replacing the hydraulic hoses, replace the O-rings and seals at the same time.

Check the fuel and hydraulic hoses according to the periodic schedule described below.

Refer to "Maintenance".

Type of inspection	Inspection item
Daily inspection	Leakages from joints, hydraulic or fuel hoses.
Monthly inspection	Leakages from joints, hydraulic or fuel hoses. Damaged hydraulic or fuel hoses (cracks, wear and tear).
Annual inspection	Leakages from joints, hydraulic or fuel hoses. Deteriorated, twisted, damaged hydraulic or fuel hoses (cracks, wear and tear) or hoses in contact with other parts of the machine.

D-4. SCHEDULE

D-4-1. MAINTENANCE SCHEDULE

ITEM		MAINTENANCE INTERVAL								REMARK
		DAILY	EVERY 50 HOURS	EVERY 150 HOURS	EVERY 250 HOURS	EVERY 500 HOURS	EVERY 1000 / 6 MOS.	EVERY 1YEAR	WHEN REQUIRED	
Engine oil	Change		◎		○					
Engine oil level	Check	○								
Engine oil filter	Replace		◎		○					
Fuel filter	Replace					○				
Oil and water separator filter	Replace					○				
Water separator	Drain				○					
Fuel tank	Drain				○					
Engine air cleaner filter	Replace					○				
Fan belt tension & wear	Check		○							
Battery	Check			○						
Radiator core	Flush	○								
Coolant(Anti-freeze)	Change						○			
Hydraulic oil level	Check	○								
Hydraulic oil	Change						○			
Hydraulic oil suction filter	Clean						○			
Hydraulic oil return filter	Replace		◎		○					
Hydraulic oil drain filter	Replace		◎		○					
Drill head gear box oil level	Check	○								
Drill head gear box oil	Change		◎		○					
Drill head gear box oil filter	Replace		◎		○					
Drill head cam follower play	Check			○						If applicable
Feed chain tension	Check								○	
Engine gear box oil level	Check	○								If applicable
Engine gear box oil	Change		◎		○					If applicable
Comp. oil level	Check	○								If applicable
Screw comp. oil	Change						○			If applicable
Piston comp. oil	Change		◎				○			If applicable
Comp. oil separate tank filter	Replace		◎		○					If applicable
Comp. oil return filter	Replace		◎		○					If applicable
Comp. air end filter	Replace		◎		○					If applicable
Comp. air cleaner filter	Replace					○				If applicable
Tramming reduction gear oil	Change		◎				○			
Clamp unit	Clean								○	
Swivel rotation	Check	○								
Mud pump(Hanjin) leaks	Check	○								If applicable
Mud pump(FMC) oil level	Check	○								If applicable
Mud pump(FMC) oil	Change		◎				○			If applicable
Water injection oil level	Check	○								If applicable
Water injection oil	Change		◎				○			If applicable
Crawler tracks damage & wear	Check		○							
Crawler tracks tension	Check		○							
Crawler tracks bolts tightening	Check			○						
Feed assembly bolts tightening	Check			○						
Work table bolts tightening	Check			○						
Wire rope lubrication & damage	Check	○								
Overwinding proof device	Check	○								If applicable

• The items marked ◎ must be done after the first 50 hours of operation.

SECTION D LUBRICATION AND MAINTENANCE

D-4-2. LUBRICATION SCHEDULE

ITEM		LUBRICATION INTERVAL			REMARK
		DAILY	EVERY 50 HOURS	EVERY 150 HOURS	
Spindle head	Lubricate grease fittings	○			If applicable
Swivel	Lubricate grease fittings	○			If applicable
Clamp unit	Lubricate grease fittings	○			
Main w inch	Lubricate grease fittings		○		
Wire line w inch	Lubricate grease fittings		○		If applicable
Rod rack	Lubricate grease fittings		○		If applicable
Drill head cam follow er	Lubricate grease fittings	○			If applicable
Drill head sliding surface (vertical movement)	Clean & lubricate w ith grease	○			
Drill head sliding surface (left-right motion)	Clean & lubricate w ith grease		○		If applicable
Main mast sliding surface	Clean & lubricate w ith grease	○			
Mast tilting	Lubricate grease fittings			○	
Craw ler tracks	Clean & lubricate w ith grease		○		If applicable
Mast head	Lubricate grease fittings			○	
Trolley inside the mast	Lubricate grease fittings	○			
Mast upper roller	Lubricate grease fittings	○			
Mast low er roller	Lubricate grease fittings	○			
Feed chain	Clean & lubricate w ith grease	○			
Wire ropes	Clean & lubricate w ith grease	Supplement the grease w hen required.			
Mud pump(Hanjin) shaft	lubricate with grease (Automatic grease lubricator)	Supplement the grease to the automatic lubricator when required.			If applicable
Water injection plunger	lubricate w ith grease	Turn the grease cup for two or three times at an interval of 4hours a day. Supplement the grease to the grease cup when required.			If applicable

IMPORTANT

- If the grease nipples be blocked or damaged in any way, they must be replaced.

D-5. MAINTENANCE GUIDE

D-5-1. ENGINE OIL

CHECKING ENGINE OIL LEVEL

IMPORTANT

- When using oil of a different brand or viscosity from the previous one, remove all of the old oil. Never mix two different types of oil.
- Do not start the engine if the amount of oil is insufficient.

WARNING

To avoid serious injury :

- Do not mix gasoline or alcohol with diesel fuel. This mixture may damage the engine and can cause an explosion.
- Stop the engine while refueling to avoid fire or explosion. Avoid open flames and sparks while refueling.

1. Park the machine on a flat surface.
2. Check the engine oil before starting the engine or wait 5 minutes or more after the engine has stopped.
3. To check the oil level, draw out the dipstick, wipe it clean, replace it, and draw it out again. Check to see that the oil level is between the two notches. If the level is too low, add new oil to the prescribed level at the oil inlet.
4. Always drain the oil completely when changing. Never mix different oils or engine damage may result.

CHANGING ENGINE OIL

1. Change the oil after the first 50 hours of operation
2. Remove the drain plug from the oil pan and allow all of the oil to drain. Draining the oil will be easier when the engine is slightly warm.

WARNING

- Follow environmental regulations when changing and disposing of lubricants.

3. Ensure that the oil level on the dipstick is at the upper mark.
4. Change the oil after every 250 hours of operation thereafter.

REPLACING THE OIL FILTER

1. Replace oil filter with at least every other oil change.
2. Remove the filter using a filter wrench.
3. Apply a thin layer of clean oil to the gasket on the new filter.
4. Screw the new filter on. Hand-tighten only. If the gasket contacts with the sealed place, fasten it with hands. If you fasten it with wrenches, the fastening force may be greater than necessary.
5. The level of engine oil is lowered when replacing cartridges. So, check whether any oil leakage is in sealed places when operating the engine for a while, and then check the oil level. If necessary, replenish oil.

D-5-2. FUEL

Use diesel fuel (Above cetane number 45)

WARNING

To avoid serious injury :

- Do not mix gasoline or alcohol with diesel fuel. This mixture may damage the engine and can cause an explosion.
- Stop the engine while refueling to avoid fire or explosion. Avoid open flames and sparks while refueling.

FUEL LEVEL CHECK AND REFUELING

WARNING

- Do not smoke or permit open flames while fueling or near fueling operations.
- Stop the engine in a well-ventilated place when adding fuel.
- Clean up spilled fuel immediately.
- Do not fill the fuel tank to capacity. Allow room for expansion.
- Tighten the fuel tank cap securely.

1. Check the fuel level using the sight glass.
2. If the level is low, add fuel from the fuel cap while watching the sight glass.
3. Use diesel fuel only. Other fuels and fuel mixtures will degrade performance and may damage the engine. Use the correct grade of diesel fuel for the ambient temperature.

IMPORTANT

- Always use clean fuel. Use a strainer if necessary.
- Do not let the fuel tank run empty.
- Clean up fuel spills promptly and properly to eliminate a fire hazard.

REPLACING THE FUEL FILTER

WARNING

- Do not smoke or permit open flames while handling fuel or working on the fuel system.
- Stop the engine in a well-ventilated place and allow it to cool down before performing maintenance.
- Clean up spilled fuel immediately.

1. Using a filter wrench, turn the filter counterclockwise and remove it.
2. Clean the surface of installation of the filter stand.
3. Apply a thin layer of oil to the packing of the new filter.
4. Install the new filter by hand.
5. Tighten 3/4 more turn after the filter packing comes in contact with the surface of installation.

IMPORTANT

- Replacing the fuel filter periodically will significantly reduce injection pump and fuel injector wear.

REPLACING THE WATER SEPARATOR FILTER

WARNING

- Do not smoke or permit open flames while handling fuel or working on the fuel system.
- Stop the engine in a well-ventilated place and allow it to cool down before performing maintenance.
- Clean up spilled fuel immediately.

1. Open the drain plug to empty the fuel into the filter.
2. Remove the filter and water drain plug.
3. After replacing filter, loosen air plug and depress the priming pump until air is completely evacuated.
4. Tighten air plug securely.
5. Start the engine and inspect for fuel leakage.

DRAINING WATER

WARNING

- Do not smoke or permit open flames while handling fuel or working on the fuel system.
- Stop the engine in a well-ventilated place and allow it to cool down before performing maintenance.
- Clean up spilled fuel immediately.

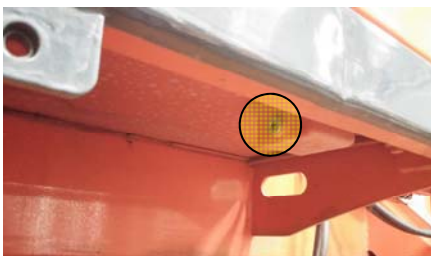
WATER SEPARATOR

1. Place a pan under the drain plug.
2. Loosen the drain plug.
3. Depress the priming pump about 7-8 times until the water is drained from the filter.
4. Tighten the drain plug securely.
5. Depress the priming pump several additional times to check that no fuel leaks out of the water separator.
6. Start the engine and, once again, inspect for fuel leakage.

THE FUEL TANK

Do this before operating the machine.

1. Remove the fuel cap.
2. Place a pan under the drain plug.
3. Loosen the drain plug and drain the water and sediment from the bottom of the tank.



Drain plug

4. tighten the drain plug.
5. While watching the sight glass, add fuel.
6. Tighten the fuel cap and lock it with the key.

D-5-3. REPLACING THE AIR CLEANER

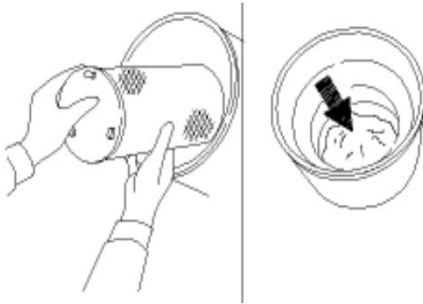
⚠ WARNING

- Stop the engine and allow the machine to cool down before performing maintenance.
- The engine, muffler, radiator and many other parts of the machine are hot directly after the engine is stopped. Touching these parts will cause burns.

⊕ IMPORTANT

- Do not use an element if its flutes, gaskets or seals are damaged.

1. Remove the air cleaner cover from the air cleaner housing
2. Clean the inside of the air cleaner cover.



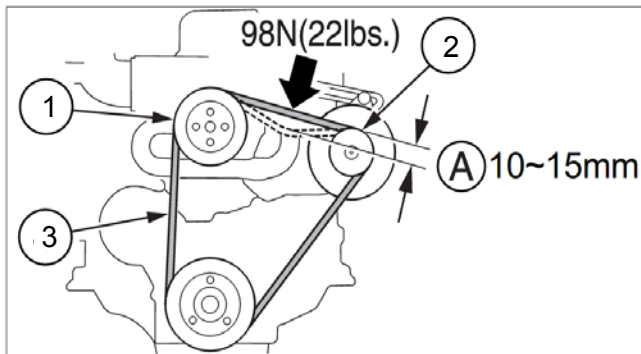
3. Remove the element.
4. Cover the intake hole at the back of the body with cloth or tape to prevent dirt from getting in.
5. Clean the inside of the body.
6. Remove the cloth or tape applied in step 4.
7. Install the new element.
8. Install the air cleaner cover securely.
9. Press the button on the dust indicator to push the red signal back in. (if equipped)

D-5-4. FAN BELT

WARNING

- Stop the engine and allow the machine to cool down before performing inspection and maintenance.
 - The engine, muffler, radiator, hydraulic lines, sliding parts and many other parts of the machine are hot directly after the engine is stopped. Touching these parts will cause burns.
- Low belt tension can result in engine overheating and insufficient battery charging.

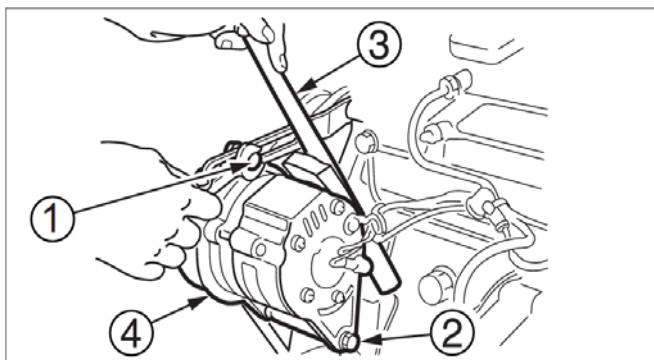
INSPECTING THE FAN BELT



1. Fan pulley
2. Alternator
3. Fan belt

1. Press at the center of the fan pulley and alternator pulley and check the tension (about 98N or 22lbs). Proper slack (A) : 10 to 15mm
2. Inspect the fan belt and replace it if :
 - there are cuts or cracks.
 - the belt is worn and touches the bottom of the V groove in the pulley.
 - the belt stretches and cannot be adjusted.

ADJUSTING THE FAN BELT



1. Adjustment bolt
2. Locking bolt
3. Lever
4. Alternator

1. Loosen the adjustment bolt and locking bolt.
2. Using a lever, move the alternator and adjust the slack.
3. Tighten the adjustment bolt and locking bolt.

D-5-5. BATTERY

CHECKING THE ELECTROLYTE LEVEL

The batteries installed do not require maintenance.

Nevertheless, it is advisable to check their efficiency periodically.

1. Keep the battery fully charged to avoid downtime.
2. Check the electrolyte level according to the maintenance schedule. Add distilled water when the level is low. Do not overfill. Flush any spillage with clean water to prevent injury or equipment damage.

D-5-6. FINS (RADIATOR, OIL COOLER AND INTERCOOLER)

FLUSHING THE FINS

Flush the fins with fresh water to remove external dirt and debris. Cleaning should only be done when the system is cold.

IMPORTANT

- Use water only to clean the radiator core. Never use tools or any other hard object that will damage fins and tubes. Leaks or degraded performance will likely occur.
- When using water, cover the electrical system to prevent water from getting in.

D-5-7. COOLANT (ANTI-FREEZE)

CHANGING COOLANT

1. To discharge coolants, always open plugs for discharge that are located on the side of the crank case and lower part of radiator, and open the radiator cap, too.
You cannot discharge coolant fully when the cap is closed.
(To discharge coolant from reservoir tank, separate the overflow pipe from the radiator cap.)
2. Replace coolant every 1000 hrs. New coolant should always be used when replacing coolant.
3. A radiator cap that is loose or has a damaged seal will result in coolant loss and may cause overheating.
4. Coolant (Radiator cleaner and anti-freeze.)

Season	Coolant
Summer	Pure water and radiator cleaner
Winter or all season (When temperature drops below 0 °C (32 °F))	Pure water and anti-freeze (Refer to "ANTI-FREEZE")

ANTI-FREEZE

Freezing temperatures can quickly and severely damage the engine if the cooling system is unprotected. Use antifreeze when temperatures fall below 0 °C (32 °F).

1. Only use permanent anti-freeze in this engine.
2. Completely drain and flush the cooling system with clean water before adding anti-freeze.
3. Mix the proper amounts of anti-freeze and pure water in accordance with "D-2-1" based on the expected ambient temperature.
4. Mix the anti-freeze and water before pouring it in the cooling system.

IMPORTANT

- The coolant mixture should not exceed 50% anti-freeze by volume.

Anti-freeze (Vol%)	Freezing point	
	°C	°F
30	-10	14
50	-30	-22

NOTE

- This data is the industry standard for a typical ethylene glycol based antifreeze. These volumes of anti-freeze, when mixed with pure water, will reduce the freezing point of the coolant mixture as shown.
- When adding coolant during daily service, use only water or anti-freeze mixed with water to ensure that the mix ratio stays at or below 50% anti-freeze.
- Keep unused anti-freeze in a clean, tightly sealed container.
- Do not use radiator cleaning agents when anti-freeze has been added to the cooling water.
(Anti-freeze contains an anti-corrosive agent, which will react with the radiator cleaning agent forming sludge which will affect the engine parts.)

D-5-8. HYDRAULIC OIL

INSPECTING THE HYDRAULIC OIL LEVEL AND REPLENISHING

⚠ WARNING

- Oil may spurt out if caps or filters are removed or pipes disconnected before releasing the pressure in the hydraulic system.
 - Gradually loosen the vent plug to relieve tank pressure.

INSPECTION

The oil level changes according to the oil temperature.

Check the hydraulic oil level daily.

To do this set the machine in its work configuration on level ground. Specifically :

1. The boom must be parallel with the machine's longitudinal axis and set at angle of approximately 45° to the ground. (If the boom is equipped)
2. The mast must be vertical with its support foot resting on the ground.
3. The rotary must be in its lowest position on the mast, close to the clamp unit.

In this configuration the tank contains the maximum quantity of hydraulic oil and the oil level must be in the middle of the oil level indicator ①.



Oil level indicator

If it is not possible to set the machine in this configuration because of the job being performed, check that the oil level does not fall below oil level indicator ②.

REPLENISHING

1. Slowly turn the vent plug to release the internal pressure, then remove.
2. Add hydraulic oil up to the middle of the oil level indicator ①.

REPLACING THE HYDRAULIC OIL AND CLEANING THE SUCTION STRAINER

⚠ WARNING

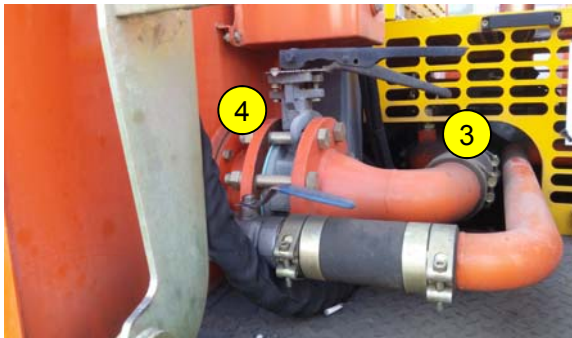
- Stop the engine and allow the machine to cool down before performing maintenance.
 - The engine, hydraulic lines and many other parts of the machine are hot directly after the engine is stopped. Touching these parts will cause burns.
 - The hydraulic fluid is also hot and under high pressure. Be careful when loosening caps and plugs. Working on the machine under these conditions could result in burns or injuries due to the hot oil spurting out.
- Oil may spurt out if caps or filters are removed or pipes disconnected before releasing the pressure in the hydraulic system.
 - Gradually loosen the vent plug to relieve tank pressure.
 - When removing plugs or screws or disconnecting hoses, stand to the side and loosen slowly to gradually release the internal pressure before removing.

1. Set the machine to the hydraulic oil level inspection posture.

Refer to D-5-8 "INSPECTING THE HYDRAULIC OIL LEVEL AND REPLENISHING"



- 1. Air breather
- 2. Filter cover



- 3. Hose & clip
- 4. flange

2. Slowly turn the air breather to relieve tank pressure, then remove.
3. Remove the bolts from the filter cover.
4. Remove the return filter.
5. Place a pan for catching the spent oil under the drain plug.
6. Loosen the drain plug and drain the hydraulic oil.

⚠ WARNING

- Follow environmental regulations when changing and disposing of lubricants.

7. Loosen the hose clip.

8. Remove the bolt, then remove the flange.
9. Remove the suction strainer and clean it
10. Clean the inside of the hydraulic tank.
11. Install the new return filter and suction strainer.
12. Install the filter cover.
13. Install the flange and connect the hose.
14. Tighten the drain plug.
15. Insert hydraulic oil through the hole in the air breather, adding hydraulic oil up to the middle of the oil level indicator ①.

REPLACING THE HYDRAULIC OIL RETURN FILTER

WARNING

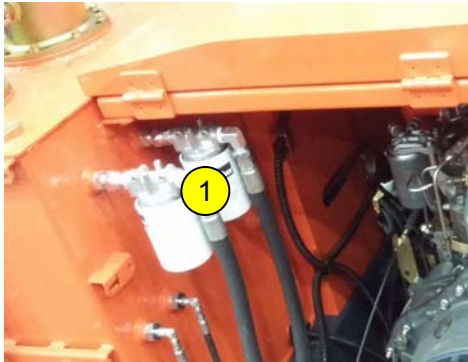
- Stop the engine and allow the machine to cool down before performing maintenance.
 - The engine, hydraulic lines and many other parts of the machine are hot directly after the engine is stopped. Touching these parts will cause burns.
 - The hydraulic fluid is also hot and under high pressure. Be careful when loosening caps and plugs. Working on the machine under these conditions could result in burns or injuries due to the hot oil spurting out.
- Oil may spurt out if caps or filters are removed or pipes disconnected before releasing the pressure in the hydraulic system.
 - Gradually loosen the vent plug to relieve tank pressure.
 - When removing plugs or screws or disconnecting hoses, stand to the side and loosen slowly to gradually release the internal pressure before removing.

1. Slowly turn the vent plug to relieve tank pressure, then remove.
2. Remove the bolts from the filter cover, then remove the filter cover.
3. Remove the return filter.
4. Install the new return filter.
5. Install the filter cover.
6. Inspect the level with the oil level indicator, and replenish if the level is low.
Refer to D-5-8 "INSPECTING THE HYDRAULIC OIL LEVEL AND REPLENISHING"

REPLACING THE OIL DRAIN FILTER

WARNING

- Stop the engine and allow the machine to cool down before performing maintenance.
 - The engine, hydraulic lines and many other parts of the machine are hot directly after the engine is stopped. Touching these parts will cause burns.
 - The hydraulic fluid is also hot and under high pressure. Be careful when loosening caps and plugs. Working on the machine under these conditions could result in burns or injuries due to the hot oil spurting out.
- Oil may spurt out if caps or filters are removed or pipes disconnected before releasing the pressure in the hydraulic system.
 - Gradually loosen the vent plug to relieve tank pressure.
 - When removing plugs or screws or disconnecting hoses, stand to the side and loosen slowly to gradually release the internal pressure before removing.



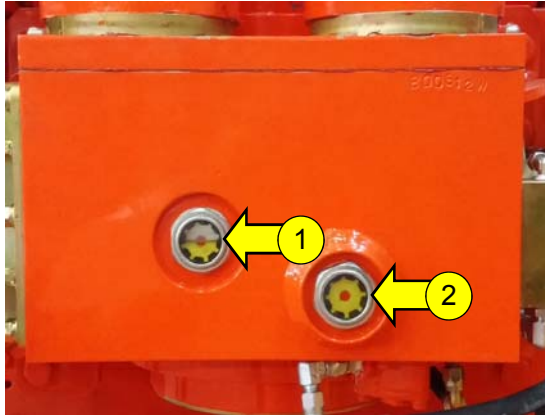
1. Hydraulic oil drain filter

1. Using a filter wrench, turn the filter counterclockwise and remove it.
2. Clean the surface of installation of the filter stand.
3. Apply a thin layer of oil to the packing of the new filter.
4. Install the new filter by hand.
5. Tighten 3/4 more turn after the filter packing comes in contact with the surface of installation.

D-5-9. ROTARY OIL

INSPECTING THE ROTARY OIL LEVEL

To check the oil level in the rotary the machine must be set on level ground, the mast must be vertical and the rotary must be in its most accessible position, close to the clamp unit.



1. RC drilling
2. Diamond drilling

Check the oil level, preferably when it is warm, through the oil level indicator. If necessary, Add oil up to middle of the sight glass through the filler cap.

⚠ WARNING

- When topping up, do not exceed the maximum level.

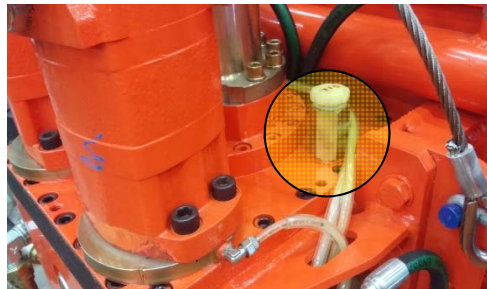
REPLACING THE ROTARY OIL

⚠ WARNING

- Stop the engine and allow the machine to cool down before performing maintenance.



Drain plug



Filler cap

1. Oil should be changed when hot to prevent build up of sludge deposits.

SECTION D LUBRICATION AND MAINTENANCE

2. To change the oil in the rotary the machine must be set on level ground, the mast must be vertical and rotary must be in its most accessible position, close to the clamp unit.
3. Place a pan for catching the spent oil under drain plug.
4. To facilitate oil drainage, unscrew the filler cap.
5. Remove drain plug and drain the oil.

WARNING

- Follow environmental regulations when changing and disposing of lubricants.

6. Wrap new sealing tape around the plugs.
7. Tighten drain plug.
8. Supply oil up to middle of the sight glass through the filler cap.
(The rotary contains approximately 4 litres of oil.)
9. Tighten filler cap.

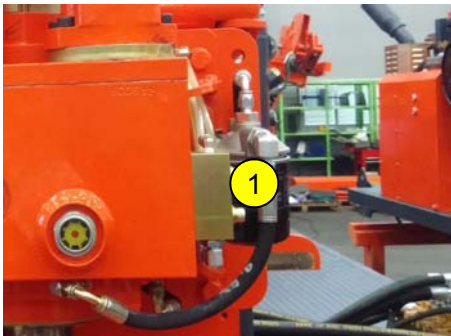
WARNING

- Do not fill beyond the maximum level.
- Ensure maximum cleanliness during the operations described above so as to prevent dirt and impurities from getting into the rotary.

REPLACING THE ROTARY OIL FILTER

WARNING

- Stop the engine and allow machine to cool down before performing maintenance.



1. Rotary oil filter

1. Using a filter wrench, turn the filter counterclockwise and remove it.
2. Clean the surface of installation of the filter stand.
3. Apply a thin layer of oil to the packing of the new filter.
4. Install the new filter by hand.
5. Tighten 3/4 more turn after the filter packing comes in contact with the surface of installation.

INSPECTING THE ROTARY CRADLE GUIDE ROLLER PLAY

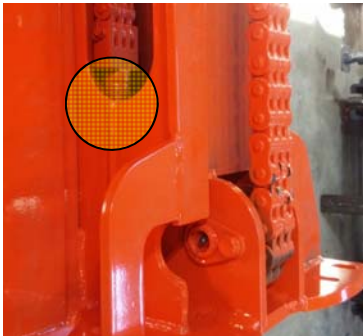
There play between the rollers and guides of the rotary cradle must not be excessive. A quick way to evaluate play is to check that the rotary is perfectly centred on the clamp unit. This check can be performed by applying a rod section and verifying any deviation against the clamp jaws.

In the case of deviation, establish the cause as follows:

1. Loosen the bearing support nuts.
2. Remove the supports and check the state of the bearings(by rolling them) and the pins.
3. Replace any damaged parts.

D-5-10. INSPECTING THE FEED CHAIN TENSION

A quick way to check for excessive slack in the rotary cradle chains is to observe the rope when fast rotary cradle advance is operated. The chains must not knock against the mast structure.



Lower tension adjuster



Upper tension adjuster

A more thorough check must be conducted as follows.

With the mast vertical double check the tensioning, once with the rotary in its high position and once in its low position. In both cases the maximum deflection must not exceed 20 mm. If it does, re-tension the chains by adjusting the tensioner nut.

D-5-11. 2/3/4 CYLINDERS COMPRESSOR (OPTION)

INSPECTING THE COMPRESSOR OIL LEVEL

1. To check the oil level in the compressor the machine must be set on level ground.
 2. Check the oil level, preferably when it is warm, through the oil level indicator.
- If necessary, Add oil up to middle of the oil level indicator through the filler cap.

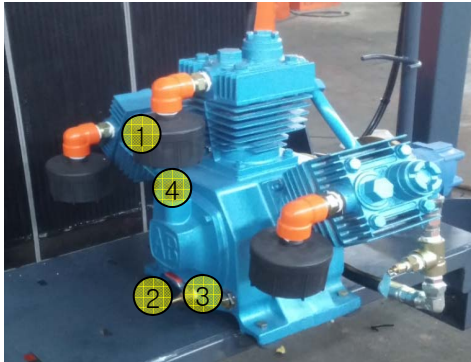
NOTE

- Do not over-fill, oil will run out of oil fill petcock when too full.

REPLACING THE COMPRESSOR OIL

WARNING

- Stop the engine and allow the machine to cool down before performing maintenance.



1. Air cleaner filter
2. Drain cock
3. Oil level indicator
4. Filler cap

1. Oil should be changed when slightly warm to prevent build up of sludge deposits.
2. To change the oil in the compressor the machine must be set on level ground.
3. Place a pan for catching the spent oil under drain plug.
4. To facilitate oil drainage, unscrew the filler cap.
5. Connect the hose of a suitable size to drain cock.
6. Remove drain cock and drain the oil.

WARNING

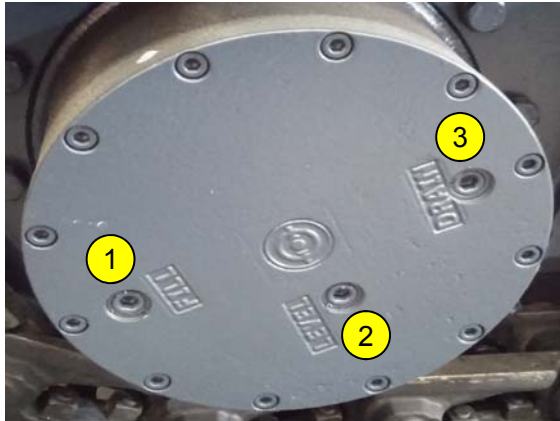
- Follow environmental regulations when changing and disposing of lubricants.

7. Close the drain cock when the oil is completely drained.
8. Supply oil through the filler cap.
9. Tighten filler cap.

D-5-12. REPLACING THE TRAMMING REDUCTION GEAR OIL

⚠ WARNING

- Stop the engine and allow the machine to cool down before performing maintenance.
- The tramming reduction gear are hot directly after the engine is stopped. Touching them will cause burns.
- The gear oil is also hot and under high pressure. Be careful when loosening plugs. Working on the machine under these conditions could result in burns or injuries.
- The pressure in the tramming reduction gear case may cause oil or the plug to fly out. Loosen the plug slowly to release the pressure.



1. *Filler plug*
2. *Level plug*
3. *Drain plug*

1. Oil should be changed when slightly warm to prevent build up of sludge deposits.
2. Set the tramming reduction gear so that drain plug is at the very bottom.
3. Place a pan for catching the spent oil under drain plug.
4. Remove filler plug, level plug and drain plug.
5. Drain the oil.

⚠ WARNING

- Follow environmental regulations when changing and disposing of lubricants.

6. Insure that the plugs are cleaned to remove debris.
7. Wrap new sealing tape around the plugs.
8. Tighten drain plug.
9. Supply oil through the hole for filler plug until oil flows out of the hole for level plug.
10. Tighten filler plug and level plug.

D-5-13. CLEANING THE CLAMP UNIT

Remove accumulated dirt and grease using compressed air or pressurized water.

D-5-14. INSPECTING THE SWIVEL ROTATION

Check that the swivel connecting the main rope to the drilling rods rotates without excessive force.

Proceed as follows:

1. Rotate the swivel manually. If manual rotation is possible, the swivel is in good condition.
2. In any case grease the swivel's bearings through the grease nipple.

D-5-15. HANJIN WATER PUMP (OPTION)

The spare parts of mud pump are needed regular maintenance and changed the wearing parts.

- Shaft : Lubricate with grease.(Automatic grease lubricator)
- Each seal : changing each 3~6 months.
- Everyday check the water leaks.
- In order to prevent from freeze in winter, please open drain valve & drain inside water.

D-5-16. FMC WATER PUMP (OPTION)

INSPECTING THE WATER PUMP (FMC) OIL LEVEL

1. To check the oil level in the water pump(FMC) the machine must be set on level ground.
2. Check oil level in crankcase by opening the petcock on the end of the pump.
(with pump stopped, oil level with petcock opening indicates proper oil level.)

NOTE

- Do not over-fill, oil will run out of oil fill petcock when too full.

REPLACING THE MUD PUMP (FMC) OIL

WARNING

- Stop the engine and allow the machine to cool down before performing maintenance.



1. Filler cap
2. Petcock
3. Drain plug

1. Oil should be changed when slightly warm to prevent build up of sludge deposits.
2. To change the oil in the water pump(FMC) the machine must be set on level ground.
3. Place a pan for catching the spent oil under drain plug.
4. To facilitate oil drainage, unscrew the filler cap.
5. Remove drain plug and drain the oil.

WARNING

- Follow environmental regulations when changing and disposing of lubricants.

6. Insure that the drain plugs are cleaned to remove debris.
7. Wrap new sealing tape around the plugs.
8. Tighten drain plug.
9. Supply oil through the filler cap.
10. Tighten filler cap.

D-5-17. WATER INJECTION (OPTION)

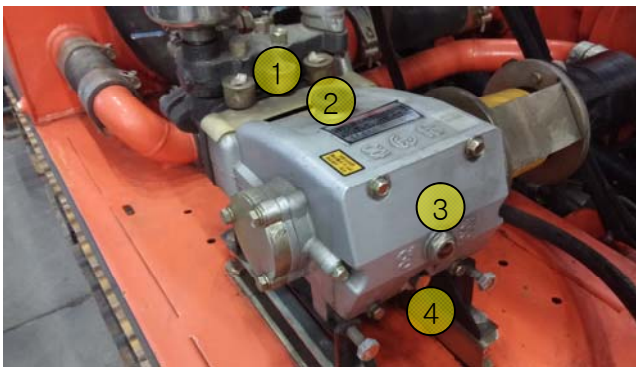
INSPECTING THE WATER INJECTION OIL LEVEL

1. To check the oil level in the water injection the machine must be set on level ground.
 2. Check the oil level, preferably when it is warm, through the oil level indicator.
- If necessary, Add oil up to middle of the oil level indicator through the filler cap.

REPLACING THE WATER INJECTION OIL

WARNING

- Stop the engine and allow the machine to cool down before performing maintenance.



1. Grease cup
2. Filler cap
3. Oil level indicator
4. Drain plug

1. Oil should be changed when slightly warm to prevent build up of sludge deposits.
2. To change the oil in the water injection the machine must be set on level ground.
3. Place a pan for catching the spent oil under drain plug.
4. To facilitate oil drainage, unscrew the filler cap.
5. Remove drain plug and drain the oil.

WARNING

- Follow environmental regulations when changing and disposing of lubricants.

6. Insure that the drain plugs are cleaned to remove debris.
7. Wrap new sealing tape around the plugs.
8. Tighten drain plug.
9. Supply oil up to middle of the oil level indicator through the filler cap.
10. Tighten filler cap.

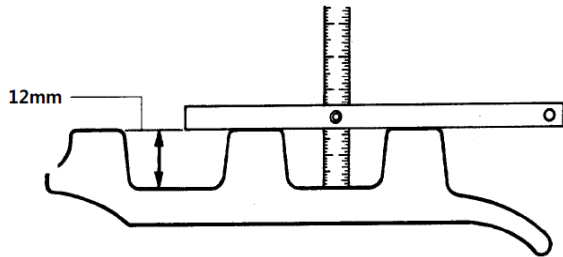
GREASING THE WATER INJECTION

Turn the grease cup for two or three times before driving and at an interval of 3~4hours a day. Supplement the grease to the grease cup as required. High-quality grease should be used.

D-5-18. INSPECTING THE CRAWLERS

STEEL CRAWLER

1. Check that the shoes are not bent or broken. Immediately replace the shoes if defects are found.

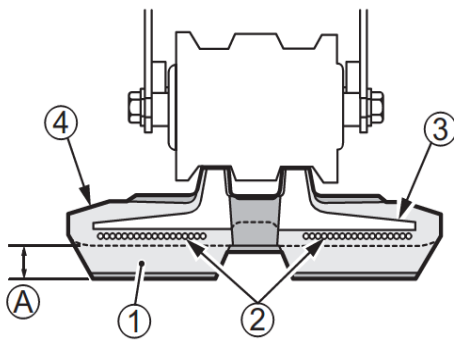


2. The shoes must be replaced when the wear is 12mm.

RUBBER CRAWLER

Replace the crawler if the entire crawler is stretched and cannot be adjusted.

1. Lug



Replace if the height of (A) is 5mm or below.

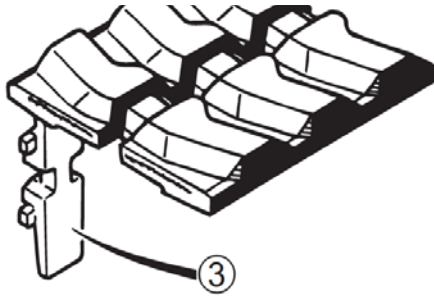
2. Steel cord



Replace if the steel cord is exposed over 2 or more links.
Replace if half or more of the steel cords on one side are cut.

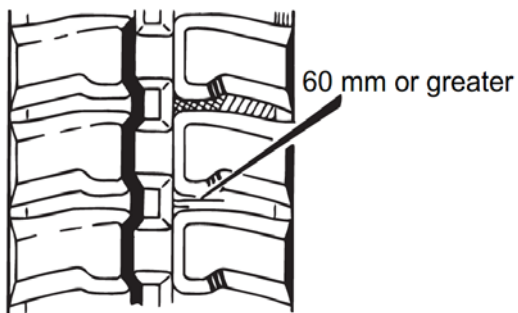
3. Metal core





Replace if even one metal core is off.

4. Rubber



Replace if there are cracks of 60mm or greater in length.

If the steel cord is visible, repair as soon as possible, regardless of the length of the crack.

Repair or replace the rubber crawlers if their conditions are as described above.

D-5-19. INSPECTING AND ADJUSTING THE CRAWLER TENSION

⚠ WARNING

- If you must work beneath the raised machine or equipment, always use wood blocks, jack-stands or other rigid and stable supports. Never get under the machine or working equipment if they are not sufficiently supported. This procedure is especially important when working on hydraulic cylinders.
- The track adjuster contains highly pressurized grease. If the tension is adjusted without following the prescribed procedure, the grease discharge valve may fly off, resulting in injury.
 - Do not loosen the grease nipple.
 - Loosen the grease discharge valve slowly.
 - Do not put your face, arms, legs or body in front of the grease discharge valve.
 - If no grease is expelled when grease discharge valve is loosened, there is a problem. Contact your service outlet for repairs. DO NOT disassemble, as this is very dangerous.

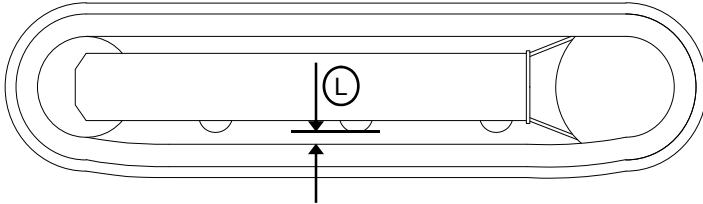
INSPECTION THE RUBBER TRACK TENSION

Stop the machine on a flat and solid surface. Lift it in safe conditions and put stable supports

under the undercarriage frame to properly support it. Measure distance L at the central roller of the undercarriage from the bottom of the roller to the rigid inside surface of the rubber track.

Track tension is normal if dimension L is between 10 and 15mm.

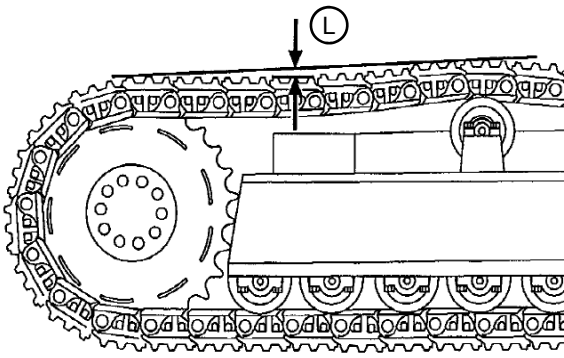
Adjust tension as described in D-5-19 "Adjustment" if track tension does not comply with these dimensions (loose or too tight).



Proper dimension "L" : 10~15mm

INSPECTION THE STEEL TRACK TENSION

Stop the machine on solid and level terrain. Check that there is a 20mm deflection on the top part of the track in the longest section of unsupported track.

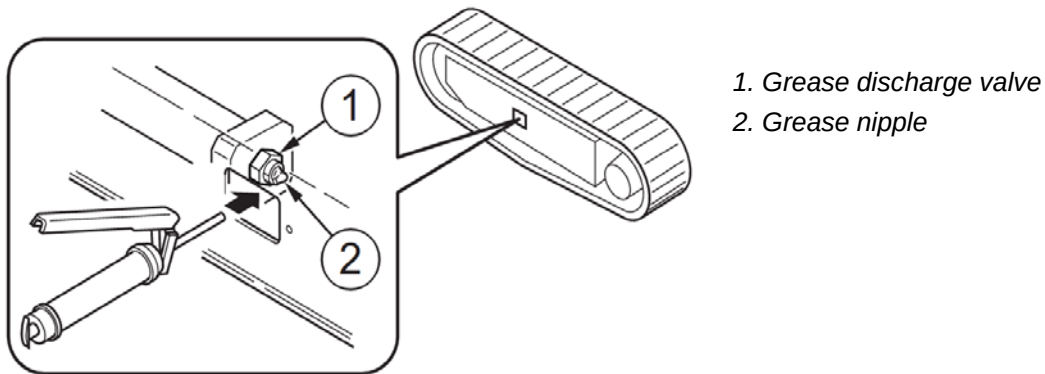


Proper dimension "L" : 20mm

If track tension is not within the above-specified dimensions then follow the procedures described in D-5-19 "Adjustment" to tighten or loosen tension.

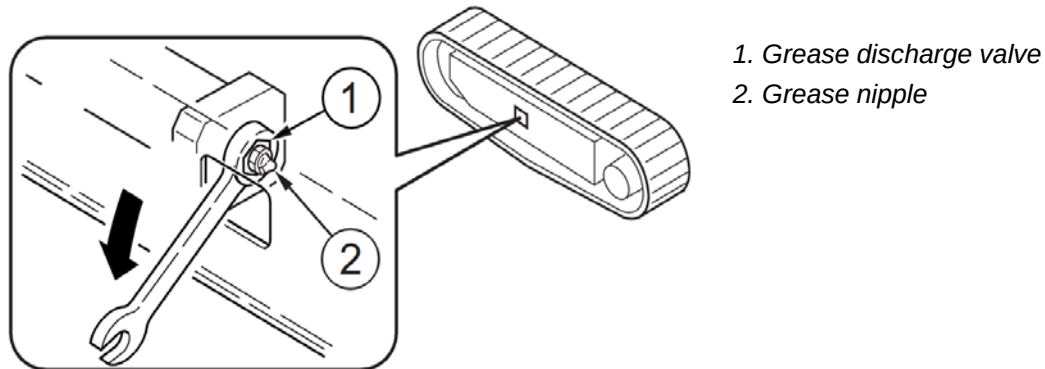
ADJUSTMENT

Increasing the tension



1. Using the grease gun, insert grease through the grease nipple in the grease discharge valve.
2. Inspect the crawler tension.

Decreasing the tension



1. Using the Spanner, slowly loosen the grease discharge valve and drain the grease.
If the grease does not drain easily, move the machine forward or backward.
2. Tighten the grease discharge valve
 - Tightening torque : 180N·m

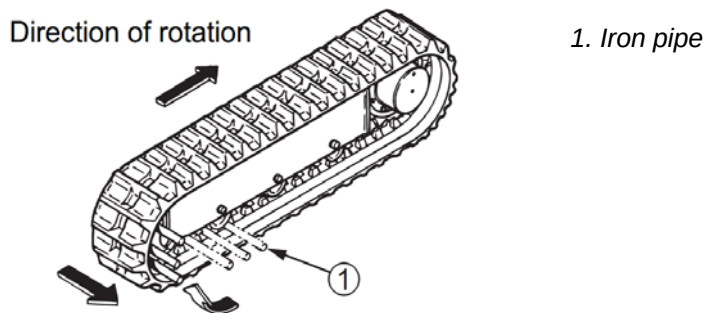
D-5-20. REPLACING THE RUBBER CRAWLERS

⚠ WARNING

- If you must work beneath the raised machine or equipment, always use wood blocks, jack-stands or other rigid and stable supports. Never get under the machine or working equipment if they are not sufficiently supported. This procedure is especially important when working on hydraulic cylinders.
- If maintenance must be performed with the engine running, always work as a two-person team
 - When performing maintenance, be sure to keep your body and clothing away from moving parts.

REMOVAL

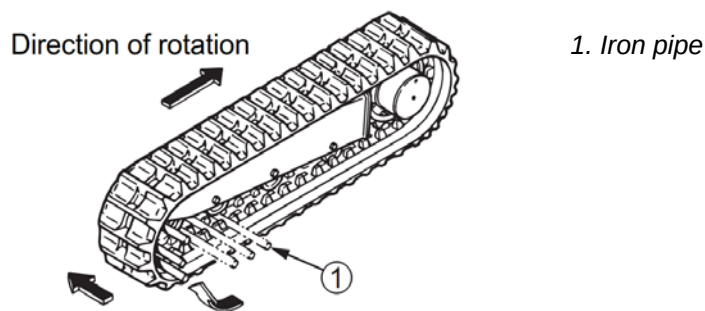
1. Fully release the tension of the rubber crawler.
Refer to D-5-19 "Inspecting and adjusting the crawler tension".
2. Use the jack to lift the body.



3. Set an iron pipe in the rubber crawler and turn the sprocket slowly in the reverse direction.
4. Turn until the iron pipe is directly next to the idler and the rubber crawler lifts away from the idler, then stop turning the sprocket.
5. Slide the rubber crawler sideways and remove it from the crawler frame.
Remove the other rubber crawler using the same procedure.

INSTALLATION

1. Use the jack to lift the body.



2. Set the rubber crawler on the sprocket.
3. Set an iron pipe in the rubber crawler and turn the sprocket slowly in the reverse direction.
4. Turn until the iron pipe is directly next to the idler and the rubber crawler lifts away from the

idler, then stop turning the sprocket.

5. Slide the rubber crawler inward, engage it on the idler, then pull out the iron pipe.
6. Check that the rubber crawler is securely engaged on the sprocket and idler.
7. Tighten the rubber crawler to the standard tension.

Refer to D-5-19 "Inspecting and adjusting the crawler tension".

8. Install the other rubber crawler using the same procedure.

D-5-21. WIRE ROPE

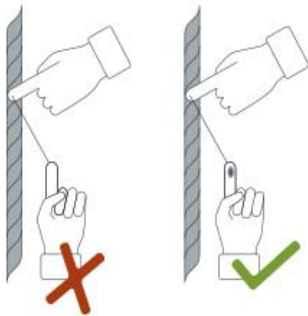
LUBRICATING WIRE ROPES

Wire ropes are initially lubricated during manufacturing. This lubrication protects the rope from corrosion during transportation and storage and reduces friction and wear during its initial use. However, the initial lubricant does not last. Relubrication is required because the lubricant works out of the rope or dries out after a certain period of use.

If you relubricate in time, you can increase the service life of the wire rope.

When is lubrication needed?

If there are no traces of lubricant left on your fingers when you touch the rope, you need to relubricate.

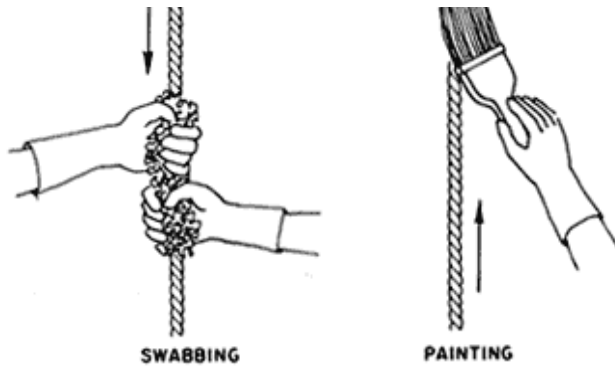


Principles for relubrication

You should relubricate your wire ropes often, but sparingly. The lubricant has to be evenly distributed on the complete rope surface. The relubrication should be only done on clean rope (humidity, dust, etc.).

Techniques for relubrication





CRITERIA FOR SUBSTITUTING WIRE ROPE

The operational safety of a wire rope is guaranteed by the proper evaluation of the following :

- Nature and number of wires near terminal ends
- Breakage of metal wires near terminal ends
- Localized grouping of thread breakage
- Increased rhythm of wires broken
- Strand breakage
- Reduction of wire rope diameter
- Reduction in elasticity
- External and internal wear and tear
- External and internal corrosion
- Deformation
- Deterioration due to heat or voltaic arc
- Increased rhythm of permanent stretching.

⚠ WARNING

Normally wire rope deterioration is due to a combination of more than one factor. It is essential that the examination of wear and tear is carried out by experts. Do not hesitate to contact expert personnel in the event of serious doubts!

⚠ WARNING

- During the checking, lubrication and replacement of cable ropes always wear protective gloves.

D-5-22. AUTOMATIC STOP FOR OVERWINDING (above D&B-16D/W)

INSPECTING THE BATTERY

Check the status of battery lamp in the receiver.

(The receiver is located on the side of the sub operation panel.)

REPLACING THE BATTERY

- (1) Turn OFF power to the machine (Turn OFF the starter switch.).
- (2) Remove the four screws of the transmitter and then remove the cover.
- (3) Replace old batteries in the battery holder with new ones.
- (4) Tighten up the battery cover securely.

Battery to be employed

a size AA battery : 2 pieces

Use alkaline-type battery. (Manganese-type battery has a short service life.)

FUNCTIONAL CHECK OF OVERWINDING PROOF DEVICE

If the downhaul weight comes close to the boom top and it hits against the weight for overwinding proof device, functions of winding-up hook and extending submast stop automatically.

When the automatic stop is activated, lower the downhaul weight and retract the submast until the downhaul weight detaches from the weight for overwinding proof device.

This allows the activated automatic stop to return to be normal.

CAUTION

Since viscosity of hydraulic oil increases during cold winter or in low temperature environment, when "winding-up downhaul weight" or "extending submast" is operated in high-speed, the crane may not be stopped immediately but with some delay even if the downhaul weight hits against the weight for overwinding proof device which is not a disorder. Operate the crane after temperature of hydraulic oil rises to a sufficient level by carrying out warming-up or operate it with a low speed while paying attention that the downhaul weight may not hit against the weight.

D-5-23. LUBRICATION

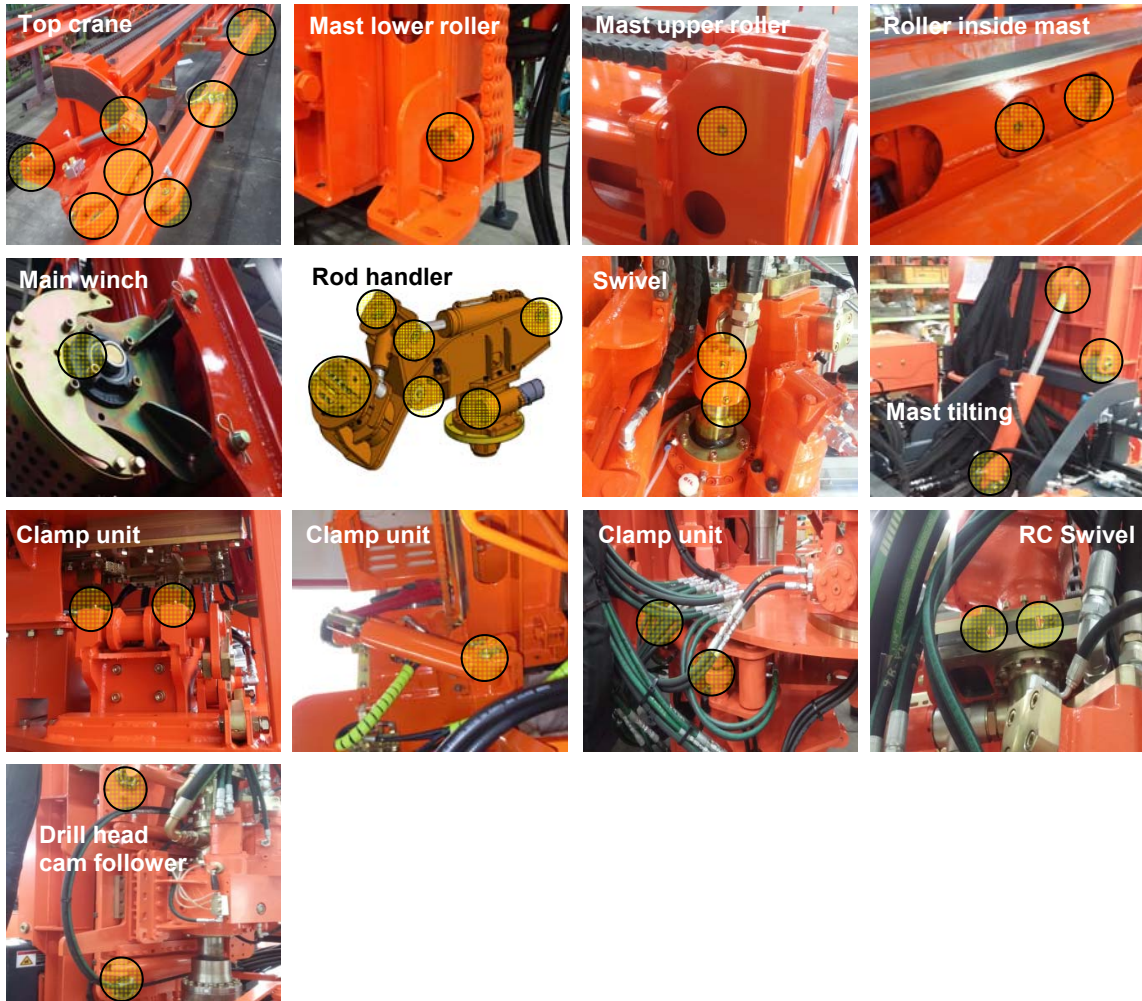
LUBRICATING THE WORKING EQUIPMENT

SECTION D LUBRICATION AND MAINTENANCE

1. Stop the engine.
2. Use the grease gun to lubricate the working equipment.
3. Wipe off the expelled grease.

⊕ IMPORTANT

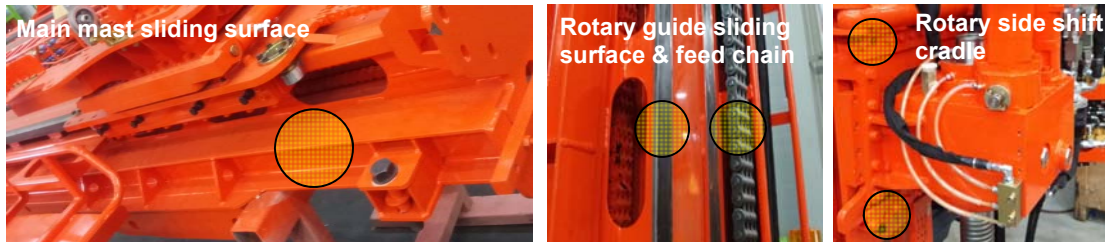
- Should the grease nipples be blocked or damaged in any way, they must be replaced.



LUBRICATING THE SLIDING SURFACE AND CHAIN

1. Stop the engine.
2. Use the soft brush or grease gun to lubricate the sliding surface and chain.

3. Wipe clean and lubricate with recommended grease.

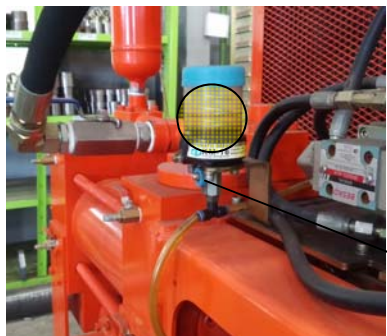


LUBRICATING THE WATER INJECTION (OPTION) PLUNGER

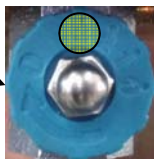


1. Stop the engine.
2. Supplement the grease to the grease cup
3. Turn the grease cup for two or three times before driving and at an interval of 3~4hours a day.

LUBRICATING THE HANJIN MUD PUMP (OPTION) SHAFT



1. Stop the engine.
2. Supply the grease to the grease cup as much as you need.
3. Set the controller to "3" position.
4. Grease is automatically injected.



D-6. LONG-TERM STORAGE

PROCEDURES FOR STORAGE

If the machine is to be stored for 30 days or more, store it indoors. If it must be stored outdoors, stop it on a flat surface and place a waterproof cover over it so that it stays dry.

1. Clean the machine.
2. Inspect for oil leakage, water leakage and loose nuts and bolts.
3. Add fuel and replace the hydraulic oil and oil.
4. To prevent rusting and freezing, replace the engine coolant with long-life coolant (LLC).
5. Use the grease gun to supply grease to the grease nipples.
6. Fully contract the tilting cylinders and other mast cylinders.
7. Apply rust-prevention oil to the hydraulic cylinder rods.
8. Disconnect the cable from the battery's "-" terminal and cover the battery to prevent freezing.

DURING STORAGE

WARNING

- Do not operate the engine in an enclosed area without adequate ventilation.
- If natural ventilation is poor, install ventilators, fans, exhaust extension pipes or other artificial venting devices.

1. To prevent rusting, operate the machine once a month so that the oil is fully circulated.
2. Inspect the battery and recharge it if necessary.

STARTING THE MACHINE AFTER STORAGE

IMPORTANT

- If the "Procedures for storage" have not been performed and the machine has been stored for a long period of time, consult your dealer before reusing the machine.

1. Wipe off the rust-prevention oil that was applied to the hydraulic oil cylinders' piston rods.
2. Add fuel, oil and grease to all parts.

CORROSION-INHIBITING PRODUCTS

To treat the machined surfaces of metal mechanical parts which would otherwise be subject to aging and corrosion, we recommend you use CHESTERTON HEAVY DUTY RUST GUARD or other products with equivalent characteristics that leave a thin and long-lasting protective film on the surfaces treated.

The use of these products is essential in order to preserve spare parts and dismantled mechanical parts when the drilling rig is in storage.

WARNING

- Do not use these products on rubber components!

SECTION E

TROUBLESHOOTING



DO NOT OPERATE THE MACHINE BEFORE READING
AND UNDERSTANDING THE INSTRUCTIONS OF THIS MANUAL

HANJIN D&B CO., LTD.

E-1. IF THE ENGINE OVERHEATS

WARNING

- Do not open the engine hood when there is steam coming from the engine room.
The steam or hot water may spurt out, resulting in burns.
- Do not remove the radiator cap or drain plugs when the coolant is hot.
Stop the engine, let the engine and radiator cool and loosen the radiator cap or drain plugs slowly.
- Stop the engine and allow the machine to cool down before performing inspection and maintenance.

The following symptoms indicate overheating :

- The coolant temperature gauge is in the red zone.
- The engine slows down and the force decreases.
- Steam comes from the engine room.

PROCEDURE

1. Park the machine in a safe place.
2. With the engine hood closed, inspect whether steam is coming from the engine room.
3. If there is steam, stop the engine immediately and contact a HANJIN D&B customer service for repairs. If there is no steam, run the engine at low idle and let the coolant temperature decrease.
4. Once the coolant temperature gauge drops to the green zone, stop the engine.
5. Once the engine is cool, perform the following inspections and procedures :
 - Fan belt slack Adjust.
 - Coolant level Add.
 - Coolant leakage Repair.
 - Radiator fins Clean.
 - Sediment in cooling system Clean.

If the problem persists after the above procedures are taken, contact a HANJIN D&B customer service for repairs.

E-2. IF THE BATTERY GOES DEAD

The following symptoms indicate that the battery is dead :

- The starter motor does not turn or turns weakly, and the engine does not start.

E-2-1. PROCEDURE

Use jumper cables and start the engine using the rescue vehicle's battery.

WARNING

- Use jumper cables only in the recommended manner. Improper use of jumper cables can result in battery explosion or unexpected machine motion.
 - Do not let the problem vehicle and rescue vehicle touch each other.
 - Do not let the "+" and "-" clips of the jumper cables touch each other.
 - Connect the jumper cables to the "+" terminals first, and disconnect them from the "-" terminals (ground) first.
 - Connect the final clip of the jumper cable to a point as far away from the battery as possible.
- Use jumper cables only in the recommended manner. Improper use of jumper cables can result in battery explosion
- Use safety glasses when using jumper cables to start the machine

IMPORTANT

Use jumper cables and clips of a size suited to the battery's capacity. Do not use damaged or corroded jumper cables and clips.

IMPORTANT

The rescue vehicle's battery must have the same capacity as the problem vehicle's battery.

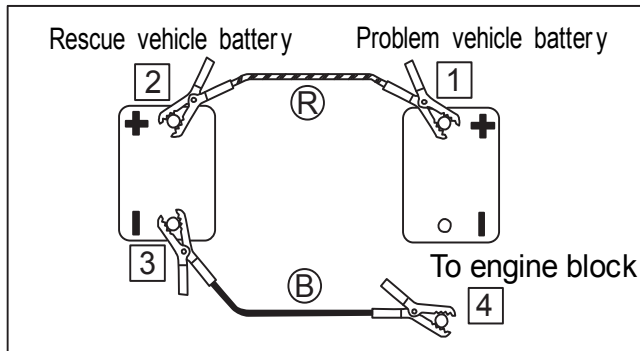
IMPORTANT

Connect the clips securely.

E-2-2. CONNECTING THE JUMPER CABLES

⚠ IMPORTANT

Set the starter keys of both the rescue vehicle and problem vehicle to the OFF position.



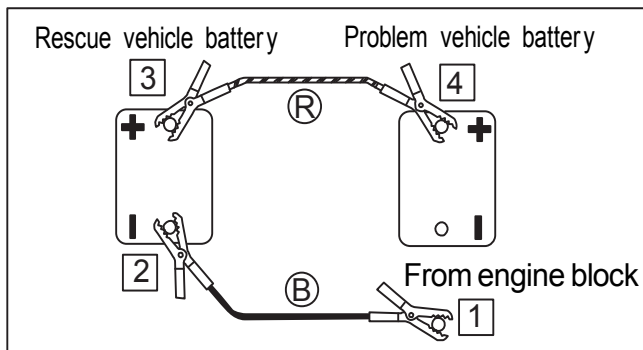
1. Connect the clip of jumper cable (R) to the problem vehicle's "+" terminal.
2. Connect the other clip of jumper cable (R) to the rescue vehicle's "+" terminal.
3. Connect the clip of jumper cable (B) to the rescue vehicle's "-" terminal.
4. Connect the other clip of jumper cable (B) to the problem vehicle's engine block.
Connect the clip as far from the battery as possible.

E-2-3. STARTING THE ENGINE

1. Check that the clips are securely connected to the terminals.
2. Start the rescue vehicle's engine and run it at high speed.
3. Start the problem vehicle's engine.

E-2-4. DISCONNECTING THE JUMPER CABLES

Once the engine starts, disconnect the jumper cables following the connection procedure in reverse order.



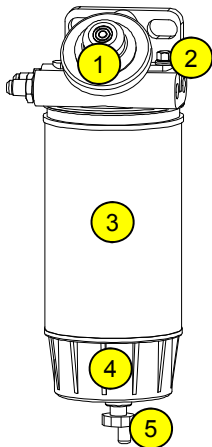
1. Disconnect the clip of jumper cable (B) from the problem vehicle's engine block.
2. Disconnect the other clip of jumper cable (B) from the rescue vehicle's "-" terminal.
3. Disconnect the clip of jumper cable (R) from the rescue vehicle's "+" terminal.
4. Disconnect the other clip of jumper cable (R) from the problem vehicle's "+" terminal.

E-3. AFTER THE FUEL RUNS OUT

BLEEDING THE AIR FROM THE FUEL SYSTEM

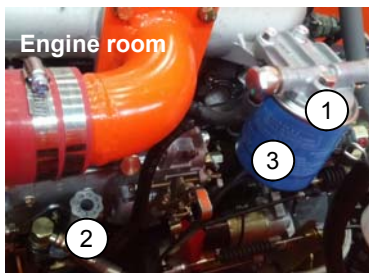
If the priming pump is mounted on the water separator filter :

1. Add fuel.
2. Loosen air plug.
3. Depress the manual pump until air is completely evacuated.
4. Tighten air plug securely.
5. Start the engine and inspect for fuel leakage.



1. Manual pump
2. Air vent plug
3. Water separator filter
4. Bowl
5. Drain plug

If there is no priming pump on the water separator filter :



1. Air plug
2. Manual pump
3. Fuel filter

1. Add fuel.
2. Loosen air plug.
3. Rotate the knob of manual pump to the knob stick out.
4. Depress the manual pump until air is completely evacuated.
5. Tighten air plug securely.
6. Start the engine and inspect for fuel leakage.

Supplement : Air in the fuel system can make it difficult to start the engine and cause engine problems.

Also bleed the air when the fuel tank is emptied or air in the fuel system.

E-4. IF THE GAUGE IS IN THE RED ZONE

If the gauge is not in the proper range during operation, park the machine in a safe place and perform the procedures described below.

Gauge	State	Procedure
Battery voltage	Red zone * Proper range : - One battery : 13V~15V - Two battery : 25V~28V	There is a problem with the fan belt or charger. Inspect the fan belt for slack or breakage and adjust as necessary. If the lamp continues flashing or lights after maintenance, there is a problem with the charger. Consult a HANJIN D&B customer service. Refer to section D "INSPECTING AND ADJUSTING THE FAN BELT"
Coolant temperature	Red zone	The coolant temperature has risen irregularly and the engine is overheating. Refer to section E "IF THE ENGINE OVERHEATS".
Engine oil pressure	Red zone	Inspect the engine oil level. If the level is low, add new oil. If the engine oil pressure gauge is in the red zone even though the level is normal, consult a HANJIN D&B customer service. Refer to section D "ENGINE OIL"

E-5. OTHER SYMPTOMS

For symptoms not included on the table below or if the problem persists after the proper procedures have been taken, consult a HANJIN D&B customer service.

Symptom	Main cause	Procedure
Engine does not start or difficult to start	Battery bad or low battery Starter damaged Poor connection/short circuit Operation of the emergency stop switch See engine manual for other malfunction	Change / charge battery Replace Repair Release the emergency stop switch
Starter motor turns but engine does not start	Insufficient fuel Air in fuel system Water in fuel system	Add fuel. Bleed the air Drain the water
Engine exhaust is white or bluish	Excessive engine oil Insufficient fuel	Adjust to the prescribed level Add the fuel
Engine exhaust is occasionally black	Air cleaner is clogged	Replace the air cleaner
Irregular noise is produced from the engine (combustion or mechanical noise)	Low quality fuel is being used Engine is overheating Damage in muffler	Replace the fuel Refer to "IF THE ENGINE OVERHEATS" Replace the muffler (Request at a sales)
Hydraulic oil temperature is too high	Insufficient hydraulic oil	Replenish to the prescribed level
Pull up force is insufficient	Insufficient hydraulic oil level Hydraulic oil is not heated Air cleaner is clogged Hydraulic oil is not of suitable type	Replenish to the prescribed level Perform the warm-up procedure Replace the air cleaner Replace the hydraulic oil
Traveling is not possible or not smooth	Stones or foreign objects are stuck Insufficient pressure	Remove the foreign object Check the hydraulic pump pressure
Machine does not travel straight forward	Stones or foreign objects are stuck Faulty crawler tension adjustment	Remove the foreign object Adjust the crawler to the prescribed tension
Travel speed cannot be changed	Fuse is blown Catridge solenoid valve	Replace the fuse Clean or replace
Crawlers slip off	Crawlers are too loose	Adjust the crawlers tension

SECTION E TROUBLESHOOTING

Symptom	Main cause	Procedure
Abnormal sound in rotary head	Bad lubricant	Replace the lubricant
	Low lubricant	Replenish to the prescribed level
	Gear damage, worn out	Replace the gear
	Bearing worn out	Replace the bearing
Cylinders not working/slow	Pilot valve	Repair the pilot valve
	Cylinder seals	Replace the seals
	Cylinder piston or rod damaged	Replace the piston or rod
Sliding parts do not move smoothly	Insufficient grease on slide surface	Add grease
No swing / slow swing (Rod handler)	Hydraulic motor	Replace the motor
	Swing speed reducer	Add grease or replace the reducer
	Slewing bearing	Add grease or replace the bearing
	Slewing ring	Replace the slewing ring
	Port relief or break valve pressure set low	Adjust pressure
Lever feels "heavy" when operated	Foreign objects are stuck in control valve spool	Clean control valve
	Valve spool sticking	Replace valve housing assembly.
No signal from gauges	Gauges damaged	Repair/Replace
	Fuse blown	Replace
	Poor connection/short circuit	Repair
No flow from water pump (FMC, Water injection)	No liquid in reservoir (tank)	Insure lines are connected and fill tank
	Inlet line valve closed	Insure lines are connected and open valve
	Inlet strainer is totally clogged with debris	Clean or replace strainer
Insufficient pressure from water pump (FMC, Water injection)	Pump speed is too low	Check the power to motor
	Relief valve improperly adjusted or worn	Check relief valve and adjust setting
	Excessive leakage from pump seals	Adjust or replace packing or damaged parts
Insufficient flow from water pump (FMC, Water injection)	Pump speed is too low	Check the power to motor
	Relief valve improperly adjusted or worn	Check relief valve and adjust setting
	Worn pump valves	Inspect pump valves and repair or replace
	Excessive leakage from pump seals	Adjust or replace packing or damaged parts
	Plunger or piston worn	Replace plunger or piston

SECTION E TROUBLESHOOTING

Symptom	Main cause	Procedure
Insufficient pressure from water pump (HANJIN D&B)	Relief valve improperly adjusted or worn Excessive leakage from pump seals	Check relief valve and adjust setting Adjust or replace packing or damaged parts
Insufficient flow from water pump (HANJIN D&B)	Relief valve improperly adjusted or worn Worn pump valves Excessive leakage from pump seals	Check relief valve and adjust setting Inspect pump valves and repair or replace Adjust or replace packing or damaged parts
Winch will not pay out	The brake is not releasing Hydraulic motor is failed Relief valve improperly adjusted or worn	Check the pressure at the port of the brake valve Repair the hydraulic motor Check relief valve and adjust setting
Winch will not draw in	The brake is not releasing Hydraulic motor is failed Relief valve improperly adjusted or worn The overwinding proof sensor	Check the pressure at the port of the brake valve Repair the hydraulic motor Check relief valve and adjust setting Check the overwinding proof sensor of the crane
Overwinding proof device fails to be operated	Batteries in transmitter have been run out	Replace batteries in transmitter

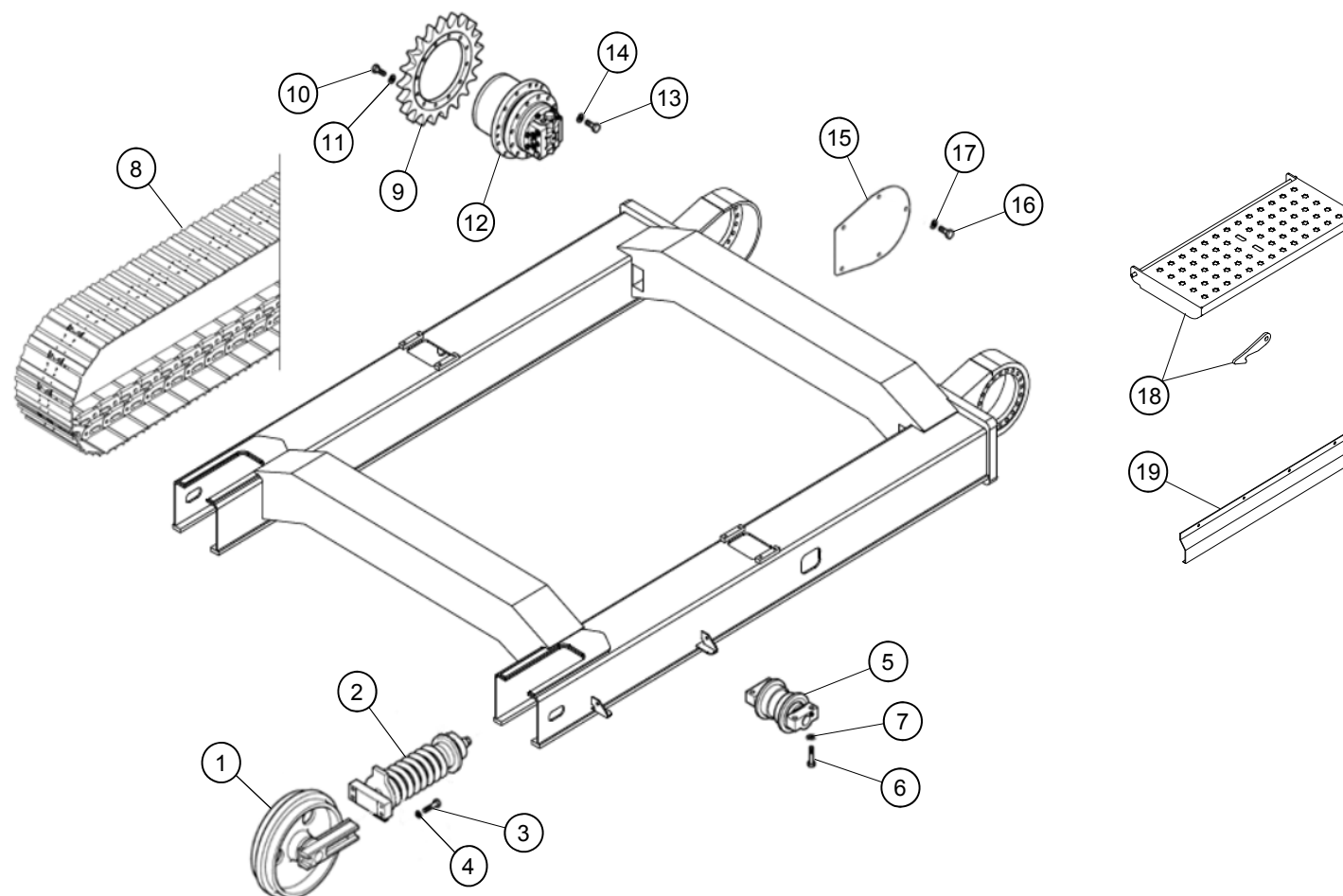
SECTION F

SPARE PARTS

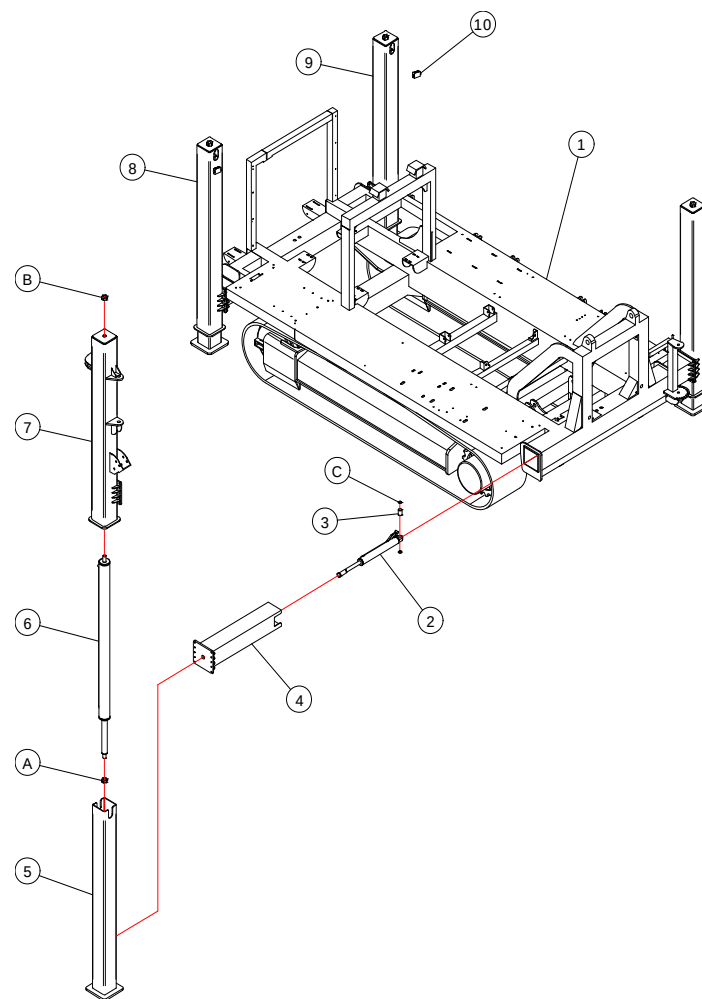


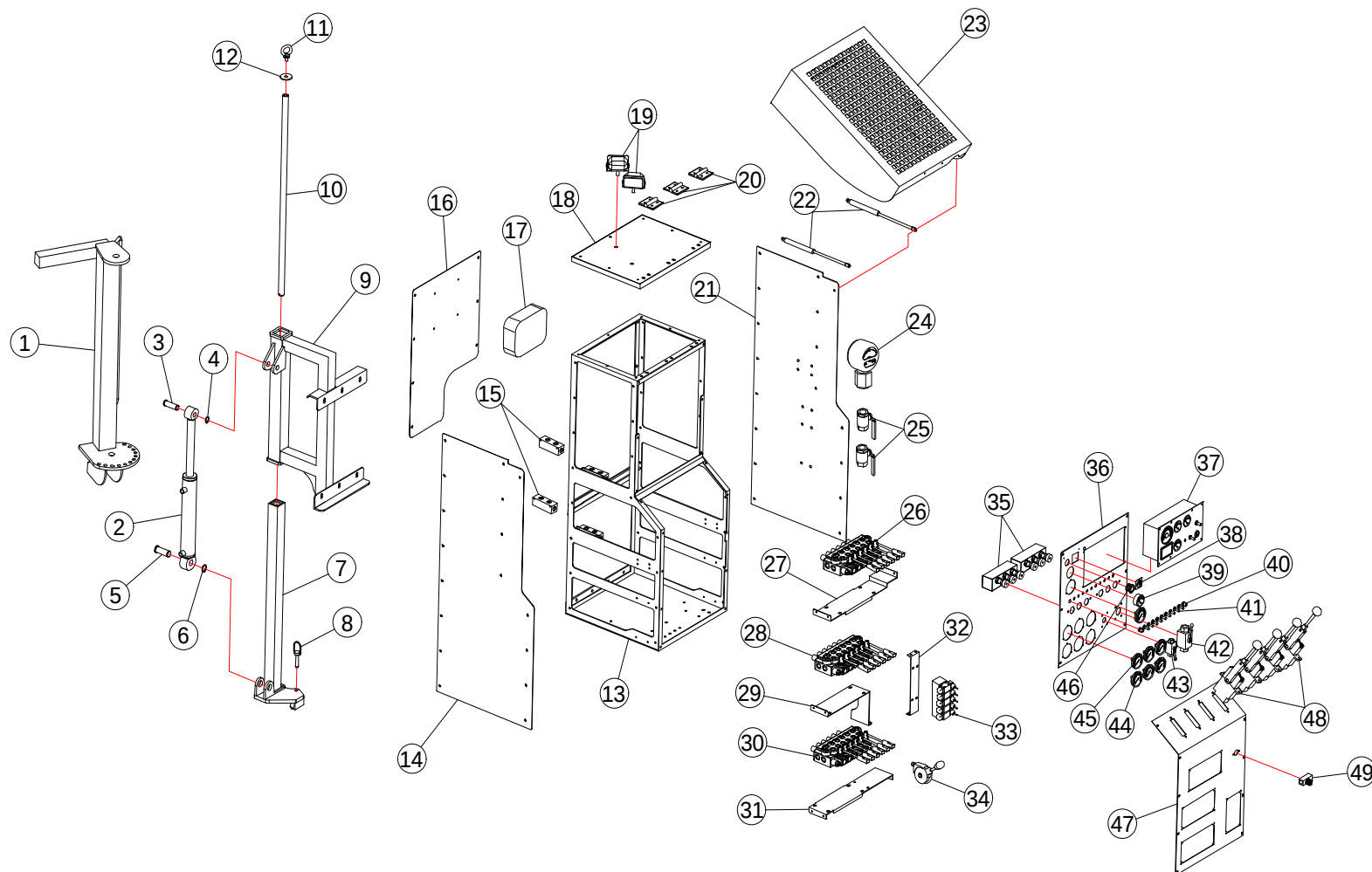
DO NOT OPERATE THE MACHINE BEFORE READING
AND UNDERSTANDING THE INSTRUCTIONS OF THIS MANUAL

HANJIN D&B CO., LTD.

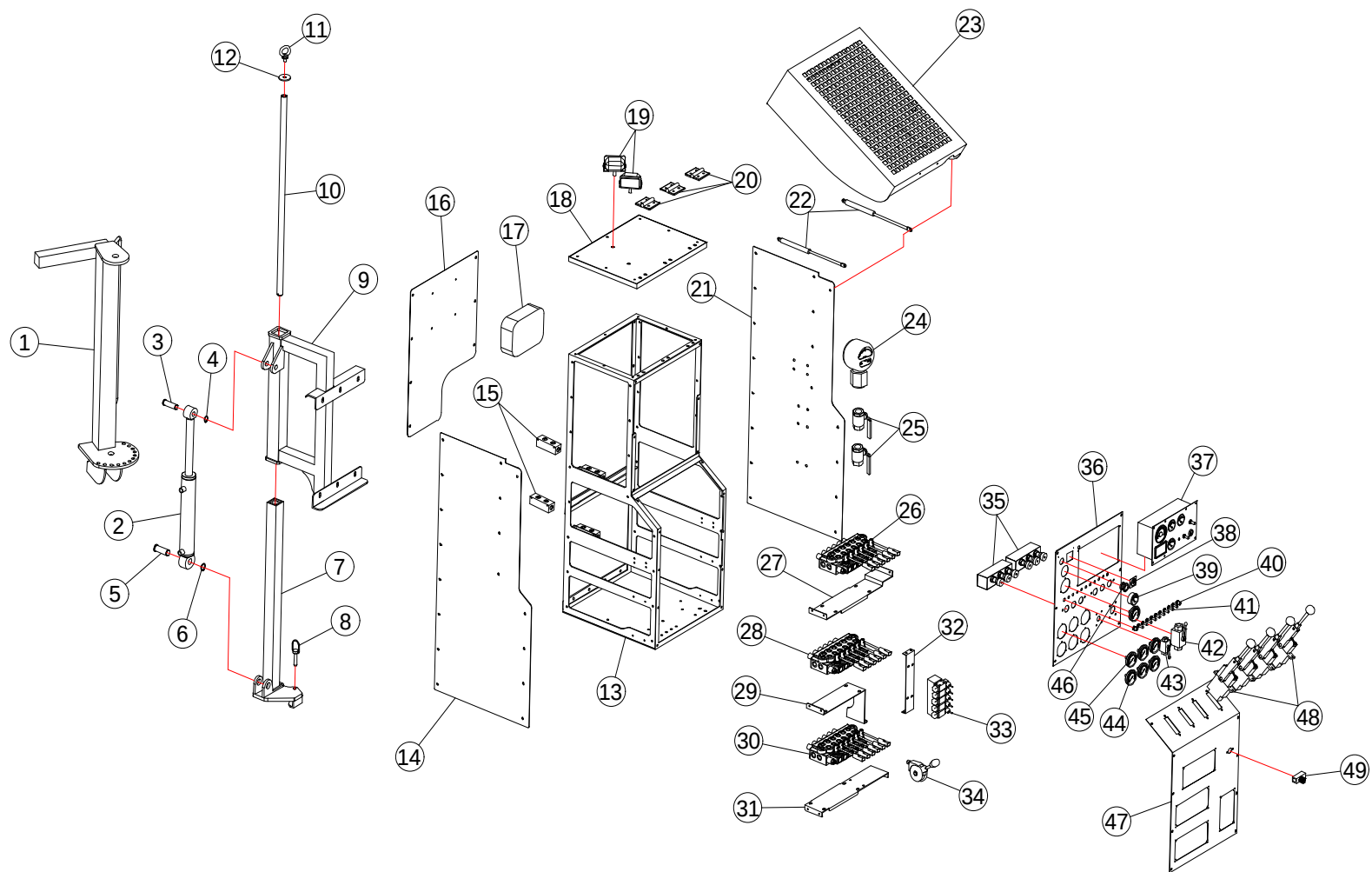


ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
1	2	HJUC75130 - 01	Idler Ass'y	아이들러 조립품	
2	2	HJUC75130 - 04	Adjust Cylinder Ass'y	텐션 조정 실린더 조립품	
3	8	HJUC75130 - 05	Bolt	볼트	
4	8	HJUC75130 - 06	Spring Wahser	스프링와셔	
5	18	HJUC75130 - 07	Roller	롤러	
6	72	HJUC75130 - 08	Bolt	볼트	
7	72	HJUC75130 - 09	Spring Wahser	스프링와셔	
8	2	HJUC75130 - 10	Track Shoe Ass'y	트랙 슈 조립품	
9	2	HJUC75130 - 11	Sprocket	스프라켓	
10	30	HJUC75130 - 12	Bolt	볼트	
11	30	HJUC75130 - 13	Spring Wahser	스프링와셔	
12	2	HJUC75130 - 14	Travel Motor	주행 모터	Solar130
13	40	HJUC75130 - 15	Bolt	볼트	
14	40	HJUC75130 - 16	Spring Wahser	스프링와셔	
15	2	HJUC75130 - 17	Motor Cover	모터커버	
16	10	HJUC75130 - 18	Bolt	볼트	
17	10	HJUC75130 - 19	Spring Wahser	스프링와셔	
18	1	HJUC75130 - 20	Foot Plate Ass'y	발판 조립품	
19	1	HJUC75130 - 21	Safety Guide	안전 가이드	

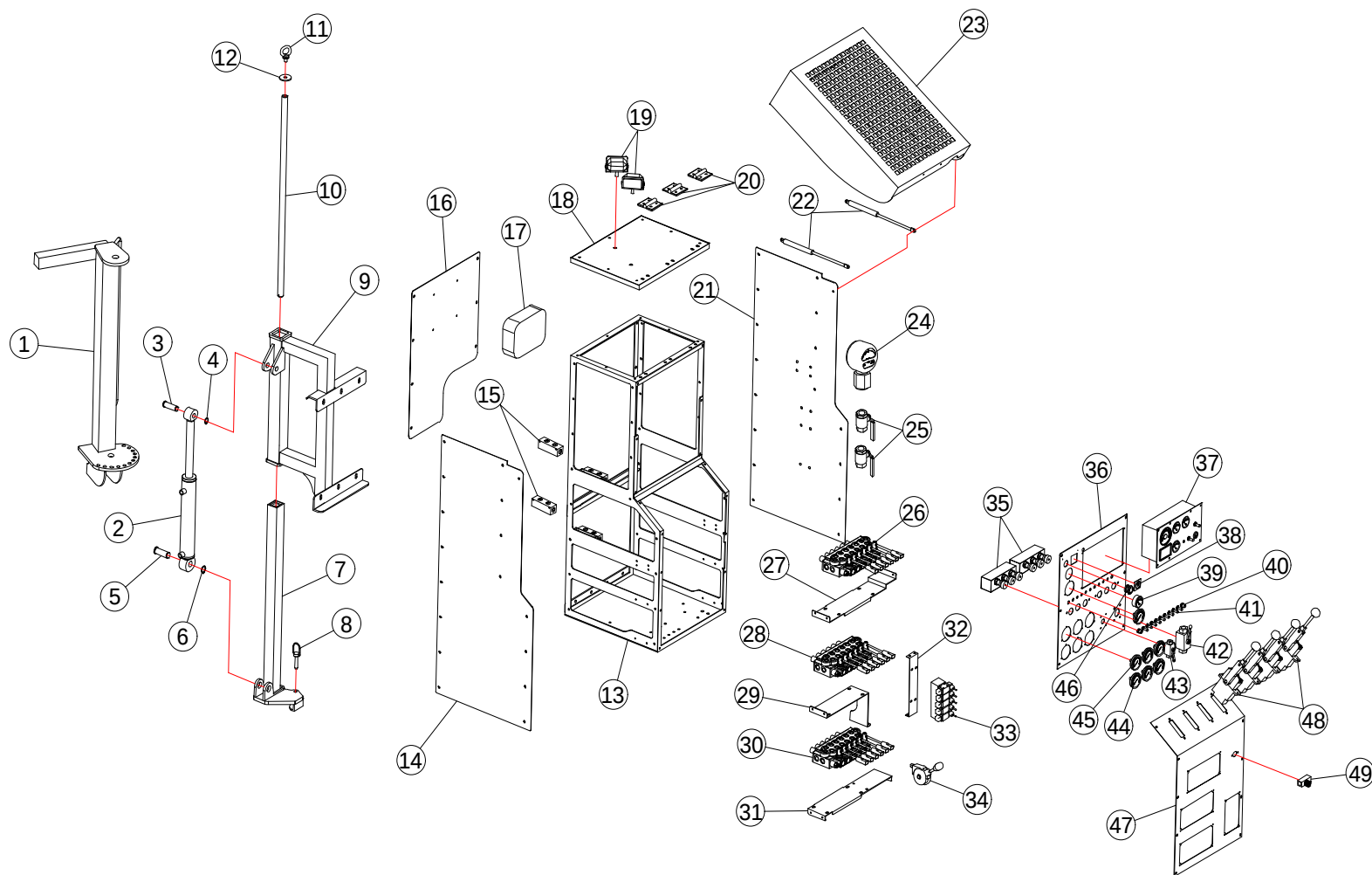


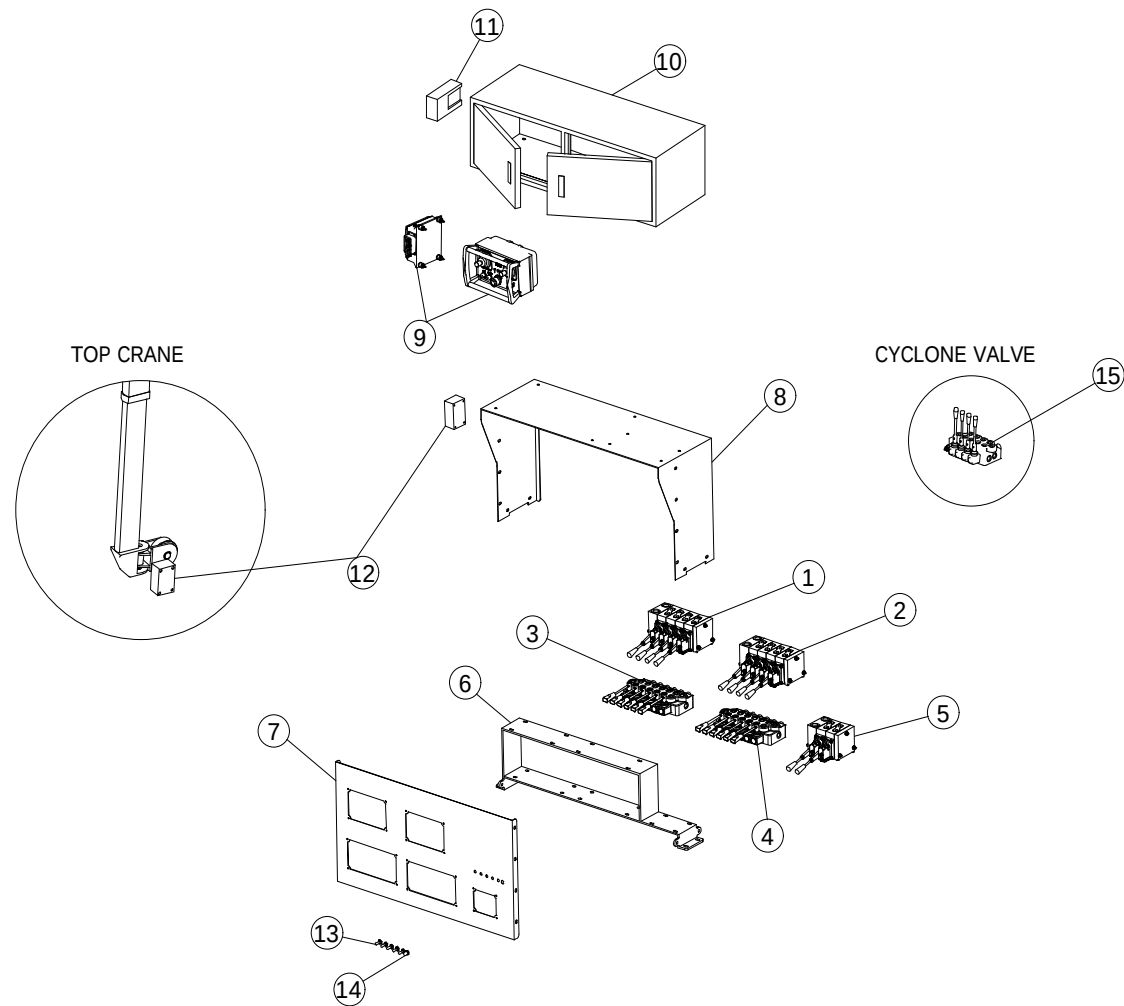


ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
1	1	HJOP35D01 - 01	Fix Frame	고정 프레임	
2	1	HJOP35D01 - 02	Panel Up/Down Cylinder	판넬 업/다운 실린더	A71D230
3	1	HJOP35D01 - 03	Pin	핀	Ø20 x 68L
4	1	HJOP35D01 - 04	Snap Ring	스냅링	S20
5	1	HJOP35D01 - 05	Pin	핀	Ø25 x 70L
6	1	HJOP35D01 - 06	Snap Ring	스냅링	S25
7	1	HJOP35D01 - 07	Panel Turn Frame	판넬 턴 프레임	
8	1	HJOP35D01 - 08	Pin	핀	
9	1	HJOP35D01 - 09	Panel Fix Frame	판넬 고정 프레임	
10	1	HJOP35D01 - 10	Pin	핀	
11	1	HJOP35D01 - 11	Eye-Bolt	아이 볼트	
12	1	HJOP35D01 - 12	Washer	와셔	
13	1	HJOP35D01 - 13	Panel Main Frame	판넬 메인 프레임	
14	1	HJOP35D01 - 14	Side Cover (L)	옆면 커버(좌)	
15	2	HJOP35D01 - 15	Pilot P&T Block	파이럿 분배 블록	
16	1	HJOP35D01 - 16	Rear Cover	뒷 커버	
17	1	HJOP35D01 - 17	Relay Box	릴레이 박스	
18	1	HJOP35D01 - 18	Upper Cover	상부 커버	
19	2	HJOP35D01 - 19	LED Light	라이트	
20	3	HJOP35D01 - 20	Hinge	경첩	
21	1	HJOP35D01 - 21	Side Cover (R)	옆면 커버(우)	
22	2	HJOP35D01 - 22	Shock Absorber	충격흡수장치	
23	1	HJOP35D01 - 23	Panel Protection Cover	판넬 보호커버	

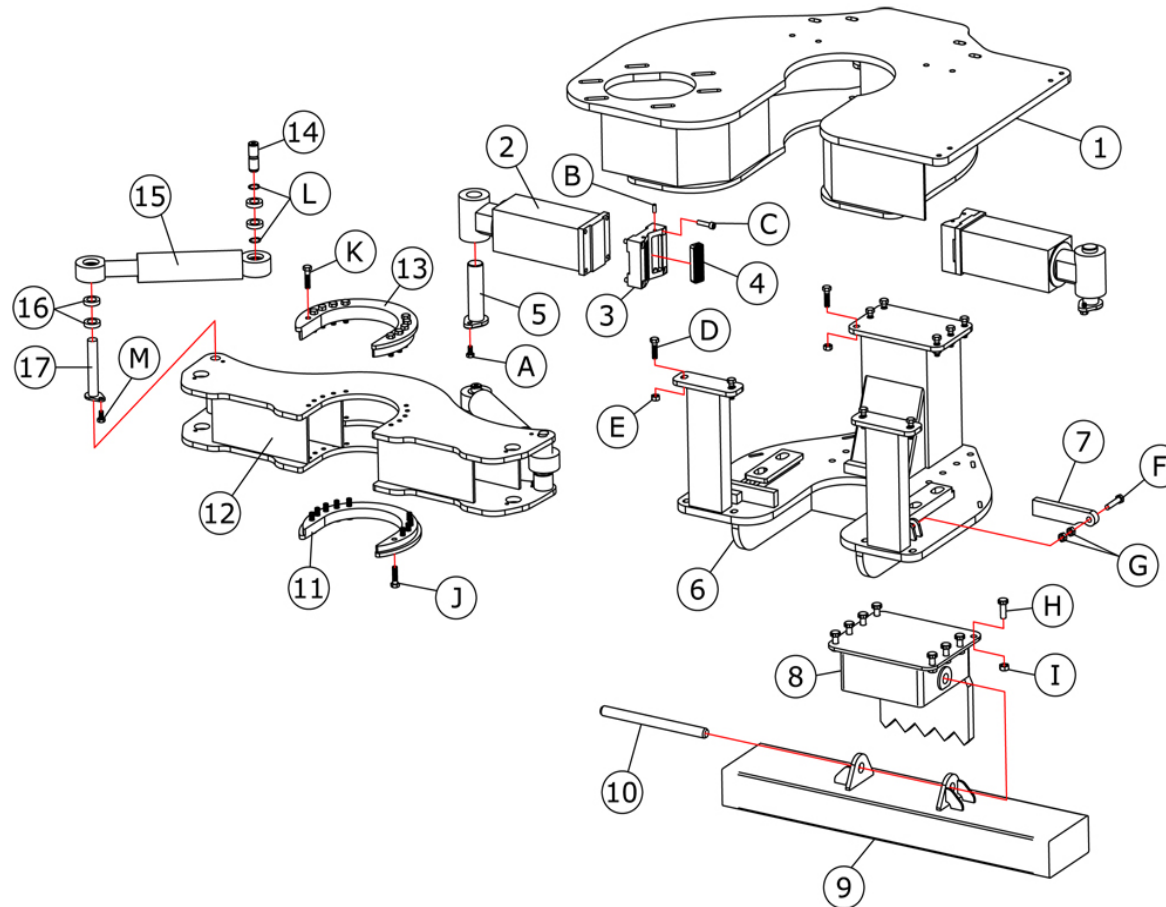


ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
24	1	HJOP35D01 - 24	Cameron Gauge	카메론 게이지	TYPE-F (1500 PSI)
25	2	HJOP35D01 - 25	Ball Valve	볼밸브	1"
26	1	HJOP35D01 - 26	Walvoil Valve	발보일 밸브	SD5/6
27	1	HJOP35D01 - 27	Valve Upper Bracket	밸브 상 브라켓	
28	1	HJOP35D01 - 28	Walvoil Valve	발보일 밸브	SD5/6
29	1	HJOP35D01 - 29	Valve Middle Bracket	밸브 중간 브라켓	
30	1	HJOP35D01 - 30	Walvoil Valve	발보일 밸브	SD5/6
31	1	HJOP35D01 - 31	Valve Lower Bracket	밸브 하 브라켓	
32	1	HJOP35D01 - 32	Valve Side Bracket	밸브 측면 브라켓	
33	1	HJOP35D01 - 33	Walvoil Valve	발보일 밸브	SD5/4
34	4	HJOP35D01 - 34	Engine Rpm Control Lever	엔진 rpm 조정레버	
35	2	HJOP35D01 - 35	Relief Valve Ass'y	릴리프 밸브 앗세이	
36	1	HJOP35D01 - 36	Upper Front cover	상부 앞 커버	
37	1	HJOP35D01 - 37	Engine Key Box	엔진 키박스	
38	4	HJOP35D01 - 38	Hammer Oil Timer	함마 오일 타이머	
39	1	HJOP35D01 - 39	Fuel Gauge	연료 게이지	
40	2	HJOP35D01 - 40	Fuse	퓨즈	
41	9	HJOP35D01 - 41	Toggle Switch	토글 스위치	
42	1	HJOP35D01 - 42	Ball Valve	볼밸브	1/2"
43	1	HJOP35D01 - 43	Ball Valve	볼밸브	1/4"
44	2	HJOP35D01 - 44	Hydraulic Gauge	유압 게이지	100BAR
45	5	HJOP35D01 - 45	Hydraulic Gauge	유압 게이지	600BAR
46	1	HJOP35D01 - 46	Emergency Switch	비상 스위치	

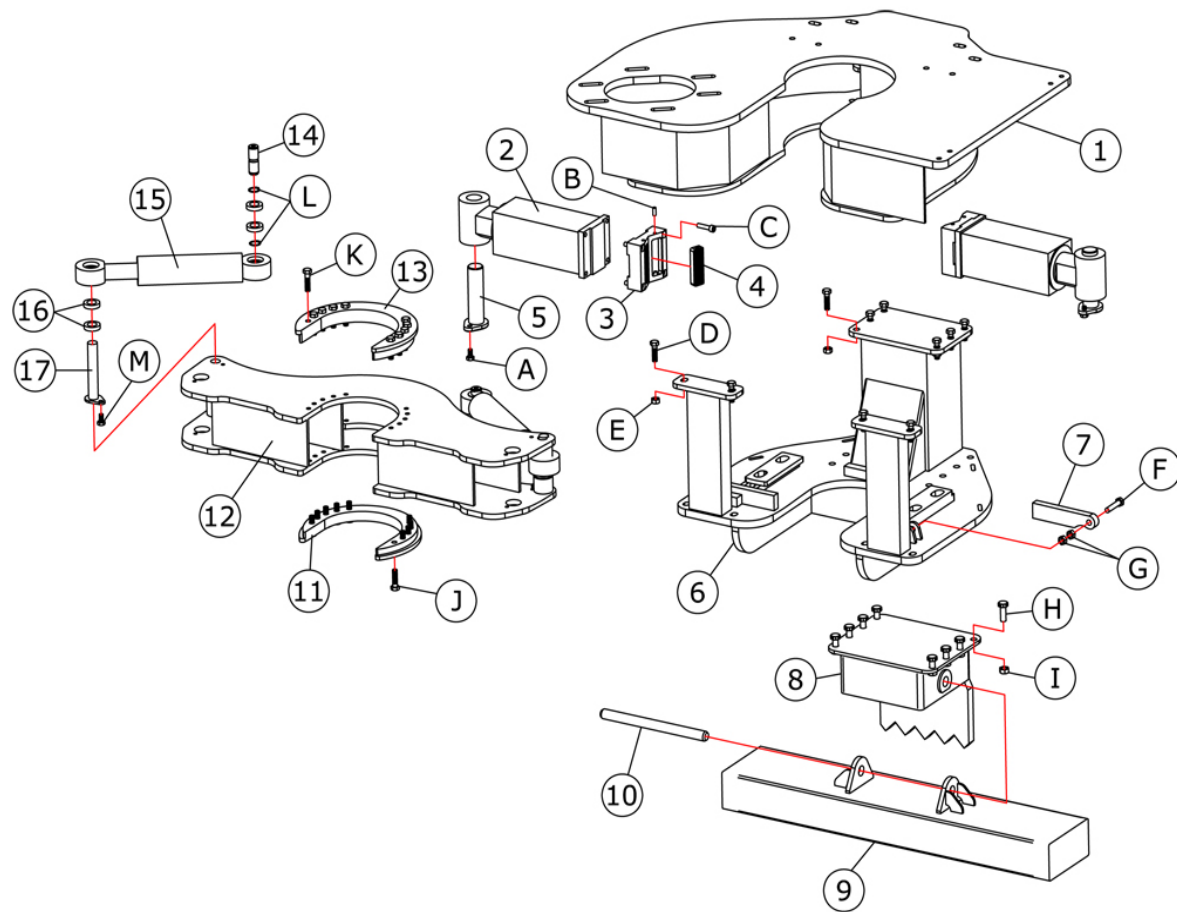


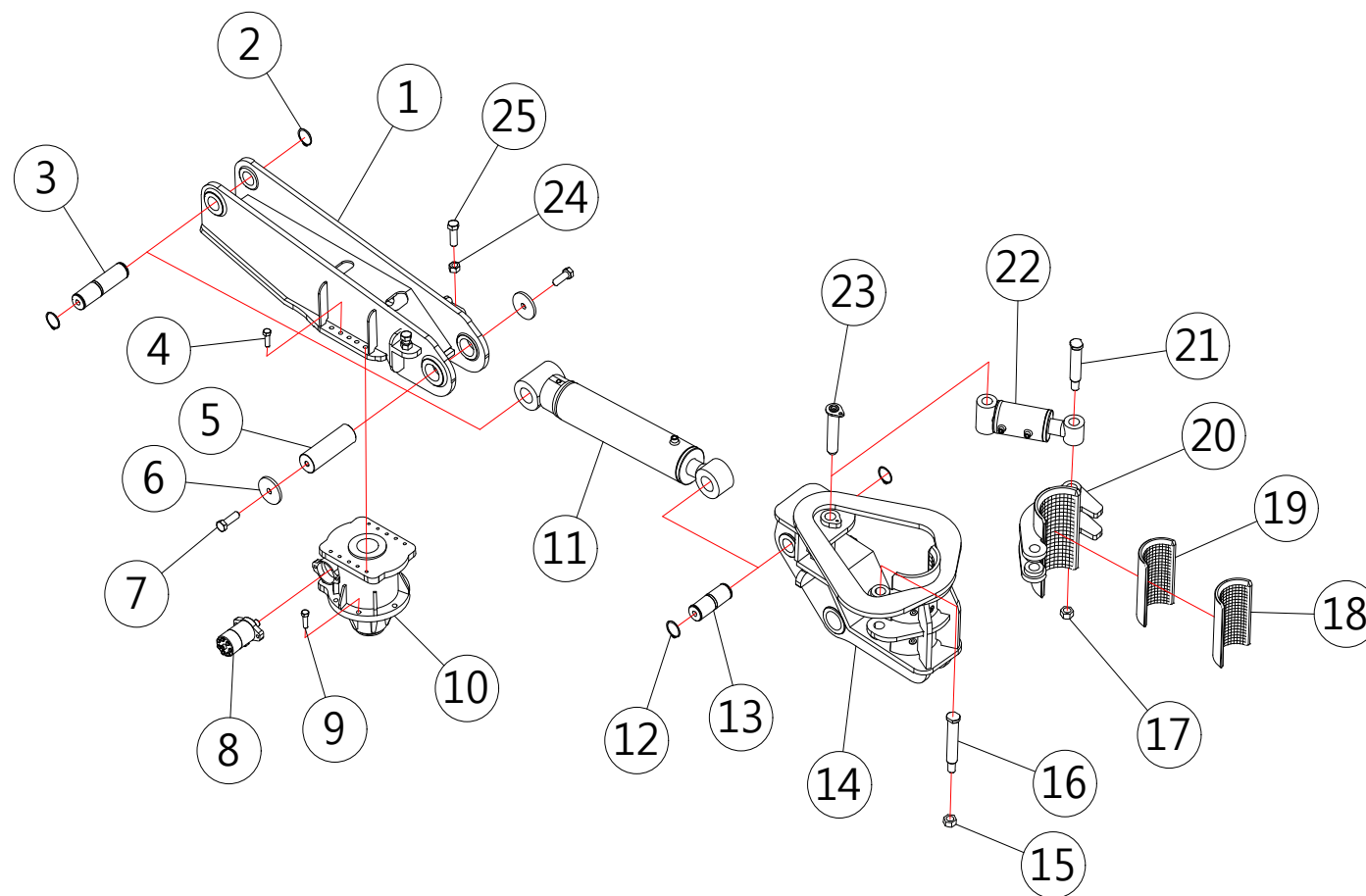


ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
1	1	HJSP35D01 - 01	Danfoss4	댄 포스4단	
2	1	HJSP35D01 - 02	Danfoss4	댄 포스4단	
3	1	HJSP35D01 - 03	Walvoil SD5-6	발보일 sd5-6단	
4	1	HJSP35D01 - 04	Walvoil SD5-6	발보일 sd5-6단	
5	1	HJSP35D01 - 05	Danfoss2	댄 포스2단	
6	1	HJSP35D01 - 06	Valve fixing frame	밸브 고정 프레임	
7	1	HJSP35D01 - 07	Front cover	앞 커버	
8	1	HJSP35D01 - 08	Upper cover	상부커버	
9	1	HJSP35D01 - 09	Transmitter-Receiver	송수신기(주행)	Travel
10	1	HJSP35D01 - 10	Remote controller box	원격 컨트롤러 박스	
11	1	HJSP35D01 - 11	Battery charger	배터리 충전기	
12	4	HJSP35D01 - 12	Transmitter-Receiver	송수신기(과권방지장치)	Overwinding-proof device
13	5	HJSP35D01 - 13	Toggle switch	토글스위치	
14	1	HJSP35D01 - 14	Fuse	퓨즈	
15	1	HJSP35D01 - 15	Walvoil SD11-4	발보일 sd11-4단	

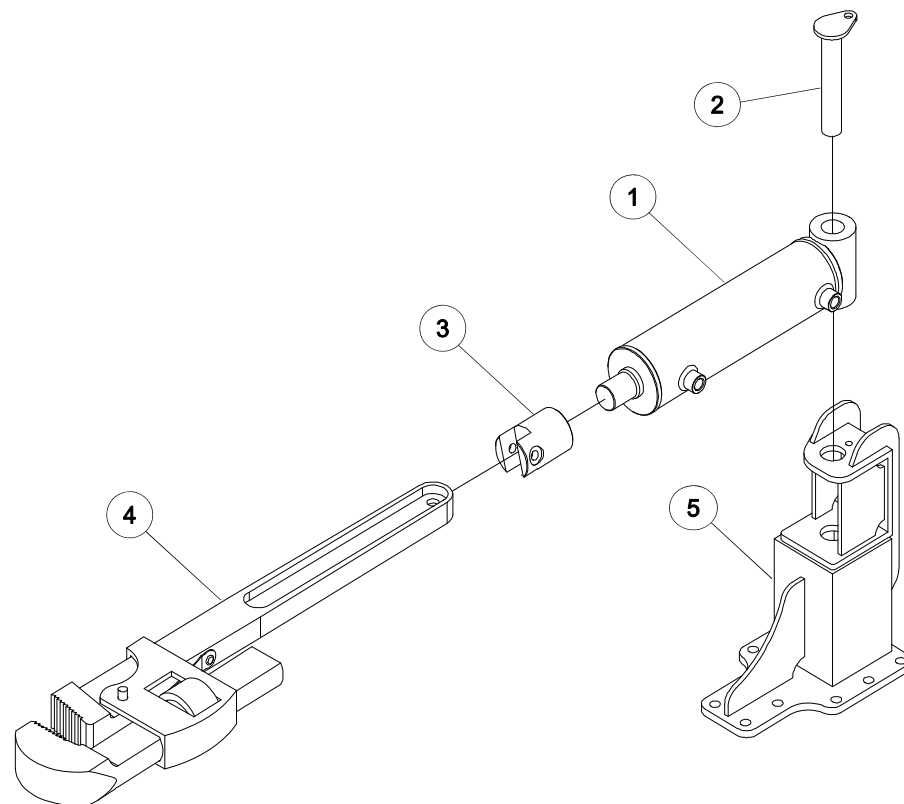


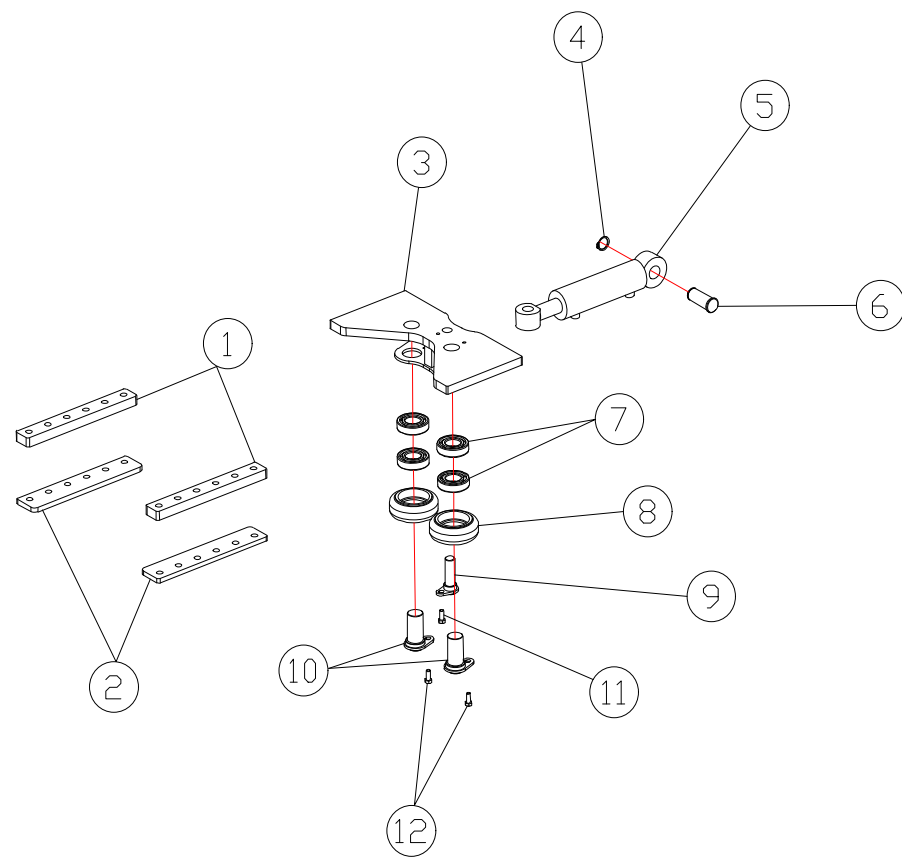
ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
1	1	HJUWP35D1000-01	Upper Clamp Base	상부 클램프 베이스	10"
2	2	HJUWP35D1000-02	Holder Cylinder	홀더 실린더	Ø100 x Ø70 x ST120
3	2	HJUWP35D1000-03	Jaw Holder	쑤 홀더	
4	4	HJUWP35D1000-04	Jaw	쑤	
5	2	HJUWP35D1000-05	Holder Cylinder Pin	홀더 실린더 핀	Ø40 x 161L
6	1	HJUWP35D1000-06	Foot Clamp Base	풋클램프 베이스	
7	2	HJUWP35D1000-07	Foot Clamp Guide Bar	풋 클램프 고정바	
8	1	HJUWP35D1000-08	Ground Fix Plate	삼지창	
9	1	HJUWP35D1000-09	Support	각파이프 지지대	
10	1	HJUWP35D1000-10	Ground Fix Plate Pin	삼지창 핀	Ø25 x 320L
11	1	HJUWP35D1000-11	Rotation Plate (Lower)	회전판(하)	
12	1	HJUWP35D1000-12	Turn Frame	턴 프레임	
13	1	HJUWP35D1000-13	Rotation Plate (Upper)	회전판(상)	
14	2	HJUWP35D1000-14	Turn Cylinder Pin	턴 실린더 고정핀	Ø25 x 74L
15	2	HJUWP35D1000-15	Turn Cylinder	턴 실린더	Ø63 x Ø40 x ST140
16	8	HJUWP35D1000-16	Spacer	스페이서	
17	2	HJUWP35D1000-17	Turn Cylinder Pin	턴 실린더 고정핀	Ø25 x 157L
A	2	HJUWP35D1000-18	H/Bolt	육각볼트	M10 x 15mm
B	8	HJUWP35D1000-19	Set Screw	무드 볼트	M8 x 15mm
C	8	HJUWP35D1000-20	W/Bolt	육각소켓볼트	M10 x 40mm
D	10	HJUWP35D1000-21	H/Bolt	육각볼트	M14 x 60mm
E	10	HJUWP35D1000-22	Nut	너트	M14
F	2	HJUWP35D1000-23	H/Bolt	육각볼트	M12 x 60mm

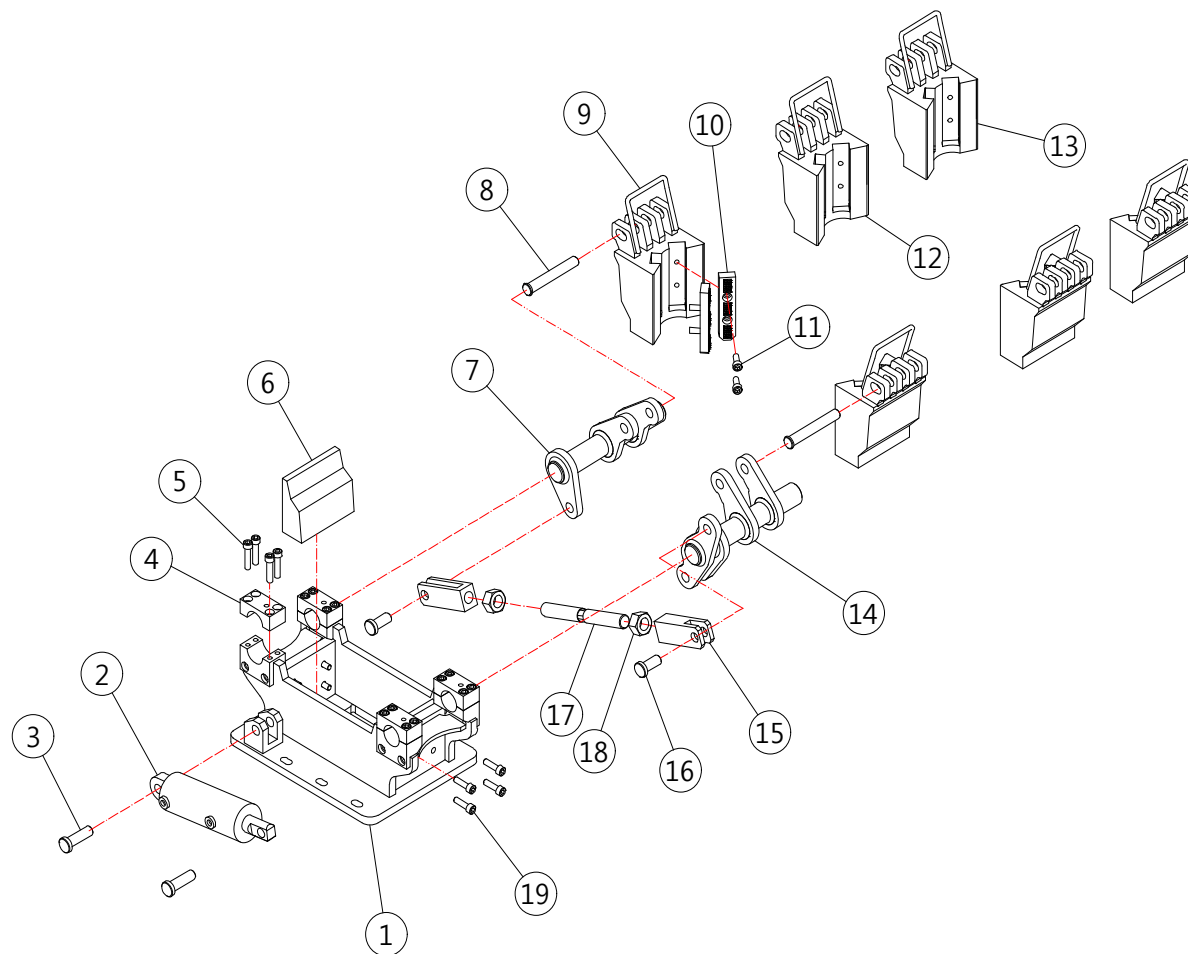




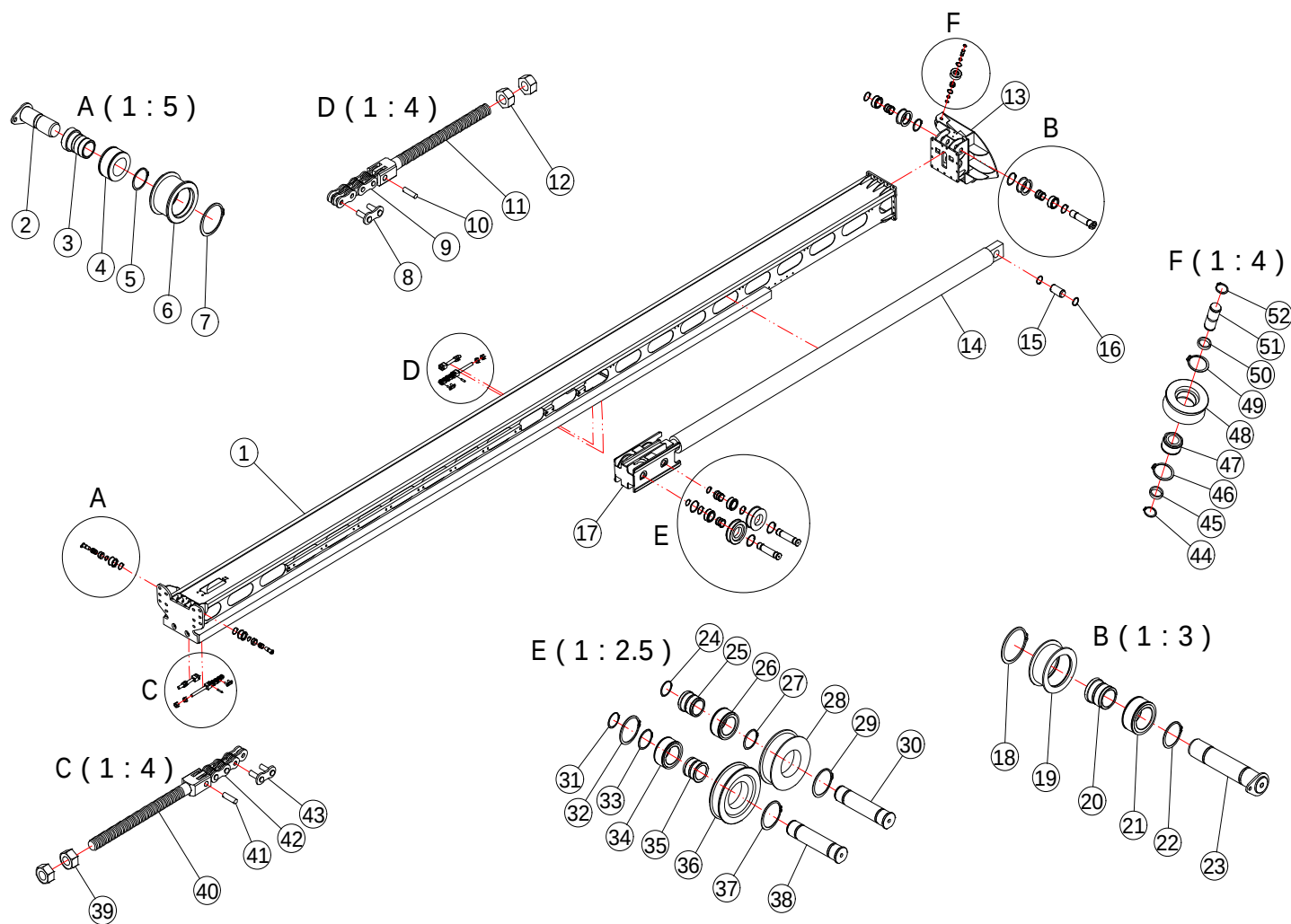
ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
1	1	HJRH30 - 01	Tilting Support Frame	틸팅 서포트 프레임	
2	2	HJRH30 - 02	Retaining Ring	스냅링	Ø40
3	1	HJRH30 - 03	Pin	핀	Ø40 x 196L
4	10	HJRH30 - 04	H/Bolt	육각볼트	M12 x 40
5	1	HJRH30 - 05	Pin	핀	Ø55 x 187L
6	2	HJRH30 - 06	Plain Washer	평와셔	
7	2	HJRH30 - 07	H/Bolt	육각볼트	M16 x 30L
8	1	HJRH30 - 08	Rotation Motor	회전 모터	
9	5	HJRH30 - 09	H/Bolt	육각볼트	M14 x 50L
10	1	HJRH30 - 10	Gear Box	기어박스	
11	1	HJRH30 - 11	Tilting Cylinder	틸팅 실린더	
12	2	HJRH30 - 12	Retaining Ring	스냅링	Ø40
13	1	HJRH30 - 13	Pin	핀	Ø40 x 122L
14	1	HJRH30 - 14	Tilting Frame	틸팅 프레임	
15	1	HJRH30 - 15	Nut	너트	M20
16	1	HJRH30 - 16	Pin	핀	Ø30 x 171L
17	1	HJRH30 - 17	Nut	너트	M20
18	2	HJRH30 - 18	Jaw	쪼	NQ
19	2	HJRH30 - 19	Jaw	쪼	HQ
20	1	HJRH30 - 20	Clamp Frame	클램프 프레임	
21	1	HJRH30 - 21	Pin	핀	Ø30 x 138L
22	1	HJRH30 - 22	Clamp Cylinder	클램프 실린더	
23	1	HJRH30 - 23	Pin	핀	Ø30 x 123L
24	4	HJRH30 - 24	Nut	너트	M20
25	2	HJRH30 - 25	Bolt	볼트	M20 x 60L



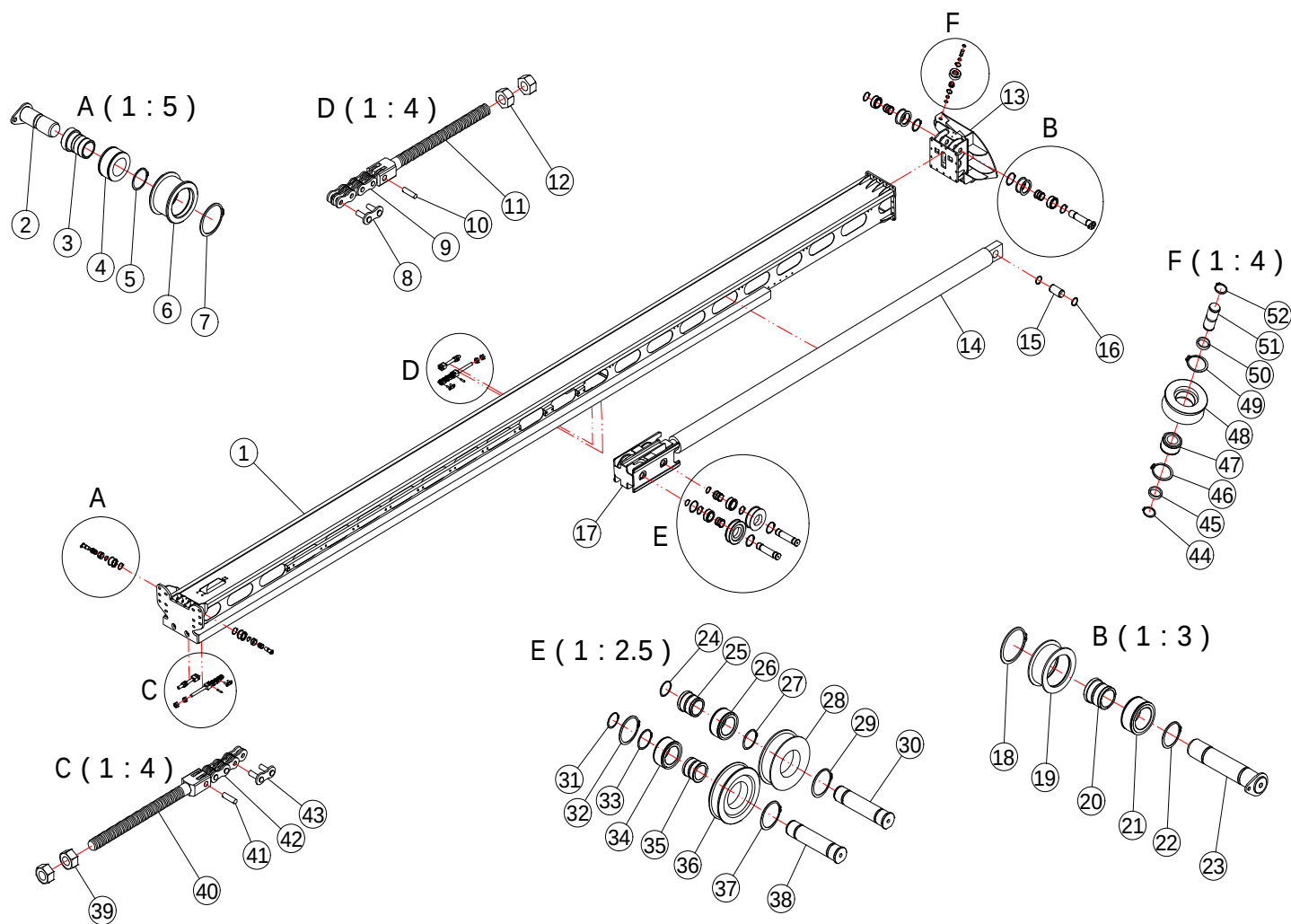




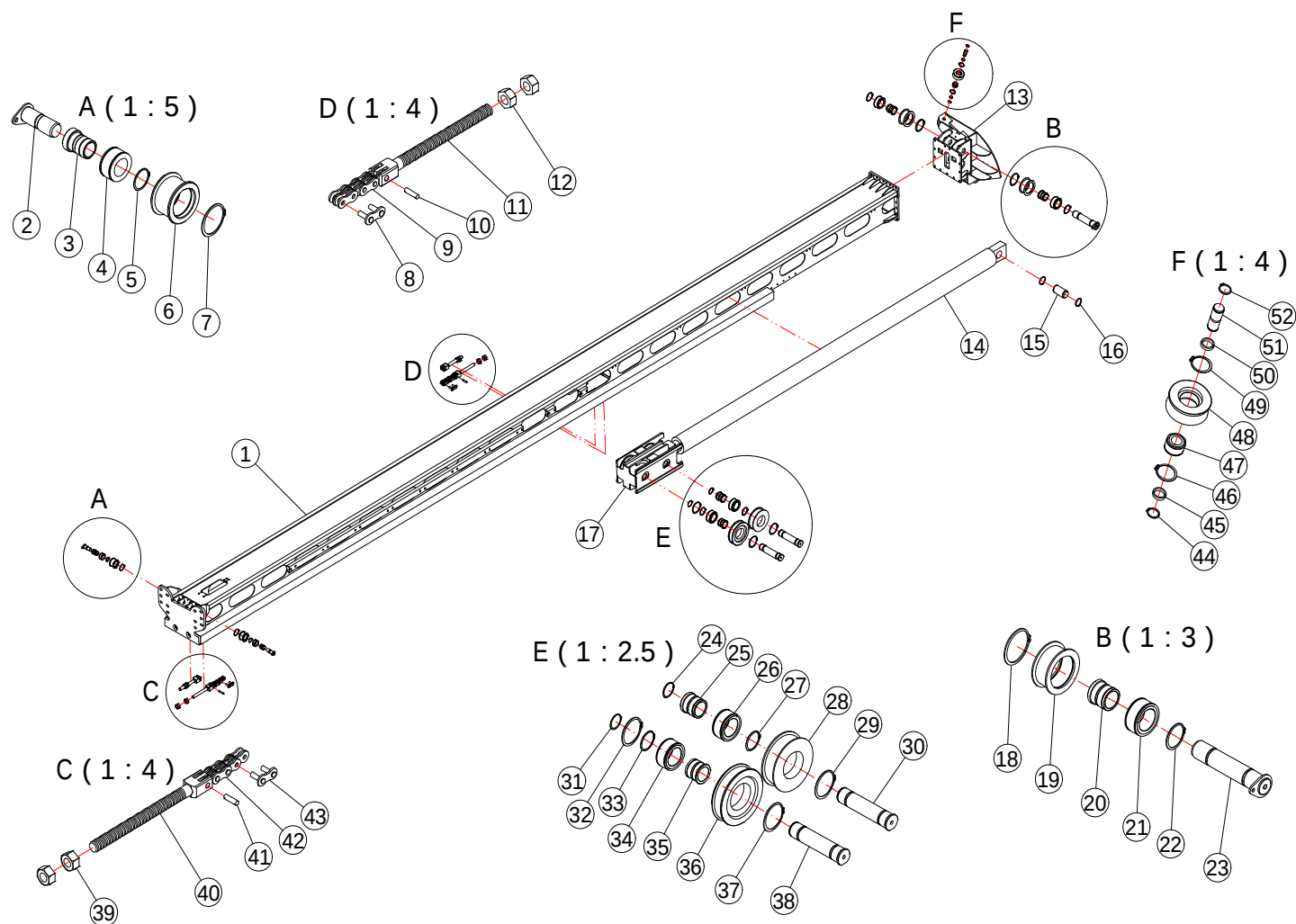
ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
1	1	HJFC04 - 01	Foot Clamp Body	풋클램프 바디	
2	1	HJFC04 - 02	Clamp Cylinder	클램프 실린더	
3	2	HJFC04 - 03	Pin	핀	
4	4	HJFC04 - 04	Drive Arm Fixing Flange	드라이브 암 고정 플랜지	
5	16	HJFC04 - 14	W/Bolt	렌치 볼트	
6	2	HJFC04 - 05	Jaw Holder Base	쫌 홀더 베이스	
7	1	HJFC04 - 06	Drive Arm (Left)	드라이브 암(좌)	
8	2	HJFC04 - 08	Pin	핀	
9	2	HJFC04 - 07	Jaw Holder	쫌 홀더	HQ
10	4	HJFC04 - 09	Jaw	쫌	
11	8	HJFC04 - 16	W/Bolt	렌치 볼트	
12	2	HJFC04 - 07	Jaw Holder	쫌 홀더	PQ
13	2	HJFC04 - 07	Jaw Holder	쫌 홀더	NQ
14	1	HJFC04 - 10	Drive Arm (Right)	드라이브 암(우)	
15	2	HJFC04 - 11	Adjusting Nut	조정 너트	
16	2	HJFC04 - 12	Pin	핀	
17	1	HJFC04 - 13	Adjusting bolt	조정 볼트	
18	2	HJFC04 - 15	Nut	너트	
19	8	HJFC04 - 12	W/Bolt	렌치 볼트	

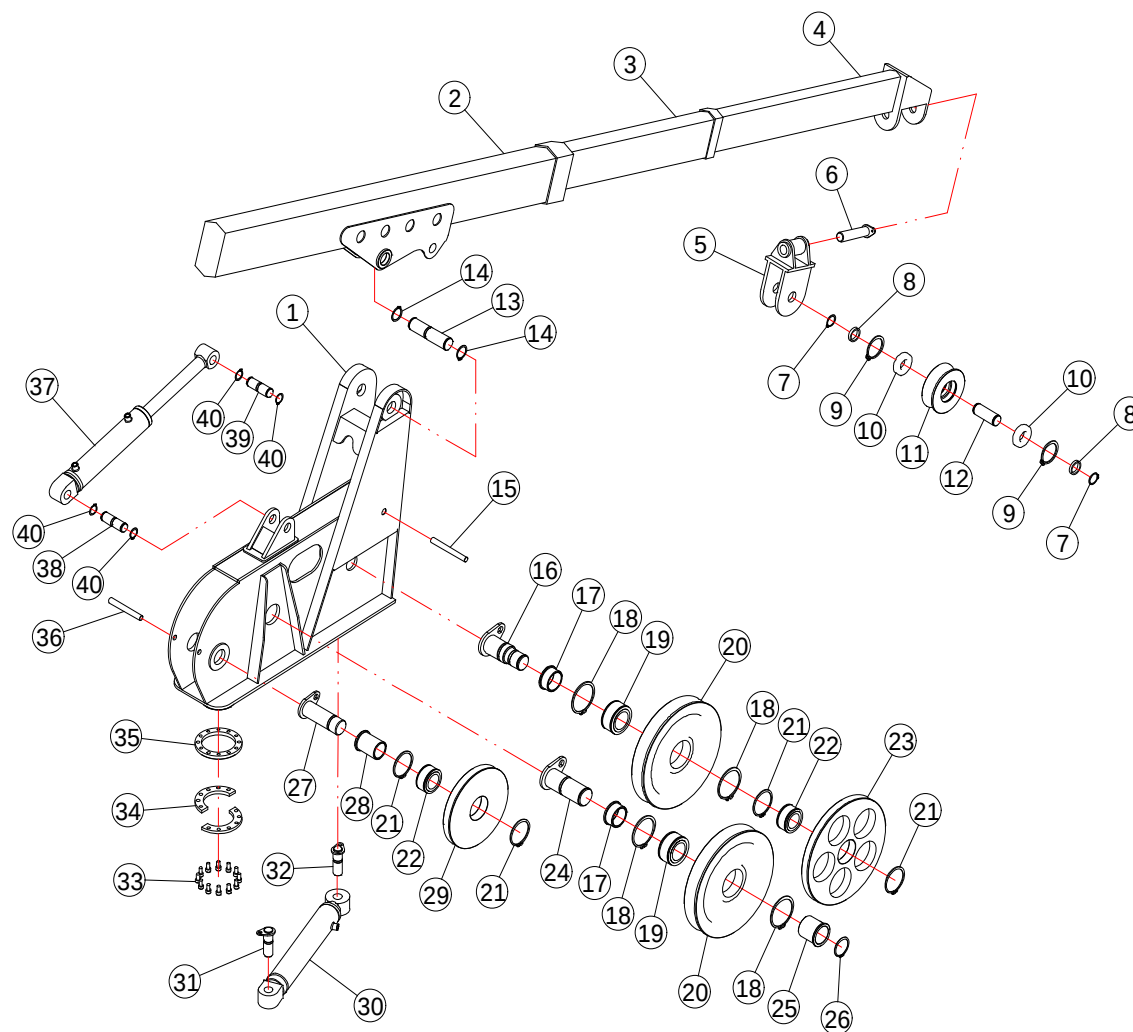


ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
1	1	HJMT08 - 01	Mast frame	주탑프레임	
2	2	HJMT08 - 02	Pin	핀	Ø35 x 97L
3	2	HJMT08 - 03	Sleeve	슬리브	Ø49 x Ø45 x 61L
4	2	HJMT08 - 04	Bearing	베어링	NNF5009
5	2	HJMT08 - 05	Retaining Ring	스냅링	S45
6	2	HJMT08 - 06	Lower Roller	하부롤러	Ø99 x 56L
7	2	HJMT08 - 07	Retaining Ring	스냅링	H75
8	2	HJMT08 - 08	Chain Link	체인링크	BL1244
9	2	HJMT08 - 09	Chain	체인	BL1244
10	4	HJMT08 - 10	Pin	핀	
11	2	HJMT08 - 11	Chain Tension Adjuster	체인장력조정장치	BL1244
12	4	HJMT08 - 12	Nut	너트	M30
13	1	HJMT08 - 13	Upper Roller Frame	상부롤러프레임	
14	1	HJMT08 - 14	Mast Cylinder	마스트 실린더	Ø160 x 3500ST x CL4050
15	1	HJMT08 - 15	Pin	핀	Ø80
16	2	HJMT08 - 16	Retaining Ring	스냅링	S80
17	1	HJMT08 - 17	Trolley Frame	활차 프레임	
18	2	HJMT08 - 18	Retaining Ring	스냅링	H115
19	2	HJMT08 - 19	Upper Roller	상부롤러	Ø158 x 68L
20	2	HJMT08 - 20	Sleeve	슬리브	Ø84 x Ø60 x 75L
21	2	HJMT08 - 21	Bearing	베어링	NNF5015
22	2	HJMT08 - 22	Retaining Ring	스냅링	S75
23	1	HJMT08 - 23	Pin	핀	Ø60 x 374L

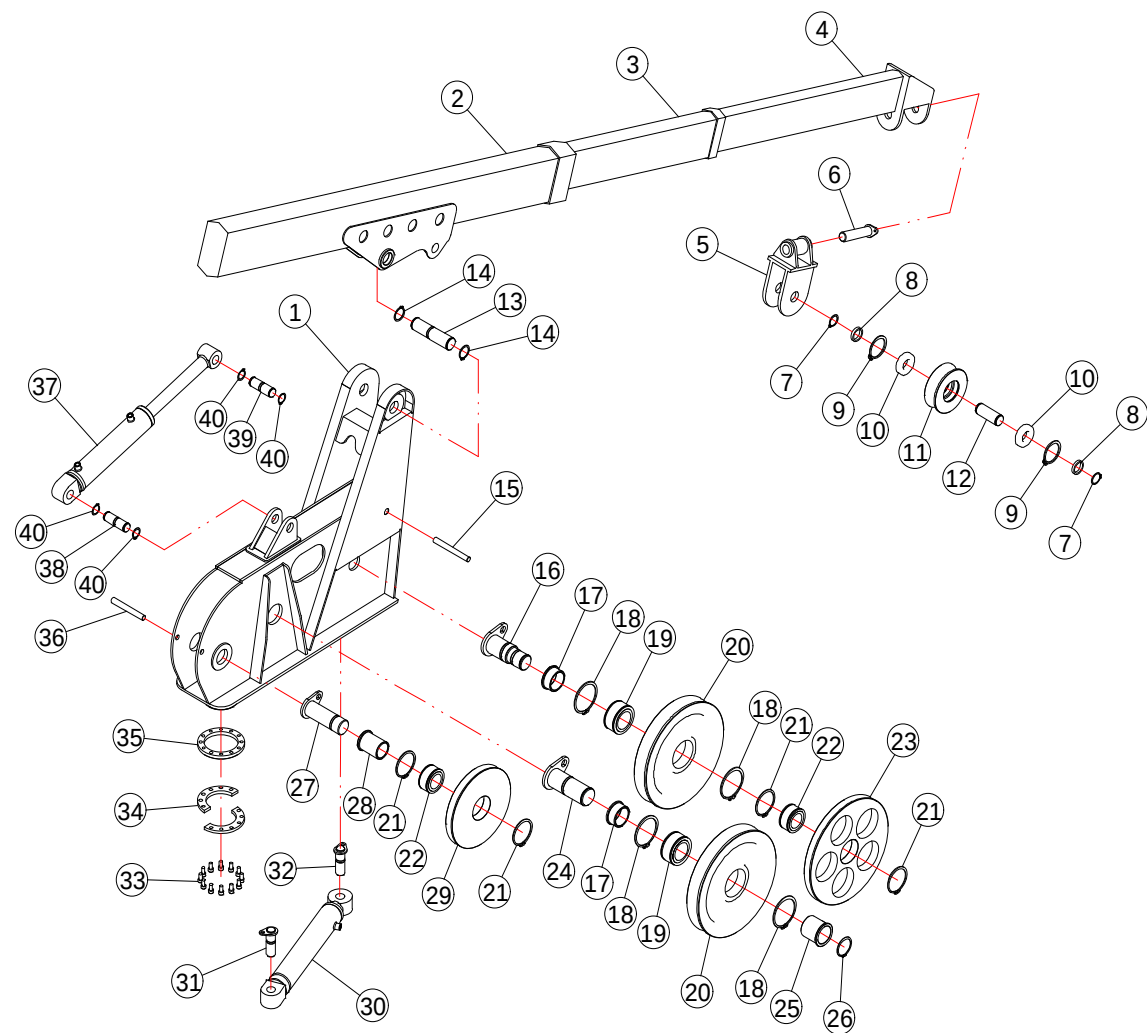


ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
24	1	HJMT08 - 24	Retaining Ring	스냅링	S60
25	2	HJMT08 - 25	Sleeve	슬리브	Ø84 x Ø60 x 72.5L
26	2	HJMT08 - 26	Bearing	베어링	NNF5015
27	2	HJMT08 - 27	Retaining Ring	스냅링	S75
28	2	HJMT08 - 28	Roller	롤러	Ø217 x 69L
29	2	HJMT08 - 29	Retaining Ring	스냅링	H115
30	1	HJMT08 - 30	Pin	핀	Ø60 x 352L
31	1	HJMT08 - 31	Retaining Ring	스냅링	S60
32	2	HJMT08 - 32	Retaining Ring	스냅링	S115
33	2	HJMT08 - 33	Retaining Ring	스냅링	S75
34	2	HJMT08 - 34	Bearing	베어링	NNF5015
35	2	HJMT08 - 35	Sleeve	슬리브	Ø84 x Ø60 x 73L
36	2	HJMT08 - 36	Roller	롤러	Ø226 x 60L
37	2	HJMT08 - 37	Retaining Ring	스냅링	S115
38	1	HJMT08 - 38	Pin	핀	Ø60 x 352L
39	4	HJMT08 - 39	Nut	너트	M27
40	2	HJMT08 - 40	Chain Tension Adjuster	체인장력조정장치	BL1044
41	4	HJMT08 - 41	Pin	핀	
42	2	HJMT08 - 42	Chain	체인	BL1044
43	2	HJMT08 - 43	Chain Link	체인링크	BL1044
44	2	HJMT08 - 44	Retaining Ring	스냅링	S35
45	2	HJMT08 - 45	Spacer	스페이서	Ø35.5 x Ø45 x 9T
46	2	HJMT08 - 46	Retaining Ring	스냅링	S62

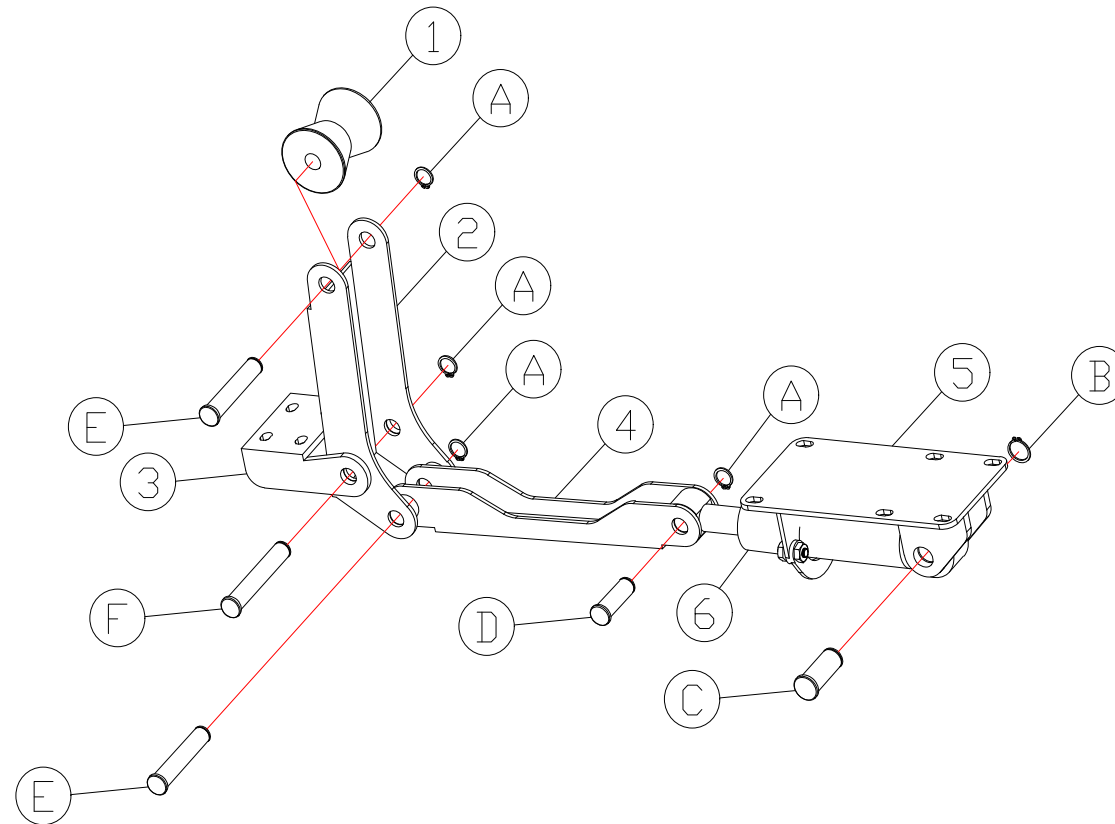


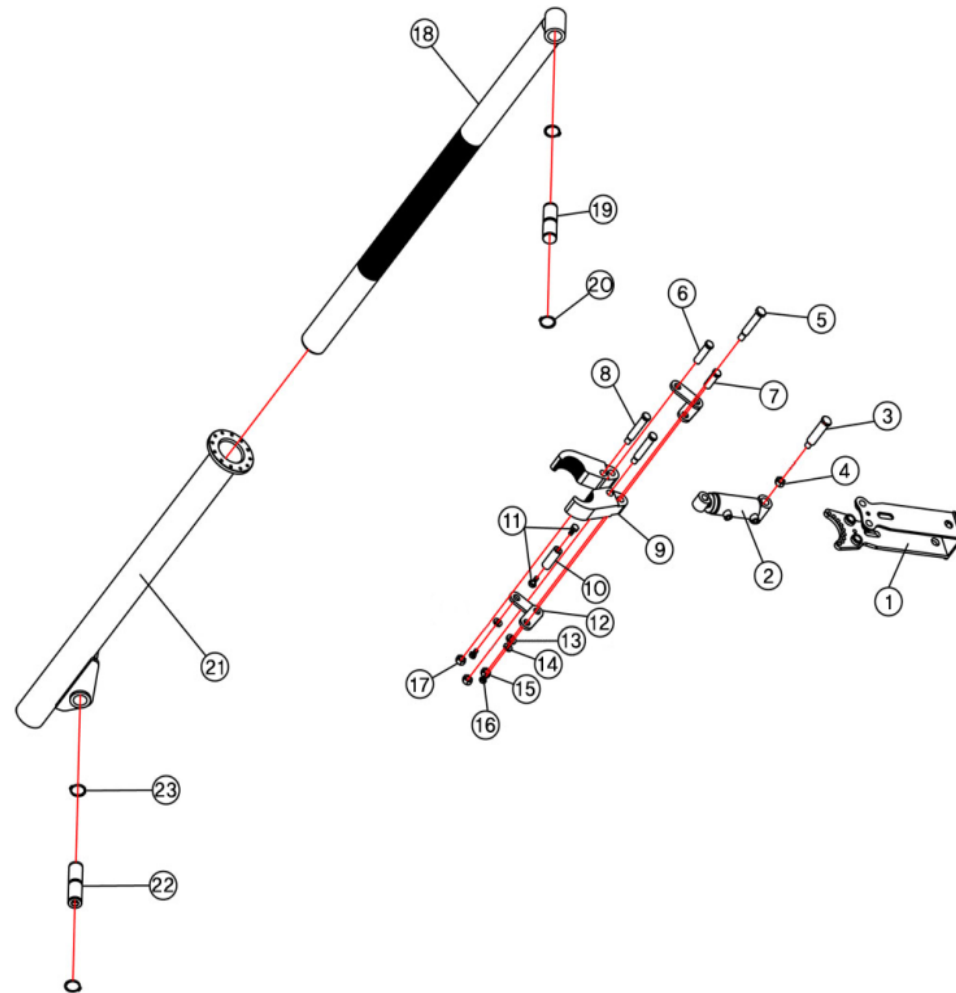


ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
1	1	HJTW05 - 01	Crane Body	크레인 바디	
2	1	HJTW05 - 02	Boom 1	뚝 1	
3	1	HJTW05 - 03	Boom 2	뚝 2	
4	1	HJTW05 - 04	Boom 3	뚝 3	
5	1	HJTW05 - 05	Boom Point Sheave Block	뚝 포인트 쉬브 블록	
6	1	HJTW05 - 06	Pin	핀	Ø30 x 132L
7	2	HJTW05 - 07	Retaining Ring	스냅링	Ø35
8	2	HJTW05 - 08	Spacer	스페이서	Ø45 x Ø35.5 x 8L
9	2	HJTW05 - 09	Retaining Ring	스냅링	Ø72
10	2	HJTW05 - 10	Bearing	베어링	6207
11	1	HJTW05 - 11	Boom Point Sheave	뚝 포인트 쉬브	Ø148 x 50L
12	1	HJTW05 - 12	Pin	핀	Ø35 x 94L
13	1	HJTW05 - 13	Pin	핀	Ø40 x 162L
14	2	HJTW05 - 14	Retaining Ring	스냅링	Ø40
15	1	HJTW05 - 15	Guide Pin - B	가이드 핀 - B	Ø16 x 149L
16	1	HJTW05 - 16	Pin	핀	Ø60 x Ø50 x 156L
17	2	HJTW05 - 17	Spacer	스페이서	Ø70 x Ø60 x 35L
18	4	HJTW05 - 18	Retaining Ring	스냅링	Ø95
19	2	HJTW05 - 19	Bearing	베어링	NNF5012
20	2	HJTW05 - 20	Main Winch Sheave	메인윈치 쉬브	Ø360 x 54L
21	4	HJTW05 - 21	Retaining Ring	스냅링	Ø80
22	2	HJTW05 - 22	Bearing	베어링	NNF5010
23	1	HJTW05 - 23	Wire Line Sheave	와이어라인 쉬브	Ø360 x 29L



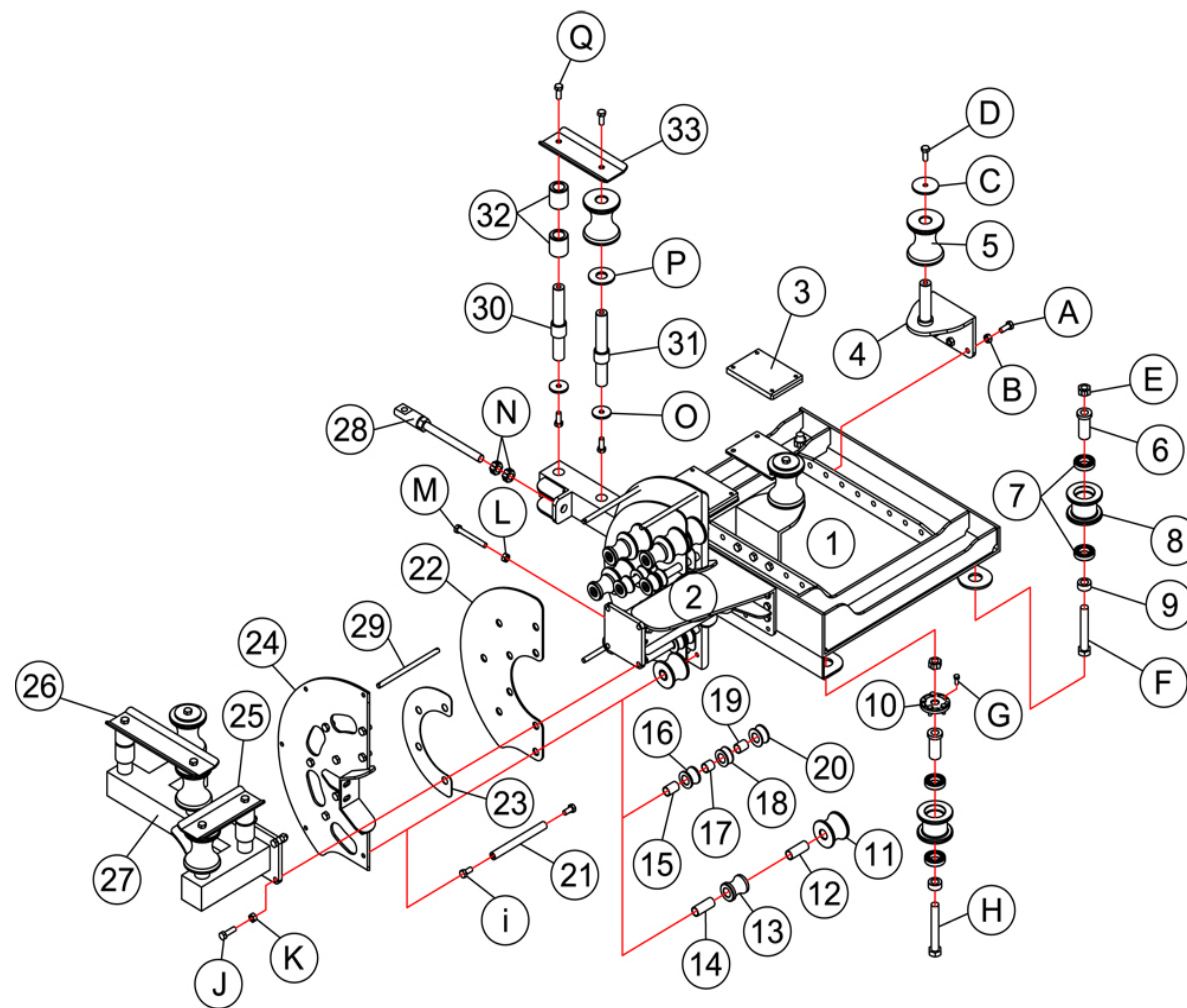
ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
24	1	HJTW05 - 24	Pin	핀	Ø60 x 164L
25	1	HJTW05 - 25	Spacer	스페이서	Ø70 x Ø60 x 61L
26	1	HJTW05 - 26	Retaining Ring	스냅링	Ø60
27	1	HJTW05 - 27	Pin	핀	Ø50 x 156L
28	1	HJTW05 - 28	Spacer	스페이서	Ø60 x Ø50 x 82L
29	1	HJTW05 - 29	Wire Line Sheave	와이어라인 쉬브	Ø272 x 29L
30	1	HJTW05 - 30	Turn Cylinder	턴 실린더	
31	1	HJTW05 - 31	Pin	핀	Ø30 x 112L
32	1	HJTW05 - 32	Pin	핀	Ø30 x 92L
33	12	HJTW05 - 33	W/Bolt	렌치볼트	M10 x 20
34	2	HJTW05 - 34	Key Plate - A	키 플레이트 A	
35	1	HJTW05 - 35	Key Plate - B	키 플레이트 B	
36	1	HJTW05 - 36	Guide Pin - B	가이드 핀 - B	Ø16 x 137L
37	1	HJTW05 - 37	Tilt Cylinder	틸팅 실린더	
38	1	HJTW05 - 38	Pin	핀	Ø30 x 92L
39	1	HJTW05 - 39	Pin	핀	Ø30 x 112L
40	4	HJTW05 - 40	Retaining Ring	스냅링	Ø30



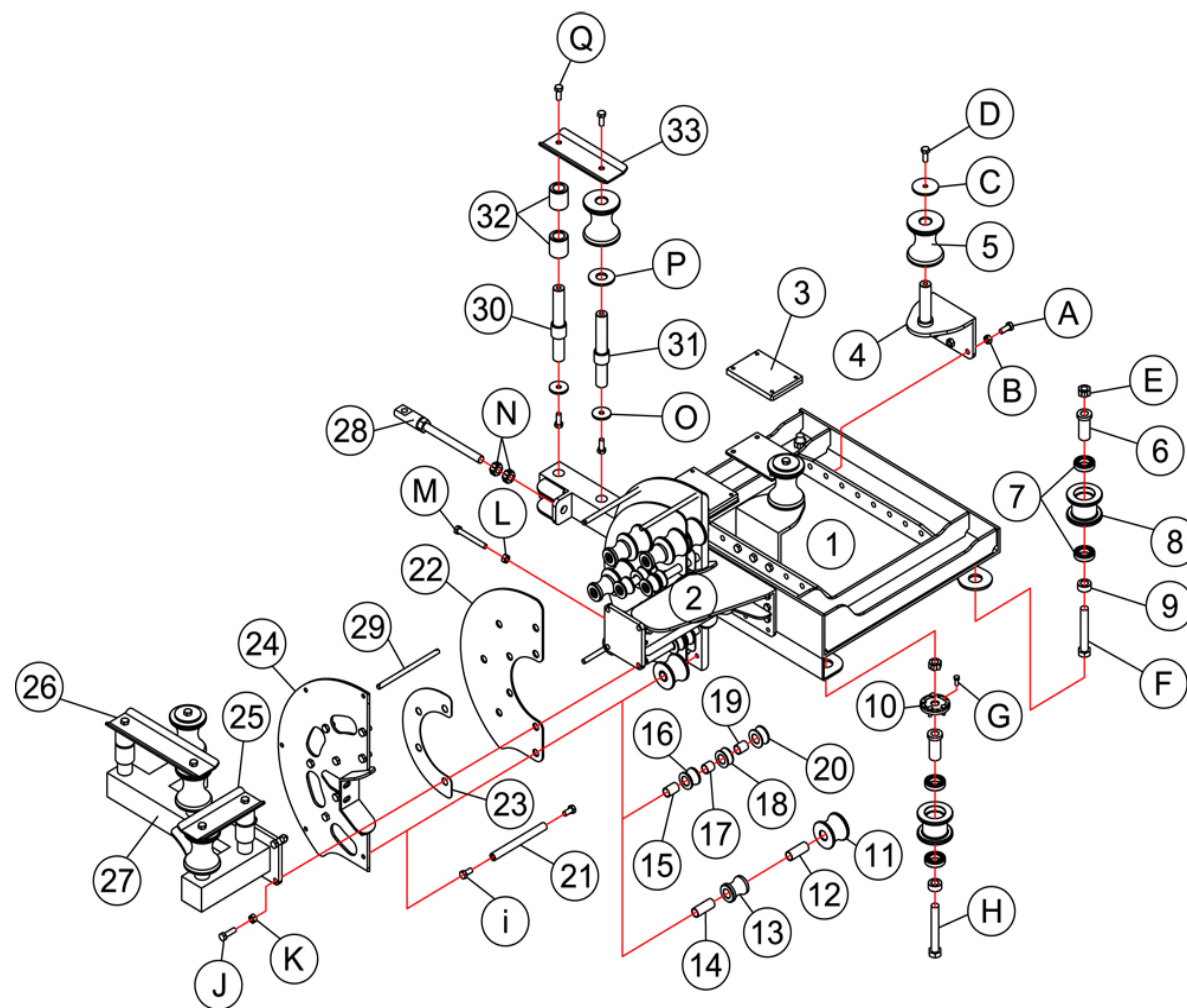


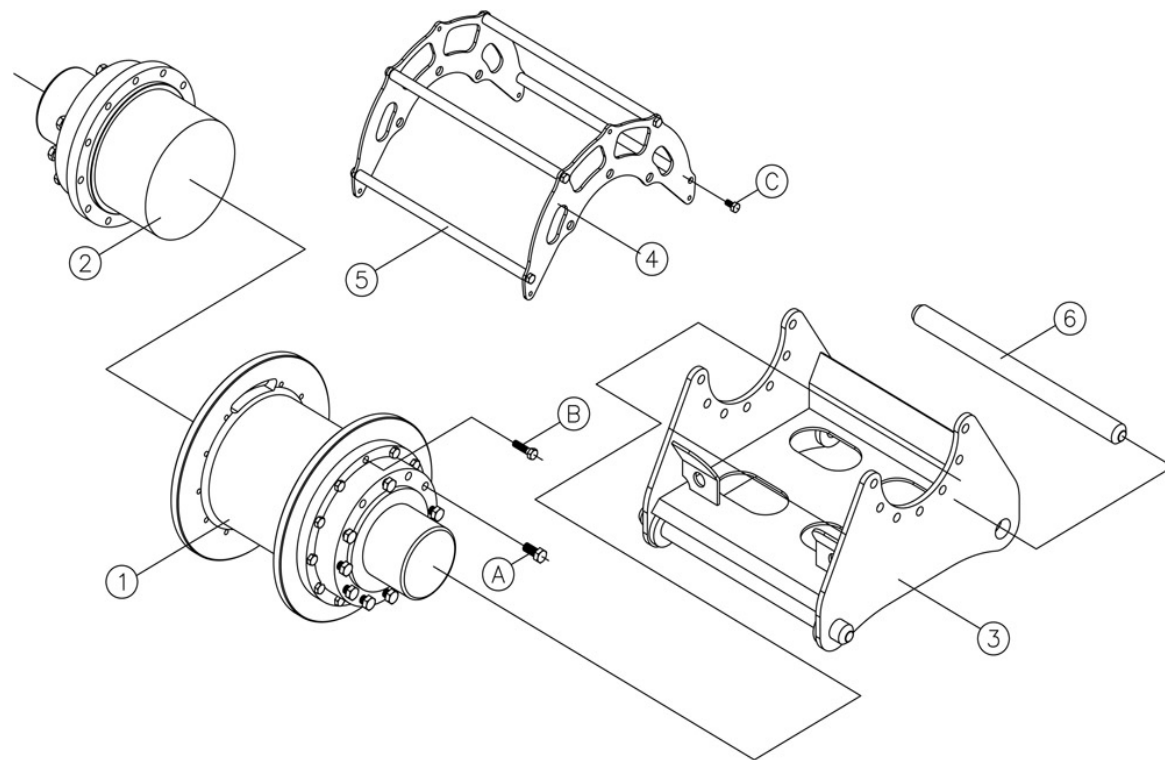
ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
1	1	HJPS1001-01	Clamp Body	롤러	
2	1	HJPS1001-02	Cylinder	롤러 브라켓	Ø50 x Ø30 x 35ST
3	1	HJPS1001-03	Pin	핀	Ø25 x 119L
4	1	HJPS1001-04	Nut	너트	M16
5	1	HJPS1001-05	Pin	핀	Ø20 x 126L
6	1	HJPS1001-06	Pin	핀	Ø20 x 78L
7	1	HJPS1001-07	Pin	핀	Ø20 x 63L
8	2	HJPS1001-08	Pin	핀	Ø25 x 119L
9	2	HJPS1001-09	Clamp Jaw	클램프 쏘	
10	1	HJPS1001-10	Pin	핀	Ø25 x 74L
11	2	HJPS1001-11	H/Bolt	육각볼트	M10 x 20
12	4	HJPS1001-12	Jaw Connect Bracket	쏘 커넥트 브라켓	
13	1	HJPS1001-13	Washer	와셔	Ø30 x Ø16.5 x 4.5T
14	2	HJPS1001-14	Washer	와셔	Ø25 x Ø11 x 4.5T
15	1	HJPS1001-15	Nut	너트	M16
16	2	HJPS1001-16	H/Bolt	육각볼트	M10 x 20
17	2	HJPS1001-17	Nut	너트	M16
18	1	HJPS1001-18	Pipe Support (In)	파이프 서포트 (In)	
19	1	HJPS1001-19	Pin	핀	Ø40 x 146L
20	2	HJPS1001-20	Snap Ring	스냅링	Ø40
21	1	HJPS1001-21	Pipe Support (Out)	파이프 서포트 (Out)	
22	1	HJPS1001-22	Pin	핀	Ø40 x 126L
23	2	HJPS1001-23	Snap Ring	스냅링	Ø40

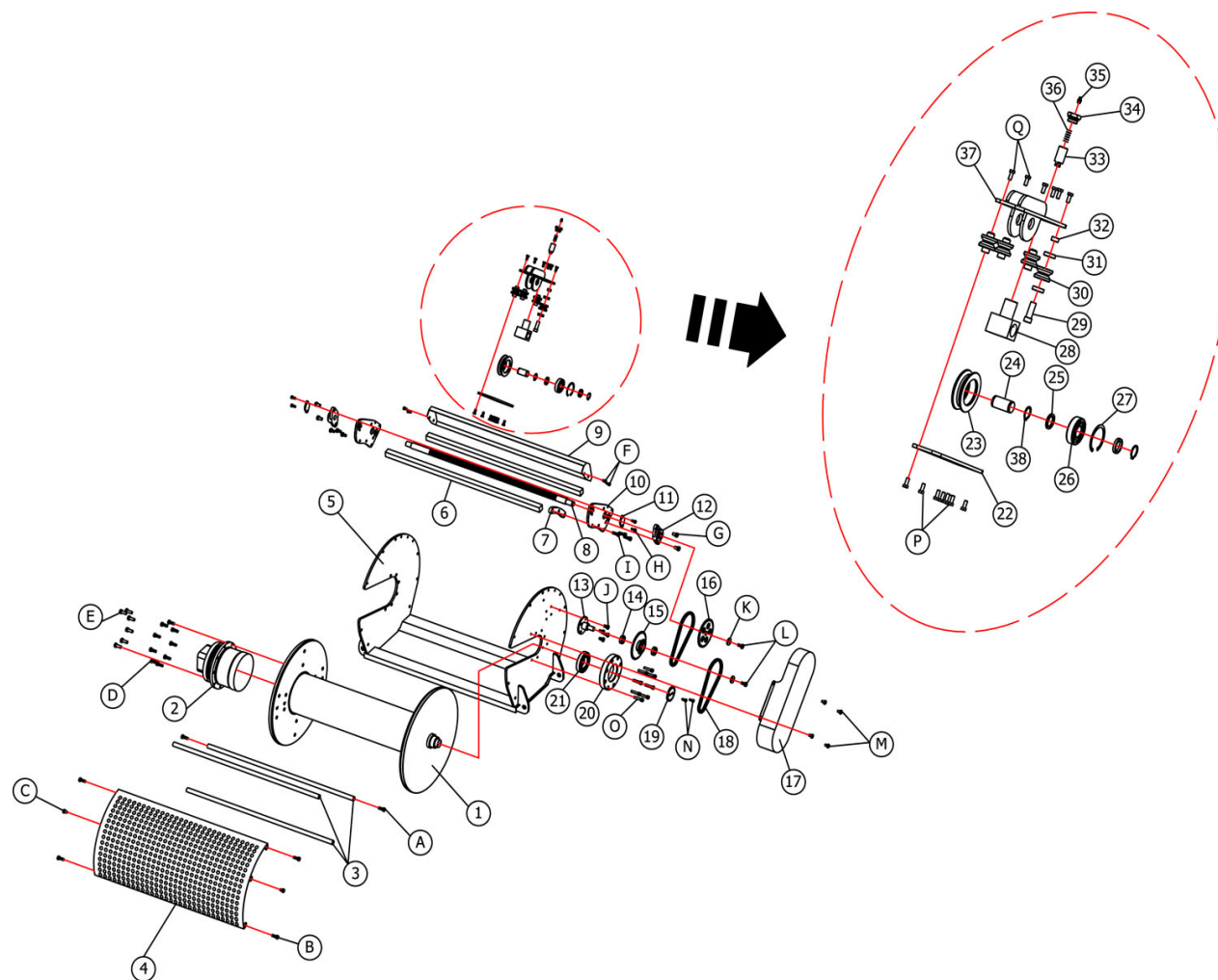
ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
1	1	HJHR03 - 01	Base	베이스	
2	2	HJHR03 - 02	RC Hose Guide A	RC 호스 가이드 A	
3	7	HJHR03 - 03	MC Plate	MC 플레이트	
4	2	HJHR03 - 04	RC Hose Guide	RC 호스 가이드	
5	2	HJHR03 - 05	RC Hose Reel Roller	RC 호스릴 롤러	Ø30.3 x Ø98 x 110L
6	7	HJHR03 - 06	Guide Roller Collar	가이드 롤러 칼라	
7	7	HJHR03 - 07	Guide Roller Bearing	가이드 롤러 베어링	6006
8	1	HJHR03 - 08	Guide Roller	가이드 롤러	
9	1	HJHR03 - 09	Spacer	스페이서	
10	8	HJHR03 - 10	Guide Roller Adjust Bracket	가이드 롤러 조정 브라켓	
11	4	HJHR03 - 11	Hose Reel Roller	호스릴 롤러	1 1/4"
12	8	HJHR03 - 12	Collar	칼라	
13	4	HJHR03 - 13	Hose Reel Roller	호스릴 롤러	1 1/2"
14	2	HJHR03 - 14	Collar	칼라	
15	1	HJHR03 - 15	Collar	칼라	
16	1	HJHR03 - 16	Hose Reel Roller	호스릴 롤러	3/4"
17	1	HJHR03 - 17	Collar	칼라	
18	1	HJHR03 - 18	Hose Reel Roller	호스릴 롤러	3/8"
19	1	HJHR03 - 19	Collar	칼라	
20	7	HJHR03 - 20	Hose Reel Roller	호스릴 롤러	1/4"
21	4	HJHR03 - 21	Pin	핀	
22	1	HJHR03 - 22	Big Middle Cover	중간 커버(대)	
23	3	HJHR03 - 23	Small Middle Cover	중간 커버(소)	



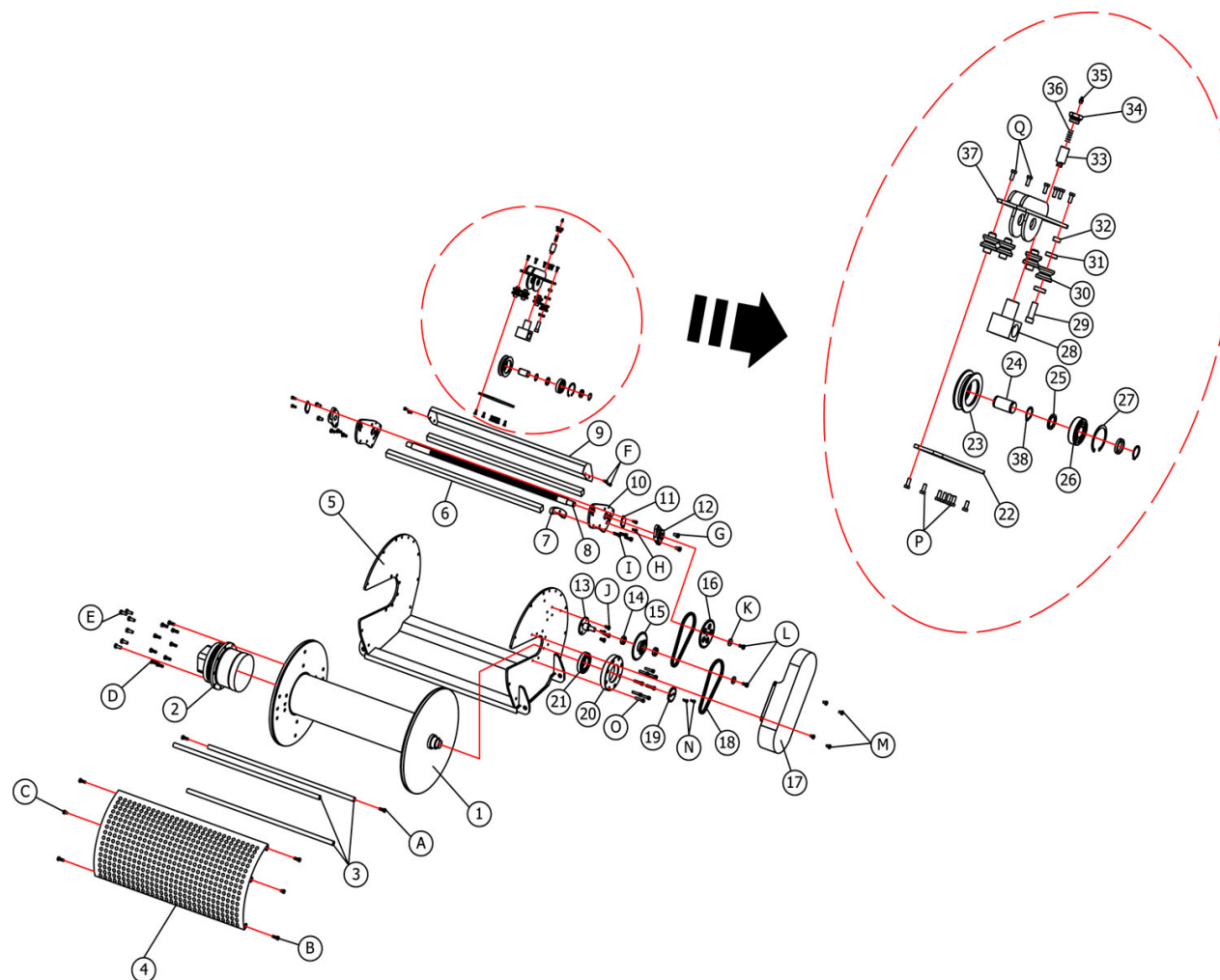
ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
24	2	HJHR03 - 24	Big Middle Cover	중간 커버(대)	
25	4	HJHR03 - 25	RC Hose Roller Bracket	RC 호스 롤러 고정 브라켓	242L
26	24	HJHR03 - 26	RC Hose Roller Bracket	RC 호스 롤러 고정 브라켓	242L
27	24	HJHR03 - 27	RC Hose Guide B	RC 호스 가이드 B	
28	15	HJHR03 - 28	Wire Adjust Bolt	와이어 조정 볼트	
29	15	HJHR03 - 29	Pin	핀	
30	9	HJHR03 - 30	RC Hose Pin	RC 호스 핀	112L
31	9	HJHR03 - 31	RC Hose Pin	RC 호스 핀	117L
32	9	HJHR03 - 32	RC Hose Reel Roller	RC 호스릴 롤러	Ø30.3 x Ø50 x 55L
33	9	HJHR03 - 33	RC Hose Roller Bracket	RC 호스 롤러 고정 브라켓	246L
A	8	HJHR03 - 34	Bolt	육각 볼트	M12 x 30L
B	7	HJHR03 - 35	Nut	너트	
C	6	HJHR03 - 36	Spacer	스페이서	
D	2	HJHR03 - 37	Bolt	육각 볼트	M12 x 30L
E	4	HJHR03 - 38	Nut	너트	M20
F	2	HJHR03 - 39	Bolt	육각 볼트	M20 x 130L
G	10	HJHR03 - 40	Bolt	육각 볼트	M8 x 20L
H	2	HJHR03 - 41	Bolt	육각 볼트	M20 x 140L
I	9	HJHR03 - 42	Bolt	육각 볼트	M10 x 25L
J	9	HJHR03 - 43	Bolt	육각 볼트	M12 x 40L
K	4	HJHR03 - 44	Nut	너트	M12
L	4	HJHR03 - 45	Nut	너트	M12
M	4	HJHR03 - 46	Bolt	육각 볼트	M12 x 100L



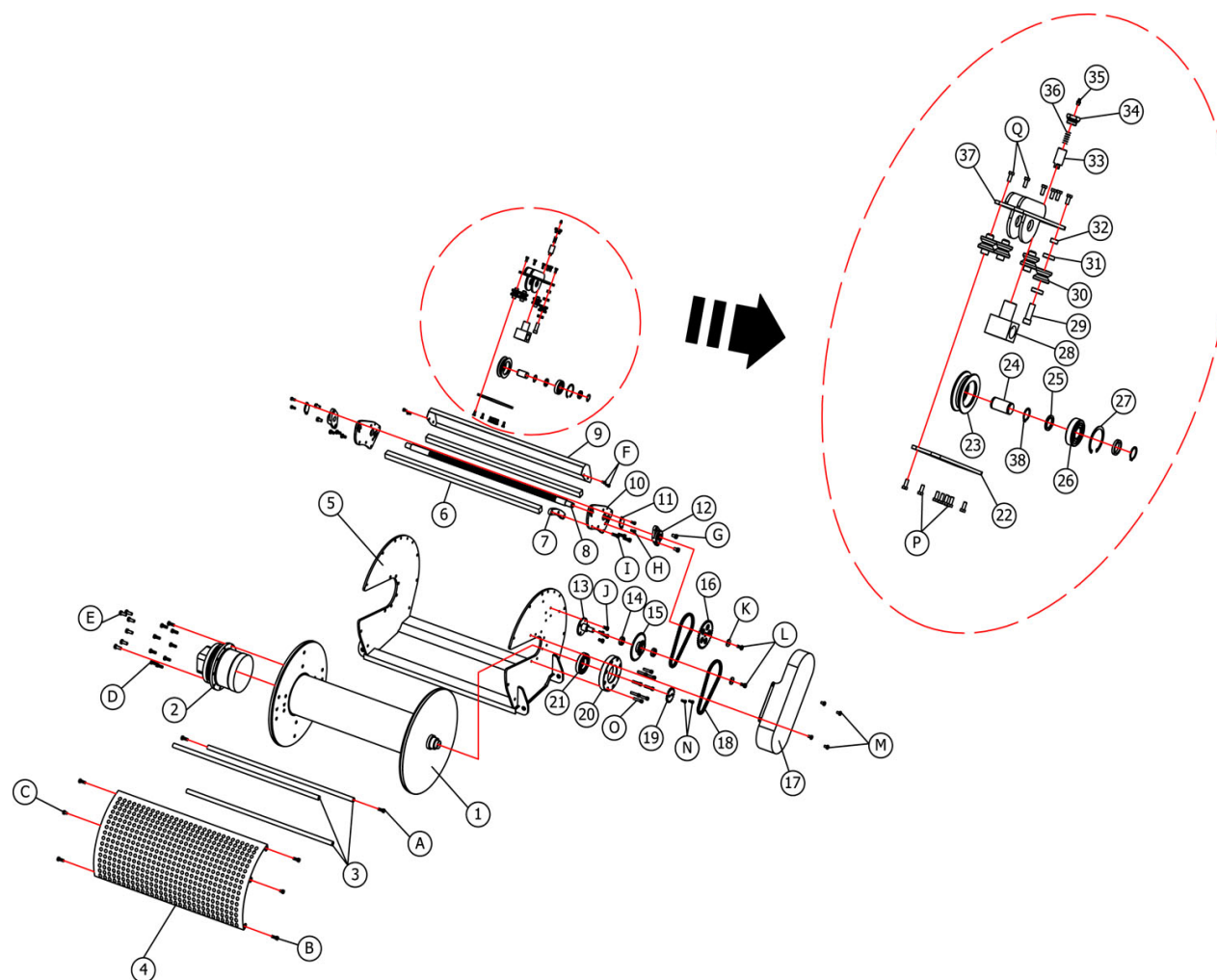


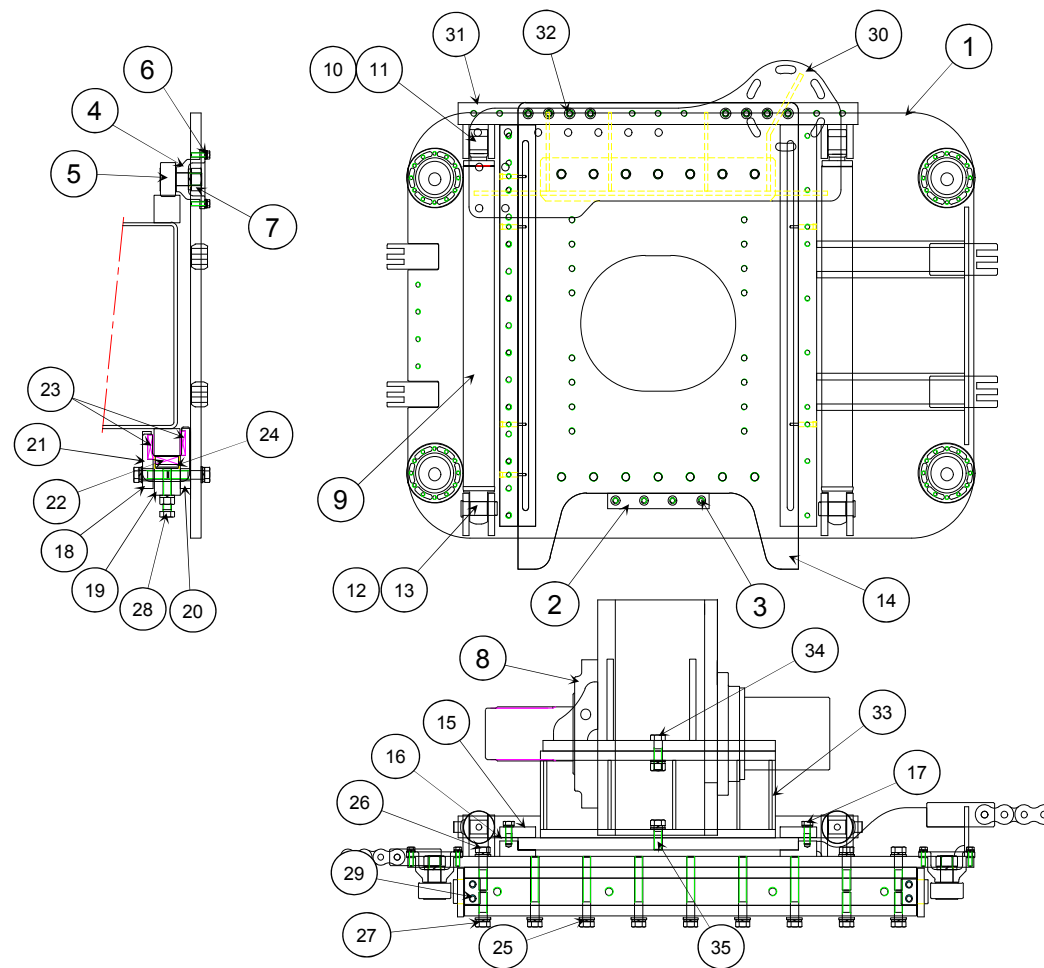


ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
1	1	HJWL03-01	WIRE LINE DRUM	와이어 라인 드럼	SOLAR035
2	1	HJWL03-02	HYD. MOTOR	유압모터	
3	3	HJWL03-03	WIRE GUIDE BAR	와이어 가이드 바	
4	1	HJWL03-04	COVER	커버	
5	1	HJWL03-05	WIRE LINE FRAME	와이어 라인 프레임	
6	2	HJWL03-06	SQUARE BAR	사각 바	
7	1	HJWL03-07	ARRANGEMENT SPACER	정렬장치 스페이서	
8	1	HJWL03-08	ARRAY BAR	정렬장치 바	
9	1	HJWL03-09	ARRANGEMENT COVER	정렬장치 커버	
10	2	HJWL03-10	GUIDE ROLLER BRACKET	가이드 롤러 브라켓	
11	2	HJWL03-11	SQUARE BAR FIX BRACKET	사각 바 고정 브라켓	
12	2	HJWL03-12	BEARING	베어링	UCFL 205
13	1	HJWL03-13	MIDDLE SPRACKET FRANGE	중간 스프라켓 플랜지	
14	2	HJWL03-14	BALL BEARING	볼 베어링	6004DD
15	1	HJWL03-15	MIDDLE SPRACKET	중간 스프라켓	
16	1	HJWL03-16	ROLLER GUIDE SPRACKET	롤러 가이드 스프라켓	
17	1	HJWL03-17	CAHIN COVER	체인 커버	
18	2	HJWL03-18	CHAIN	체인	RS40
19	1	HJWL03-19	DRUM SPRACKET	드럼 스프라켓	
20	1	HJWL03-20	DRUM FRANGE	드럼 플랜지	
21	1	HJWL03-21	BALL BEARING	볼 베어링	6210
22	1	HJWL03-22	ROLLER GUIDE BASE COVER	롤러 가이드 베이스 커버	
23	1	HJWL03-23	WIRE ROLLER	와이어 롤러	

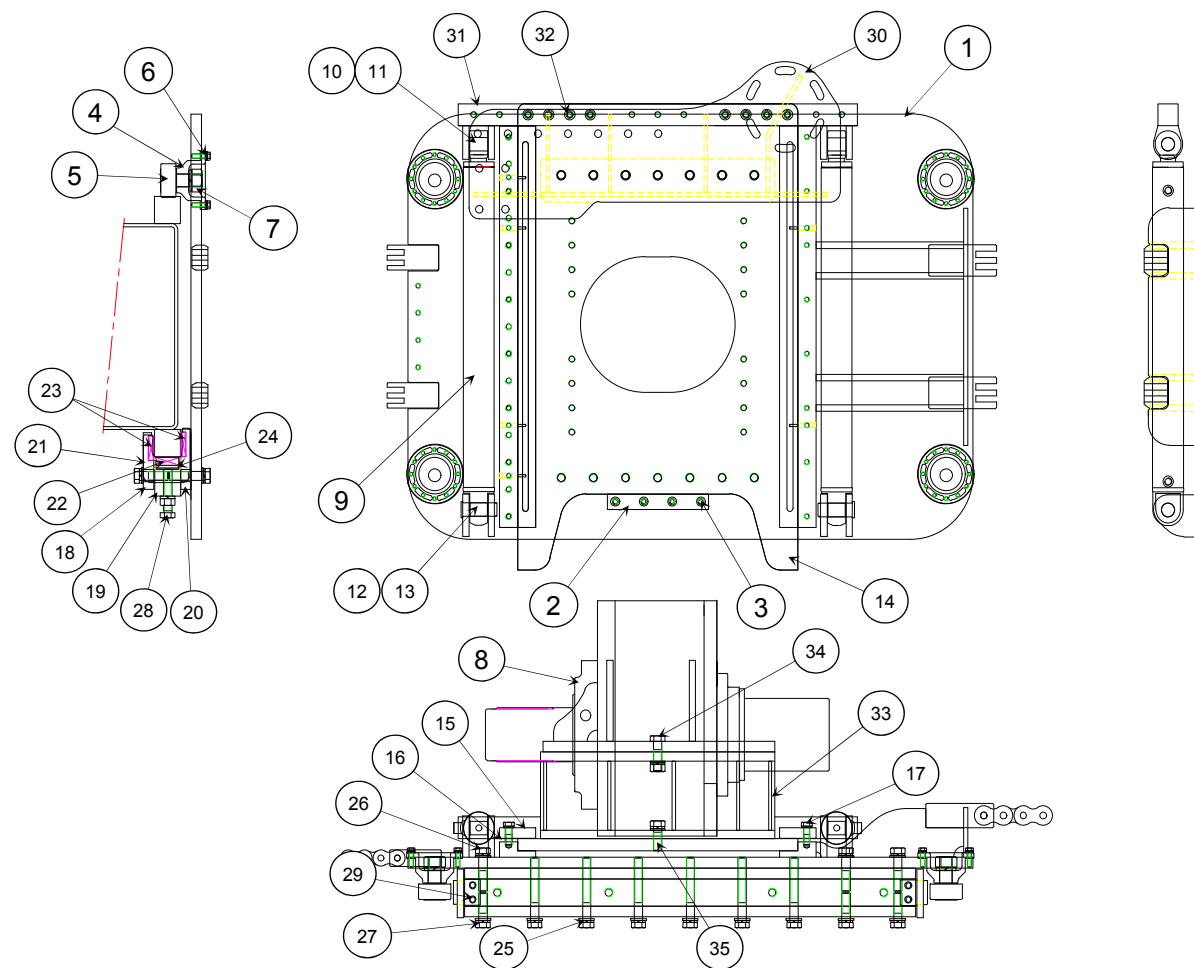


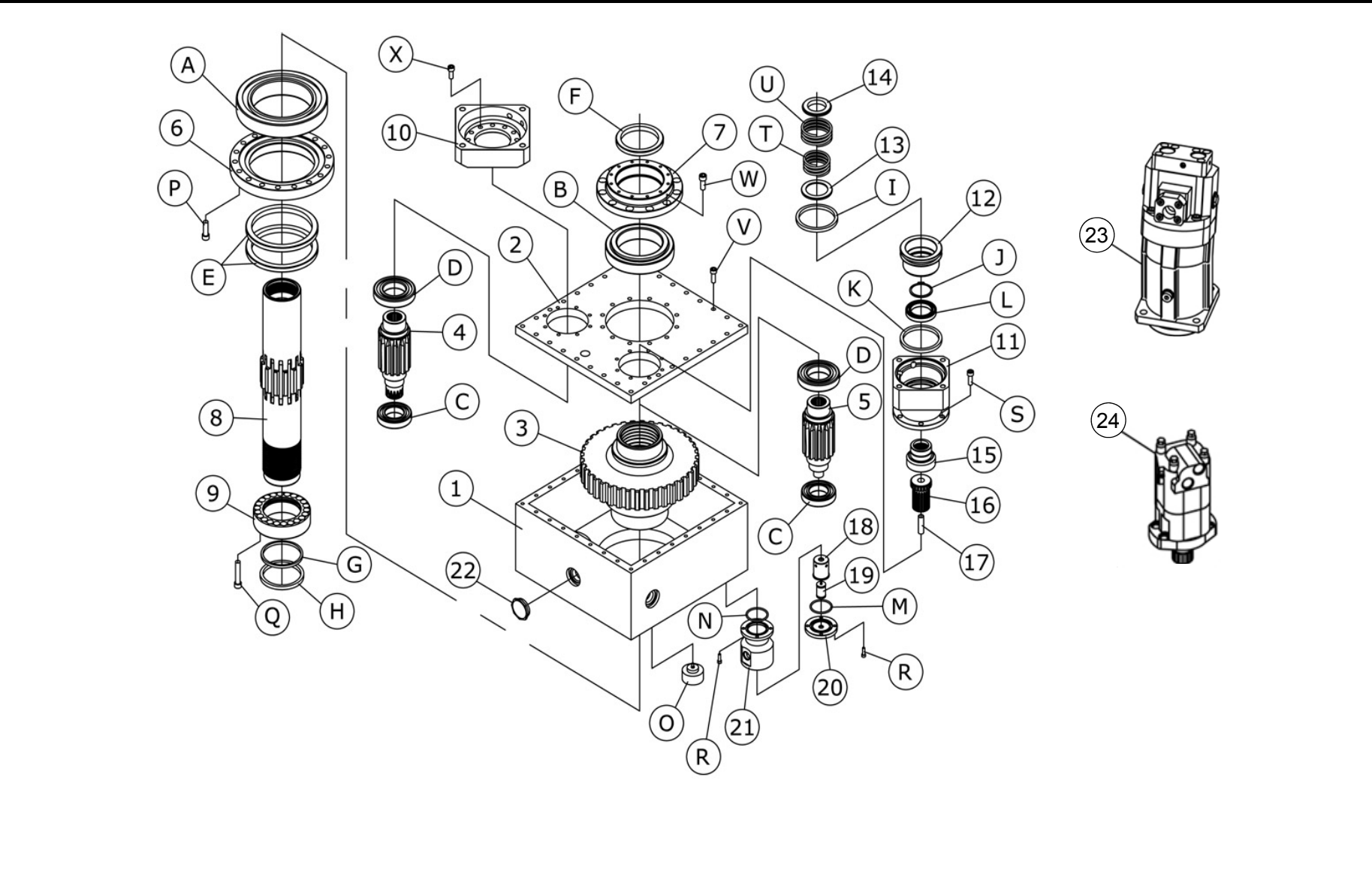
ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
24	1	HJWL03-24	PIN	핀	
25	2	HJWL03-25	SPACER	스페이서	
26	1	HJWL03-26	BALL BEARING	볼 베어링	6306
27	1	HJWL03-27	SNAP RING	스냅링	Ø72
28	1	HJWL03-28	ARRANGEMENT	정렬장치	
29	4	HJWL03-29	ROLLER PIN	롤러 고정 핀	
30	4	HJWL03-30	ROLLER	롤러	
31	8	HJWL03-31	BALL BEARING	볼 베어링	6002
32	4	HJWL03-32	SPACER	스페이서	
33	1	HJWL03-33	ROLLER GUIDE PIN	롤러 가이드 핀	
34	1	HJWL03-34	GREASE INJECTION FITTING	그리스 주입 니플	
35	1	HJWL03-35	GREASE NIPPLE	구리스 니플	
36	1	HJWL03-36	SPRING	스프링	
37	1	HJWL03-37	ROLLER GUIDE BASE	롤러 가이드 베이스	
38	2	HJWL03-38	SNAP RING	스냅링	Ø30
A	2	HJWL03-39	BOLT	육각 볼트	M10 x 30L
B	4	HJWL03-40	BOLT	육각 볼트	M10 x 30L
C	2	HJWL03-41	BOLT	육각 볼트	M10 x 15L
D	9	HJWL03-42	BOLT	육각 볼트	M10 x 30L
E	6	HJWL03-43	BOLT	육각 볼트	M12 x 30L
F	4	HJWL03-44	BOLT	육각 볼트	M8 x 15L
G	4	HJWL03-45	BOLT	육각 볼트	M12 x 20L
H	4	HJWL03-46	BOLT	육각 볼트	M8 x 20L



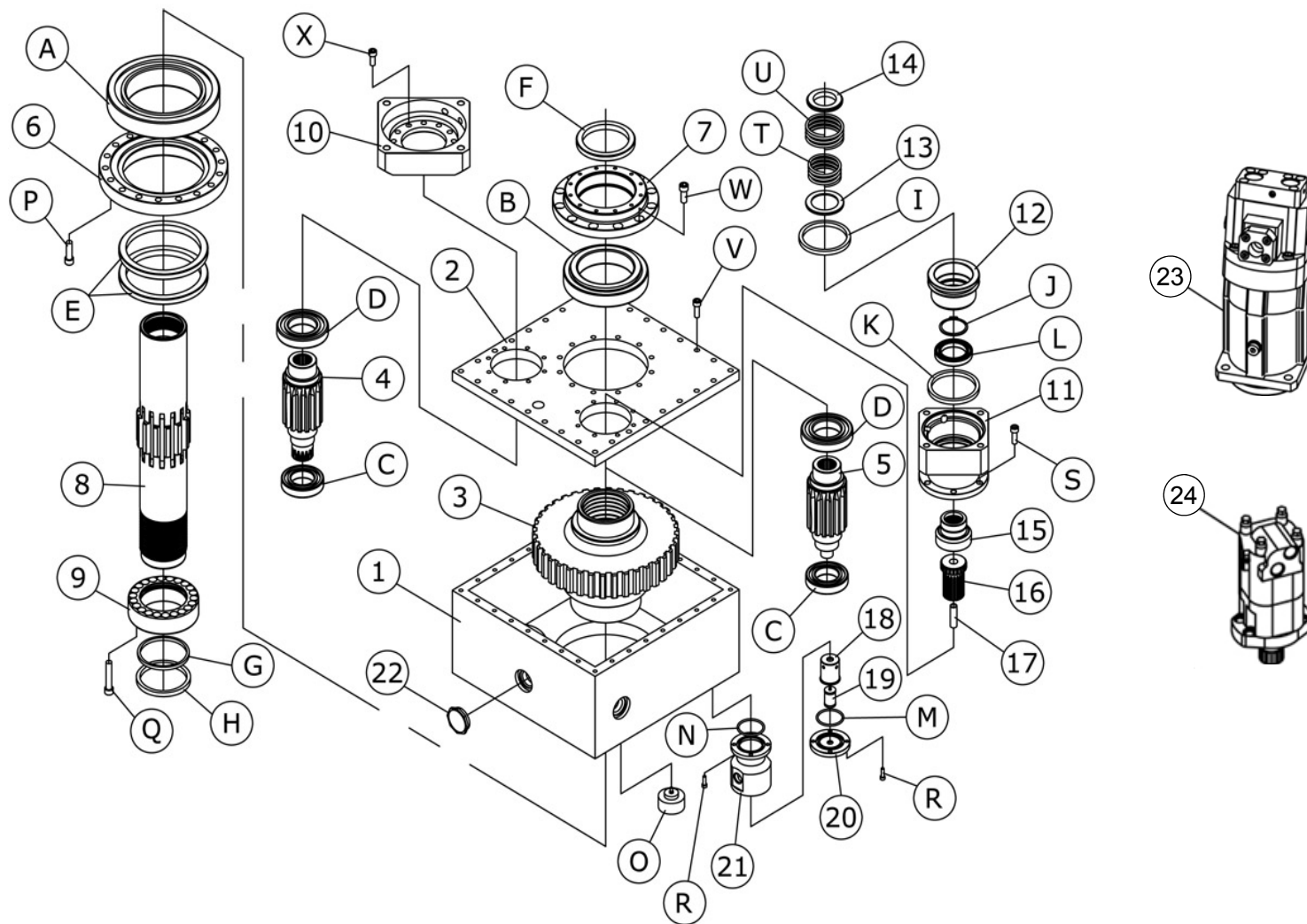


ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
1	1	HJGBG902 - 01	Gear box base	기어박스 베이스	
2	1	HJGBG902 - 02	Slide stopper	슬라이드 스토퍼	
3	4	HJGBG902 - 03	W/bolt	렌치볼트	M10X45
4	4	HJGBG902 - 04	Bearing sleeve	베어링 슬리브	
5	4	HJGBG902 - 05	Camfollower bearing	캠팔로워 베어링	CF-24
6	24	HJGBG902 - 06	H/bolt, spring/plain washer	볼트, 스프링/평 와셔	M8X30
7	4	HJGBG902 - 07	Nut	너트	M24
8	1	HJGBG902 - 08	Gear box ass'y	기어박스 아세이	
9	2	HJGBG902 - 09	Slide cylinder	슬라이드 실린더	Ø60-500st
10	2	HJGBG902 - 10	Pin	핀	Ø25
11	2	HJGBG902 - 11	Snap ring	스냅링	C25
12	2	HJGBG902 - 12	Pin	핀	Ø25
13	2	HJGBG902 - 13	Snap ring	스냅링	C25
14	1	HJGBG902 - 14	Slide plate	슬라이드 플레이트	
15	2	HJGBG902 - 15	Guide plate	가이드 플레이트	
16	2	HJGBG902 - 16	Spacer	스페이서	
17	30	HJGBG902 - 17	H/bolt, spring/plain washer	볼트, 스프링/평 와셔	M12X30
18	2	HJGBG902 - 18	Lower guide plate	하부 가이드 플레이트	
19	2	HJGBG902 - 19	Middle guide plate	중앙 가이드 플레이트	
20	2	HJGBG902 - 20	Upper guide plate	상부 가이드 플레이트	
21	4	HJGBG902 - 21	MC stopper	MC 스토퍼	
22	2	HJGBG902 - 22	MC nylon	MC 나일론	15T x 46 x 806
23	4	HJGBG902 - 23	Liner	라이너	10T x 43 x 870
24	2	HJGBG902 - 24	Push plate	밀판	5T x 46 x 806

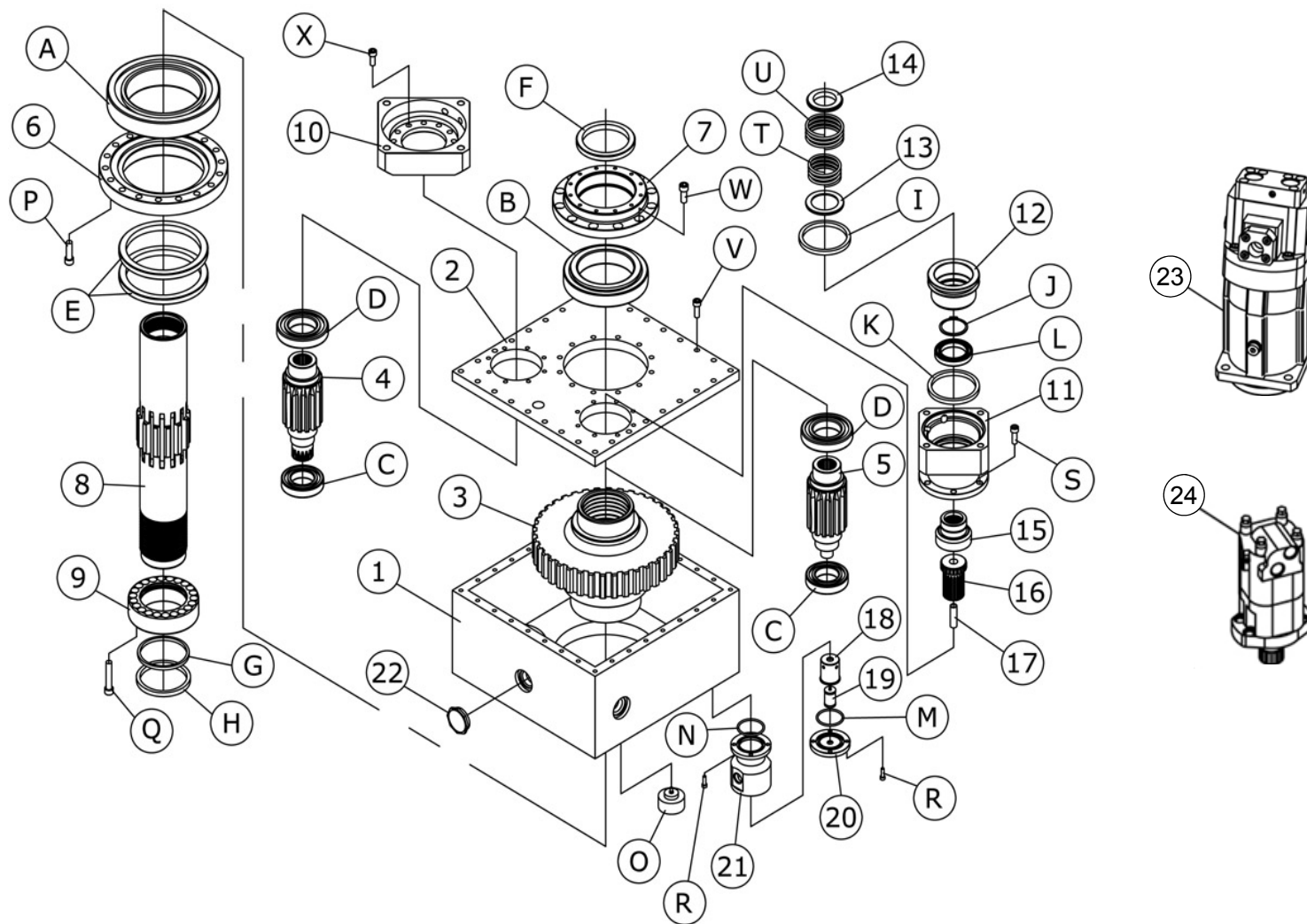


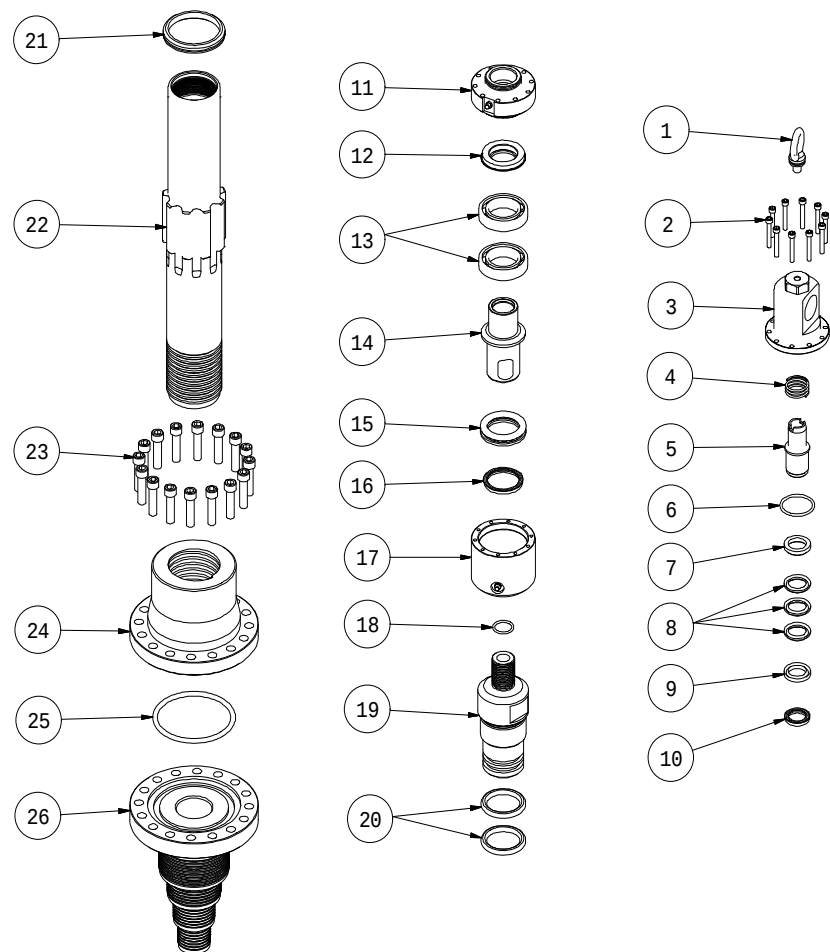


ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
1	1	HJGB901 - 01	GEAR BOX BASE	기어박스 바디	
2	1	HJGB901 - 02	GEAR BOX COVER	기어박스 커버	
3	1	HJGB901 - 03	MAIN GEAR	오기어	
4	1	HJGB901 - 04	PINION GEAR LEFT SIDE	소기어(좌)	
5	1	HJGB901 - 05	PINION GEAR RIGHT SIDE	소기어(우)	
6	1	HJGB901 - 06	UNDER BEARING COVER	베어링 커버(하)	
7	1	HJGB901 - 07	UPPER BEARING COVER	베어링 커버(상)	
8	1	HJGB901 - 08	900 SHANK	900 샹크	
9	1	HJGB901 - 09	SHANK COVER	샹크 커버	
10	1	HJGB901 - 10	MOTER COVER FOR HIGH SPEED	고속모터 플랜지	
11	1	HJGB901 - 11	MOTER COVER FOR LOW SPEED	저속모터 플랜지	
12	1	HJGB901 - 12	CHANGE GEAR PISTON	체인지기어 피스톤	
13	1	HJGB901 - 13	SPRING PLATE UNDER	스프링 플레이트(하)	
14	1	HJGB901 - 14	SPRING PLATE UPPER	스프링 플레이트(상)	
15	1	HJGB901 - 15	CHANGE GEAR	체인지기어	
16	1	HJGB901 - 16	CHANGE GEAR ADAPTER	체인지기어 어댑터	
17	1	HJGB901 - 17	BUSH	붓싱	
18	1	HJGB901 - 18	CIRCULATION STRAINER CASING	오일여과기 케이스	
19	1	HJGB901 - 19	STRAINER	오일여과기	
20	1	HJGB901 - 20	STRAINER HOUSING COVER	오일여과기 하우징 커버	
21	1	HJGB901 - 21	STRAINER HOUSING	오일여과기 하우징	
22	1	HJGB901 - 22	OIL LEVEL GLASS	유면계	1" PF
23	1	HJGB901 - 23	HIGH-SPEED MOTOR	고속모터	REXROTH 160CC

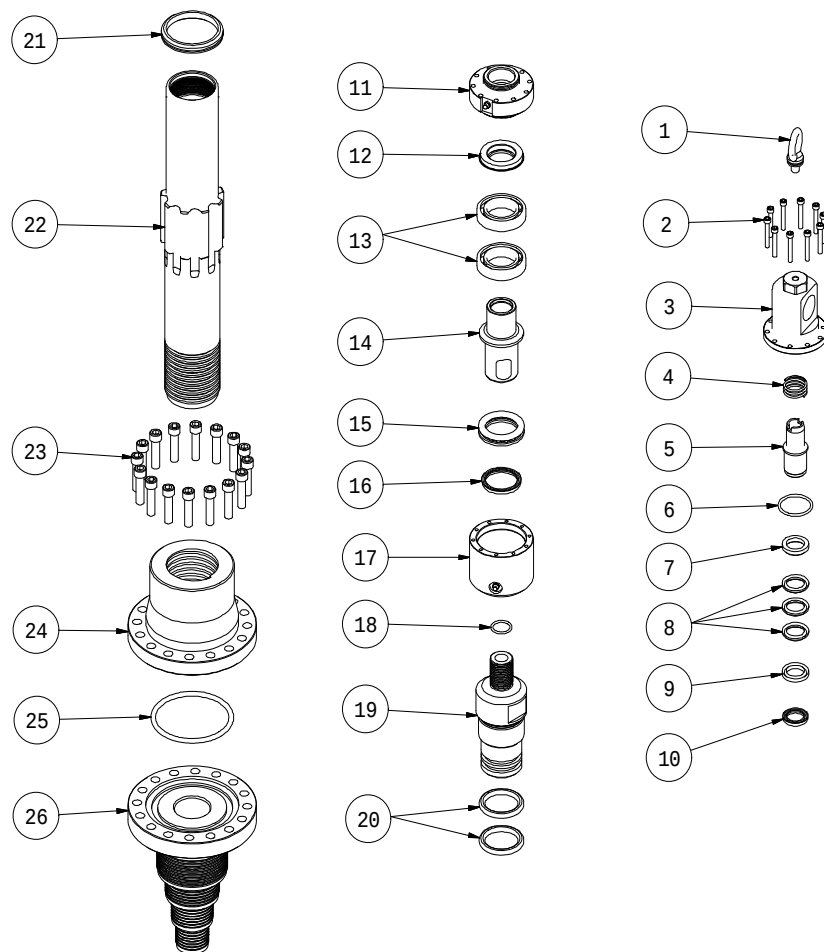


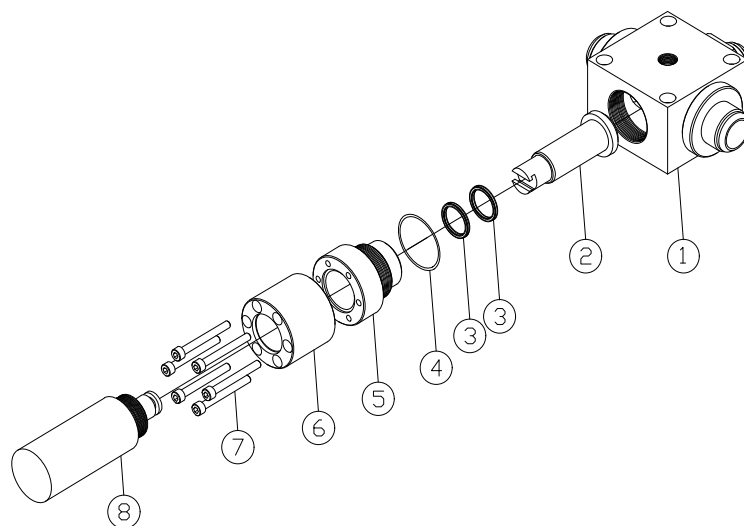
ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
24	1	HJGB901 - 24	LOW-SPEED MOTOR	저속모터	Eaton 6-310CC
A	1	HJGB901 - 25	BEARING	베어링	32032
B	1	HJGB901 - 26	BEARING	베어링	32024
C	2	HJGB901 - 27	BEARING	베어링	6210
D	2	HJGB901 - 28	BEARING	베어링	6212
E	2	HJGB901 - 29	OIL-SEAL	오일 씰	Ø160 x Ø190 x 14
F	1	HJGB901 - 30	OIL-SEAL	오일 씰	Ø100 x Ø125 x 13
G	1	HJGB901 - 31	USH OIL SEAL	오일 씰	USH100
H	1	HJGB901 - 32	OIL-SEAL DUST	먼지떨이 씰	U-PACKING Ø100
I	1	HJGB901 - 33	U-PACKING	오일 씰	Ø95 x Ø110 x 9
J	1	HJGB901 - 34	SNAP RING	스냅링	Ø55
K	1	HJGB901 - 35	U-PACKING	오일 씰	Ø95 x Ø110 x 9
L	1	HJGB901 - 36	BEARING	베어링	6911
M	1	HJGB901 - 37	O-RING	오링	G55
N	1	HJGB901 - 38	O-RING	오링	G55
O	1	HJGB901 - 39	CIRCULATION PUMP	기어박스 순환펌프	
P	22	HJGB901 - 40	HEXAGON SOCKET BOLT	렌치 볼트	M12 x 40L
Q	12	HJGB901 - 41	HEXAGON SOCKET BOLT	렌치 볼트	M12 x 65L
R	4	HJGB901 - 42	HEXAGON SOCKET BOLT	렌치 볼트	M6 x 20L
S	6	HJGB901 - 43	HEXAGON SOCKET BOLT	렌치 볼트	M10 x 30L
T	1	HJGB901 - 44	SPRING INNER	스프링(소)	
U	1	HJGB901 - 45	SPRING OUT	스프링(대)	
V	32	HJGB901 - 46	HEXAGON SOCKET BOLT	렌치 볼트	M10 x 30L

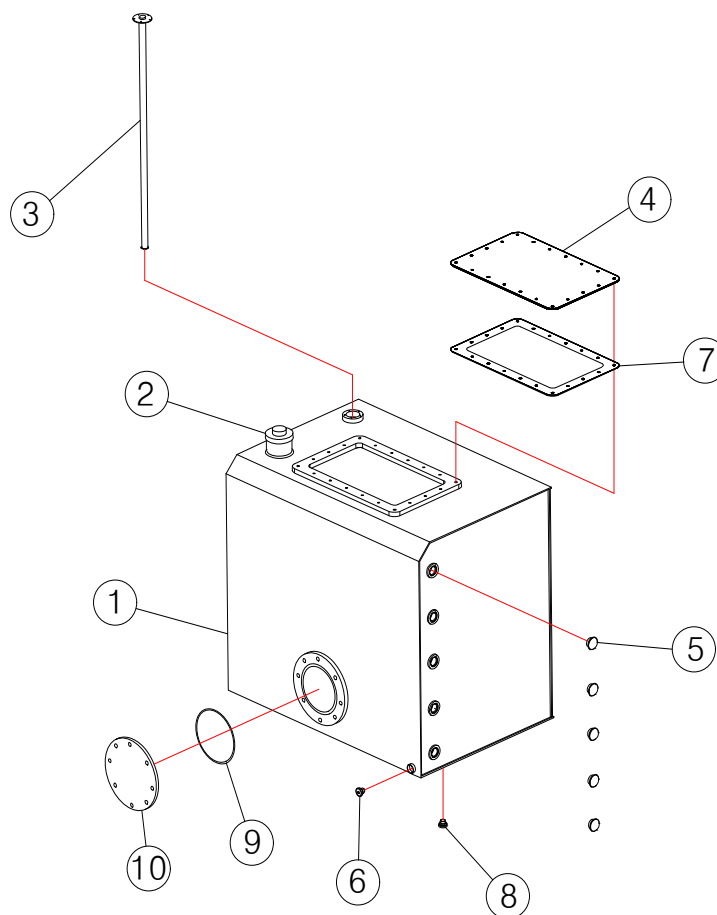


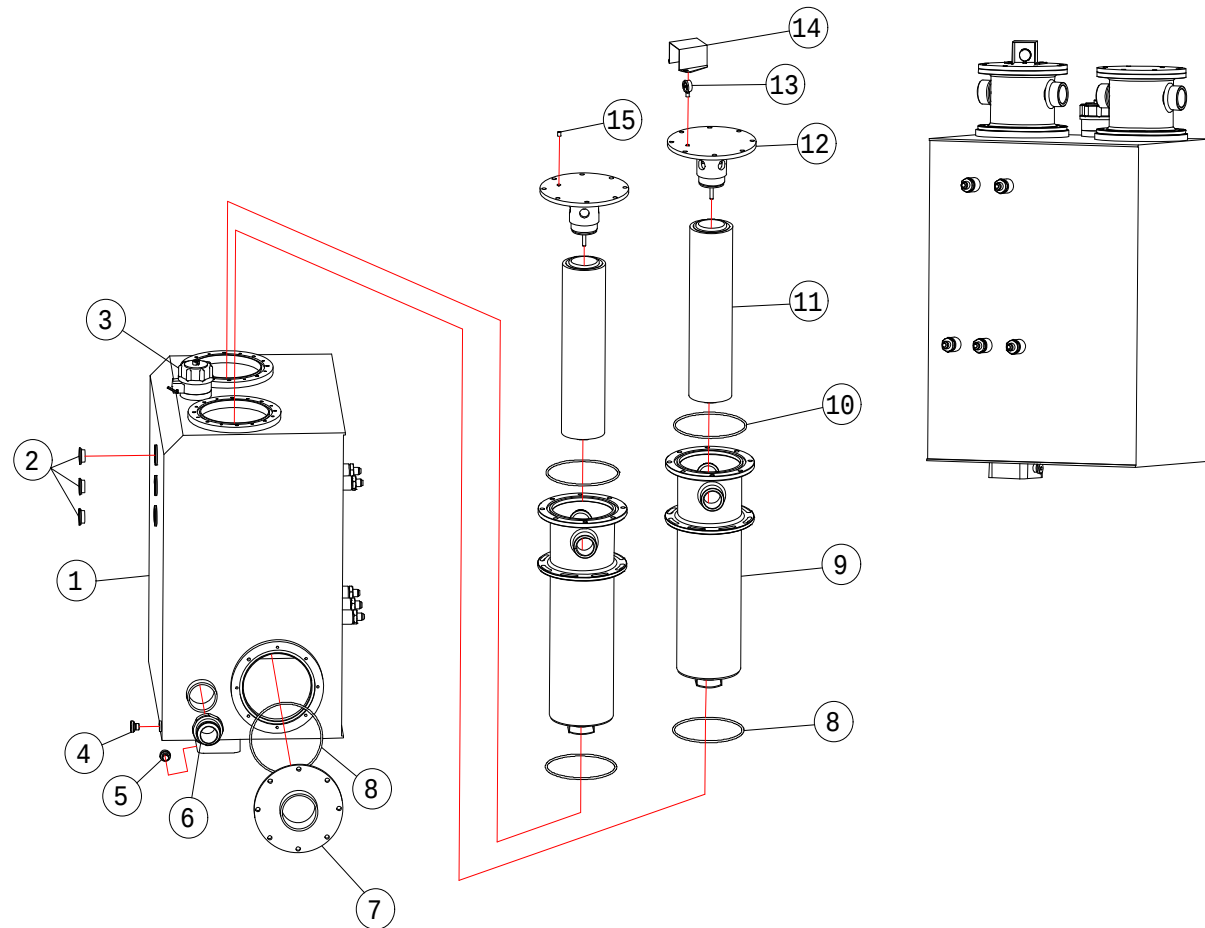


ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
1	1	HJH20 - DS - 01	I-bolt	아이볼트	M10
2	10	HJH20 - DS - 02	W/bolt	육각렌 치볼트	M6 X 45
3	1	HJH20 - DS - 03	Upper case	상부 케이스	
4	1	HJH20 - DS - 04	Spring	스프링	
5	1	HJH20 - DS - 05	Water pipe	물대	
6	1	HJH20 - DS - 06	O-ring	오링	G50
7	1	HJH20 - DS - 07	Upper adapter	상부 어댑터	
8	3	HJH20 - DS - 08	V-packing	브이 패킹	Ø28 X Ø41
9	1	HJH20 - DS - 09	Lower adapter	하부 어댑터	
10	1	HJH20 - DS - 10	U-packing	유패킹	Ø28 X Ø36 X 5 NOK USH28A
11	1	HJH20 - DS - 11	Seal case	실케이스	
12	1	HJH20 - DS - 12	Bearing nut, washer	베어링너트, 와셔	AN09, M45 X 1.5P
13	2	HJH20 - DS - 13	Bearing	베어링	6009
14	1	HJH20 - DS - 14	Shaft	샤프트	
15	1	HJH20 - DS - 15	Bearing	베어링	51110
16	1	HJH20 - DS - 16	U-packing	유패킹	NOK USH50
17	1	HJH20 - DS - 17	Lower case	하부케이스	
18	1	HJH20 - DS - 18	O-ring	오링	G30
19	1	HJH20 - DS - 19	Swivel adapter	스위벨 어댑터	
20	2	HJH20 - DS - 20	O-ring	오링	P60
21	1	HJH20 - DS - 21	VS-seal	VS실	VS75
22	1	HJH20 - DS - 22	Shank	샹크	800
23	16	HJH20 - DS - 23	W/bolt	육각렌 치볼트	M12 X 50

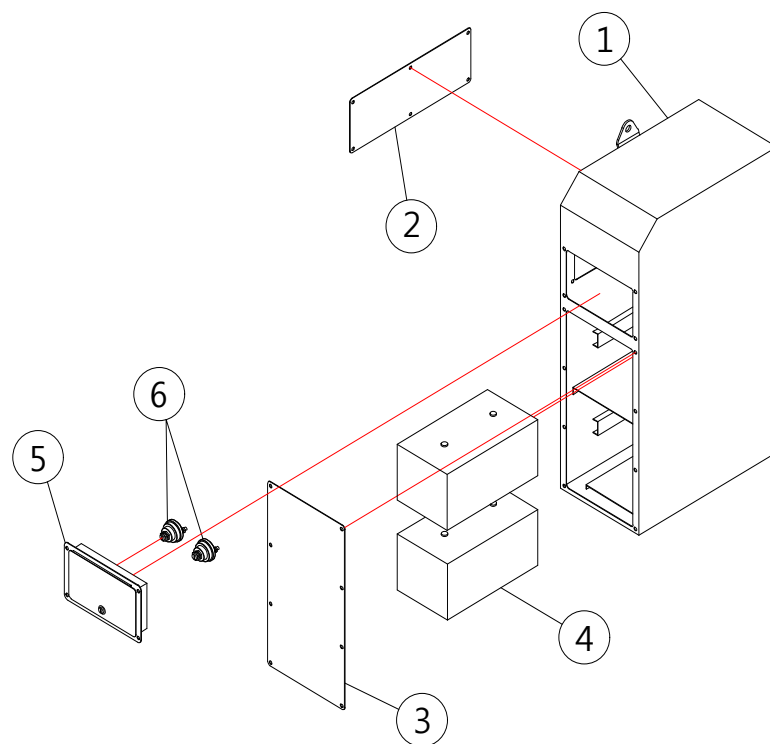


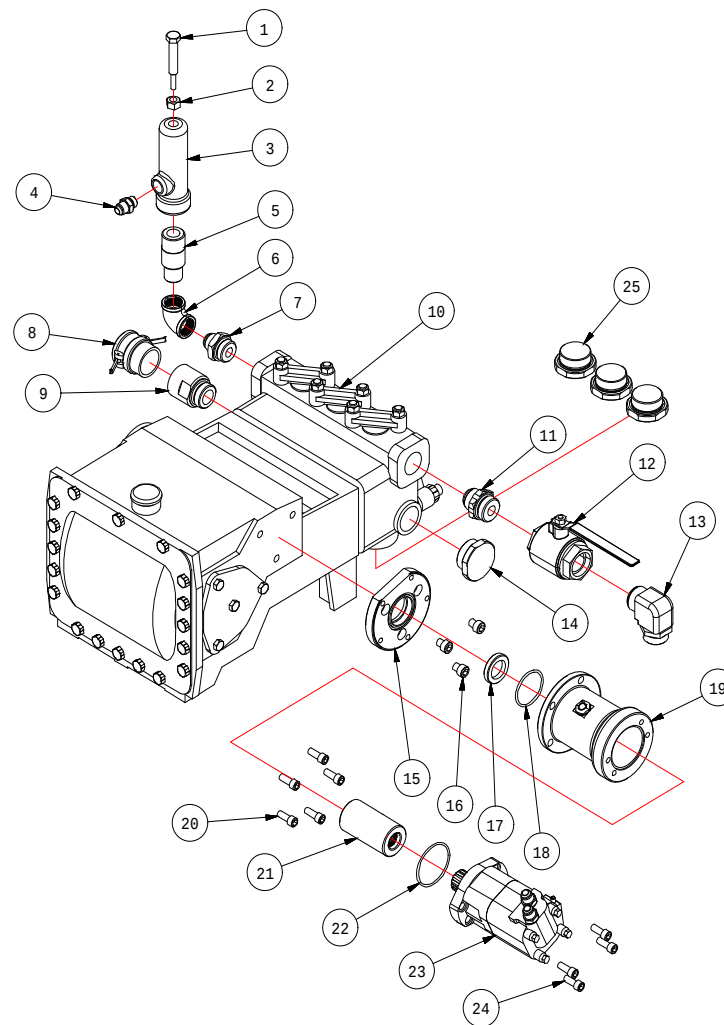




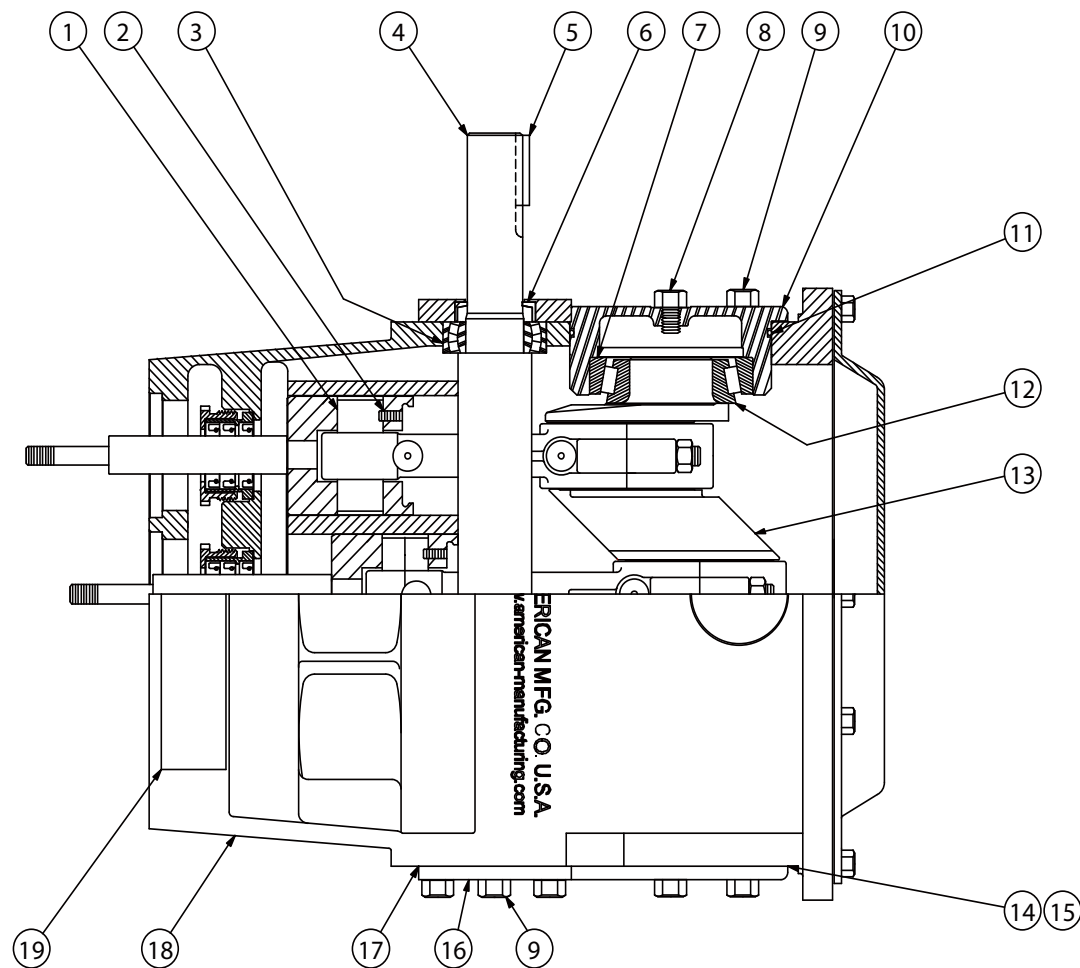


ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
1	1	HJHT06 - 01	Hydraulic tank body	유압탱크바디	
2	3	HJHT06 - 02	Oil level guage	오일 레벨 게이지	
3	1	HJHT06 - 03	Air breather	에어브리더	
4	1	HJHT06 - 04	PT cap	PT 메꾸라	3/8"
5	1	HJHT06 - 04	PF cap	PF 메꾸라	3/8"
6	1	HJHT06 - 05	PF nipple	PF 니플	2"
7	1	HJHT06 - 06	Pipe flange	파이프 플랜지	
8	3	HJHT06 - 07	O-ring	오링	G185
9	2	HJHT06 - 10	Return filter body	리턴 필터 바디	
10	2	HJHT06 - 11	O-ring	오링	G175
11	2	HJHT06 - 12	Return filter	리턴 필터	
12	1	HJHT06 - 13	Filter body cover	필터 바디 커버	
13	1	HJHT06 - 14	Indicator	인디케이터	
14	1	HJHT06 - 15	Indicator cover	인디케이터 커버	
15	1	HJHT06 - 16	Set screw	무두렌치볼트	PT 1/8"

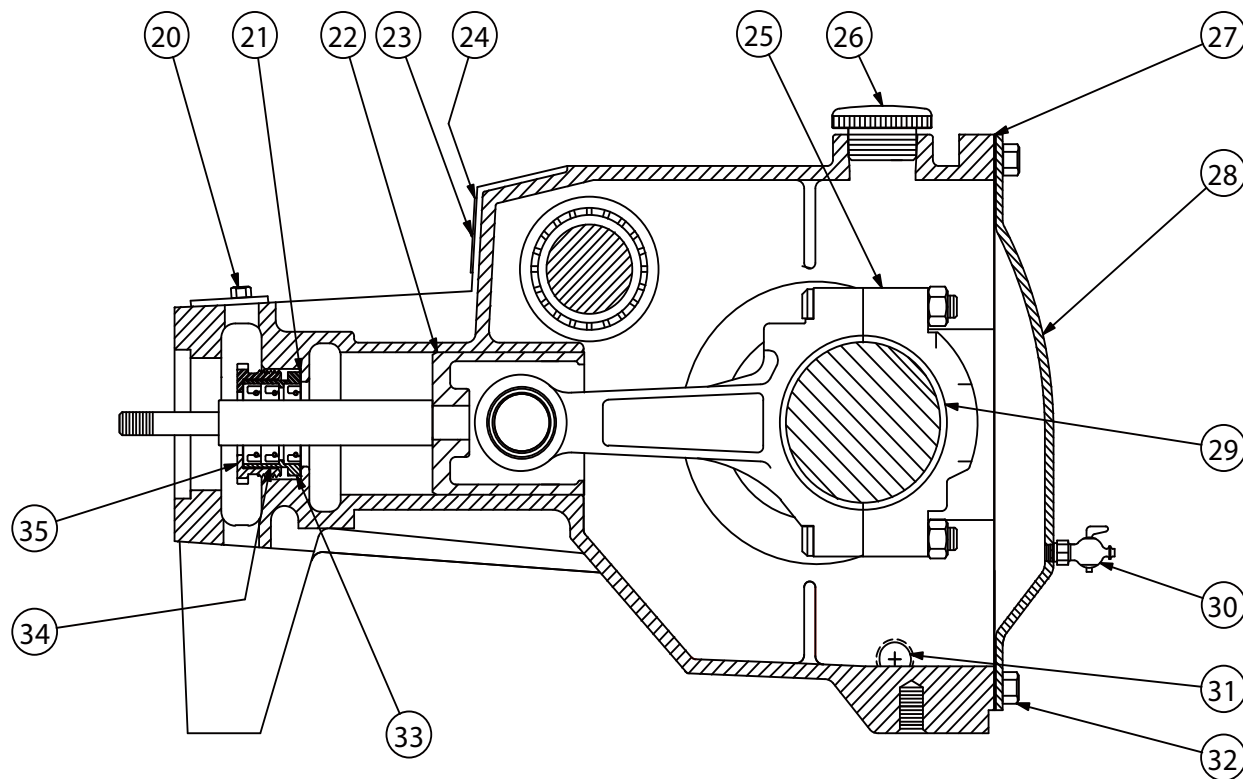




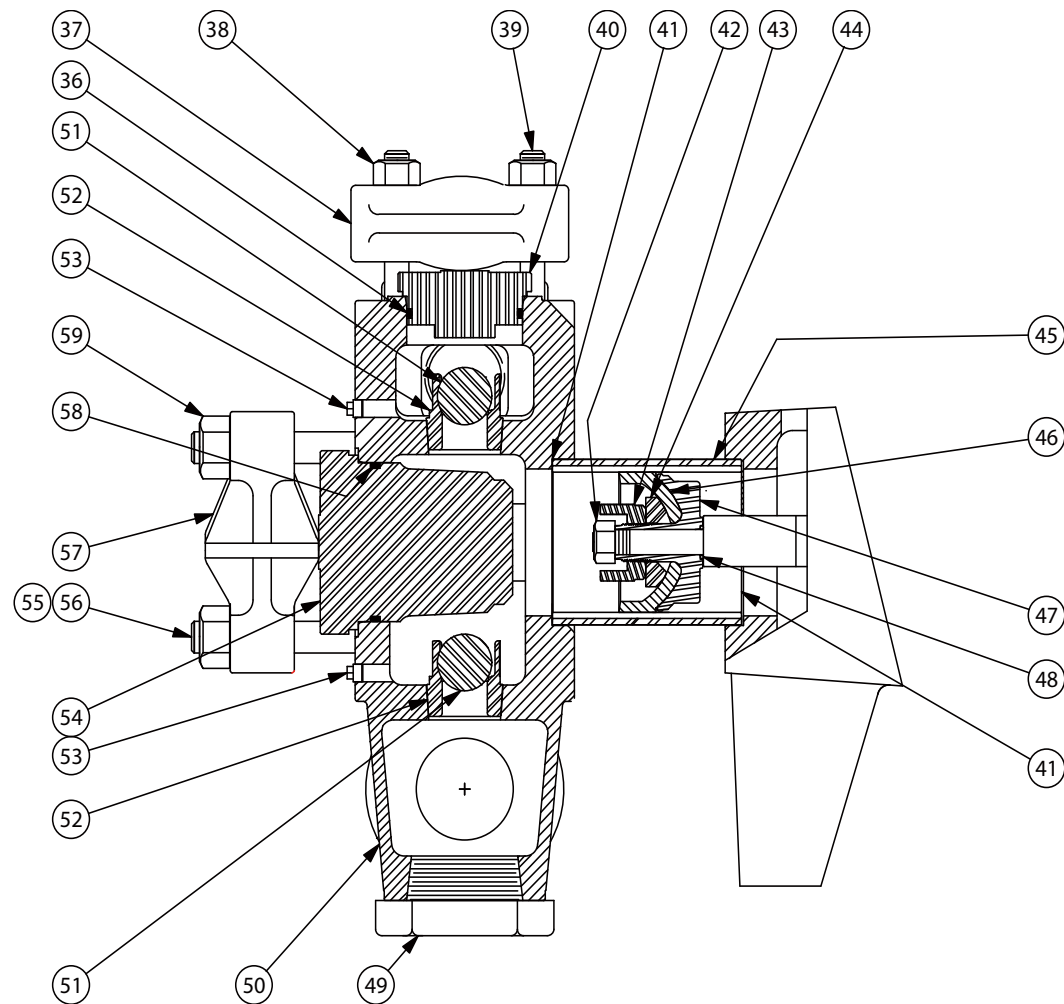
ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
1	1	HJFMC - 01	Pressure Relief Control Screw	압력 릴리프 제어 스크류	
2	1	HJFMC - 02	Nut	너트	
3	1	HJFMC - 03	Pressure Relief Valve Body	릴리프 밸브 바디	
4	1	HJFMC - 04	Connecting Nipple	니플	
5	1	HJFMC - 05	Connecting Nipple	니플	
6	1	HJFMC - 06	Elbow	엘보우	
7	1	HJFMC - 07	Connecting Nipple	니플	
8	1	HJFMC - 08	Hose Coupling	호스 커플링	
9	1	HJFMC - 09	Bushing	부싱	
10	1	HJFMC - 10	Mud Pump	머드펌프	
11	1	HJFMC - 11	Connecting Nipple	니플	
12	1	HJFMC - 12	Ball Valve	볼밸브	
13	1	HJFMC - 13	Elbow	엘보우	
14	1	HJFMC - 14	Plug	플러그	
15	1	HJFMC - 15	Drive Pinion Housing	유압 실린더	
16	3	HJFMC - 16	Wrench Bolt	렌치 볼트	M14 x 15L
17	1	HJFMC - 17	Oil Seal	오일 씸	58 x 38 x 11
18	1	HJFMC - 18	O-Ring	오링	G70
19	1	HJFMC - 19	Motor Coupling Body	연결 커플링 바디	
20	5	HJFMC - 20	Wrench Bolt	렌치 볼트	M12 x 30L
21	1	HJFMC - 21	Motor Coupling	연결 커플링	
22	1	HJFMC - 22	O-Ring	오링	G85
23	1	HJFMC - 23	Hydraulic Motor	유압 모터	160cc
24	4	HJFMC - 24	Wrench Bolt	렌치 볼트	M12 x 30L
25	3	HJFMC - 25	Plug	플러그	



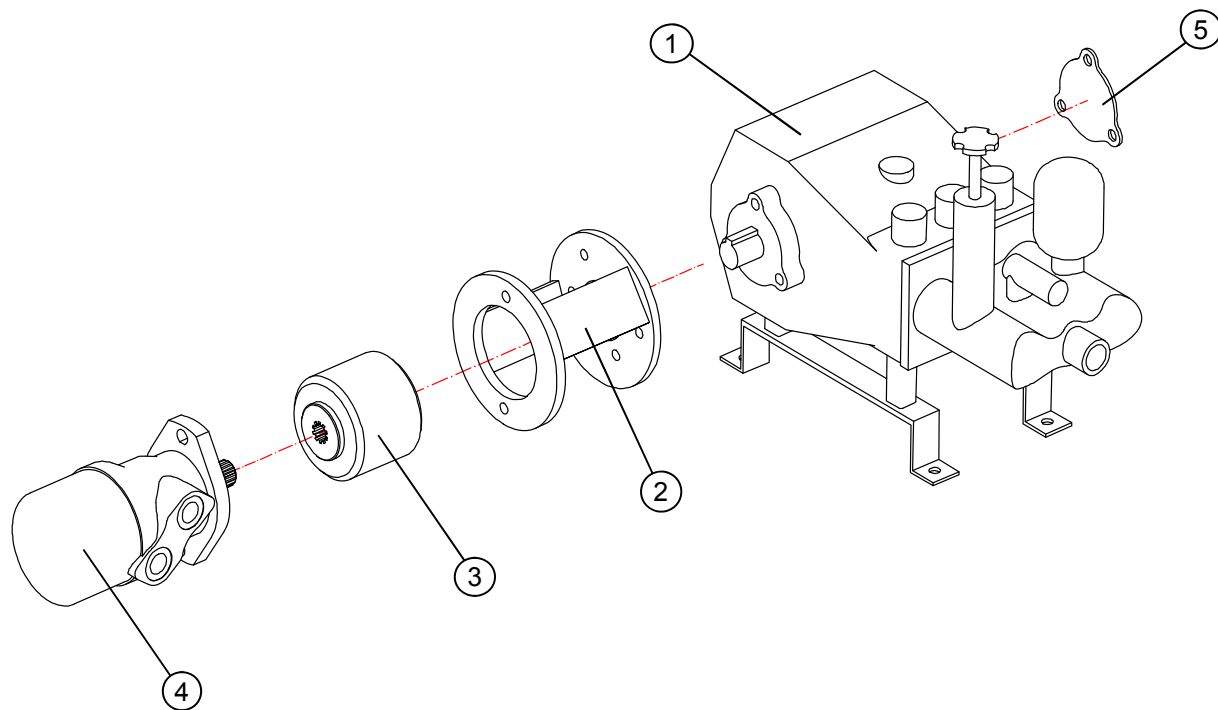
ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
1	3	HJFMC - 10 - 01	Wrist Pin	피스톤 핀	
2	3	HJFMC - 10 - 02	Screw Set	스크류 셋	
3	2	HJFMC - 10 - 03	Pinion Bearing	피니언 베어링	
4	1	HJFMC - 10 - 06	Pinion Shaft	피니언 샤프트	
5	1	HJFMC - 10 - 07	Key	키	
6	1	HJFMC - 10 - 08	Rotating Oil Seal	회전 오일 씰	
7	2	HJFMC - 10 - 09	Crank Bearing Cone	크랭크 베어링 콘	
8	2	HJFMC - 10 - 10	Screw	스크류	
9	9	HJFMC - 10 - 05	Pinion Bearing Cap Screw	피니언 베어링 캡 스크류	
10	2	HJFMC - 10 - 11	Blind Bearing Housing	블라인드 베어링 하우징	
11	2	HJFMC - 10 - 12	O-Ring	오링	
12	2	HJFMC - 10 - 13	Crank Bearing Cup	크랭크 베어링 컵	
13	1	HJFMC - 10 - 14	Crank Shaft	크랭크 샤프트	
14	6	HJFMC - 10 - 15	Bearing Housing Shim	베어링 하우징 씰	
15	2	HJFMC - 10 - 16	Bearing Housing Gasket	베어링 하우징 가스켓	
16	1	HJFMC - 10 - 17	Blind Pinion Housing	블라인드 피니언 하우징	
17	2	HJFMC - 10 - 18	Pinion Gasket	피니언 가스켓	
18	1	HJFMC - 10 - 19	Power Frame	파워 프레임	
19	1	HJFMC - 10 - 20	Inspection Plate	점검 플레이트	

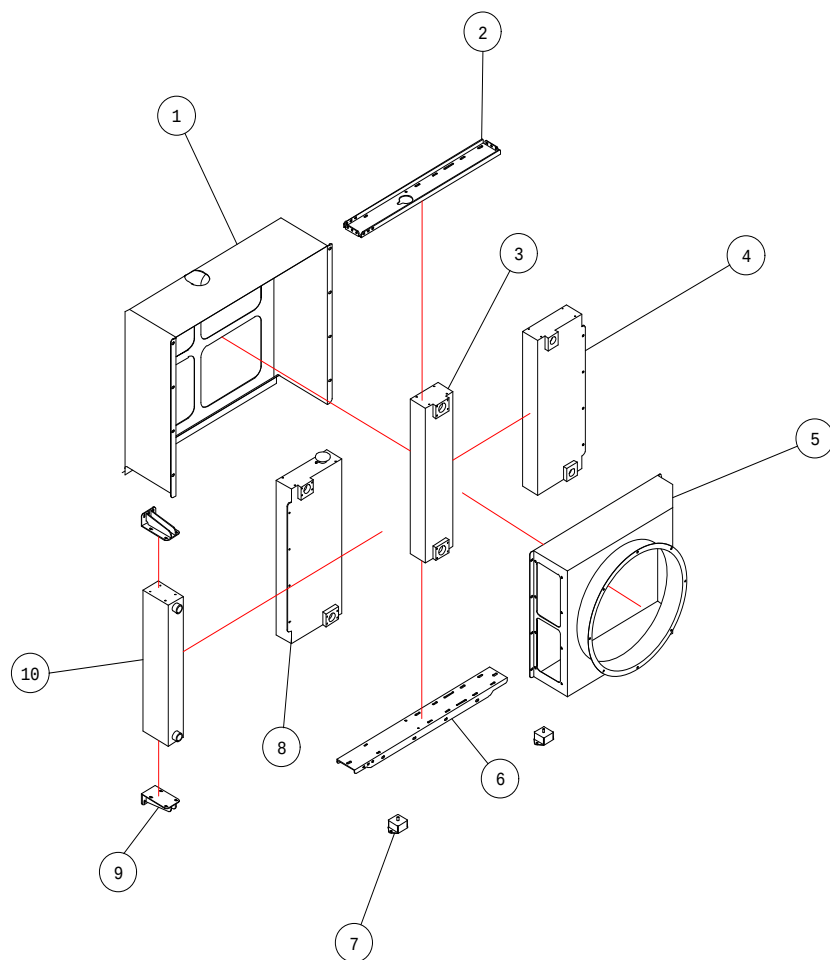


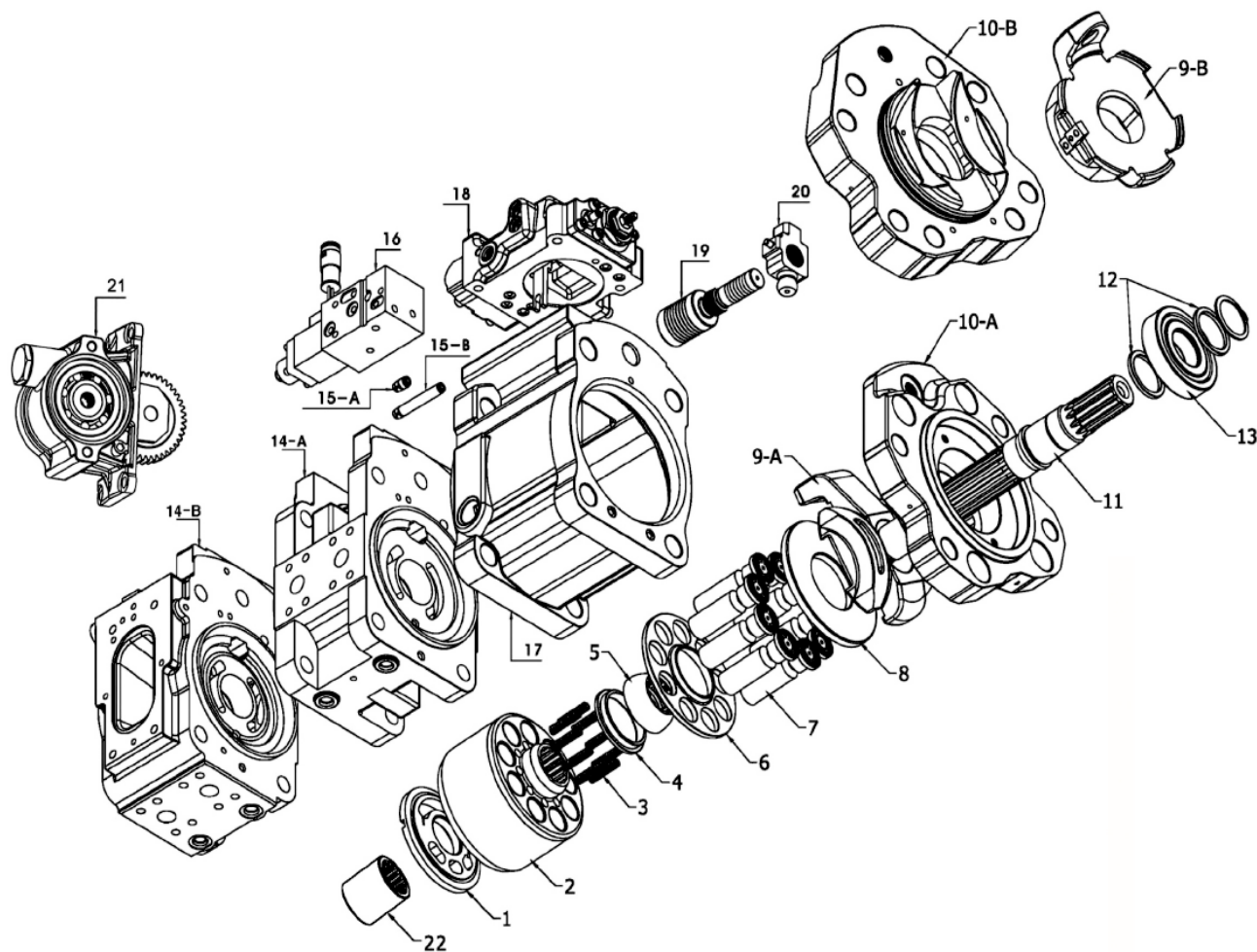
ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
20	2	HJFMC - 10 - 21	Cap Screw	캡 스크류	
21	3	HJFMC - 10 - 22	Seal Retainer Gasket	씰 리테이너 가스켓	
22	3	HJFMC - 10 - 23	Crosshead Assembly	크로스헤드 어셈블리	
23	2	HJFMC - 10 - 24	Self Tapping Screw	셀프 테핑 스크류	
24	1	HJFMC - 10 - 25	Name Plate	네임 플레이트	
25	3	HJFMC - 10 - 26	Connecting Rod Assembly	커넥팅 로드 어셈블리	
26	1	HJFMC - 10 - 27	Filler Cap or Vent	필러 캡 또는 벤트	
27	1	HJFMC - 10 - 28	Back Cover Gasket	백 커버 가스켓	
28	1	HJFMC - 10 - 29	Back Cover	백 커버	
29	3	HJFMC - 10 - 30	Rod Bearing	로드 베어링	
30	1	HJFMC - 10 - 31	Petcock	펫콕	
31	2	HJFMC - 10 - 32	Power End Pipe Plug	파워엔드 파이프 플러그	
32	18	HJFMC - 10 - 33	Screw	스크류	
33	3	HJFMC - 10 - 34	Seal Holder	씰 홀더	
34	9	HJFMC - 10 - 35	Piston Rod Oil Seal	피스톤 로드 오일 씰	
35	3	HJFMC - 10 - 36	Seal Retainer Nut	씰 리테이너 너트	



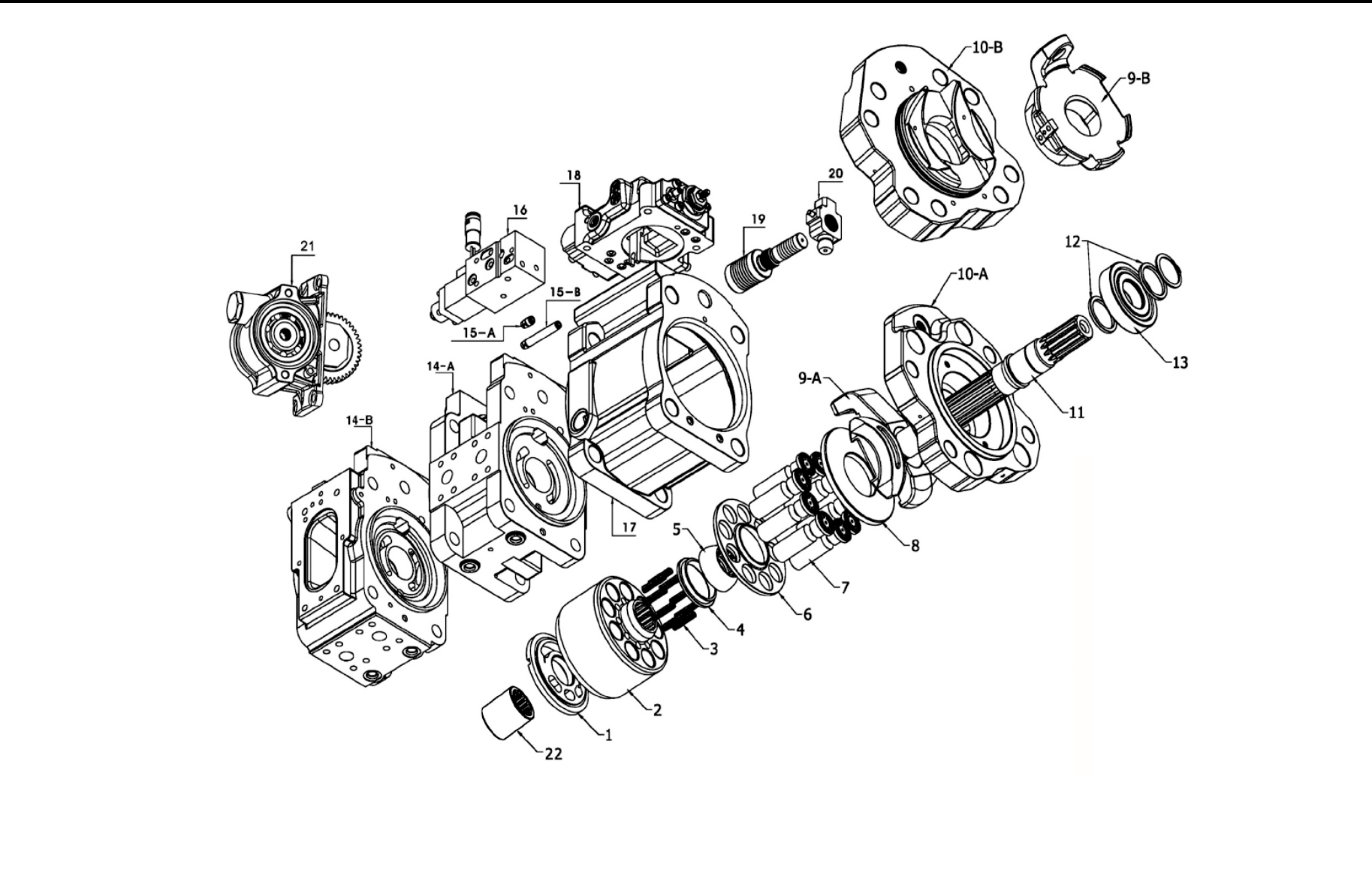
ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
36	3	HJFMC - 10 - 37	Valve Cover O-Ring	밸브 커버 오링	
37	3	HJFMC - 10 - 38	Valve Cover Clamp	밸브 커버 클램프	
38	6	HJFMC - 10 - 39	Valve Cover Hex Nut	밸브 커버 육각너트	
39	6	HJFMC - 10 - 40	Valve Cover Stud	밸브 커버 스테드	
40	3	HJFMC - 10 - 41	Valve Cover	밸브 커버	
41	6	HJFMC - 10 - 42	Fluid Cylinder Gasket	플루이드 실린더 가스켓	
42	3	HJFMC - 10 - 43	Hex Nut	육각너트	
43	3	HJFMC - 10 - 44	Nut Retainer	너트 리테이너	
44	3	HJFMC - 10 - 45	Piston Retainer	피스톤 리테이너	
45	3	HJFMC - 10 - 46	Cylinder	실린더	
46	3	HJFMC - 10 - 47	Piston Cup	피스톤 컵	
47	3	HJFMC - 10 - 48	Piston Holder	피스톤 홀더	
48	3	HJFMC - 10 - 49	Rod Seal O-Ring	로드 씰 오링	
49	3	HJFMC - 10 - 50	Suction Plug	석션 플러그	
50	1	HJFMC - 10 - 51	Fluid Chamber	플루이드 챔버	
51	6	HJFMC - 10 - 52	Valve Ball	밸브 볼	
52	6	HJFMC - 10 - 53	Valve Seat	밸브 시트	
53	4	HJFMC - 10 - 54	Pipe Plug	파이프 플러그	
54	3	HJFMC - 10 - 55	Cylinder Cover	실린더 커버	
55	2	HJFMC - 10 - 56	Fluid Cylinder Stud	플루이드 실린더 스테드	
56	6	HJFMC - 10 - 57	Cylinder Cover Stud	실린더 커버 스테드	
57	3	HJFMC - 10 - 58	Cylinder Clamp	실린더 클램프	
58	3	HJFMC - 10 - 59	Cylinder Cover O-Ring	실린더 커버 오링	
59	8	HJFMC - 10 - 60	Hex Nut	육각 너트	

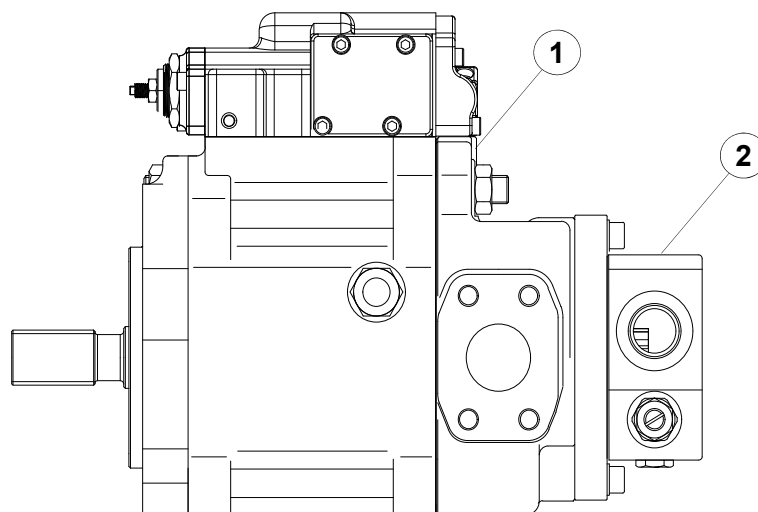


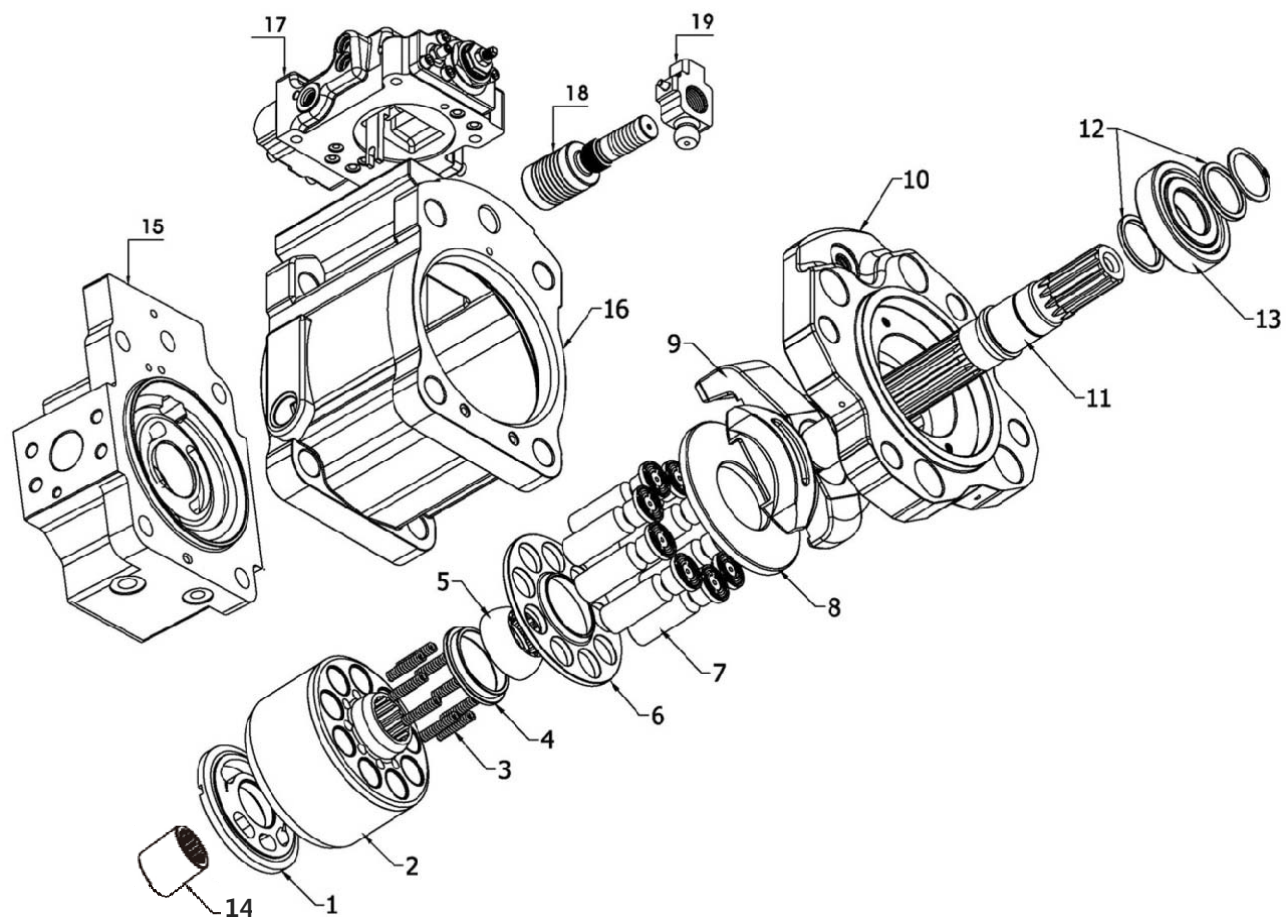




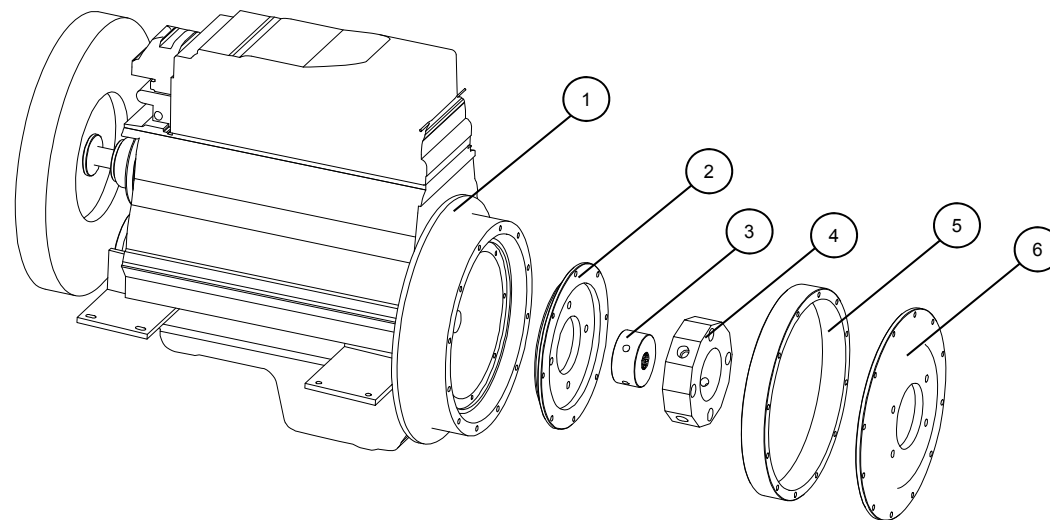
ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
1	1	H5V140 - 01	Valve plate (L/R)	밸브플레이트(L/R)	
2	1	H5V140 - 02	Cylinder block	실린더 블록	
3	9	H5V140 - 03	Coil spring	코일 스프링	
4	1	H5V140 - 04	Space of ball guide	볼가이드 스페이스	
5	1	H5V140 - 05	Ball guide	볼 가이드	
6	1	H5V140 - 06	Set plate	세트 플레이트	
7	9	H5V140 - 07	Piston shoe	피스톤 슈	
8	1	H5V140 - 08	Shoe plate	슈 플레이트	
9-A	1	H5V140 - 09	Swash plate	스와시 플레이트	
9-B	1	H5V140 - 10	Swash plate(caterpillar)	스와시 플레이트(카터필러)	
10-A	1	H5V140 - 11	Support	서포트	
10-B	1	H5V140 - 12	Support(caterpillar)	서포트(카터필러)	
11	1	H5V140 - 13	Drive shaft (FR/RR)	구동 샤프트(FR/RR)	
12	2	H5V140 - 14	Space of drive shaft	구동 샤프트 스페이스	
13	1	H5V140 - 15	Roller bearing	롤러 베어링	
14-A	1	H5V140 - 16	Valve block	밸브 블록	
14-B	1	H5V140 - 17	Valve block(H3V DTP/H5V SERIES)	밸브 블록(H3V DTP/H5V SERIES)	
15-A	1	H5V140 - 18	Check valve - short	체크밸브 - 쇼트	
15-B	1	H5V140 - 19	Check valve - long	체크밸브 - 롱	
16	1	H5V140 - 20	Epr valve	증발압력조절밸브	
17	1	H5V140 - 21	Case	케이스	
18	1	H5V140 - 22	Regulator ass'y	레귤레이터 아세이	
19	1	H5V140 - 23	Servo piston	서보 피스톤	

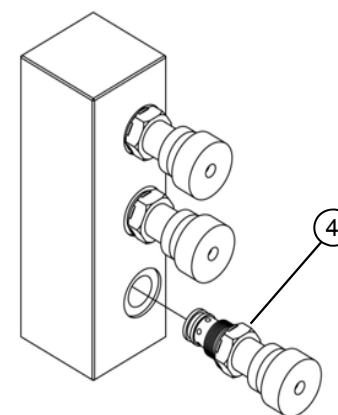
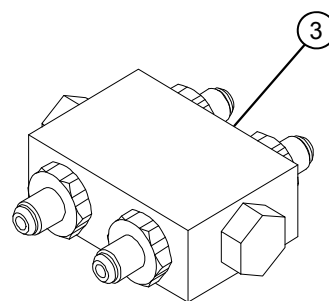
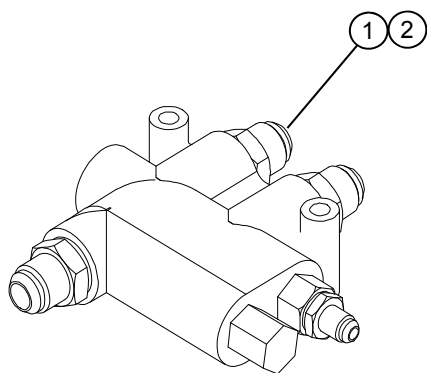






ITEM NO.	QTY.	P/NO.	P/NAME		REMARK
			ENGLISH	KOREA	
1	1	H3V63S - 01	Valve plate (L/R)	밸브플레이트	
2	1	H3V63S - 02	Cylinder block	실린더블록	
3	9	H3V63S - 03	Coil spring	코일 스프링	
4	1	H3V63S - 04	Space of ball guide	볼가이드 스페이스	
5	1	H3V63S - 05	Ball guide	볼 가이드	
6	1	H3V63S - 06	Set plate	세트 플레이트	
7	9	H3V63S - 07	Piston shoe	피스톤 슈	
8	1	H3V63S - 08	Shoe plate	슈 플레이트	
9	1	H3V63S - 09	Swash plate	스와시 플레이트	
10	1	H3V63S - 10	Support	서포트	
11	1	H3V63S - 11	Drive shaft (L/R)	구동 샤프트(L/R)	
12	1	H3V63S - 12	Space of drive shaft	구동 샤프트 스페이스	
13	2	H3V63S - 13	Roller bearing	롤러 베어링	
14	1	H3V63S - 14	Coupling	커플링	
15	1	H3V63S - 15	Valve block	밸브 블록	
16	1	H3V63S - 16	Housing	하우징	
17	1	H3V63S - 17	Regulator ass'y	레귤레이터 아세이	
18	1	H3V63S - 18	Servo piston	서보 피스톤	
19	1	H3V63S - 19	Tilting pin	틸팅 핀	





FILTERS

HJFILT35D01(DL08)



1



3



2



4



5



6

7



8

