Service Guide

for

17VXE

MINI EXCAVATOR

SERIAL NUMBERS:

17VXE: EG*00001-up

IHIMER | a joint venture IHI GROUP

IHIMER S.p.A.

This manual is used for both elelctric and diesel excavators. Parts for electric machines are custom built. Please contact Compact Excavators Sales, LLC for these parts.

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READ CAREFULLY THE SAFETY MEASURES CONTAINED IN THE SECTION 1.

ON MACHINES HAVING HYDRAULICALLY, MECHANICALLY AND/OR CABLE CONTROLLED EQUIPMENT ENSURE THE EQUIPMENT IS LOWERED TO THE GROUND BEFORE ANY SERVICING, ADJUSTING AND/OR REPAIRING OPERATION.
IF IT IS NECESSARY TO HAVE THE EQUIPMENT PARTIALLY OR FULLY RAISED TO GAIN ACCESS TO CERTAIN ITEMS, BE SURE THE EQUIPMENT IS SUITABLY SUPPORTED BY EXTERNAL SUPPORTING MEANS OTHER THAN THE DEVICES USED FOR CONTROLLING THE EQUIPMENT.
NEVER ATTEMPT TO CLEAN, OIL OR ADJUST A MACHINE WHILE IT IS IN MOTION.

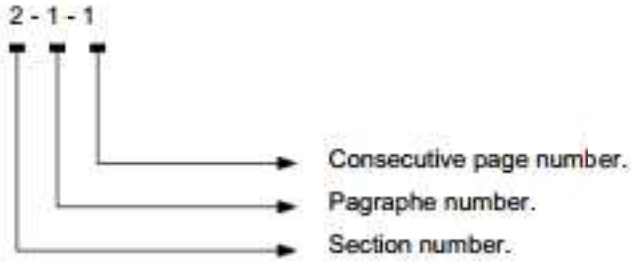
HYDRAULIC MINI EXCAVATOR

– TABLE OF CONTENTS –

This service guide covers check, adjustment, and maintenance of main parts on this machine. It is divided into 7 sections, each of them covers a specific portion of the machine or a specific related subject.

- For engine check, adjustment, and maintenance, please refer to the separate **"Engine maintenance manual"**.

- **example**



ATTENTION

- **Audience of this manual is those who have basic skills and knowledge on hydraulic excavators. Other people without such skills and knowledge may not be able to achieve maintenance according to this manual.**
- **This manual is rented to the specific maintenance shops authorized by us and those shops are managed on a ledger. If this manual is not required any mode, return it immediately to our Customer Support Department.**

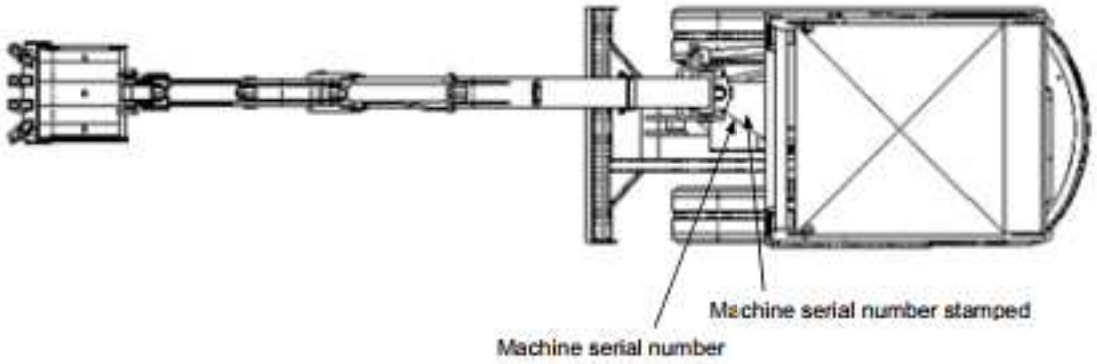
SECTION 1 SPECIFICATIONS

TABLE OF CONTENTS

1-1-1 SERIAL NUMBERS

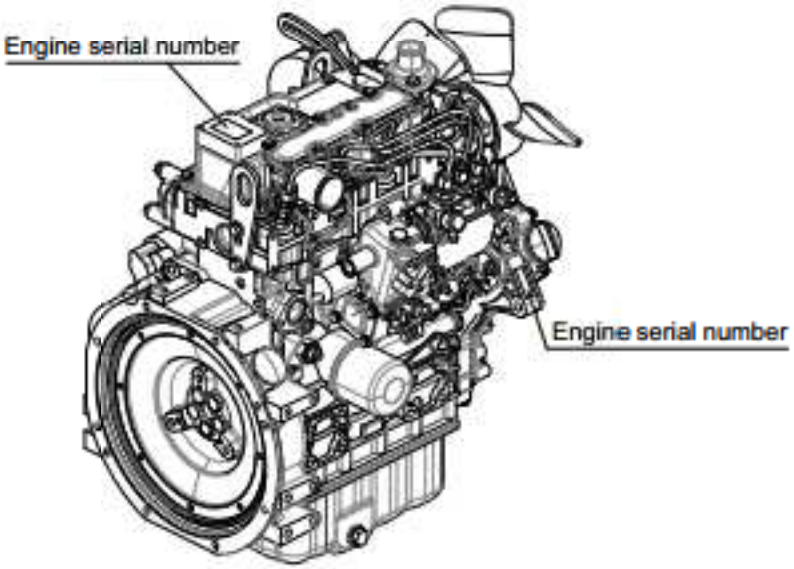
- The check/maintenance method and parts may vary depending on the time of manufacture.
- Before the start of maintenance or order placement of parts, be sure to confirm the machine and engine serial number.
- Serial numbers of this machine and the engine are marked on the positions shown below.

MACHINE SERIAL NUMBER



ENGINE SERIAL NUMBER

*There will be no engine in an electric unit



1-2-1 GENERAL SPECIFICATIONS

■ BASE MACHINE PERFORMANCE

	Unit	17VXE
Swing speed	min^{-1} (rpm)	9,4 (9,4)
Travel speed	km / h	2,1 / 4,2
Gradeability	% (deg.)	58% (30°)
Operating temperature range	℃	-20 / +46

■ Motor

Motor model	-	Reuland Electric 480V
Rated output	kW / min-1 (ps / rpm)	15 Hp

■ WEIGHT

			Standard	
			Canopy	Cabin
Machine mass	Rubber shoe	kg	1580	1670
	Steel shoe		1640	1730
Average ground bearing pressure	Rubber shoe	kgf/cm^2	0,26	0,27
	Steel shoe		0,27	0,29

■ REFILL CAPACITIES - (APPROXIMATE)

Hydraulic fluid	Oil level	Liters	19
	Total amount	Liters	23

■ NOISE LEVEL

External noise emission	LwA	10 dB
Noise emission at the operator ear (canopy)	LpA	10 dB
Noise emission at the operator ear (cabin)	LpA	10 dB

■ LEVEL OF EXPOSURE TO VIBRATIONS

(DIRECTIVE 2002/44/CE)

	Unit	Whole-body	Hand/Arm
Daily exposure action	m/sec²	0,5	2,5
Daily exposure limit value	m/sec²	1,15	5

■ Equivalent acceleration - For whole-body vibrations

(Method of measurement according to ISO2631)

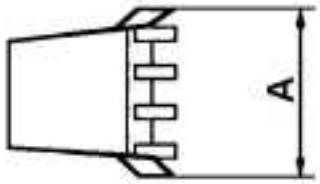
MACHINE			
GROUND	ACTION	Unit	Eq.ac. max.
Flat and compacted / asphalt	Driving 1st speed	m/sec²	0,42
	Driving 2nd speed	m/sec²	0,49
Earth	Digging / lowered blade	m/sec²	0,39
	Filling	m/sec²	0,49

■ Equivalent acceleration – For hand - arm vibrations

(Method of measurement according to ISO5349)

MACHINE			
GROUND	ACTION	Unit	Eq.ac.
Flat and compacted / asphalt	Driving 1st speed	m/sec²	1,53
	Driving 2nd speed	m/sec²	2,39
Earth	Digging / lowered blade	m/sec²	2,03
	Filling	m/sec²	1,77

■ BUCKET



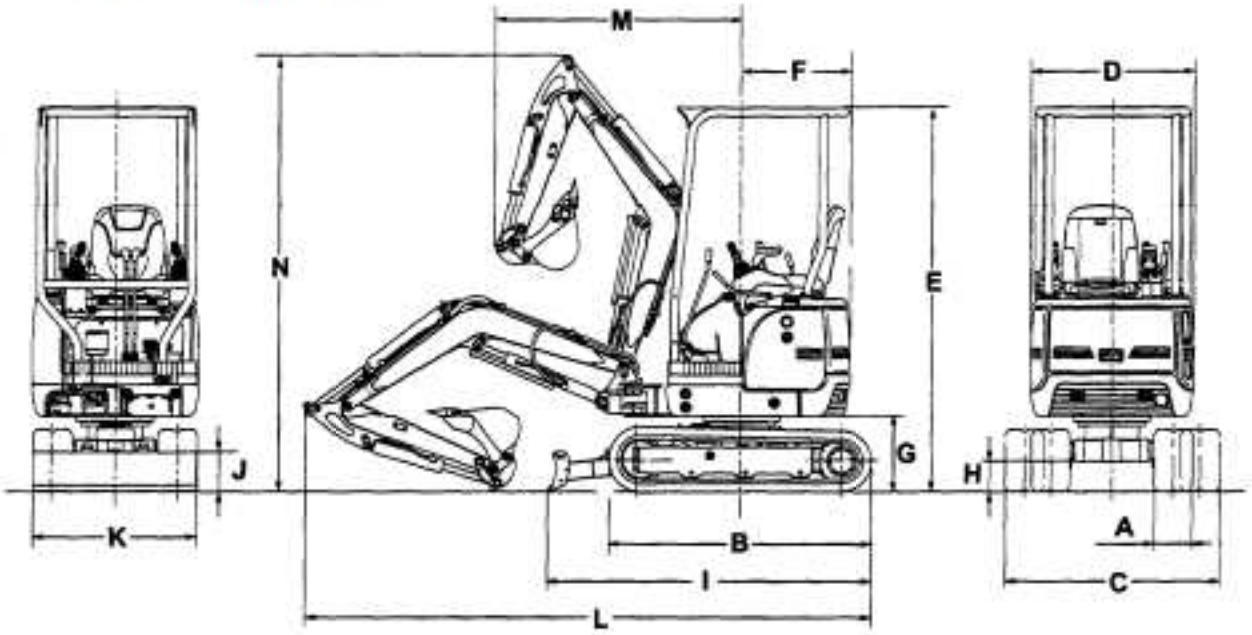
⊕ = Standard
☑ = Applicable
☒ = Not Applicable

Bucket capacity ISO (JIS) (m^3)	Width (mm) *side cutter* (A)	Number of teeth	Weight (kg)	Combinations
0,040	400	4	36	⊕ General digging
0,020	250	2	25	☑ Ditch digging
0,025	300	3	29	☑ Ditch digging
0,030	350	3	31	☑ Ditch digging
0,050	500	4	40	☑ Loading
0,075	800	-	50	☑ Ditch cleaning

Buckets with dimensions bigger than standard, where is allowed, must be used carefully in order to avoid damages to the structures and maintain the stability of machine.

1-4-1 OVERALL DIMENSIONS

■ OVERALL DIMENSIONS

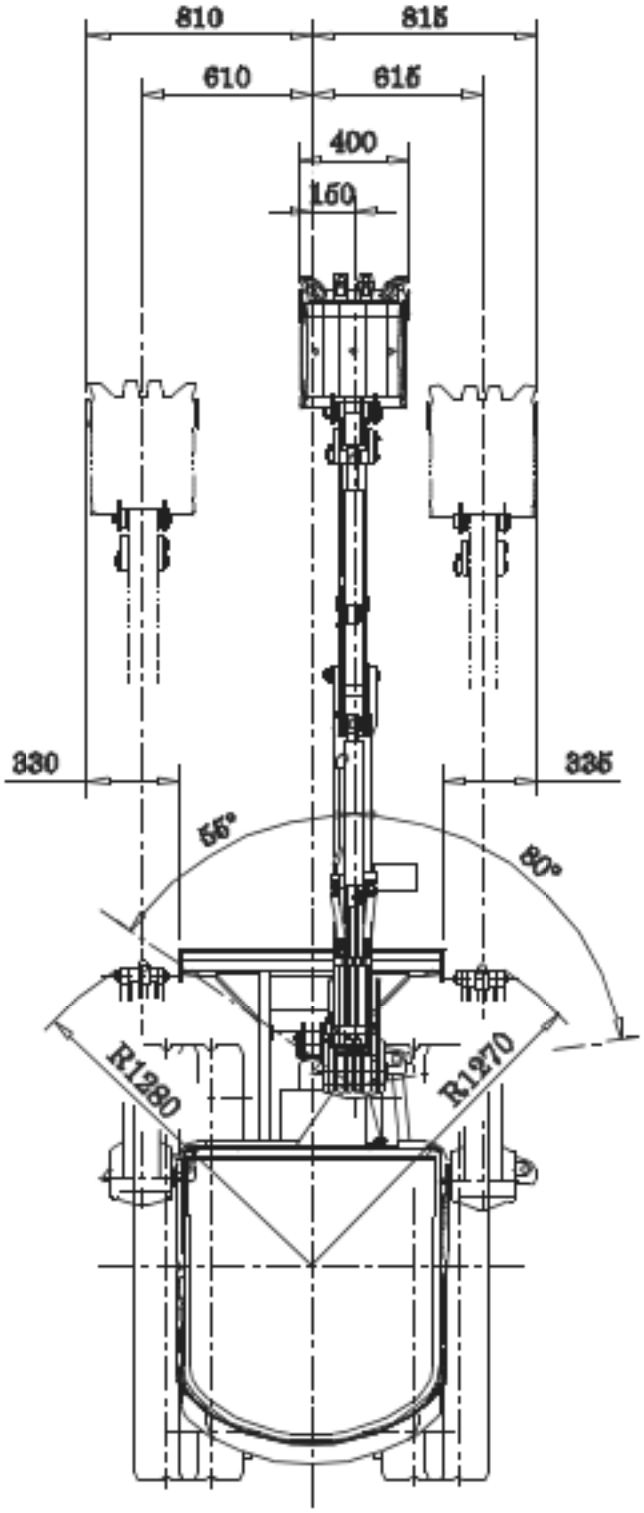


(unit: mm)

Ref.	Description	STANDARD		ADD WEIGHT	
		Rubber shoe (mm)	Steel shoe (mm)	Rubber shoe (mm)	Steel shoe (mm)
A	Shoe width	230	230	230	230
B	Shoe length	1570	1550	1570	1550
C	Crawler width	980 - 1300	980 - 1300	980 - 1300	980 - 1300
D	Canopy width	980	980	980	980
E	Canopy height	2330	2330	2330	2330
F	Rear end swing radius	680	680	720	720
G	Rear end ground clearance	460	460	460	460
H	Min. ground clearance	175	175	175	175
I	Overall length of undercarriage	1950	1950	1950	1950
J	Blade heigth	235	235	235	235
K	Blade width	980 - 1300	980 - 1300	980 - 1300	980 - 1300
L	Overall length (blade in front)	3380	3380	3380	3380
	Overall length (blade in rear)	3740	3740	3740	3740
M	Front end min. radius at center	1490	1490	1490	1490
N	Arm head clearance	2630	2630	2630	2630

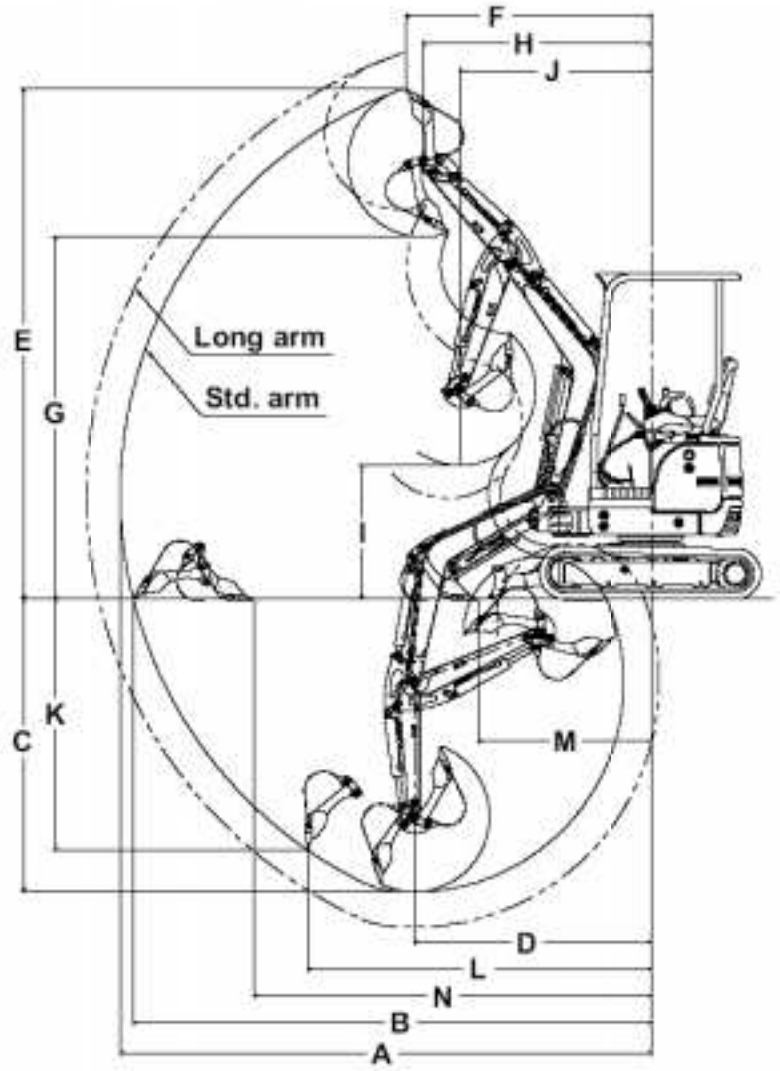
1-5-1 WORKING RANGE

■ BOOM SWING DIGGING WORKING RANGE



R=1280 Min. right swing radius
R=1270 Min. left swing radius

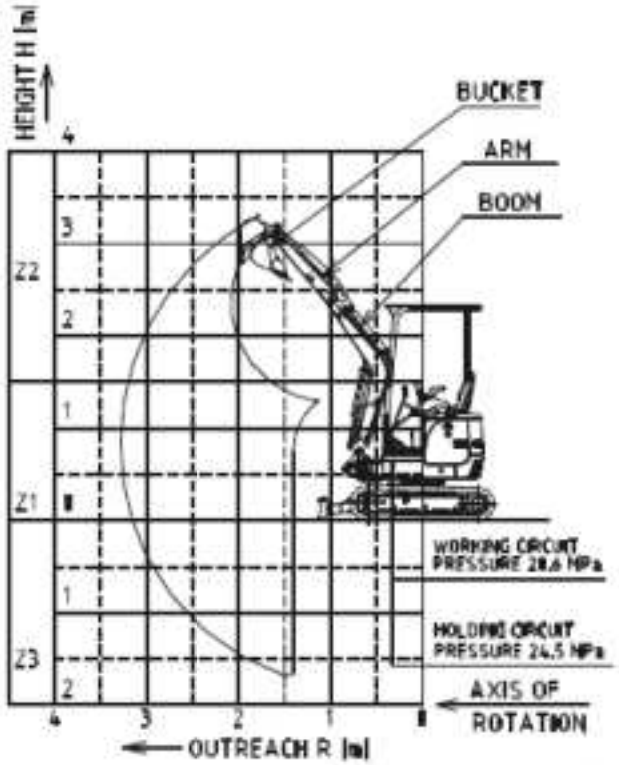
■ WORKING RANGE (BACK HOE)

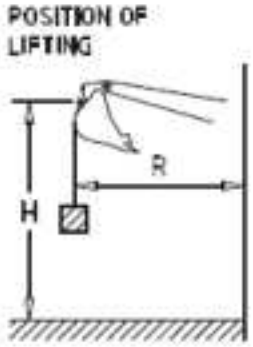


(unit: mm)

Ref.	Description	Standard arm	Long arm
	Std. of bucket capacity (m^3) ISO	0,04 m³	0,04 m³
A	Max. digging radius	3760	3990
B	Max. bucket outreach at ground level	3660	3910
C	Max. digging depth (not used blade)	2100	2350
D	Radius of max. digging depth	1680	1680
E	Max. digging height	3610	3810
F	Radius of max. digging height	1740	1900
G	Max. dumping height	2560	2760
H	Radius of max. digging height	1610	1770
I	Min. dumping height	950	720
J	Radius of min. dumping height	1350	1440
K	Max. vertical digging depth	1770	2010
L	Radius of max. vertical digging depth	2430	2490
M	Radius of min. digging ground level	1220	1120
N	Max. clean-up radius at floor level	2810	3040

1-6-1 LIFTING CAPACITIES TABLE





WORKING CONDITION:
- with bucket
- on a compact horizontal level ground
- in a complete swing of the upperstructure

These loads are value for the height of the considered zone [Z] for the intended outreach

LIFTING CAPACITY

The lifting capacity is applied for operation on a level and firm ground. If the machine is operated on an unleveled or unstable ground, the capacity decreases.

RETRACTED CRAWLER -- OUTREACH in m - LOADS in kg					
OUTREACH [m]		3.5	3	2.5	2
BOOM LENGHT 1.65 m ARM LENGHT 0.95 - L20 m	Z2		1▮▮	1▮▮	2▮▮
	Z1	1▮▮	1▮▮	1▮▮	2▮▮
	Z3		1▮▮	1▮▮	1▮▮

EXPANDED CRAWLER -- OUTREACH in m - LOADS in kg					
OUTREACH [m]		3.5	3	2.5	2
BOOM LENGHT 1.65 m ARM LENGHT 0.95 - L20 m	Z2		2▮▮	2▮▮	3▮▮
	Z1	1▮▮	2▮▮	2▮▮	3▮▮
	Z3		2▮▮	2▮▮	3▮▮

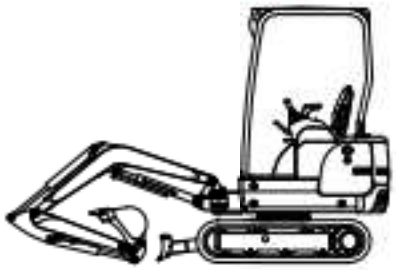
WARNING

THERE MAY BE LOCAL GOVERNMENT REGULATIONS REGARDING THE USE OF EXCAVATORS FOR LIFTING HEAVY OBJECTS. PLEASE OBSERVE THOSE REGULATIONS WHERE THEY ARE.

1-7-1 WEIGHT BREAKDOWN

■ WEIGHT BREAKDOWN

1. Total operating weight



Cabin / Canopy Spec.	Shoe	Weight (kg)
Canopy	Rubber	1450
	Steel	1510
Cabin	Rubber	1610
	Steel	1670

2. Base machine

Cabin / Canopy Spec.	Shoe	Weight (kg)
Canopy	Rubber	1260
	Steel	1320
Cabin	Rubber	1420
	Steel	1480

This weight is not the mass of the machine body. It includes the weight of water, fuel, blade and others.

3. Upper structure

Cabin / Canopy Spec.	Weight (kg)
Canopy	860
Cabin	1020

4. Under carriage

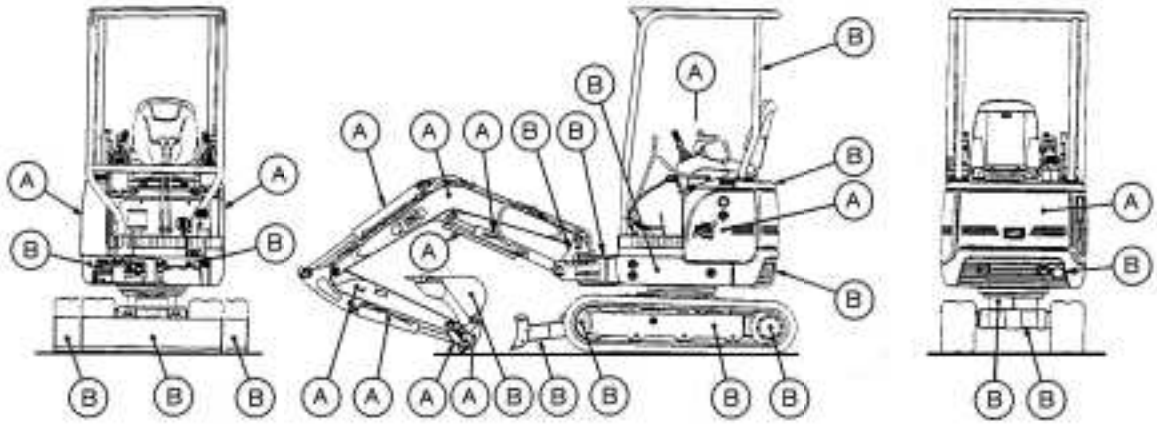
Shoe Specification	Weight (kg)
With rubber shoe	400
With steel shoe	460

5. Hoe attachment

Att. Specification	Weight (kg)
Standard arm	190

1-8-1 PAINTING DIAGRAM

■ **TOPS CANOPY SPECIFICATION**



Color code for IHIMER standard color

Code	A	B
Name	Light-green	Dark gray

Notes:

1) Do not coat rubbers, sponges, catch metal fixtures, hydraulic hoses, cylinder rods, rod packing, air cleaners, mufflers with paint.
2) Do not coat operating lever, side box, gauges, pedal, handrail, seat or undercover with paint because each of them have already been painted as a single unit.

1-9-1 UNIT SYMBOLS

Name	Measuring unit	Remarks
Mass	Kg	For the machine mass, running mass, etc. kg is used. For the rated total load list for the crane work, t is used.
Force (tensile force, compressive force, load, etc)	N	1 kgf = 9.80665 N For the excavating force and traction force, kN is used. The width for rounding is 5 or 10 N
Torque/bending moment	N•m	1 kg,m = 9.80665 N,m Tightening torques for bolts, etc. included. The width for rounding is 5 or 10 N,m.
Stress/strength	MPa	1 kgf/mm^2 = 9.80665 MPa The width for rounding is 5 or 10 MPa.
Pressure	MPa	Pressure MPa 1 kg/cm^2 = 0.09808665 MPa The hydraulic pressure is represented in MPa, and the grounding pressure in kPa. The value is rounded to the first place below decimal point.
Charpy impact strength	J/cm^2	1 kgf,m/ cm^2 = 9.80665 J/ cm^2 Rounded to an integer.
Output	kW	1PS = 0.7355 Kw Rounded to an integer.
Heat quantity	J	1cal = 4.18605 J Rounded to an integer.
Dynamic viscosity	cm^2/s	1 St = 1 cm^2/s
Rotation speed	min-1	For the turn speed and engine rotation speed, min^{-1} is used.
Length	μm, mm, m, km	For machine dimensions, mm is used. For the crane working radius, m is used. For the boom length, m is used.
Area	mm^2, cm^2, m^2	
Volume	mm^3, cm^3, L, m^3	For the volume of water and oils, L is used (i.e. l (el) is hard to distinguish from 1 (one)). For the engine exhaust volume, mL is used. For the bucket capacity, m^3 is used.
Angle	°	
Time	s, min, h	
Voltage	V	
Amperage	A	
Capacity (litre)	L	

1-10-1 GENERAL TORQUE VALUES

BOLTS							
Thread Dimension [mm]	Pich [mm]	Wrench Size [mm]		8.8		10.9	
				kgm	Nm	kgm	Nm
6	1	10	5	1,06	10,4	1,48	14,6
8	1,25	13	6	2,5	24,6	3,53	34,7
10	1,5	17	8	5,11	50,1	7,19	70,5
10	1,25	17	8	5,34	52,4	7,5	73,6
12	1,75	19	10	8,64	84,8	12,13	119
12	1,25	19	10	9,24	90,6	12,95	127
14	2	22	12	13,77	135	19,38	190
14	1,5	22	12	14,58	143	20,6	202
16	2	24	14	20,91	205	29,3	288
16	1,5	24	14	21,82	214	30,8	302
18	2,5	27	14	28,86	283	40,59	398
18	1,5	27	14	31,41	308	44,26	434
20	2,5	30	17	40,8	400	57,3	562
22	2,5	32	17	54,26	532	76,29	748
24	3	36	19	70,48	691	99,04	971

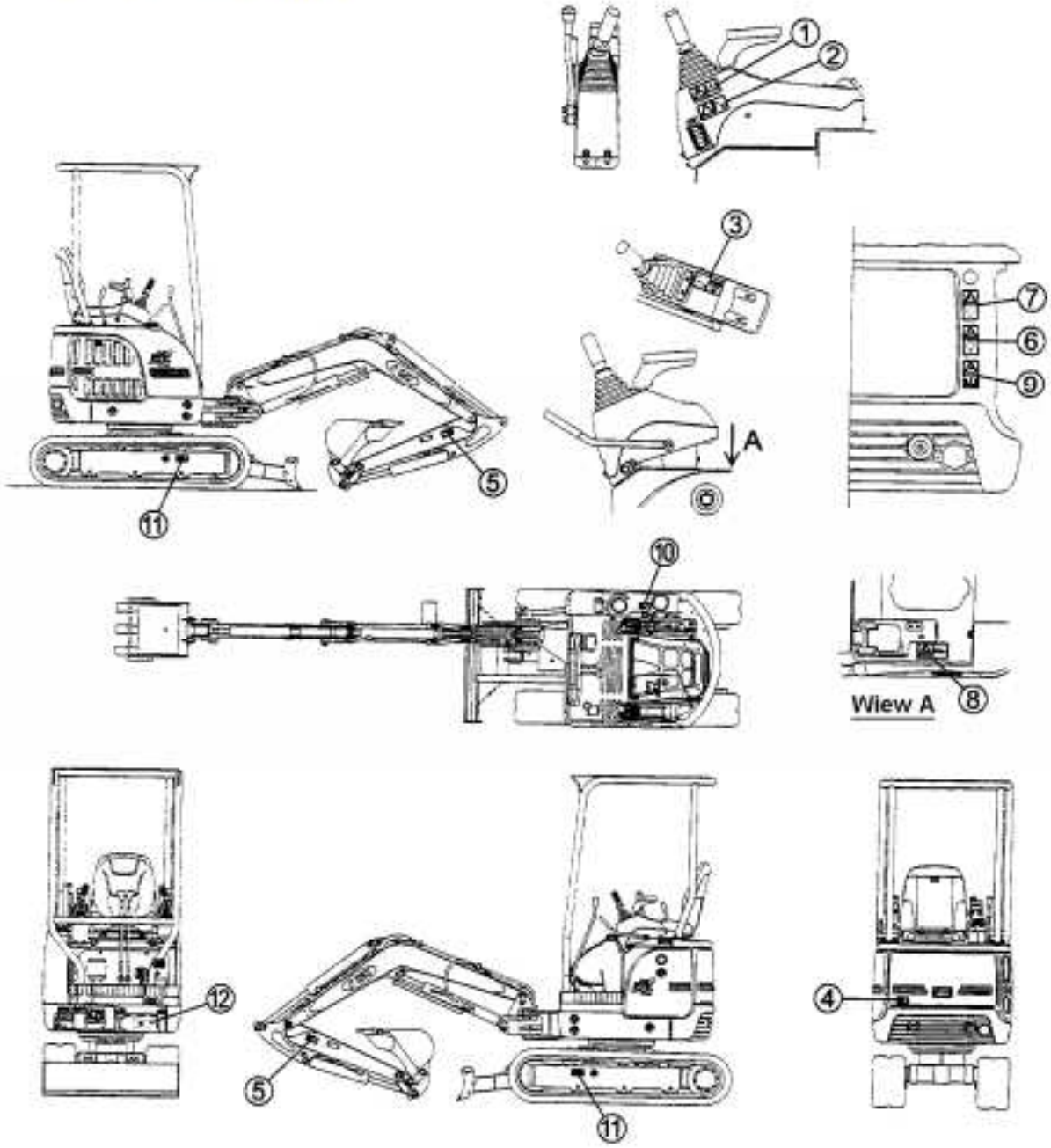
NUTS					
Diametro della filettatura [mm]	Misura della chiave [mm]	CL.8		CL.10	
		kgm	Nm	kgm	Nm
6	10	1,15	17,2	2,13	20,9
8	13	3,24	31,8	3,88	38,1
10	17	5,14	50,5	6,14	60,3
12	19	7,56	74,2	9,02	88,5
14	22	10,31	101,2	12,31	120,8
16	24	14,09	138,2	16,81	164,9
18	27	18	176,6	20,75	203,5
20	30	22,98	225,4	26,48	259,7
22	32	28,4	278,8	32,75	321,2
24	36	33,12	324,8	38,15	374,2

HOSES UNION			
			
Hose size	Wrench size [mm]	TORQUE VALUE	
		kgm	Nm
1/4"	19	2,75	27
3/8"	22	4,28	42
1/2"	27	6,93	68
3/4"	32	12,03	118
1"	41	13,97	137
1-1/4"	50	17,03	167

1-11-1 WARNING SIGNS AND LABELS

There are several specific safety signs on your machine. Their exact location and description of hazards are reviewed in this section.
Please take the time to familiarize yourself with these safety signs.
Make sure that you can read all safety signs. Clean or replace safety signs if words and pictures are not visible. Use a cloth, water and soap whenever you clean labels. Do not use solvent or gasoline etc.
You must replace a label if it is damaged, missing or unreadable. If a label is on a part that has been replaced, make sure that a new label is installed on the replaced part.
See your **IHIMER** dealer new labels.

Located WARNING labels



Illustrated symbol	Recommended explanation	Illustrated symbol	Recommended explanation
	① **WARNING!** Read manual before operation, maintenance, disassembly, assembly and transportation.		② The signal indicates a fulguration hazard if machine is brought too near electric power lines. Keep a safe distance from electric power lines.
	③ The signal indicates a hazard of being crushed or run over by unexpected moving of stopped machine. Lower working device to locked position and remove engine key before leaving machine.		④ The signal indicates a crush hazard by rotation of upper structure of the machine. Keep away from swing area of machine.
	⑤ The signal indicates a hazard of being hit by the working device of the machine. Keep away from machine during operation.		⑥ The signal indicates a hazard of rotating parts, such as belt. Turn off before inspection and maintenance.
	⑦ The signal indicates a hazard of rotating parts, such as fan. Turn off before inspection and maintenance		⑧ Do not put your hand in the machine. Otherwise, your hand might be got in it.

Illustrated symbol	Recommended explanation	Illustrated symbol	Recommended explanation

(9) The signal indicates an electrical hazard from handing the cable. Read manual for safe and proper handing.

(10) The signal indicates a burn hazard from spurting hot water or oil if radiator or hydraulic tank is uncapped while warming. Allow radiator or hydraulic tank to cool before removing cap.

(11) The signal indicates a hazard of flying plug from track adjuster that could cause injury.
Read manual before adjusting track for safe and proper handling.

(12) **DANGER!** Attach a **DO NOT OPERATE** warning tag to start switch or controls before servicing or repairing the machine.
Do not start the engine or move any of the controls if there is **DO NOT OPERATE** or similar warning tag, attached to the start switch or controls.
Keep in the tool box "do not use warning tag".

SECTION 2 STRUCTURE

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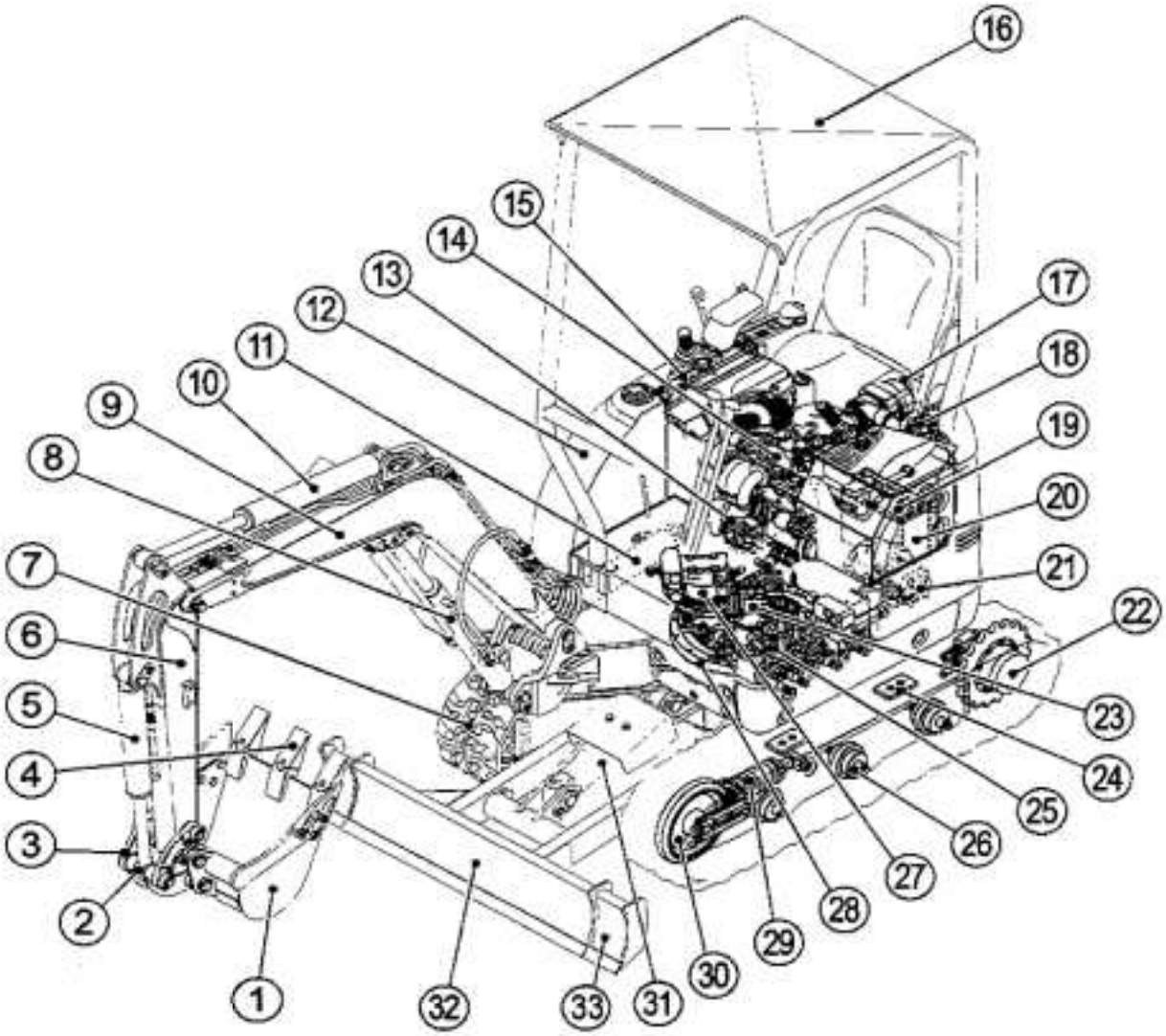
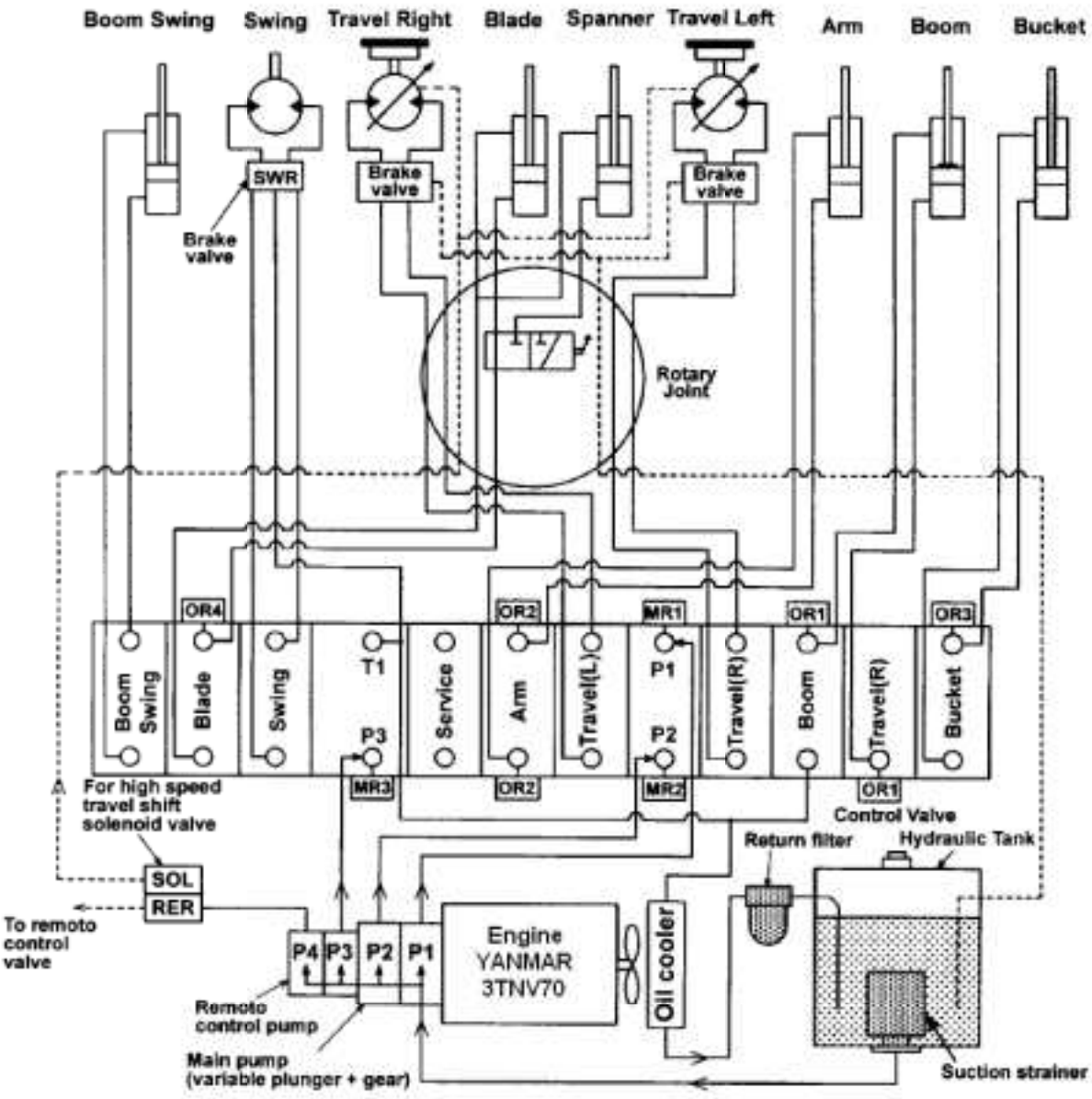
2-1-1 NOMENCLATURE



(1) Bucket
(2) Bucket Link
(3) Arm Link
(4) Tooth
(5) Bucket Cylinder
(6) Arm
(7) Track Shoe
(8) Boom Cylinder
(9) Boom
(10) Arm Cylinder
(11) Boom Swing Cylinder
(12)
(13)
(14)
(15) Oil Cooler
(16) TOPS Canopy
(17) Air Cleaner
(18) Return Filter
(19)
(20) Hydraulic Tank
(21) Hydraulic Pump
(22) Travel Drive (with motor)
(23) Rotary Joint
(24) Guide Plate
(25) Control Valve
(26) Track Roller
(27) Swing Drive (with motor)
(28) Swing Bearing
(29) Track Adjuster
(30) Front Idler
(31) Blade Cylinder
(32) Blade
(33) Blade extensions

2-2-1 HYDRAULIC SYSTEM DIAGRAM



Code	Item	PRESSURE	
		Mpa	Kgf/cm²
MR1	Main relief valve P1 pump	20,6	210
MR2	Main relief valve P2 pump	20,6	210
MR3	Main relief valve P3 pump	18,1	185
OR1	Overload relief valve (Boom)	24,5	250
OR2	Overload relief valve (Arm)	24,5	250
OR3	Overload relief valve (Bucket)	24,5	250
OR4	Overload relief valve (Blade)	20,6	210
SWR	Swing relief valve	15,2	155
RER	Remote control relief valve	2,9	30

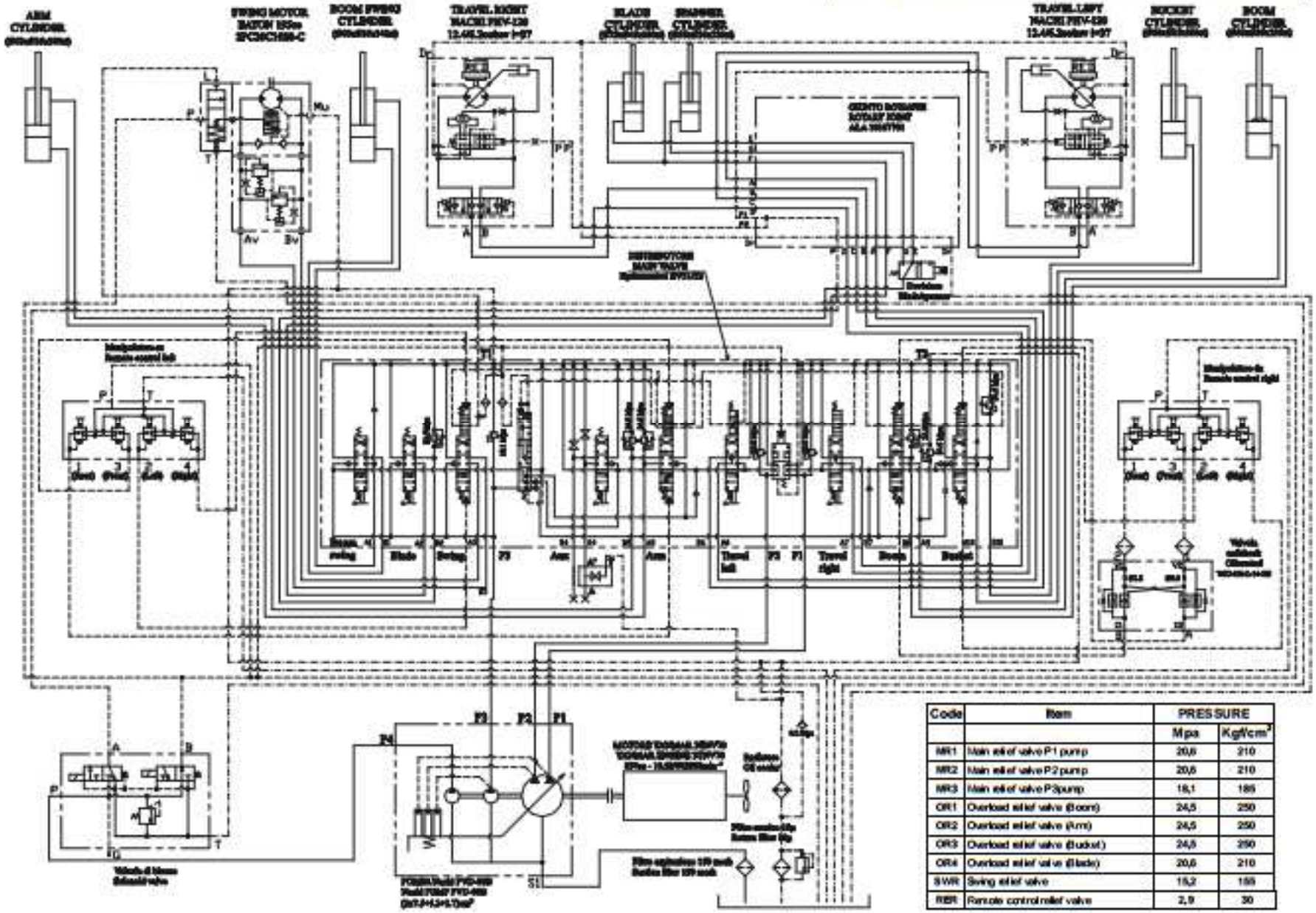
Hydraulic tank capacity
19 litres

Hydraulic system capacity
23 litres

Pump flow rate:
P1; 17,2 litres/min.
P2; 17,2 litres/min.
P3; 12,0 litres/min.

Service ports use the flow shared by the P2 e P3 pump.

2-3-1 HYDRAULIC CIRCUIT SCHEMATIC DIAGRAM



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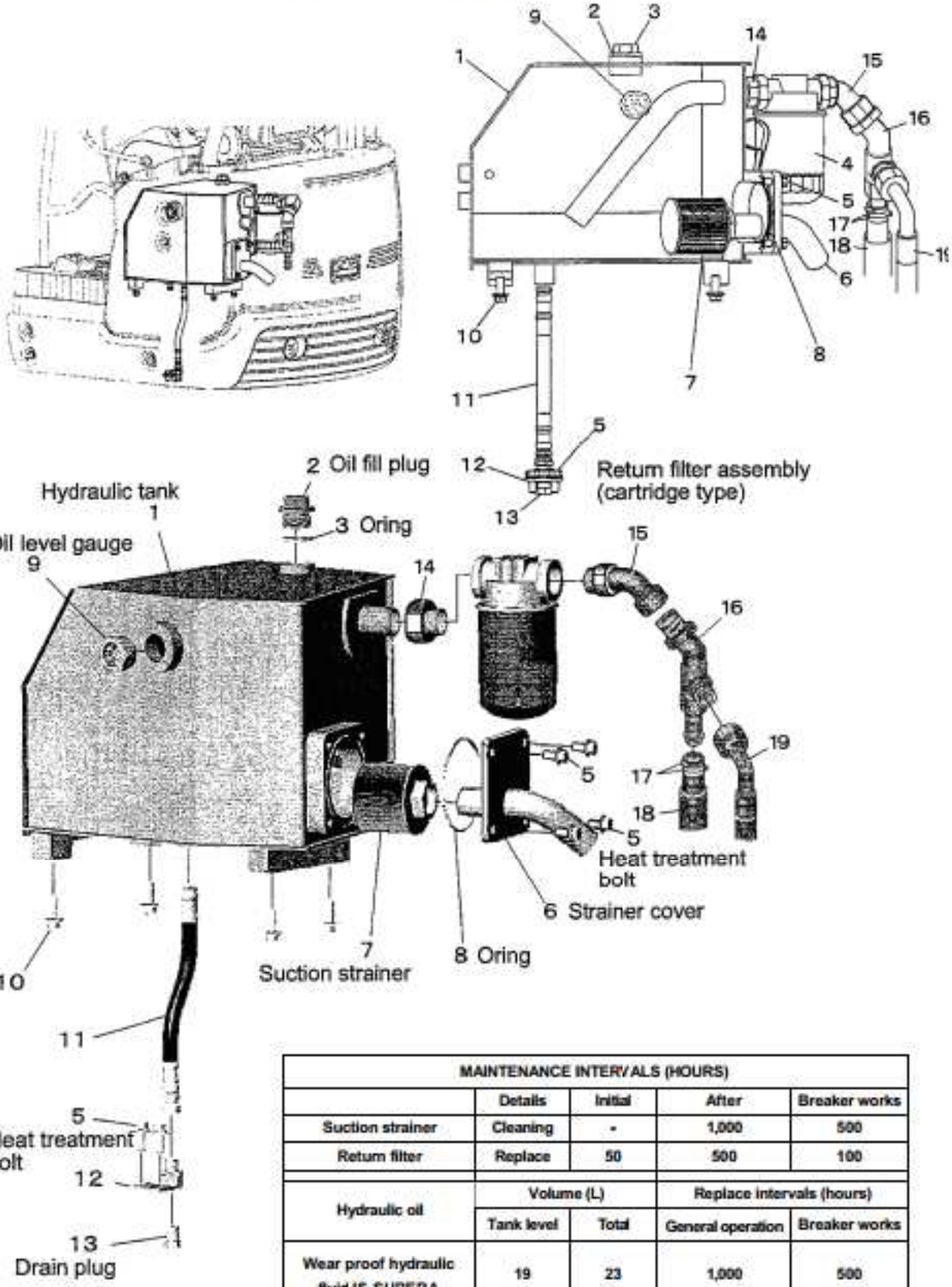
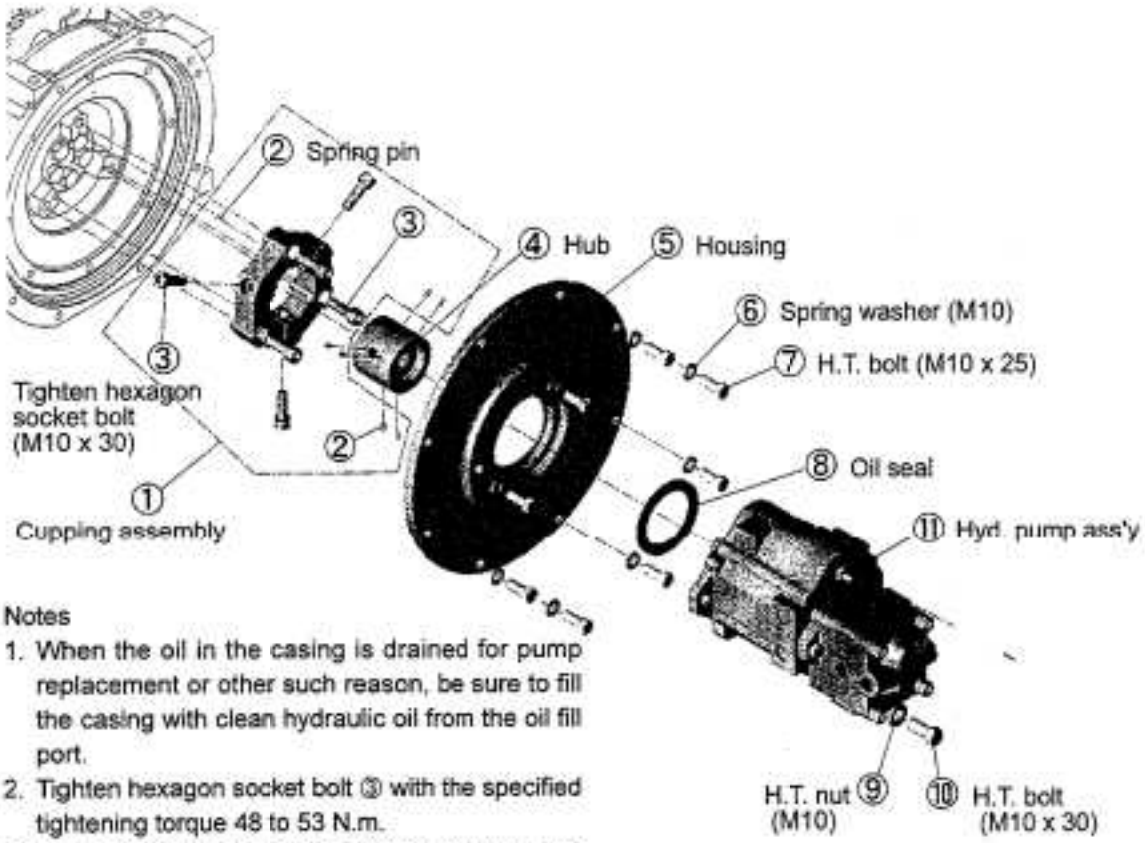
OR4	Overload relief valve (Blade)	20,6	210
SWR	Swing relief valve	15,2	155
RER	Remote control relief valve	2,9	30

2-7-1 HYDRAULIC TANK ASSEMBLY



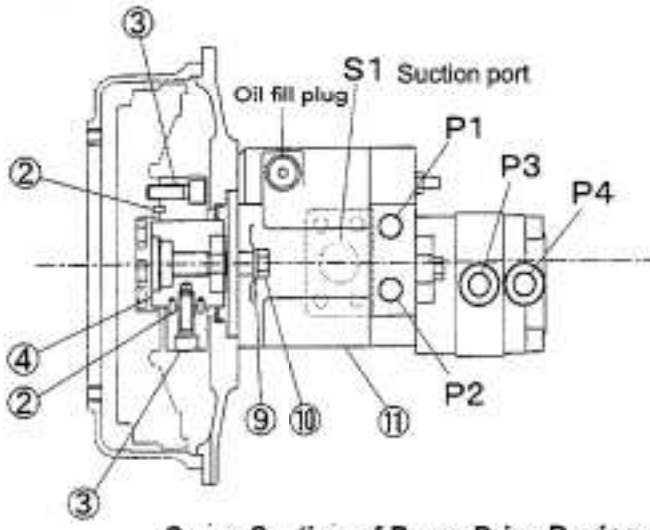
MAINTENANCE INTERVALS (HOURS)				
	Details	Initial	After	Breaker works
Suction strainer	Cleaning	-	1,000	500
Return filter	Replace	50	500	100
Hydraulic oil	Volume (L)		Replace intervals (hours)	
	Tank level	Total	General operation	Breaker works
Wear proof hydraulic fluid IS-SUPERA	19	23	1,000	500

2-8-1 PUMP DRIVE DEVICE ASSEMBLY

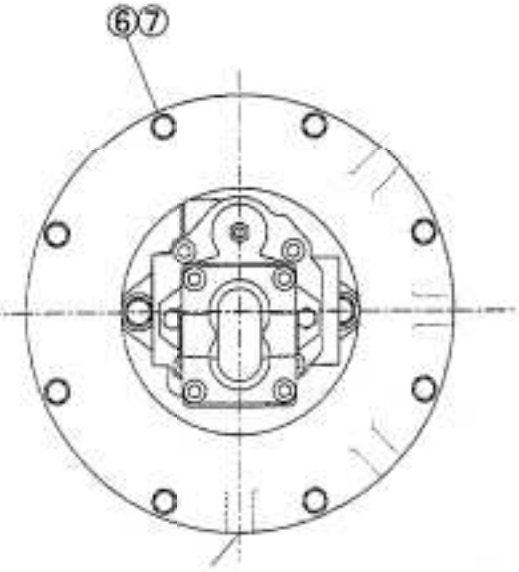


Notes

1. When the oil in the casing is drained for pump replacement or other such reason, be sure to fill the casing with clean hydraulic oil from the oil fill port.
2. Tighten hexagon socket bolt ③ with the specified tightening torque 48 to 53 N.m.
3 Fill up the spline and space with "NEVER-SEIZE" (special grease) when assembling the pump.



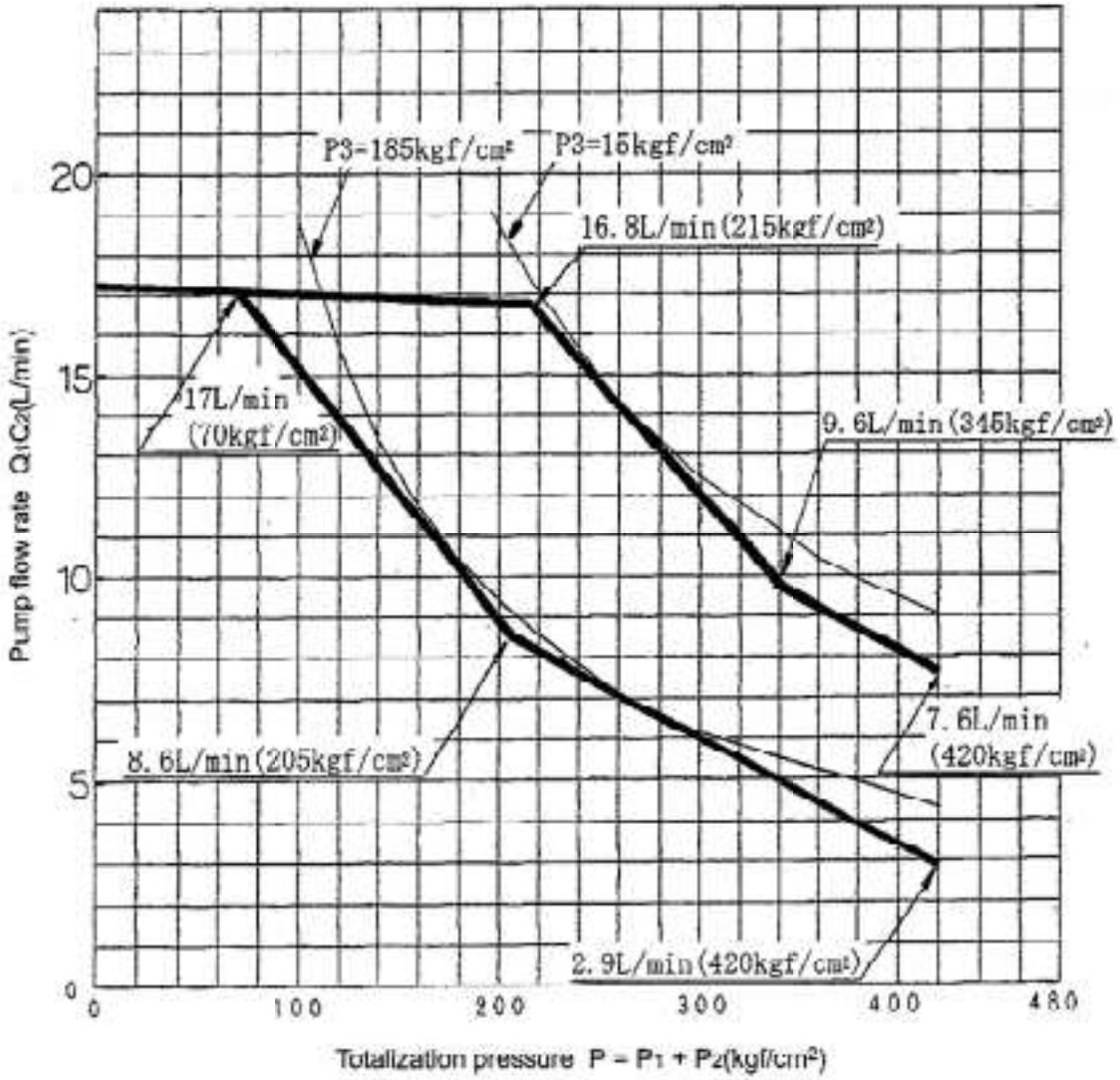
Cross Section of Pump Drive Device



When assembling the housing, be sure to install the housing groove at the place shown in the figure above.

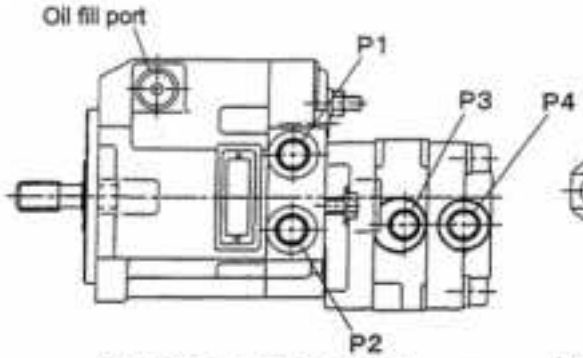
2-9-1 HYDRAULIC PUMP PERFORMANCE

No. of Pump	P1 -P2		P3		P4
Type of pump	Plunger		Gear		Gear
Working pressure: MPa (kgf/cm²)	20.6 (210)		18.1 (185)		3.4 (35)
Delivery rate: cm³/rev	7.5x2	1.3x2	5.2		2.7
Flow rate: L/min	17.3x2	2.9x2	12.0		6.2
P3 Shift pressure: MPa (kgf/cm²)	1.47 (15)	18.1 (185)	1.47 (15)	18.1 (185)	
Control system	Total power control with power shift circuit				
Used revolution: min-1	Rated 2,300 (Max. 2,460)				

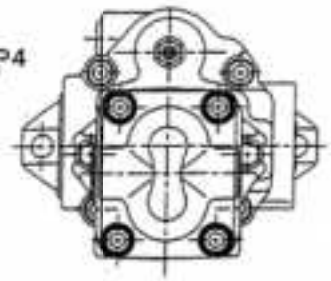


P - Q perfomance

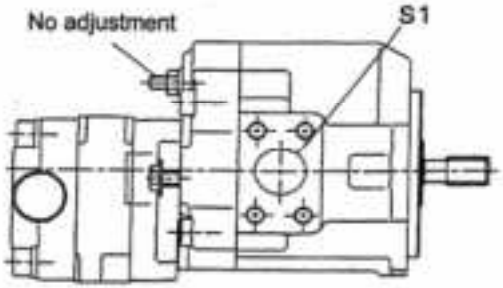
2-9-1 HYDRAULIC PUMP ASSEMBLY



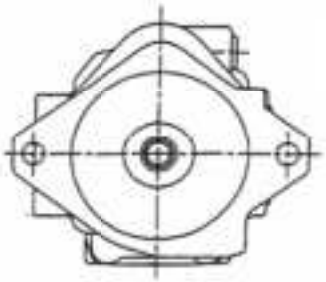
View from pump front side



View from gear pump side

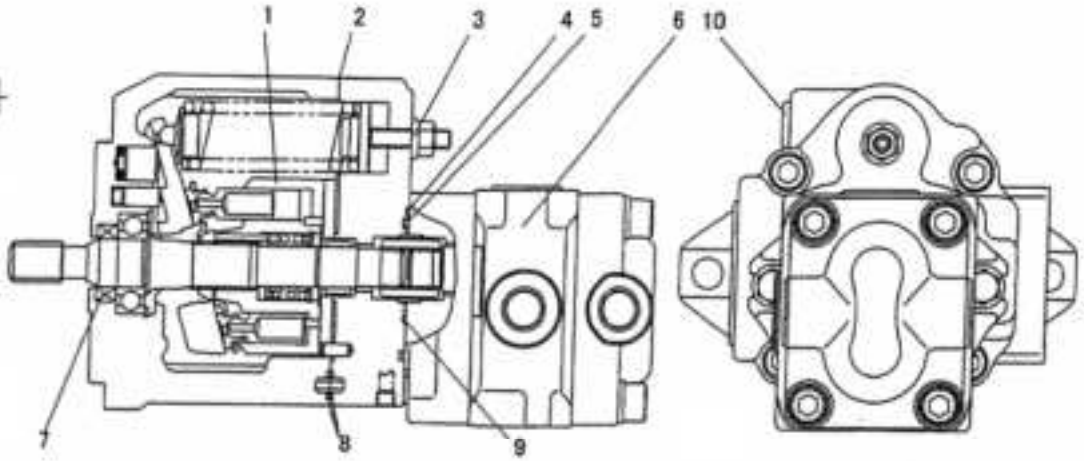


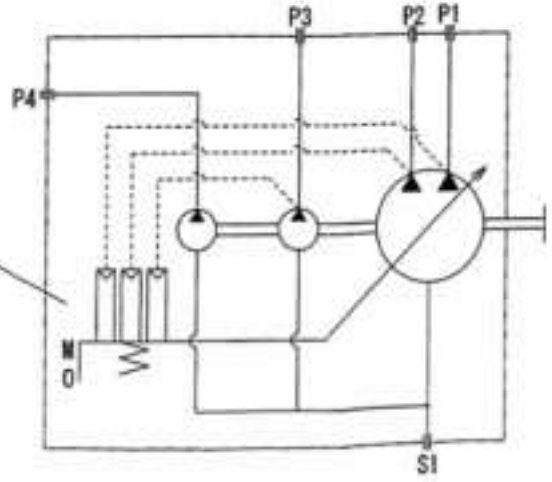
View from pump back side



View from shaft direction

Refer to the Parts Catalog for the names and No. of parts of hydraulic pump.





Pump hydraulic circuit diagram

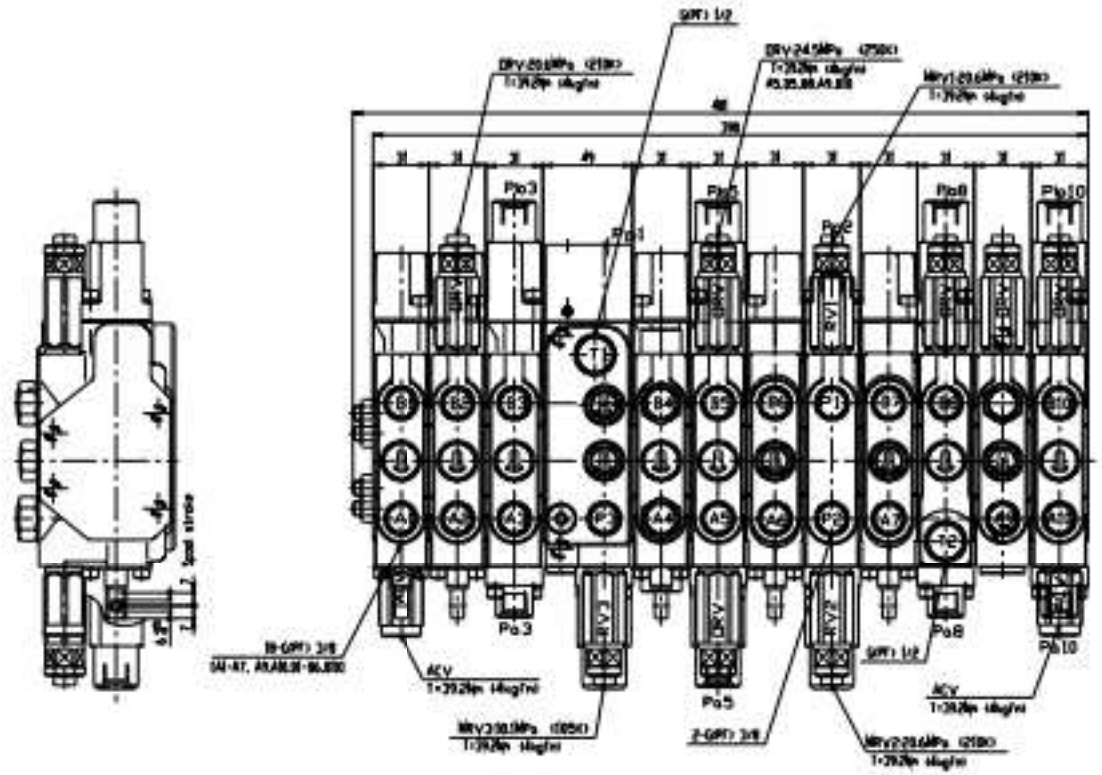
NOTICE

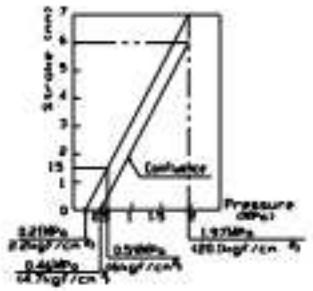
1. Never start the engine before fill the pump casing with hydraulic oil.
2. Fill the pump casing with hydraulic oil after replace hydraulic oil or replace the pump assembly.

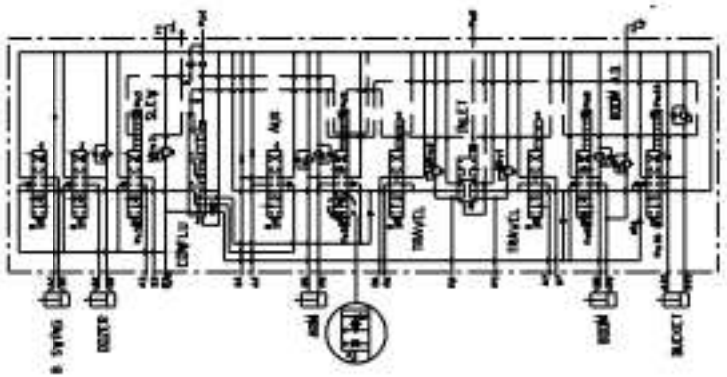
PORT

Port	Port name	Port size
S1	Suction	SAE J518b-1
P1 • P2	Delivery	G3/8
P3 • P4	Delivery	G3/8

2-10-1 CONTROL VALVE ASSEMBLY







USER'S SPEC

PUMP FLOW and RELIEF VALVE SET PRESSURE

MRV1206	MPa	kgf/cm²	at 18 L/min
MRV2206	MPa	kgf/cm²	at 18 L/min
MRV3081	MPa	kgf/cm²	at 123 L/min

OVERLOAD RELIEF VALVE IN

245	MPa	kgf/cm²	at 5 L/min

OVERLOAD RELIEF VALVE IN BP

206	MPa	kgf/cm²	at 5 L/min

HYDRAULIC FLUID : ISO VG

OPERATING TEMPERATURE RANGE : -20/+90°

SPECIFICATIONS

RATED PRESSURE 245MPa

RATED FLOW 2L/min

RELIEF VALVE ADJUSTABLE RANGE

245-245MPa

OVERLOAD RELIEF VALVE SET PRESSURE

MAX 27.4MPa

RETURN SPRING FORCE BOOM Spring

NEUTRAL POSITION

ACTUATED POSITION

RESERVE OF RETURN FORCE

Max OPERATING FORCE

RETURN SPRING FORCE BOOM, AUXILIARY

NEUTRAL POSITION

ACTUATED POSITION

RESERVE OF RETURN FORCE

Max OPERATING FORCE

RETURN SPRING FORCE TRACK

NEUTRAL POSITION

ACTUATED POSITION

RESERVE OF RETURN FORCE

Max OPERATING FORCE

SPOOL LEAKAGE at MPa

PORTS A&B

PORTS B2,A3,B3,A8

OTHER PORTS

HYDRAULIC FLUID MINERAL TYPE OIL

PILOT PORT PRESSURE Max

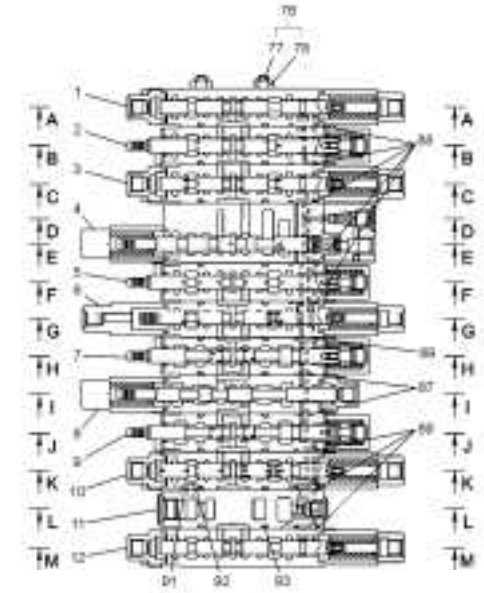
TANK LINE PRESSURE Max

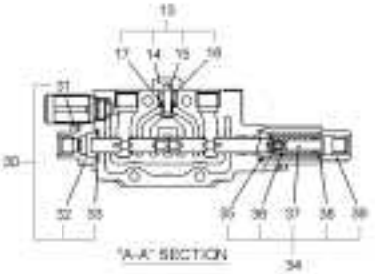
OPERATING TEMPERATURE RANGE:

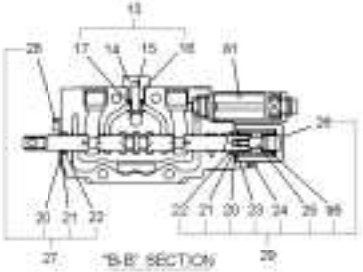
MAX

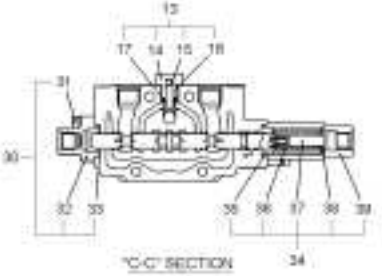
CONTAMINATION LEVEL: NAS9

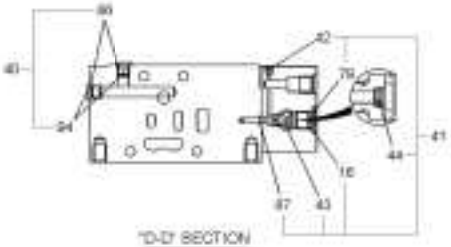
2-10-1 CONTROL VALVE ASSEMBLY

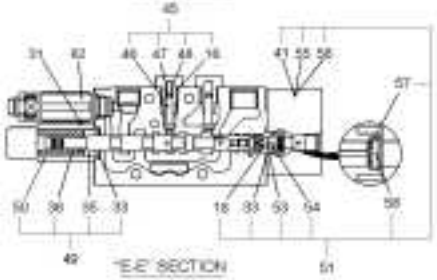


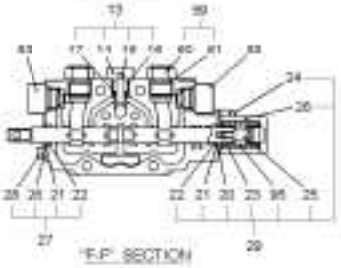


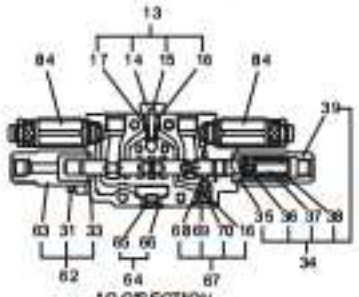


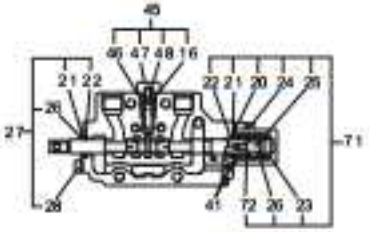


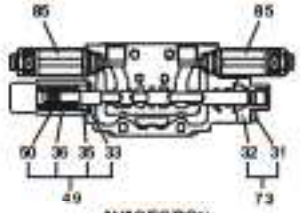


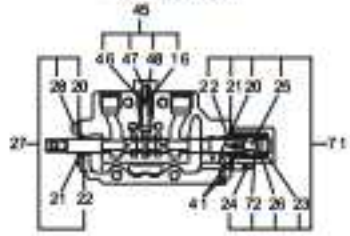


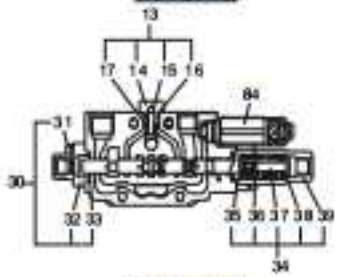


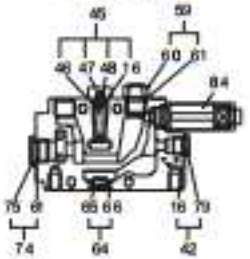


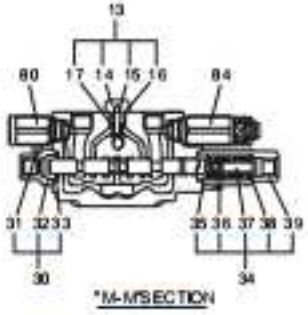


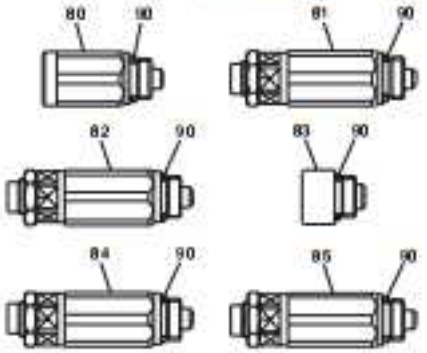




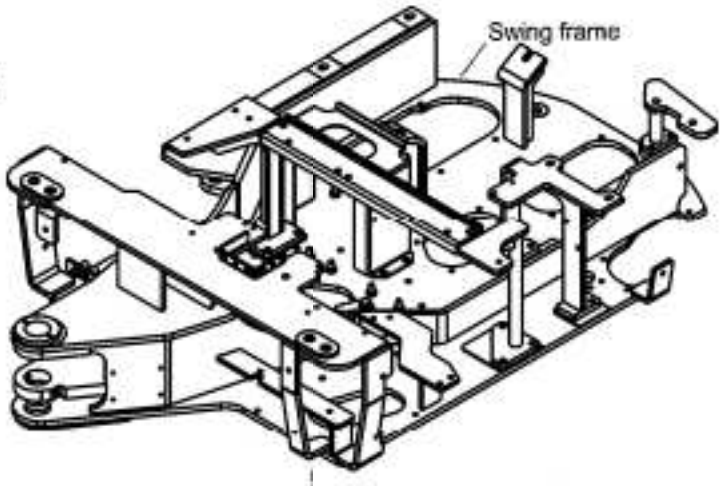




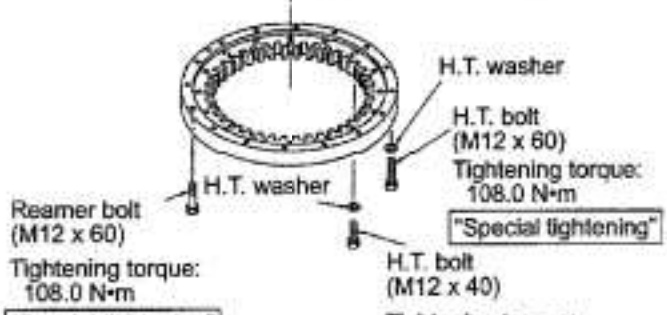


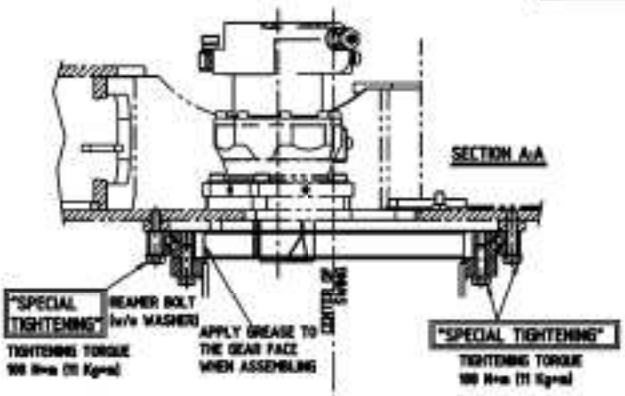


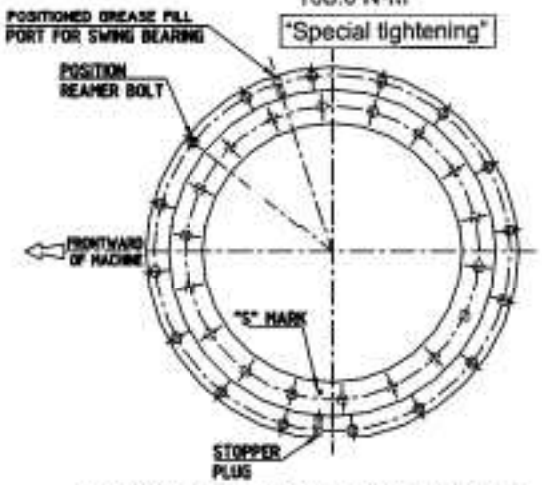
2-11-1 SWING DRIVE DEVICE & BEARING ASSEMBLY

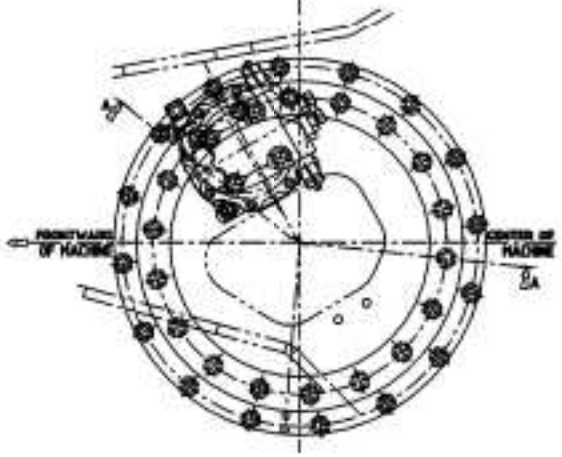


NOTE:
"Special tightening" appoint place bolts is swing motor and swing bearing tighten bolts.
Apply molybdenum grease to head seat of the bolt, and then tighten by torque wrench.





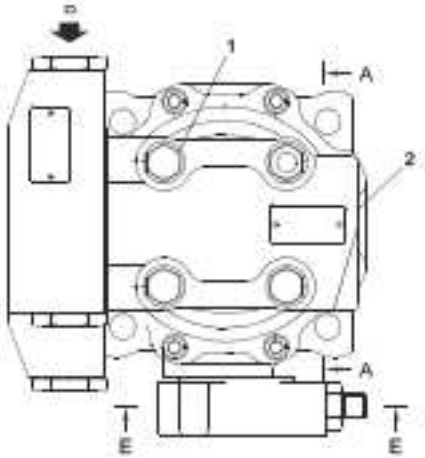


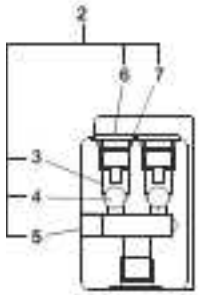


POSITION OF INSTALL THE BEARING

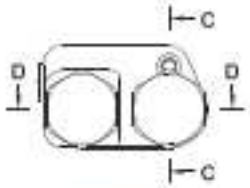
Notes:
1) Assemble the soft zone and oil-fill ports as shown in the figure above.
2) When connecting the upper and lower parts, temporarily assemble the reamer bolt earlier than other bolts, and carry out centering.
3) Tighten the reamer bolt first of all.

2-12-1 SWING MOTOR ASSEMBLY

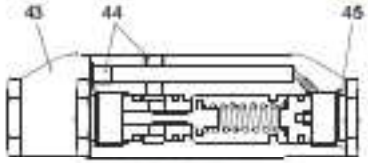




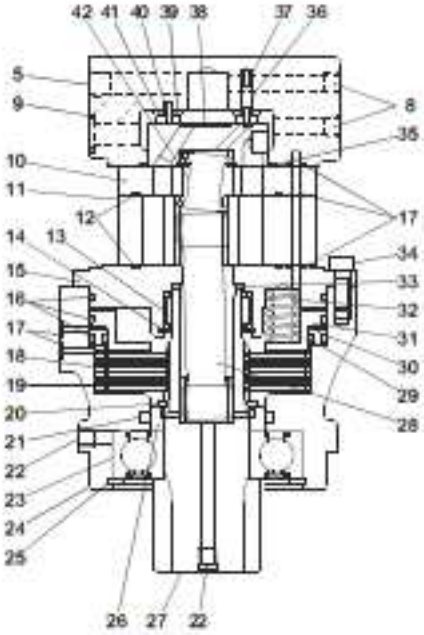
"A-A"SECTION

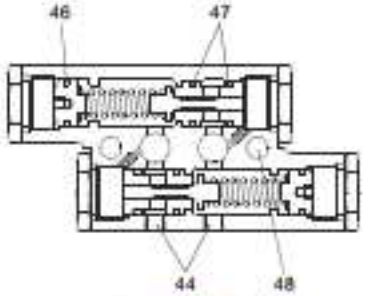


"B" DETAIL

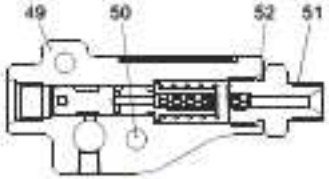


"C-C" SECTION

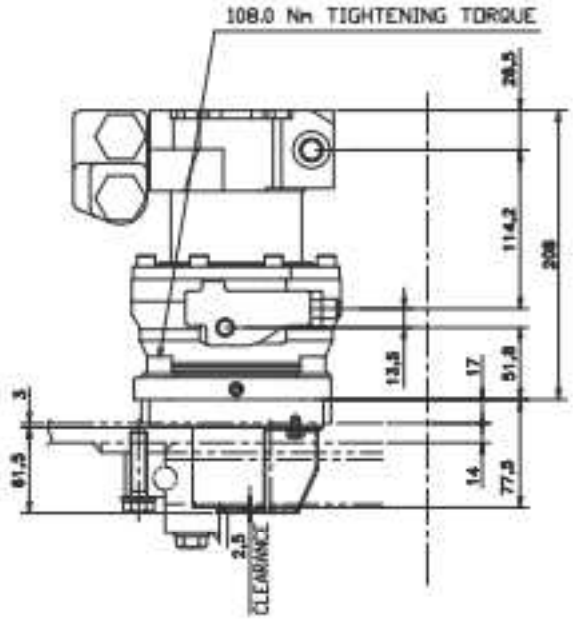




"D-D" SECTION

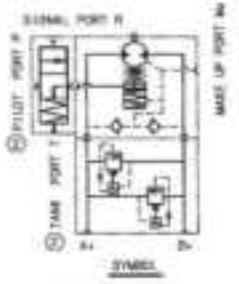


"E-E" SECTION

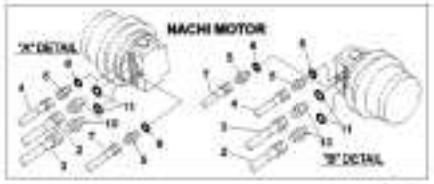


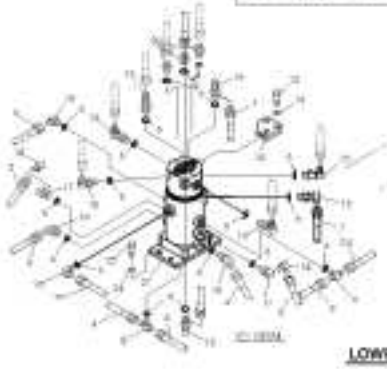
MOTOR SPEC.	
MODEL NO.	
DISPLACEMENT	
THEORETICAL SPEED	
THEORETICAL TORQUE	
STARTING PRESSURE	
BRAKE TORQUE	
BRAKE RELEASE PRESSURE	
RELIEF VALVE SPEC.	
MODEL NO.	
RELIEF PRESSURE	
RATED FLOW	
TIMER VALVE SPEC.	
MODEL NO.	
WORKING PRESSURE	
TIME DELAY	
TOTAL MASS	

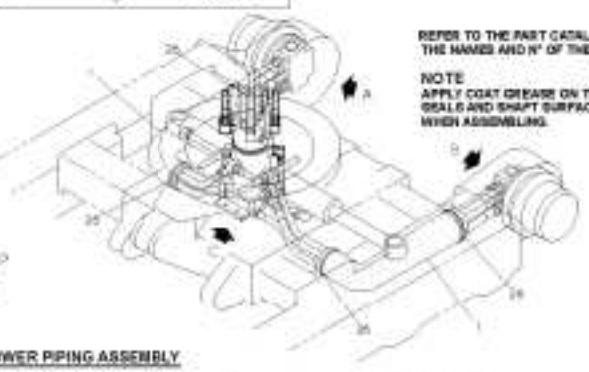
PINION GEAR SPEC.	
GEAR PROFILE	
TOOTH PROFILE	
MODULE	
PRESSURE ANGLE	
ADDENDUM MODIFICATION COEFFICIENT	
NO. OF TEETH	
PITCH DIAMETER	
BASE TANGENT LENGTH(3 TEETH)	



2-13-1 ROTARY JOINT & LOWER PIPING

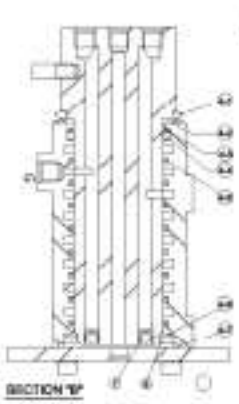


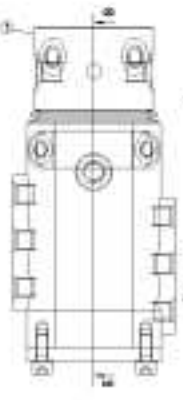




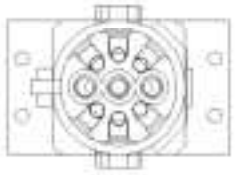
REFER TO THE PART CATALOG FOR THE NAMES AND N° OF THE PARTS

NOTE
APPLY COAT GREASE ON THE SEALS AND SHAFT SURFACES WHEN ASSEMBLING.

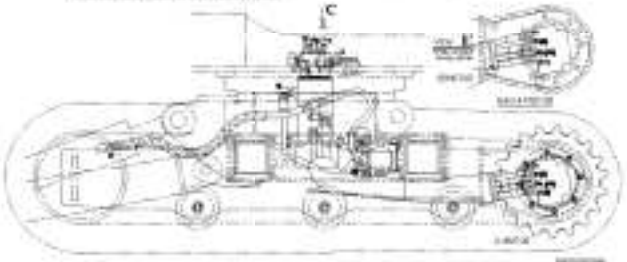


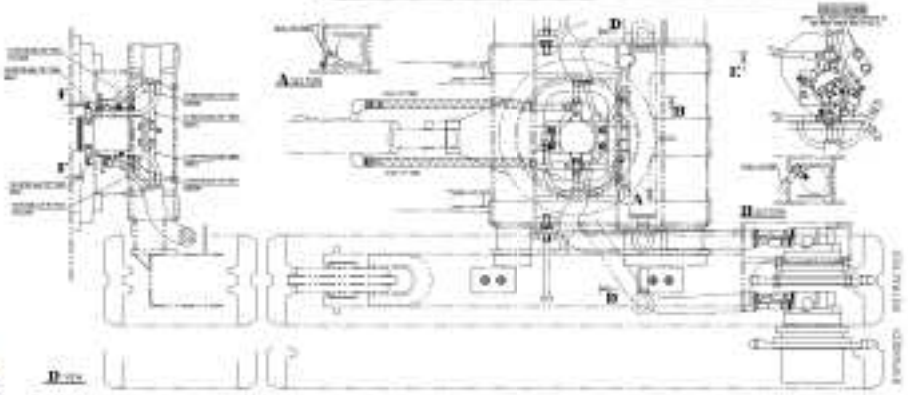


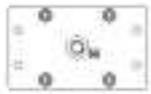
SECTION "B"

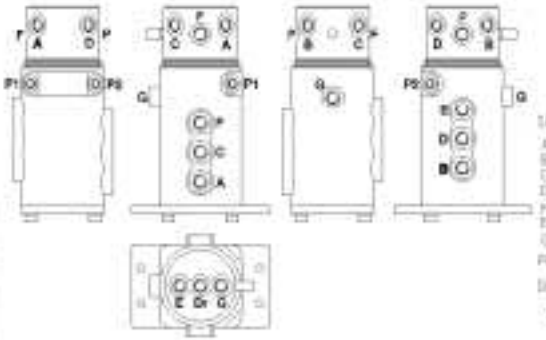


LOWER PIPING ASSEMBLY



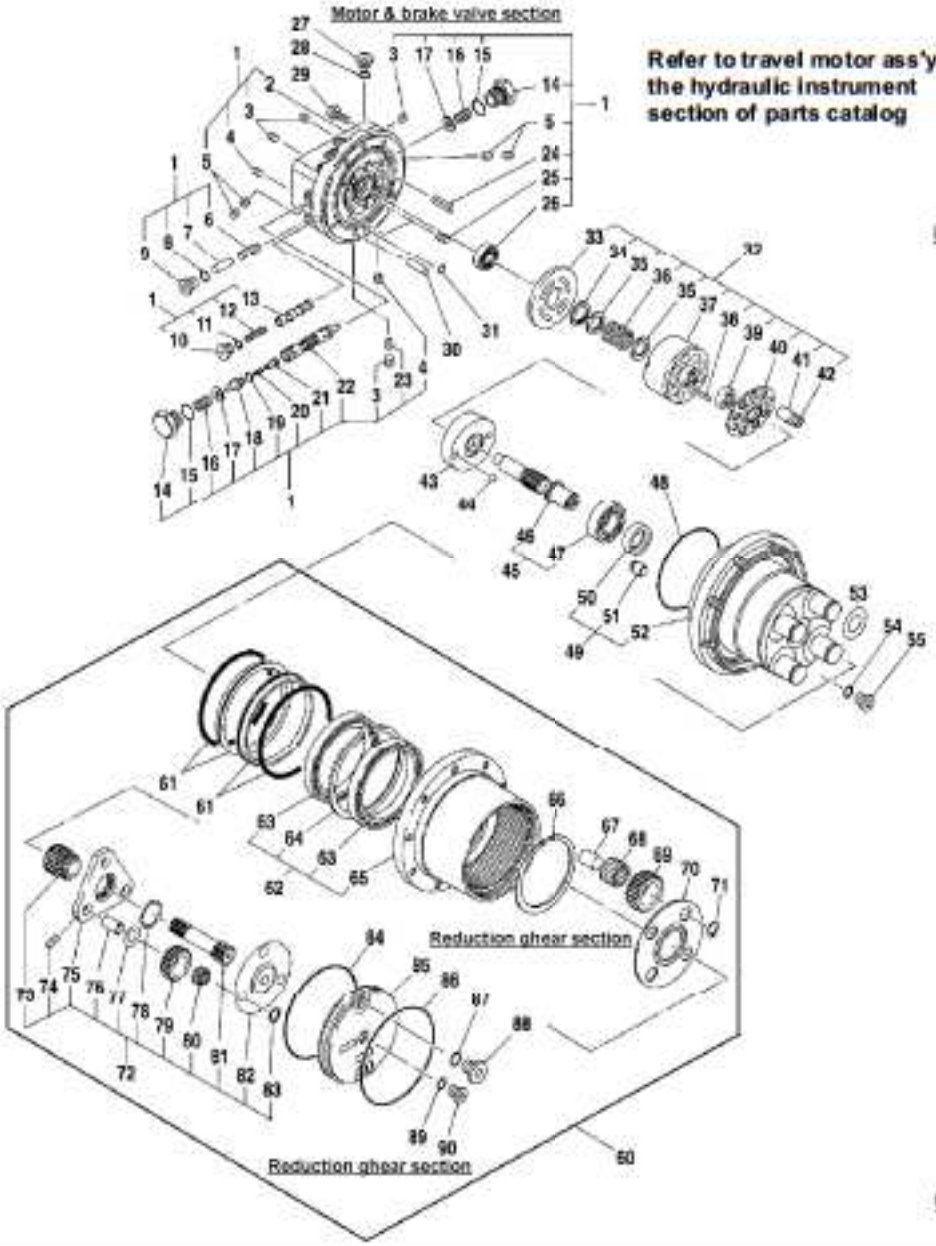




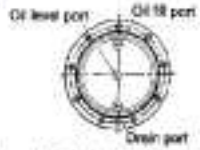


ASSEMBLY

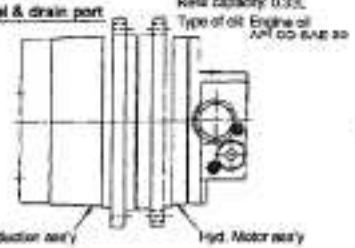
2-14-1 TRAVEL MOTOR REDUCTION (NACHI MOTOR)

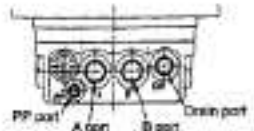


Refer to travel motor ass'y in the hydraulic instrument section of parts catalog

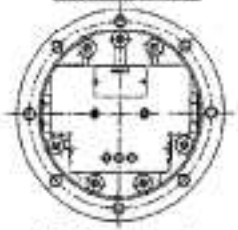


Location of oil fill, level & drain port

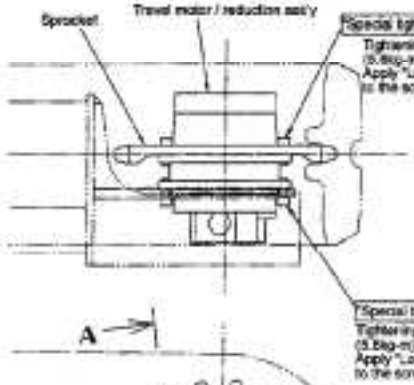




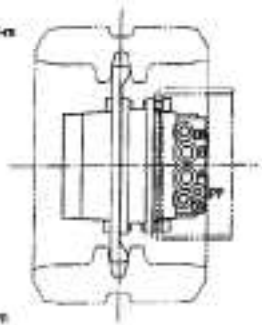
Brake valve section



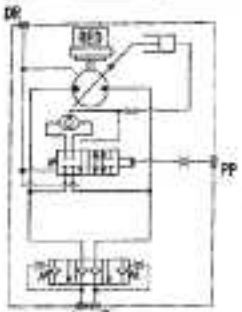
View from brake valve



Installing the travel motor and the sprocket
(Shown right side)

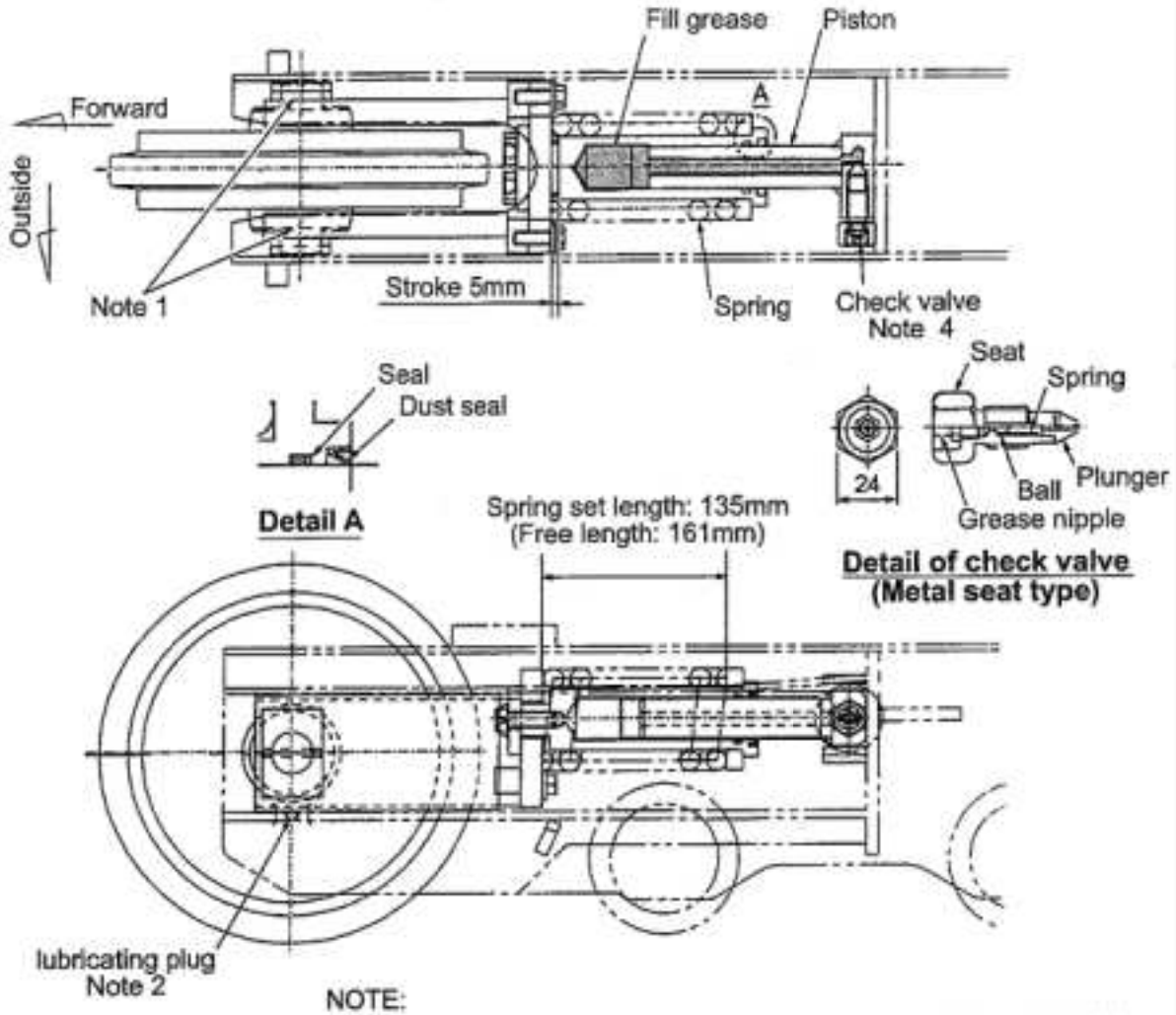


Cross section A-A



HYDRAULIC SYMBOL

2-15-1 CRAWLER SHOE ADJUSTING DEVICE



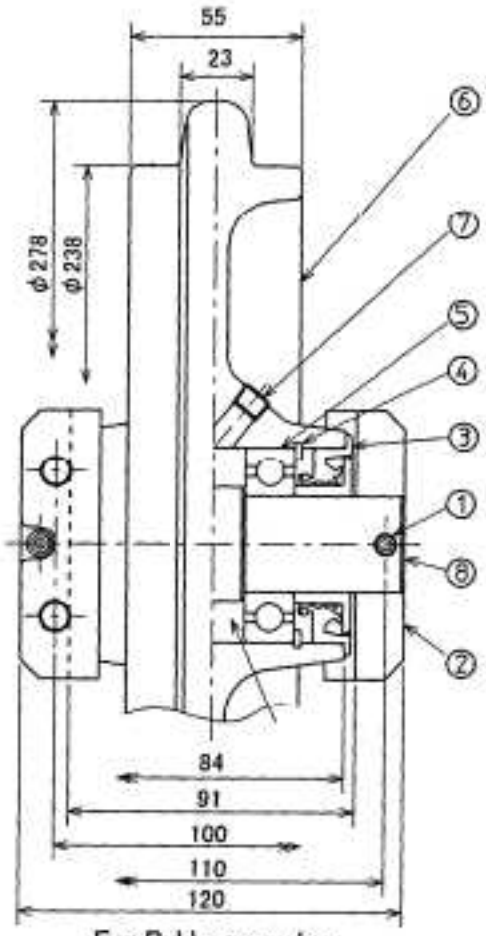
NOTE:

1. Before assembling the idler ass'y bearing block lublicate their side way to the frame with grease.
2. Position the lubricating plug side outward when assembling the idler ass'y to the frame.
3. Install the grease cylinder to position the grease fill port outward.
4. Keep tightening torque to the check valve 55.8 to 68.6 N•m (6 to 7 kgf•m) to prevent breaking it.
5. This figure shows the left side frame. Assemble the right side symmetrically.

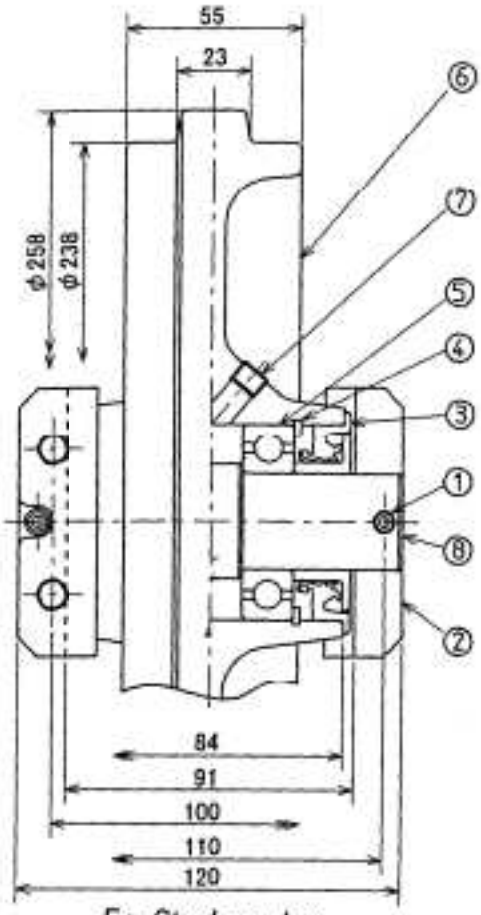
⚠ WARNING

- When the tension of the shoe is high, the grease cylinder internal pressure becomes considerably high.
- The grease can gush out of the cylinder under high pressure. NEVER remove the grease nipple.
- While adjusting, do not move your face or hands closer to the check valves.
- Relieve pressure by opening check valve gradually by 1 turn at maximum.

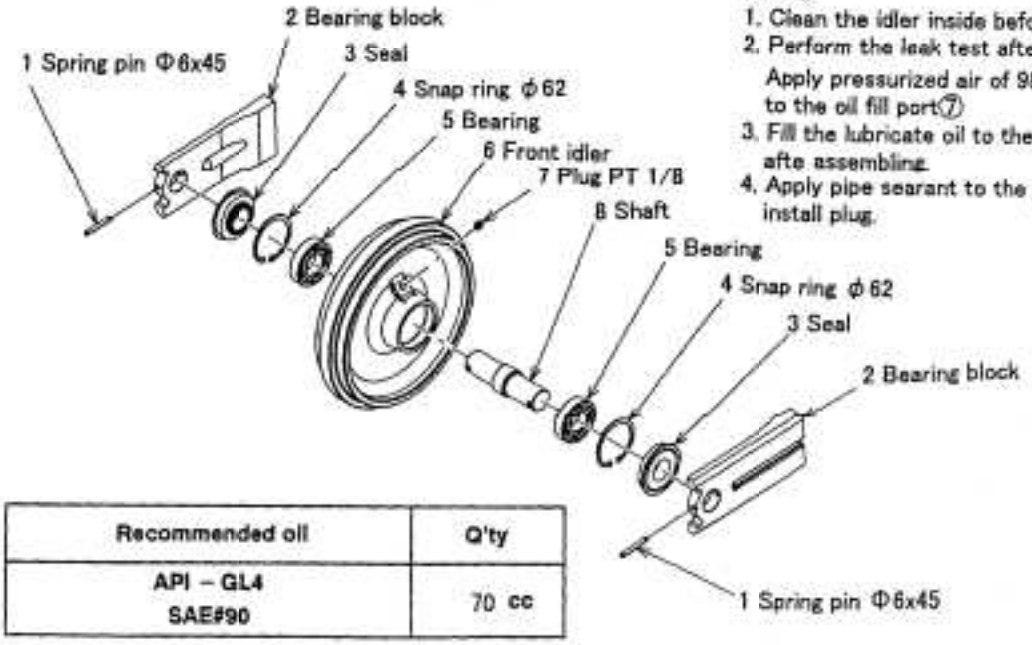
2-16-1 FRONT IDLER ASSEMBLY



For Rubber crawler



For Steel crawler

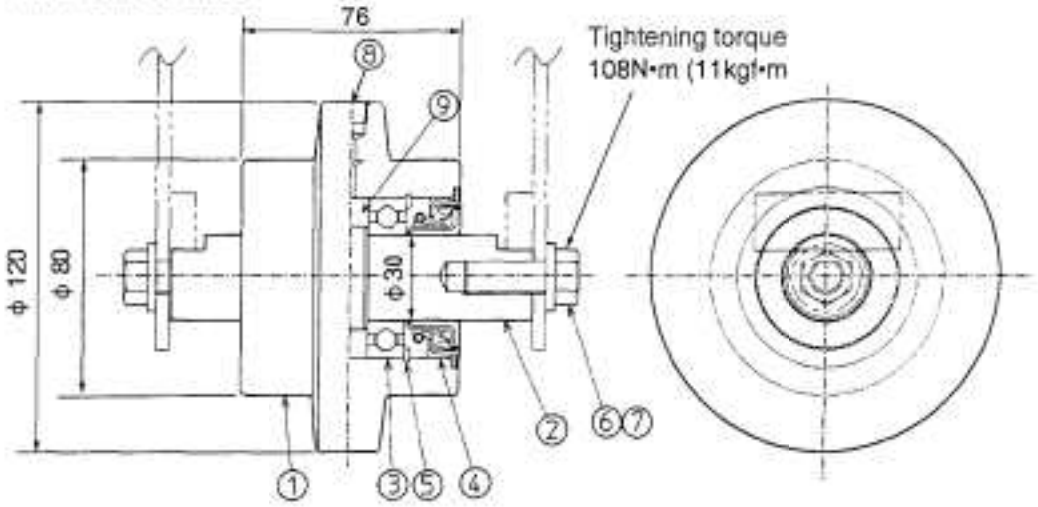


NOTE:
1. Clean the idler inside before assembling.
2. Perform the leak test after assembling.
   Apply pressurized air of 98kPa(1kg/cm²) to the oil fill port⑦
3. Fill the lubricate oil to the oil fill port⑦ afte assembling.
4. Apply pipe searant to the plug⑦, install plug.

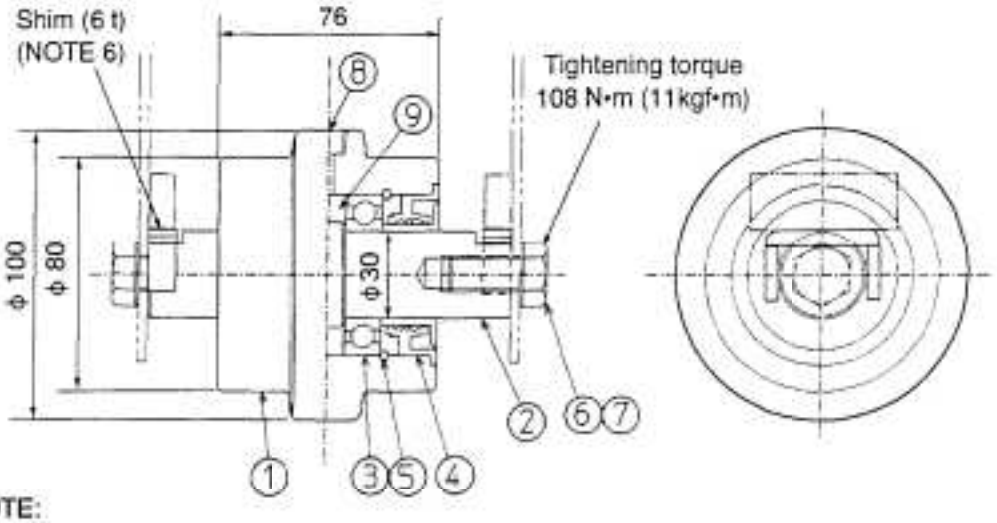
Recommended oil	Q'ty
API – GL4 SAE#90	70 cc

2-17-1 LOWER ROLLER ASSEMBLY

1. For Rubber Shoe:



2. For Steel Shoe:



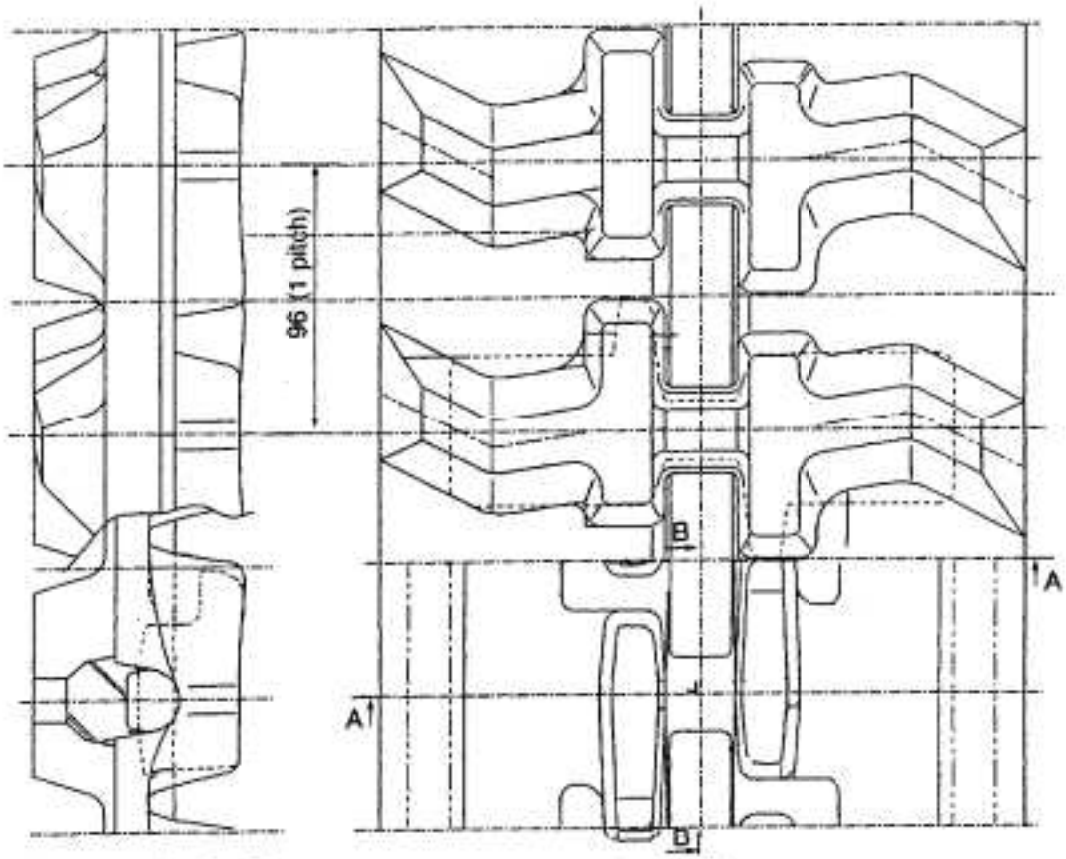
NOTE:

1. Clean the roller, collar and shaft inside before assembling.
2. Perform the leak test after assembling. Apply pressurized air of 98 kPa (1 kgf/c m²) to the oil fill port ⑧.
3. Fill the lubricate oil to the oil fill port ⑧ after assembling.
4. Apply pipe sealant to the plug ⑧. Install plug ⑨.
5. Fit the upper face of the shaft closely to the block when install the roller assembly.
6. Insert the shim between the shaft and block closely fit, and perform fixed check for the shim after tighten the bolts when install the roller assembly for steel shoe.

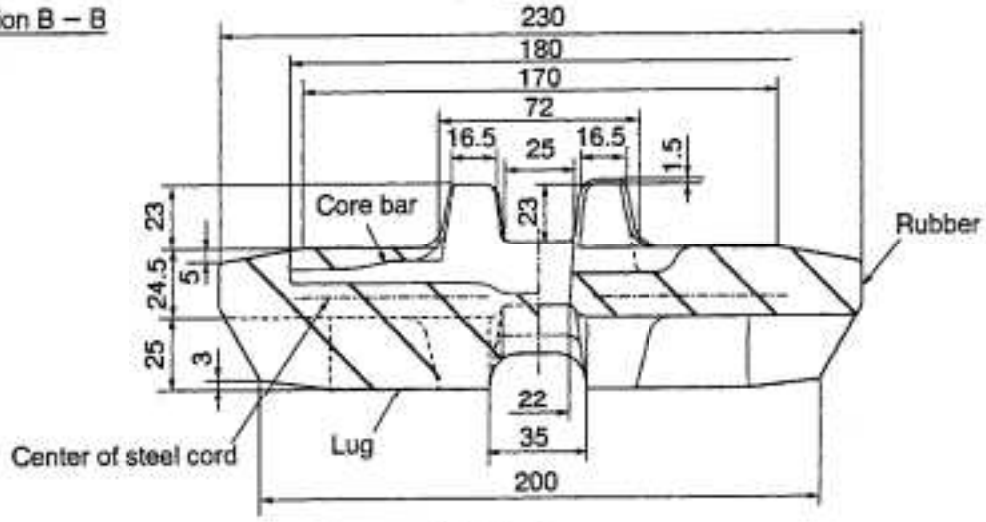
Recommended oil	Q'ty
API – GL4 SAE 90	25 cc

No.	Description	Q'ty	Remarks
1	Guide Roller	1	
2	Shaft	1	
3	Bearing	2	
4	Mud Seal	2	
5	Snap Ring	2	
6	Bolt CHT	2	M12 × 25
7	Washer	2	12
8	Plug	1	1/8
9	Gear Oil	→	25 cc

2-18-1 CRAWLER SHOE ASSEMBLY (RUBBER SHOE)



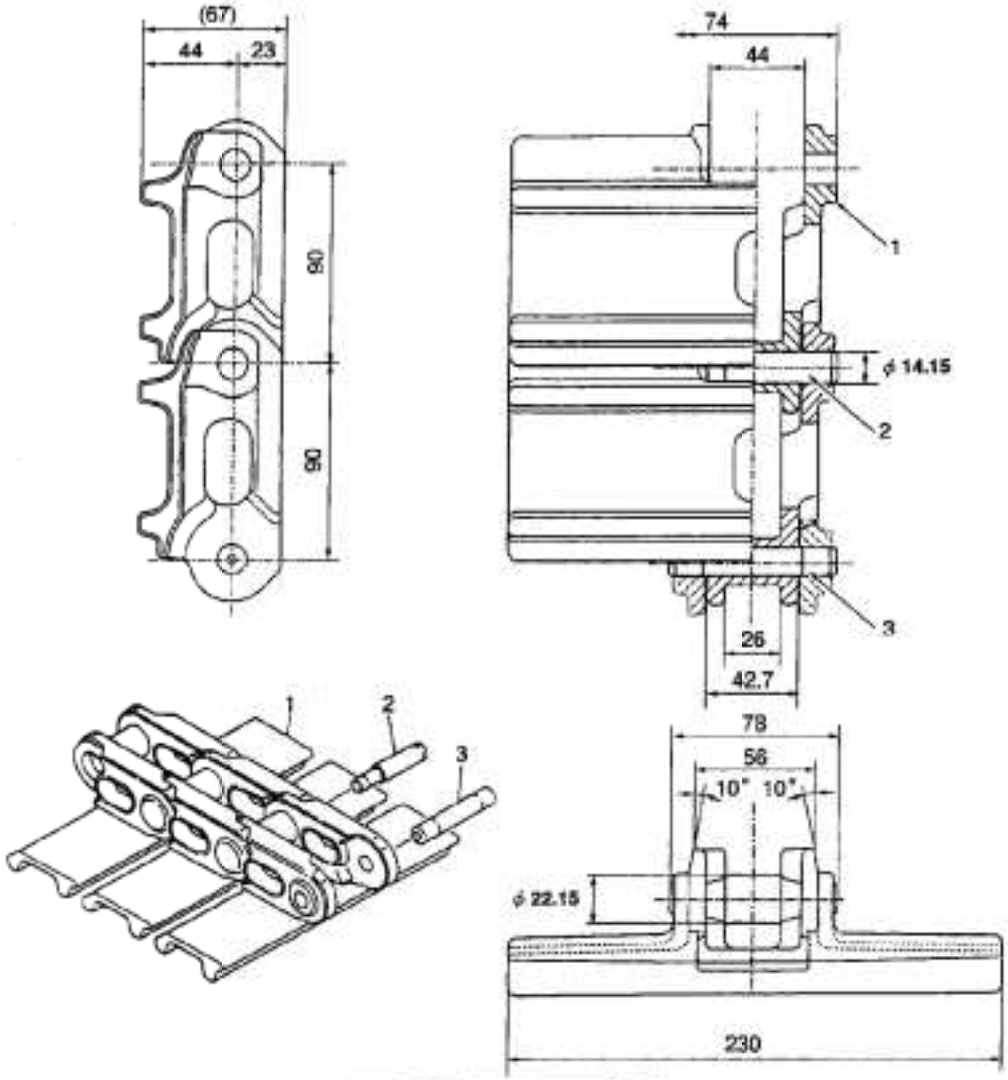
Cross-section B – B



Cross-section A – A

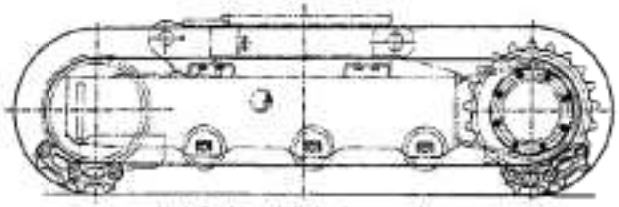
Models	Part No.	Description	Weight
17 VXE	0653 760 UA	230 x 96 x 35 Tracks	57 kg

2-18-2 CRAWLER SHOE ASSEMBLY (STEEL SHOE)



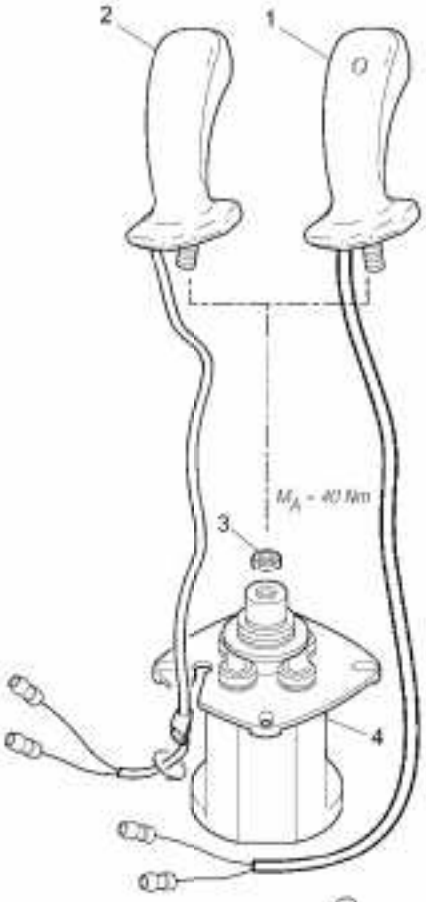
Models	Part No.	Description	Weight
17-VXE	0653 776 UA	230 x 90x 36 Links	61kg

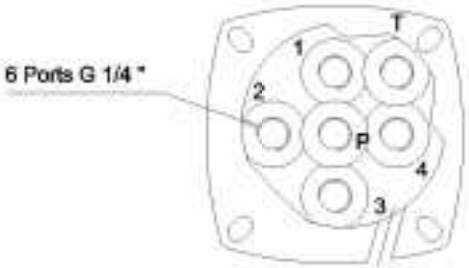
Key	Description	Q'ty
		17VXE
1	Track Shoe Complete	36
2	Track Pin	35
3	Master Pin	1

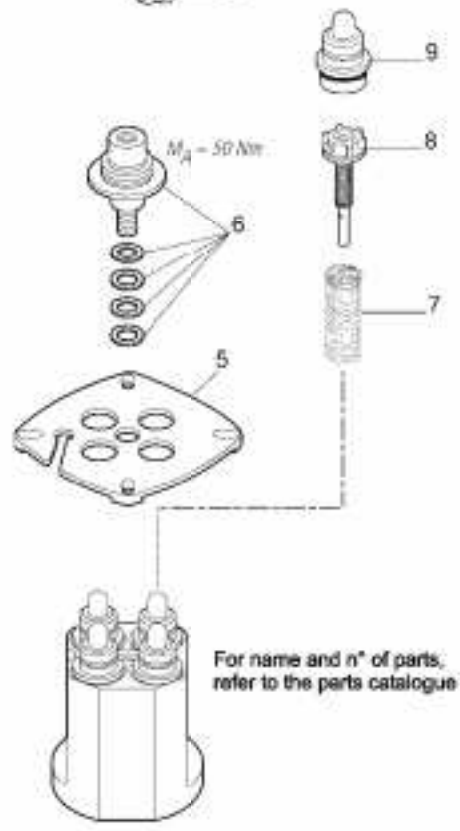


Installed track link shoe ass'y
(Steel shoe)

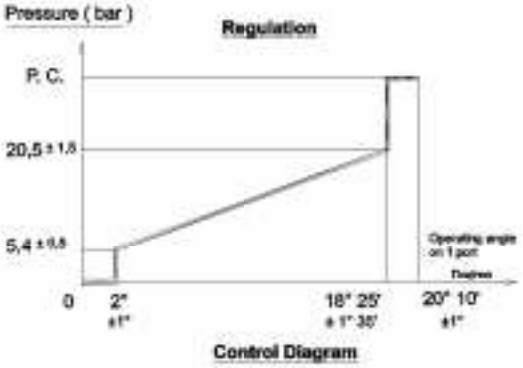
2-19-1 REMOTE CONTROL VALVE ASSEMBLY



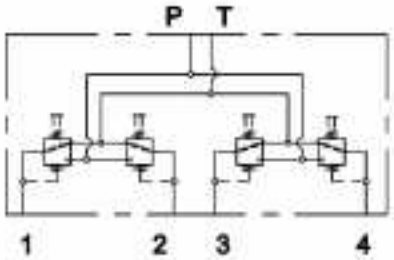




For name and n° of parts, refer to the parts catalogue

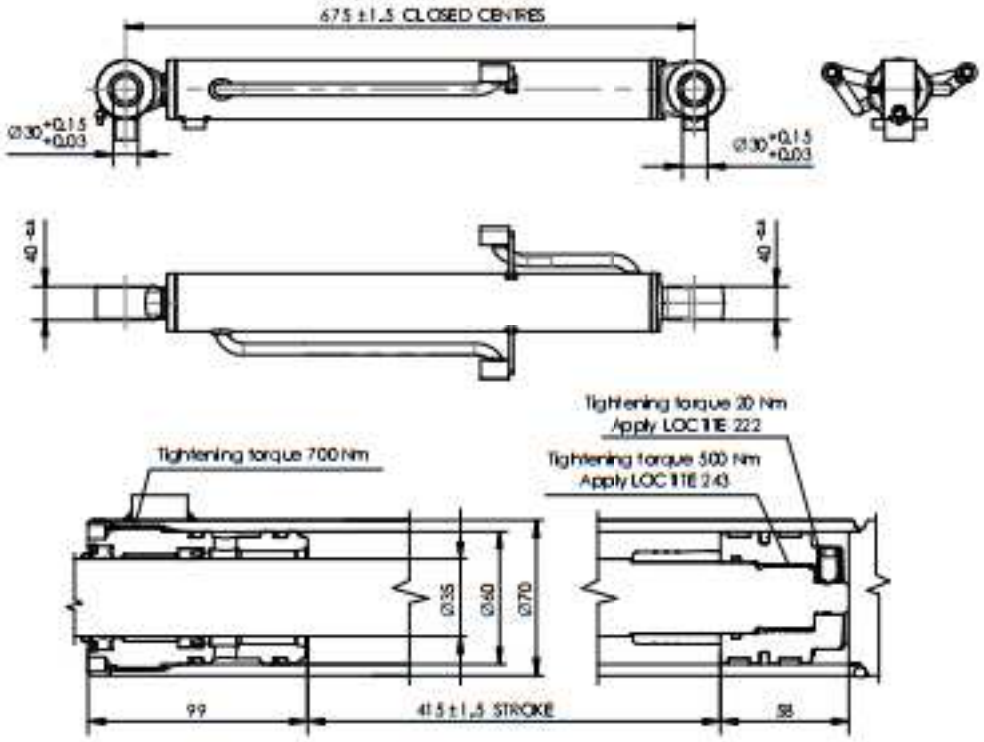


Control Diagram



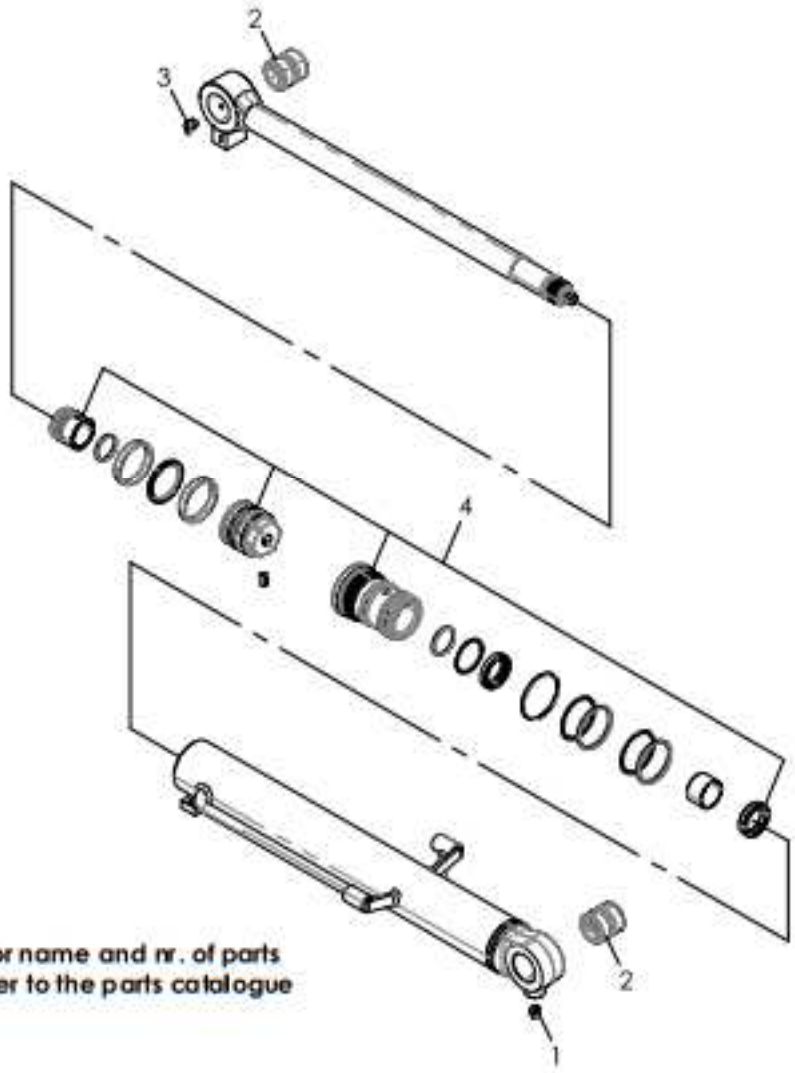
Hydraulic simbol

2-20-1 BOOM CILINDER ASSEMBLY



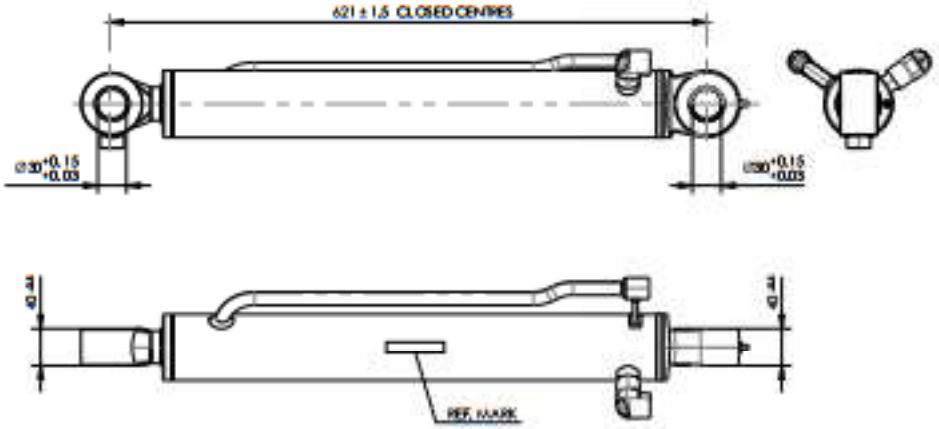
Detail of cylinder head

Detail of piston



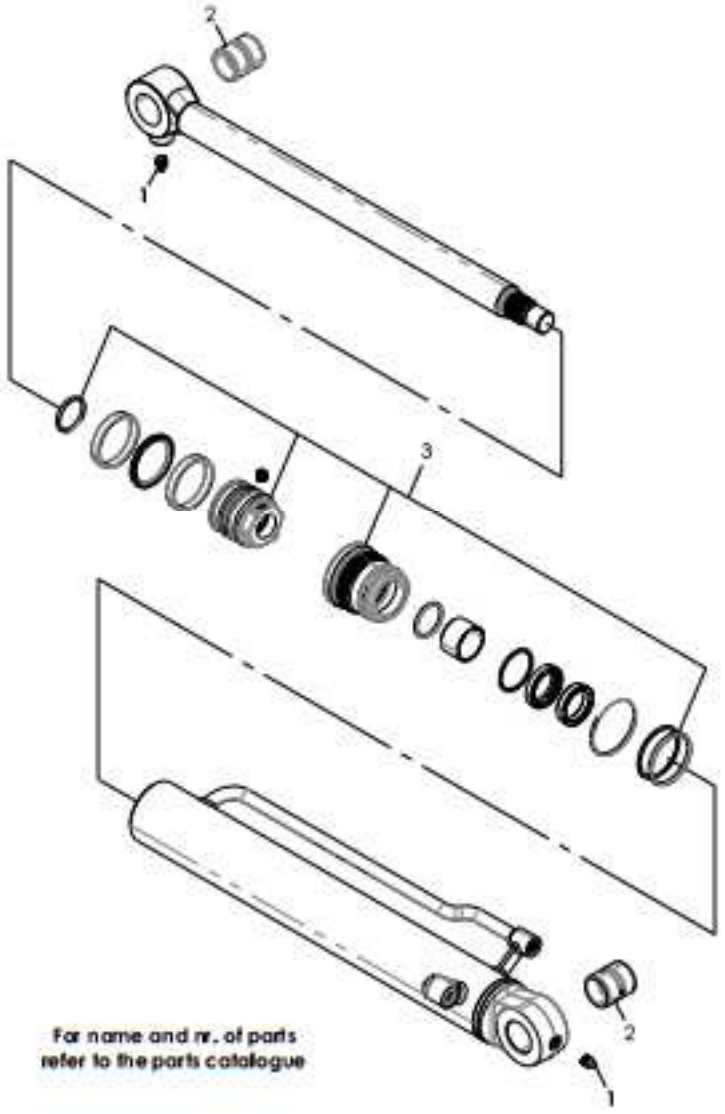
For name and nr. of parts refer to the parts catalogue

2-20-2 ARM CILINDER ASSEMBLY



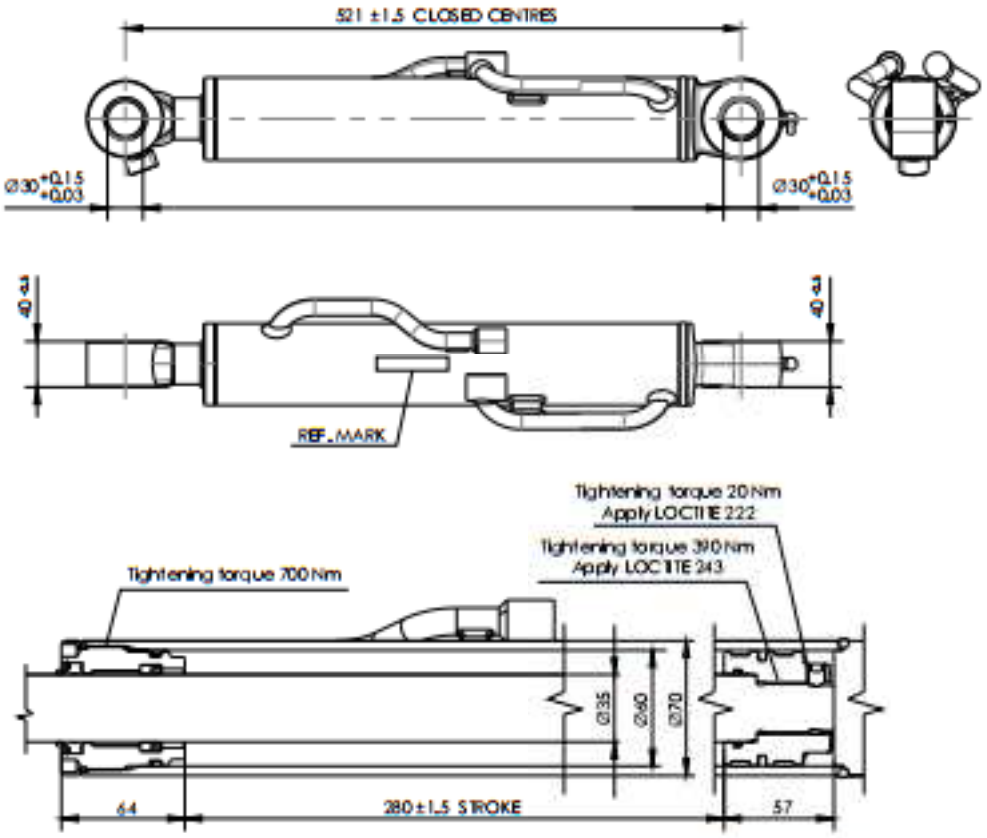
Detail of cylinder head

Detail of piston



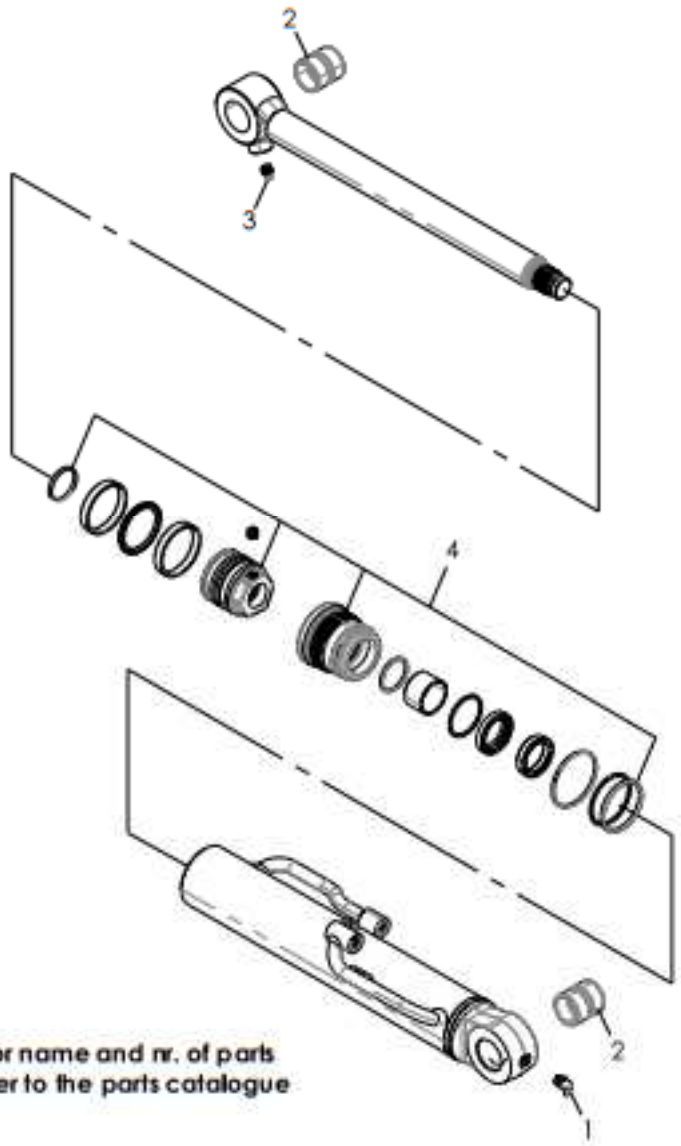
For name and nr. of parts
refer to the parts catalogue

2-20-3 BUCKET CILINDER ASSEMBLY



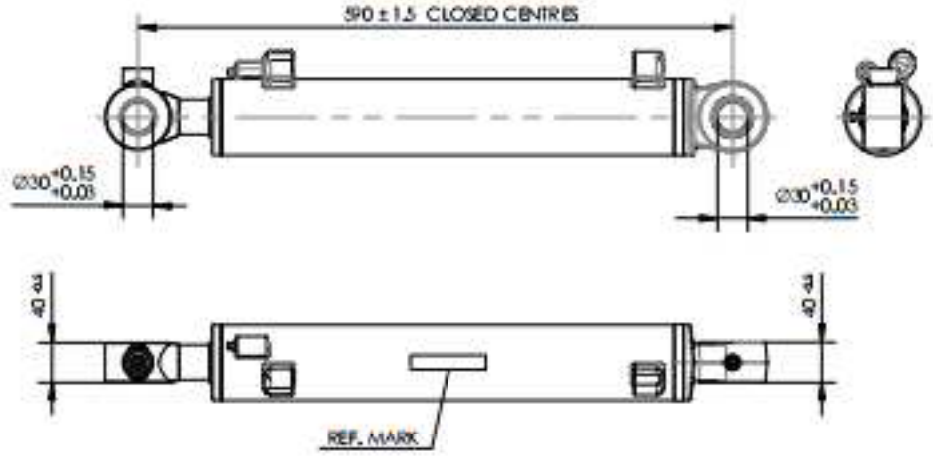
Detail of cylinder head

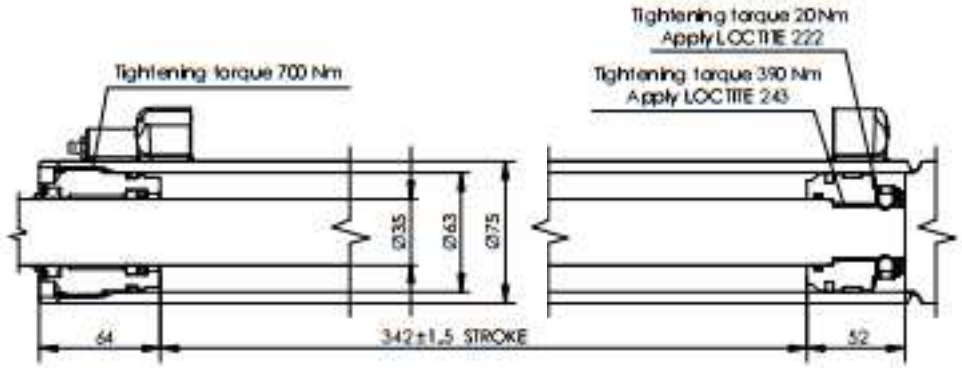
Detail of piston



For name and nr. of parts refer to the parts catalogue

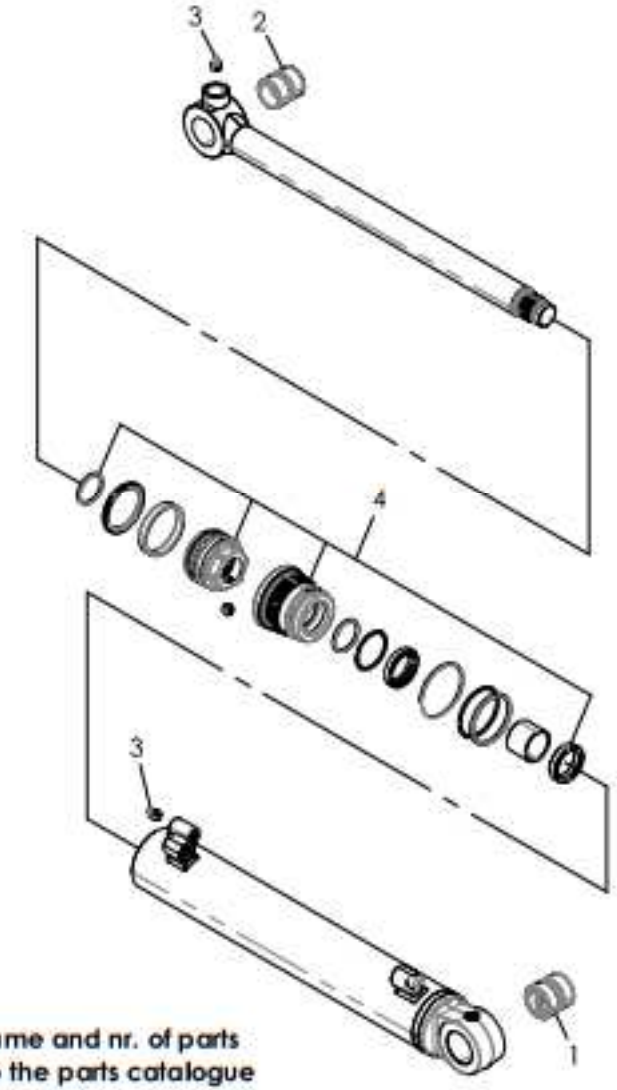
2-20-4 BOOM SWING CILINDER ASSEMBLY





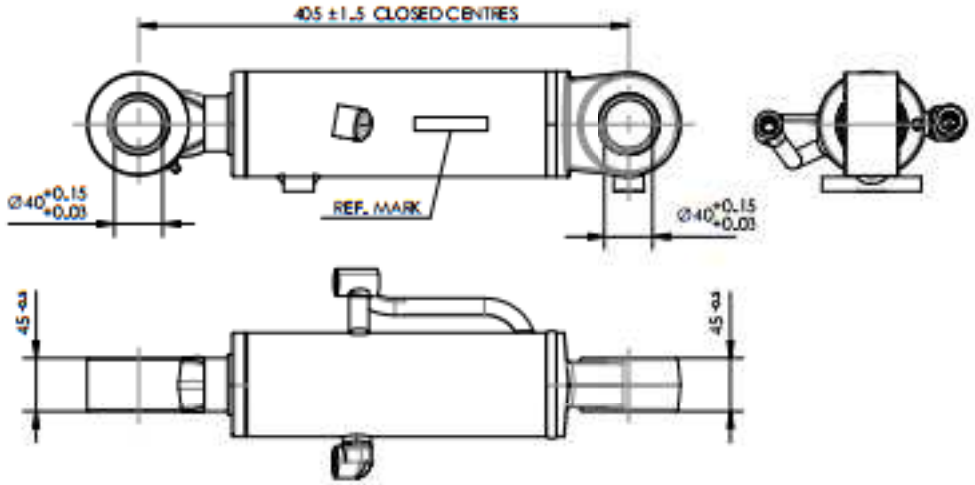
Detail of cylinder head

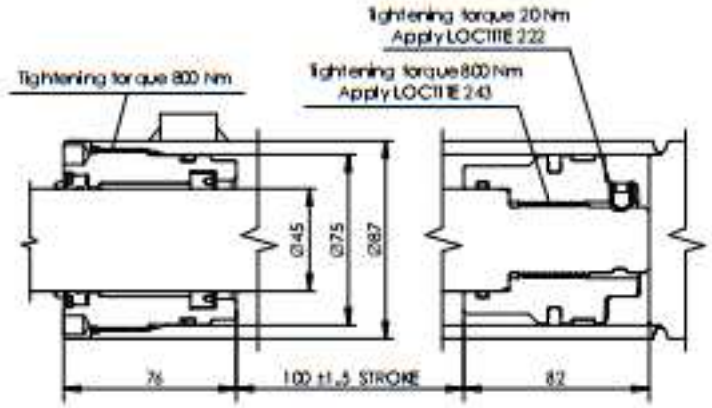
Detail of piston



For name and nr. of parts
refer to the parts catalogue

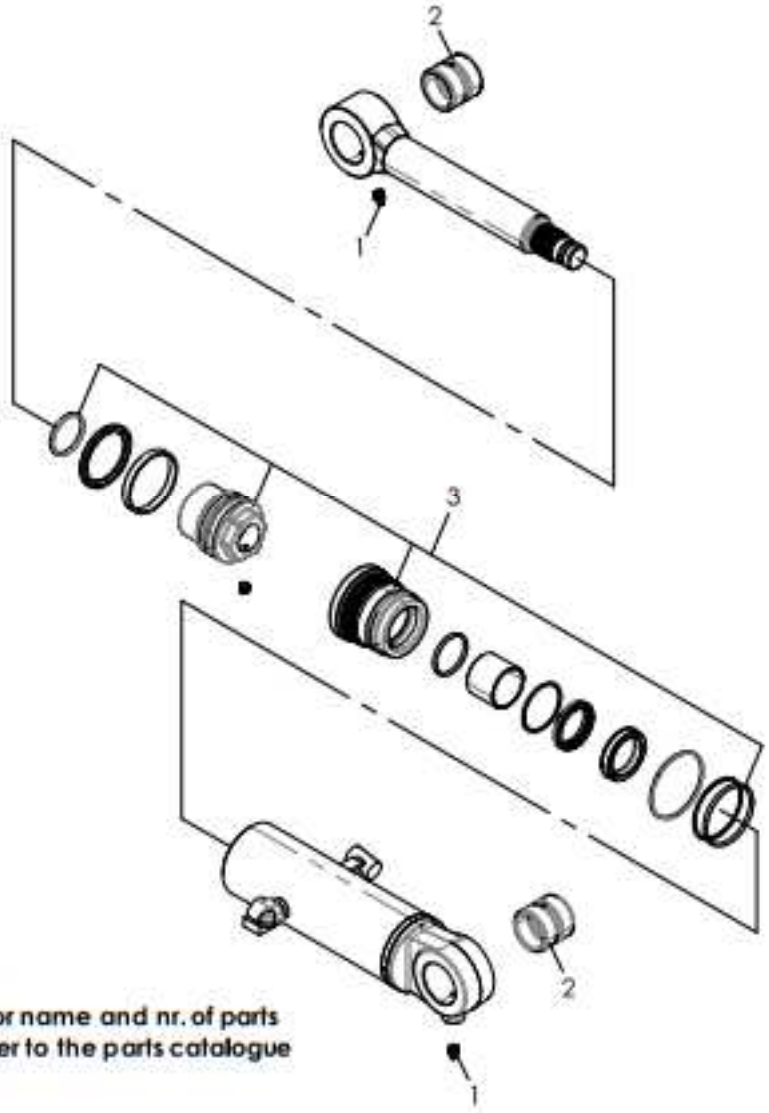
2-20-5 BLADE CILINDER ASSEMBLY





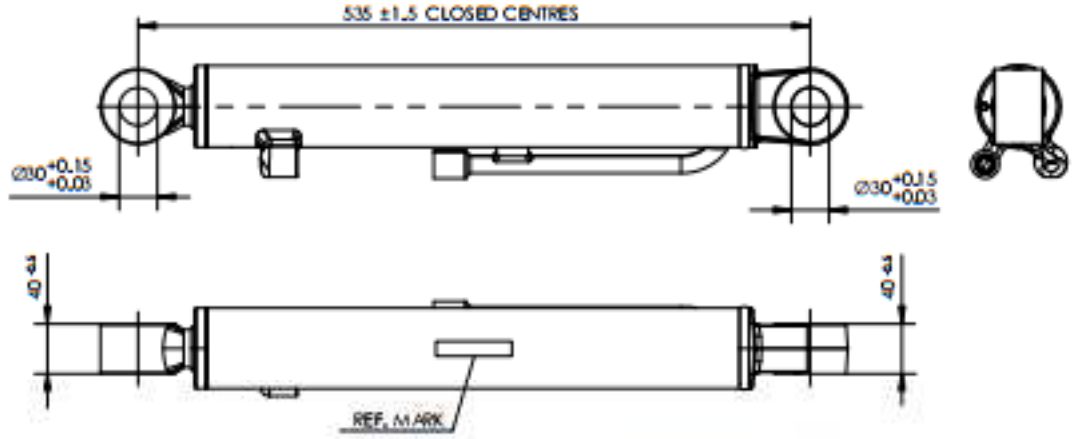
Detail of cylinder head

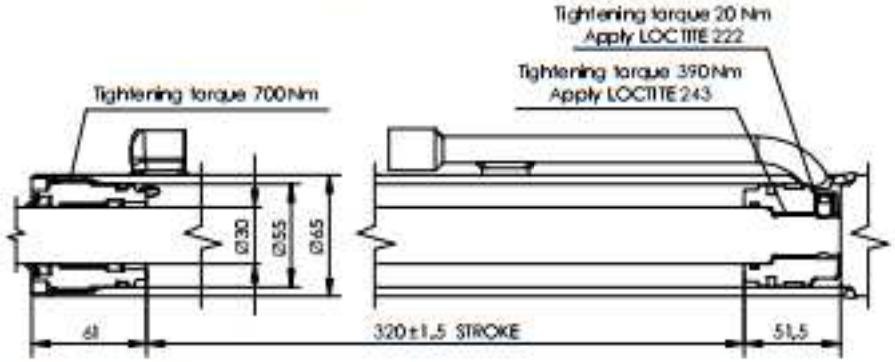
Detail of piston



For name and nr. of parts refer to the parts catalogue

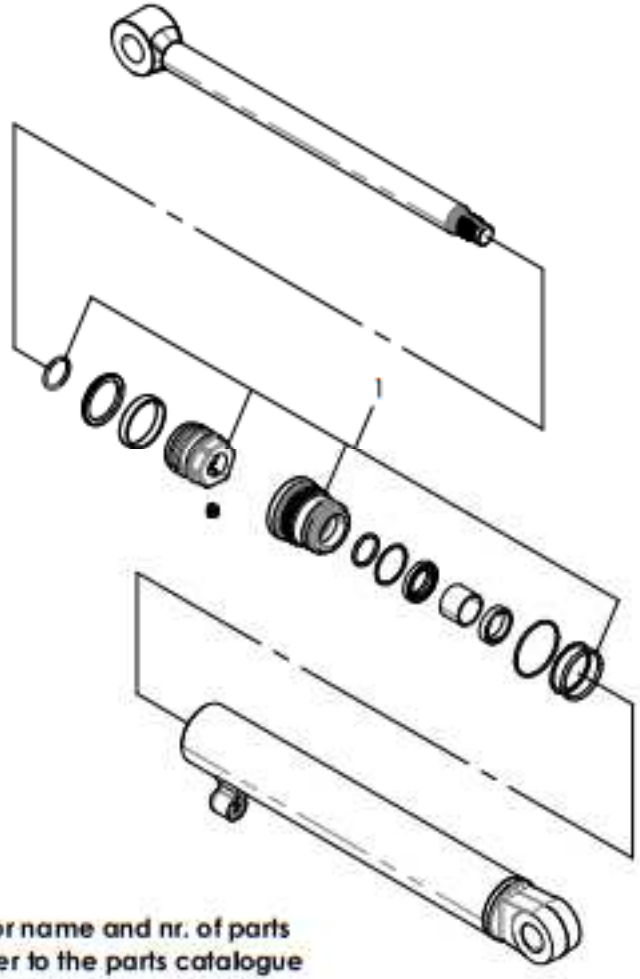
2-20-6 SPANNER CILINDER ASSEMBLY





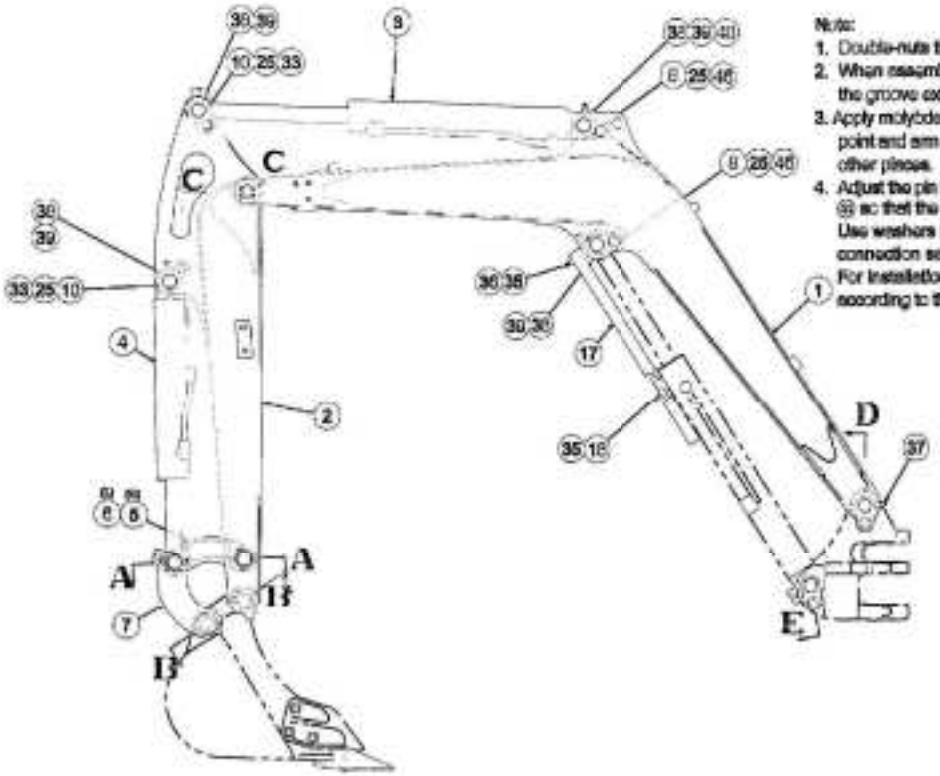
Detail of cylinder head

Detail of piston

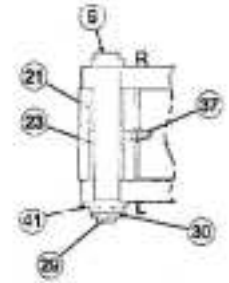


For name and nr. of parts refer to the parts catalogue

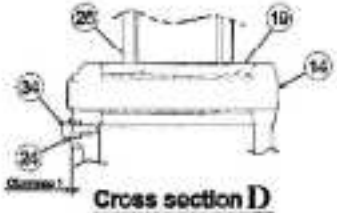
2-21-1 ATTACHMENT ASSEMBLY



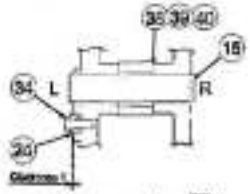
Note:
1. Double-nuts tightening clearance should be 0.5 mm to 1 mm.
2. When assembling bushing No. ⑲ and ㉑, direct inward the side where the groove extends from the end face.
3. Apply molybdenum disulfide grease at three places, the boom foot, boom point and arm point pins when assembling. EP2 grease can be applied at other places.
4. Adjust the pin tightening section using washers No. ㊸ to ㊺ and No. ㊷ to ㊹ so that the clearance will be 1.2 mm or less.
   Use washers No. ㉟ to ㊶ and No. ㉝ to ㉞ to adjust the play at the pin connection section. The number of washers is thus for reference only. For installation, the number of washers required should be determined according to the machine used.



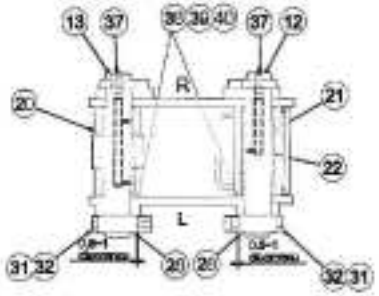
Cross section C-C



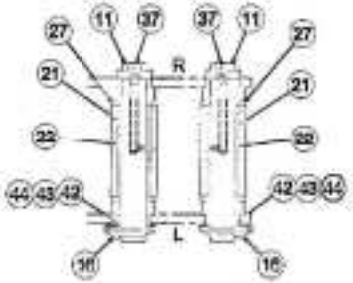
Cross section D



Cross section E



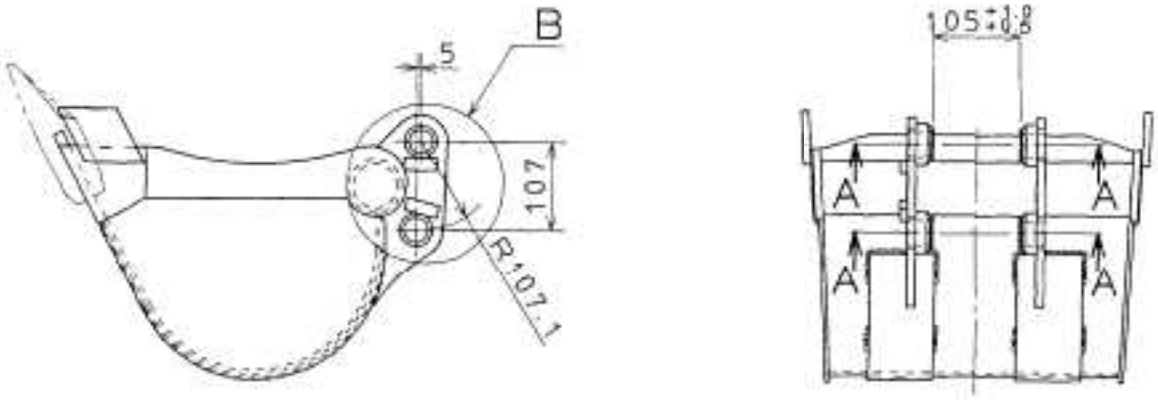
Cross section A-A

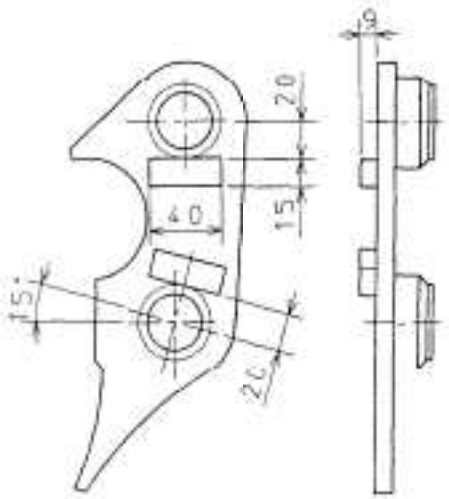


Cross section B-B

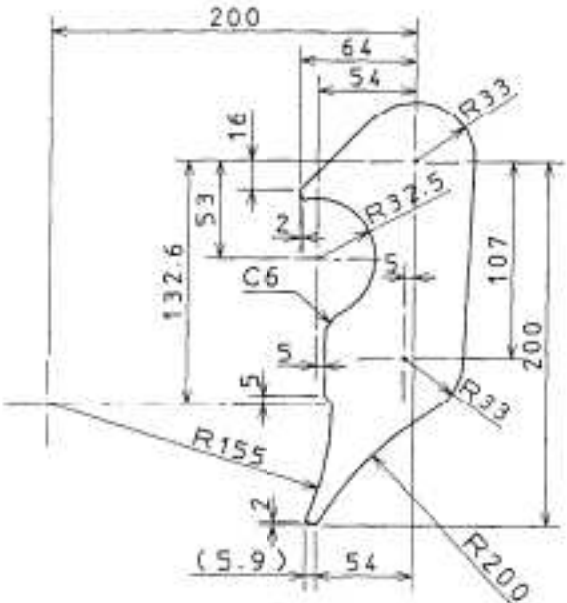
Num	Parts name	Qty	Remarks
1	Boom	1	L=1650
2	Arm STD	1	L=980
	Arm LONG	1	L=1200
3	Arm cylinder	1	ϕ60 x ϕ35 x 380
4	Bucket cylinder	1	ϕ60 x ϕ35 x 250
5	Arm link (RH)	1	
6	Arm link (LH)	1	
7	Bucket link	1	
8	Wing pin	2	ϕ30 x 114
9	Head pin	1	ϕ30 x 197
10	Wing pin	2	ϕ30 x 90
11	Head pin	2	ϕ30 x 204
12	Head pin	1	ϕ30 x 107
13	Head pin	1	ϕ30 x 197
14	Wing pin	1	ϕ35 x 259
15	Wing pin	1	ϕ30 x 140
16	Ring pin	2	G27500
17	Cover	1	
18	Stay	1	
19	Steel bushing	2	ϕ35 x ϕ45 x 40
20	Steel bushing	2	ϕ30 x ϕ40 x 30
21	Steel bushing	8	ϕ30 x 40
22	Spacer	3	ϕ30.1 x 2.5 x 24
23	Spacer	1	ϕ30.1 x 2.5 x 24
24	Bushing	2	ϕ24 x 13.5
25	Bushing	4	ϕ24 x 10
26	Spacer	1	ϕ45 x 99
27	O ring	4	ϕ56(OD) x 40(ID)
28	Collar	2	40.5 x 5 x 20
29	Cotter pin	1	ϕ5 x 50
30	Castle nut	1	M24
31	F. HT (8) nut	4	M10(P=1.25)
32	F. HT (8) bolt	2	M10(P=1.25) x 50
33	F. HT (8) bolt	2	M10(P=1.25) x 20
34	HT (8) bolt	2	M10(P=1.5) x 25
35	HT (8) bolt	4	M10(P=1.5) x 16
36	Spring washer	2	10
37	Grease fitting	6	PT1/8 St.
38	Resin washer	7	1 x 50 x 30 • D
39	Resin washer	7	2 x 50 x 30 • D
40	Resin washer	4	3 x 50 x 30 • D
41	Washer	1	5 x 50 x 25 • D
42	Washer	2	2.3 x 41 x 30.5 • D
43	Washer	2	3.2 x 41 x 30.5 • D
44	Washer	2	4 x 41 x 30.5 • D
45	HT (8) bolt	2	M10(P=1.25) x 25

2-22-1 BUCKET ASSEMBLY

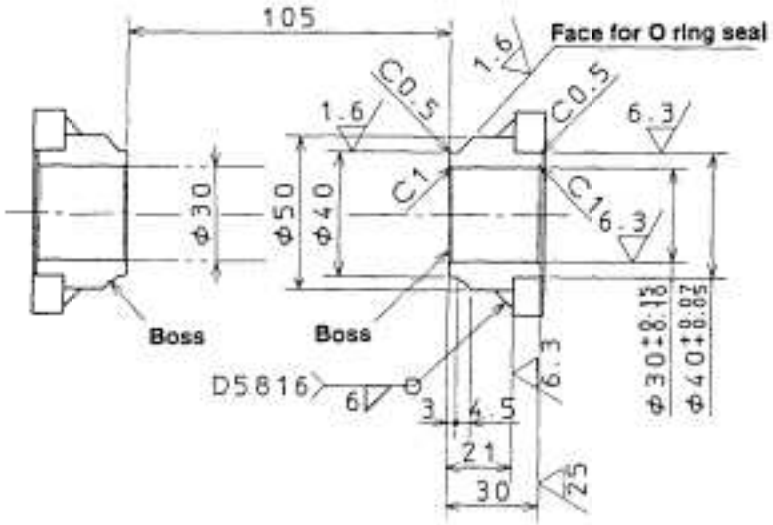




Detail B

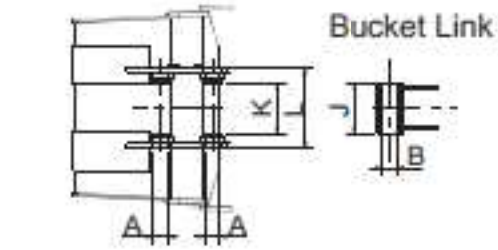


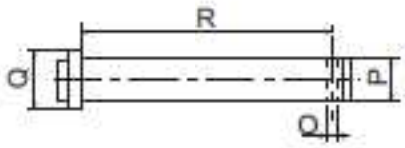
Detail of ear plate
(Free size)

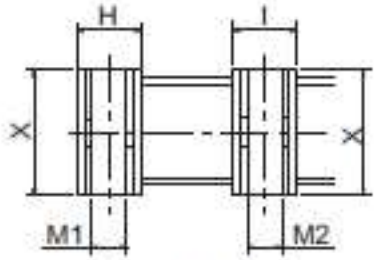


Section A – A

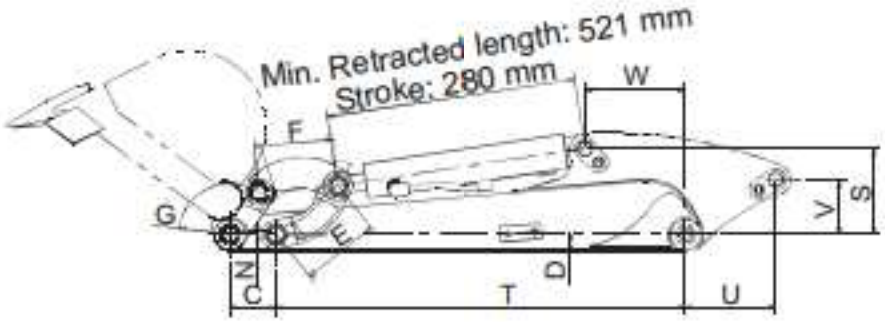
2-23-1 ATTACHMENT DATA (STD. ARM)







Arm Point Boss



ATTACHMENT DIMENSION (unit; mm)

Key	A(hole)	B(hole)	C	D	E	F	G	H	I
Dimensions (mm)	Ø 30	Ø 30	95	37	165	165	107	Ø 65	Ø 54

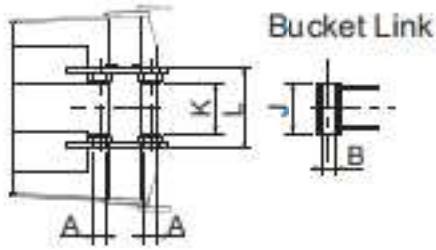
Key	J	K	L	M1(hole)	M2(hole)	N	O	P	Q
Dimensions (mm)	105	105	165	Ø 30	Ø 30	0	Ø 8	Ø 30	40x50

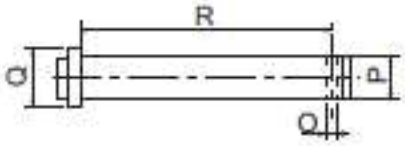
Key	R	S	T	U	V	W	X
Dimensions (mm)	174	180	950	189	120	211	105

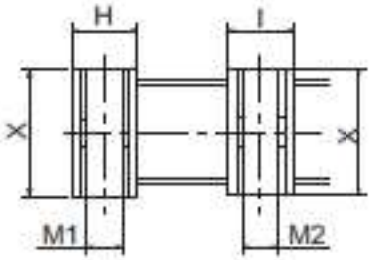
HYDRAULIC SYSTEM

Type of pump		Variable pump
Max. flow	l/min	29,2
Relief set pressure	MPa (kgf/cm^2)	20.6 (210)
Type of hyd. Tank		Pressurized totally enclosed type
Oil cooler		Air cooled type
Service ports		Standard equipped

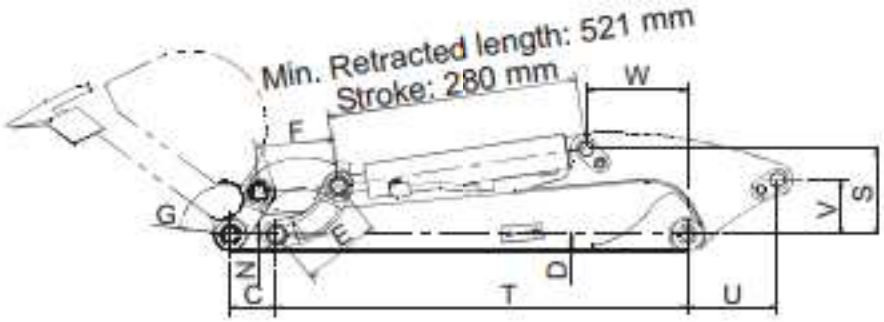
2-23-2 ATTACHMENT DATA (LONG ARM)







Arm Point Boss



ATTACHMENT DIMENSION (unit; mm)

Key	A(hole)	B(hole)	C	D	E	F	G	H	I
Dimensions (mm)	Ø 30	Ø 30	95	37	165	165	107	Ø 65	Ø 54

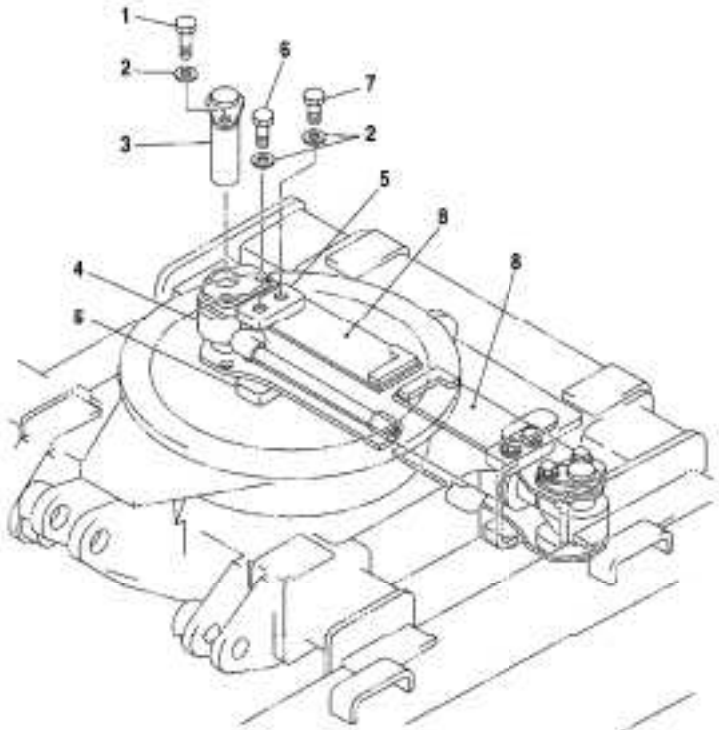
Key	J	K	L	M1(hole)	M2(hole)	N	O	P	Q
Dimensions (mm)	105	105	165	Ø 30	Ø 30	0	Ø 8	Ø 30	40x50

Key	R	S	T	U	V	W	X
Dimensions (mm)	174	180	1200	189	120	461	105

HYDRAULIC SYSTEM

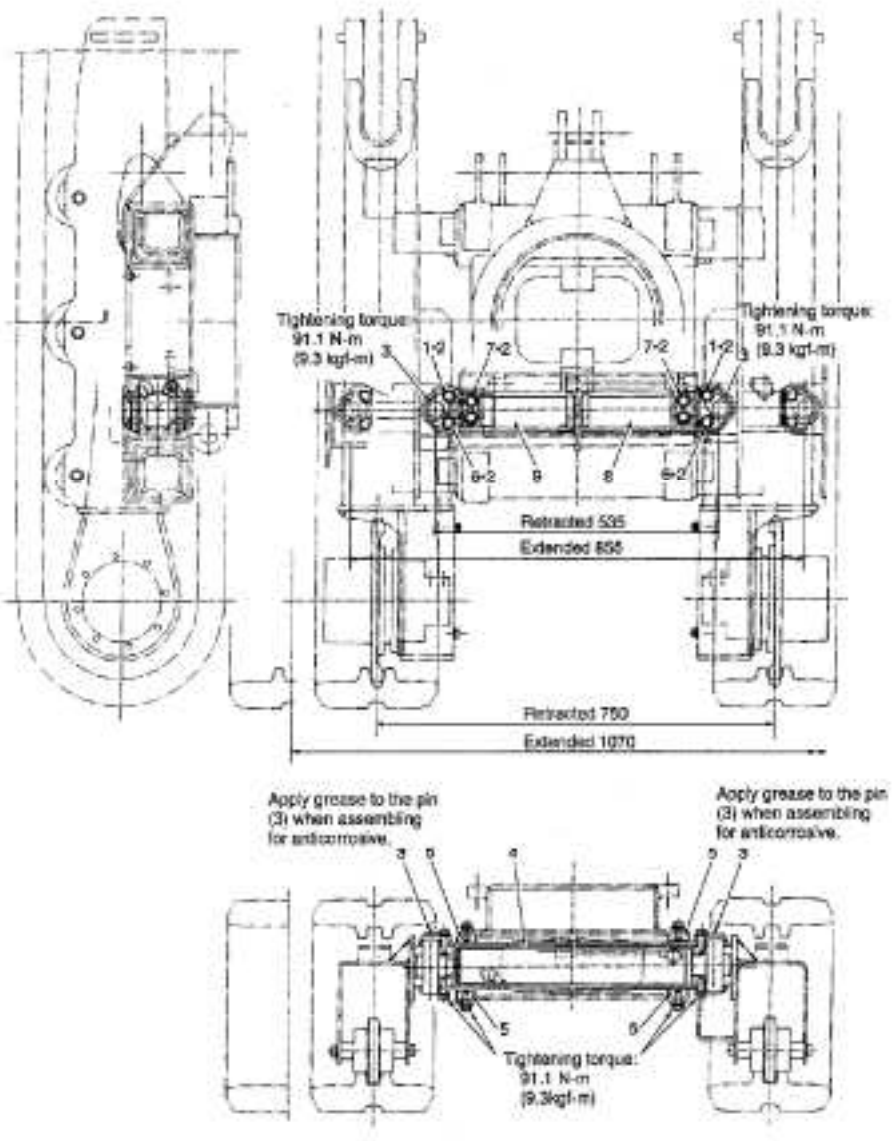
Type of pump		Variable pump
Max. flow	l/min	29,2
Relief set pressure	MPa (kgf/cm^2)	20.6 (210)
Type of hyd. Tank		Pressurized totally enclosed type
Oil cooler		Air cooled type
Service ports		Standard equipped

2-27-1 CRAWLER SPANNER DEVICE



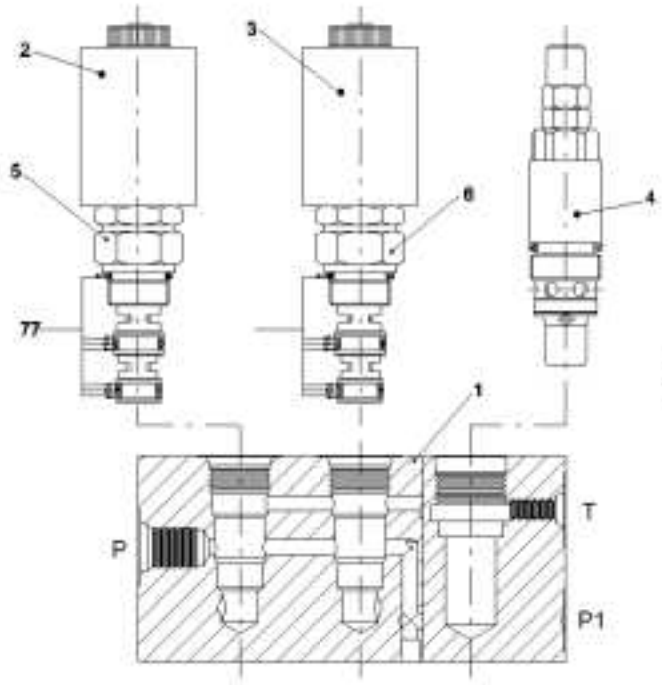
Shown crawler spanner device

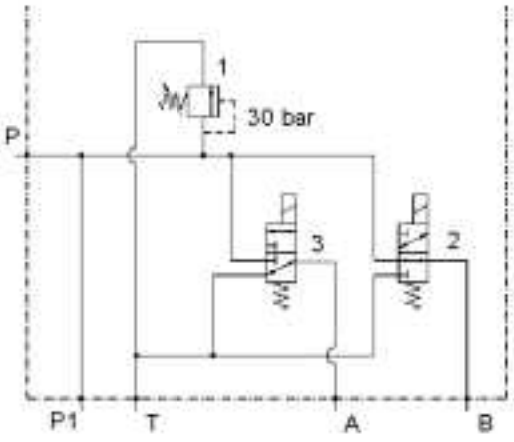
No.	Parts name	Q'ty	Note
0	Crawler spanner	1	
1	H.T. bolt	2	M12 × 35
2	H.T. washer	16	M12
3	Wing pin	2	
4	Spanner cylinder	1	
5	Plate	4	
6	H.T. bolt	6	M12 × 30
7	H.T. bolt	8	M12 × 25
8	Cover	1	
9	Cover	1	



Cross-section of crawler spanner device

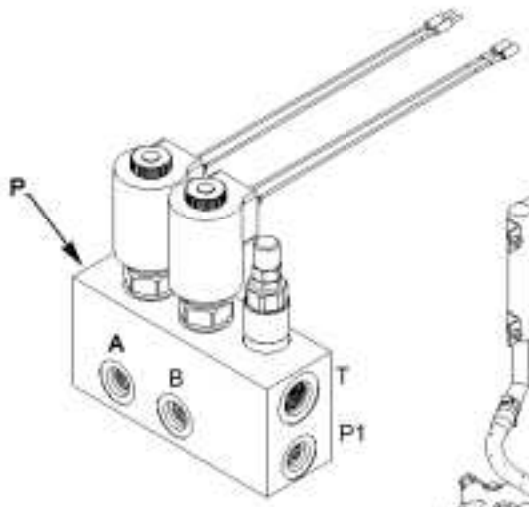
2-28-1 SOLENOID VALVE ASSEMBLY

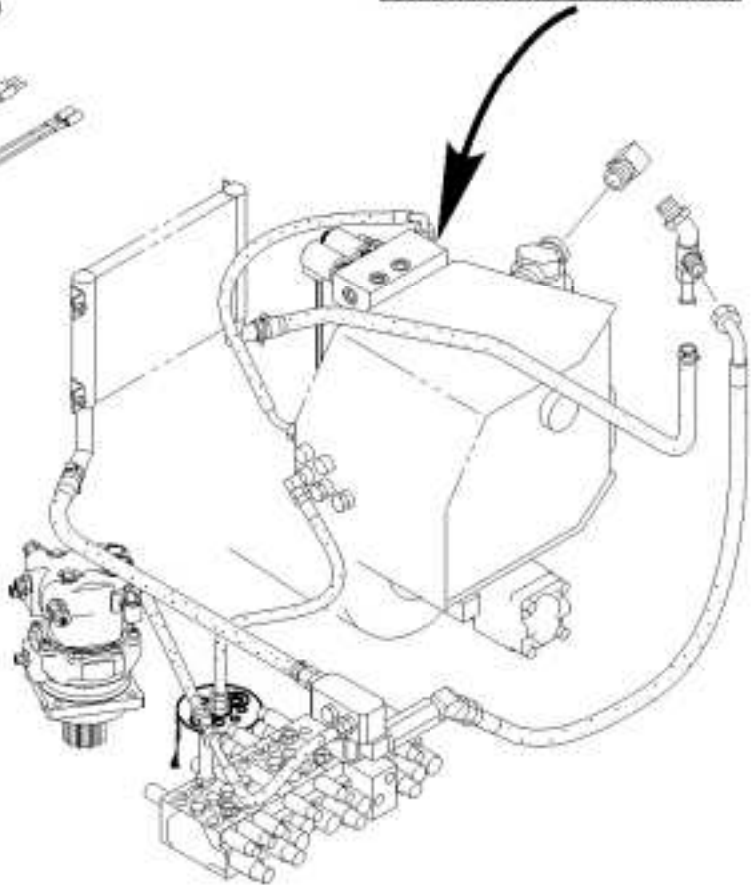




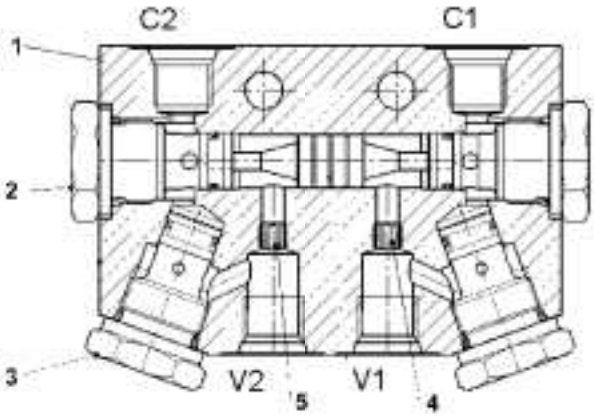
For name and n° of parts,
refer to the parts catalogue

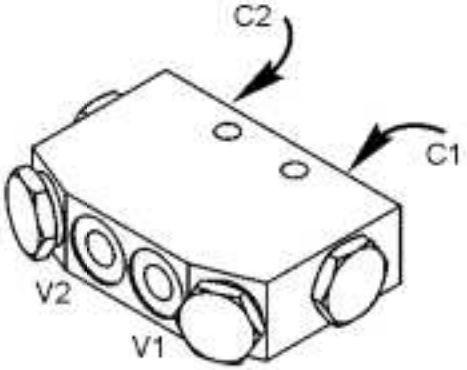
SOLENOID VALVE POSITION



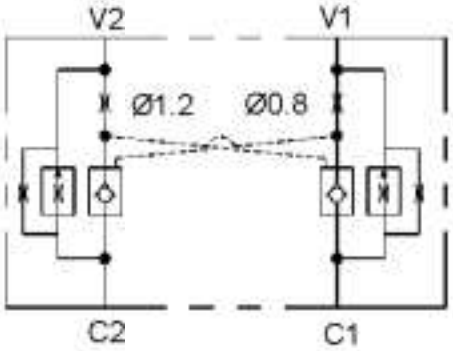


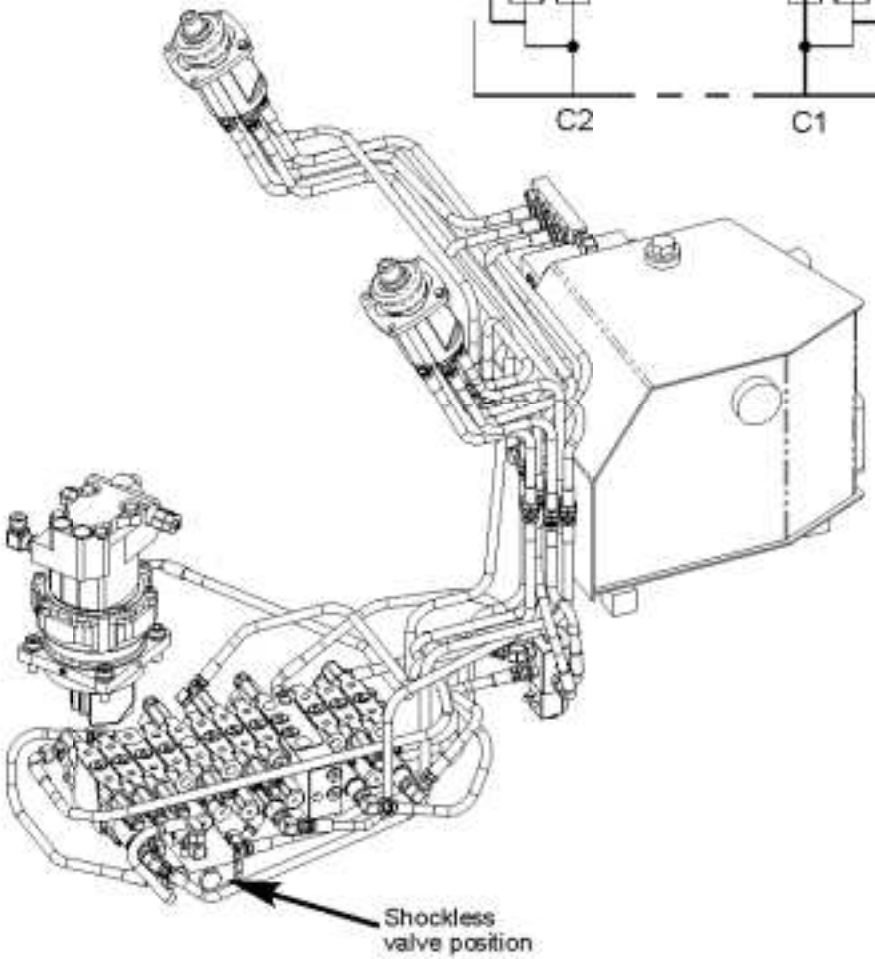
2-29-1 SHOCK LESS VALVE ASSEMBLY (OILCONTROL)



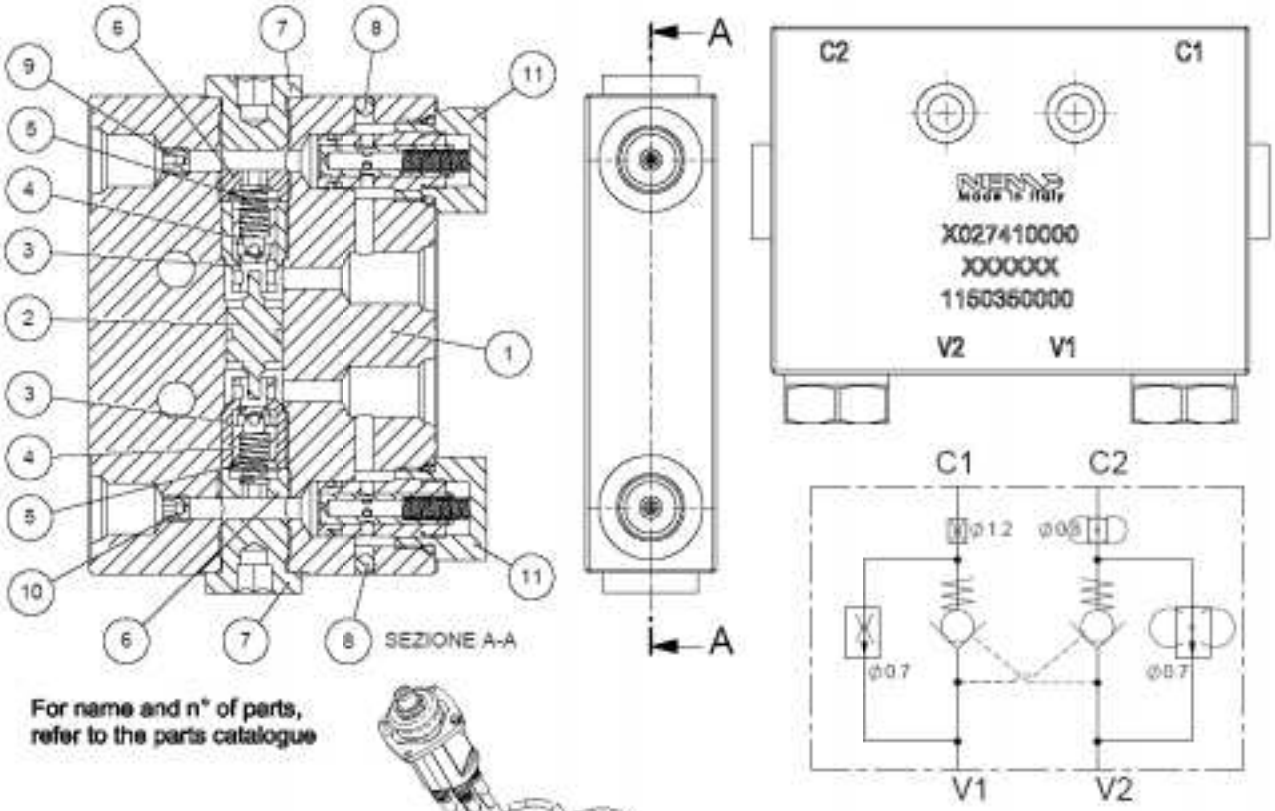


For name and n° of parts,
refer to the parts catalogue

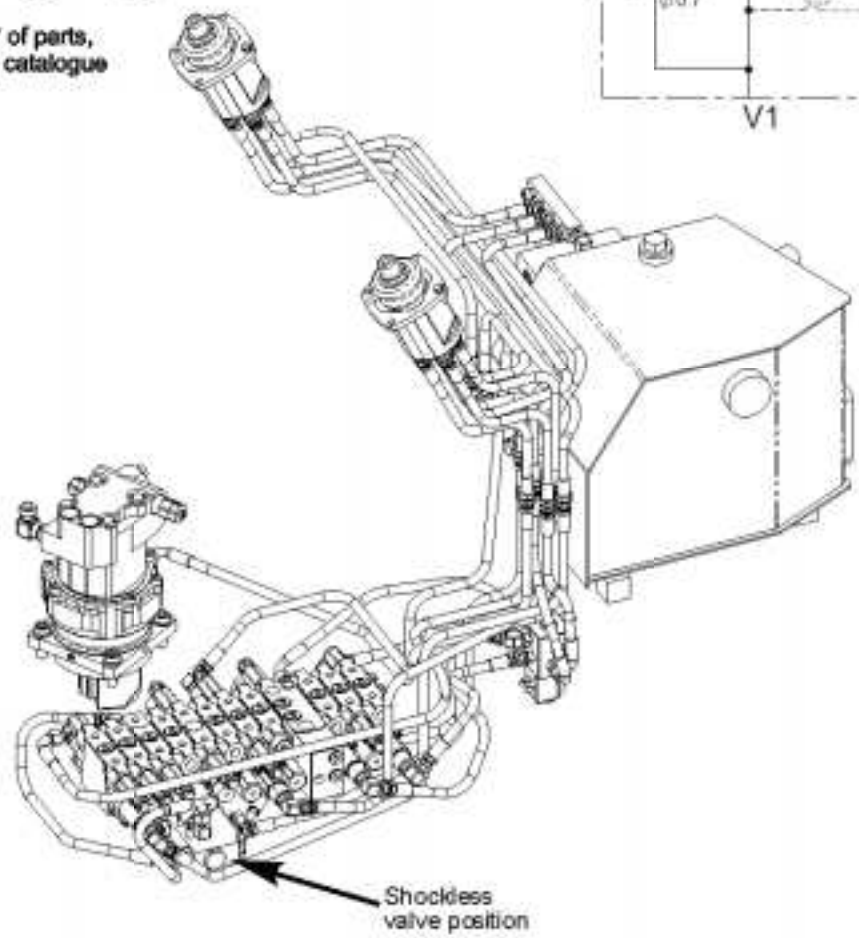




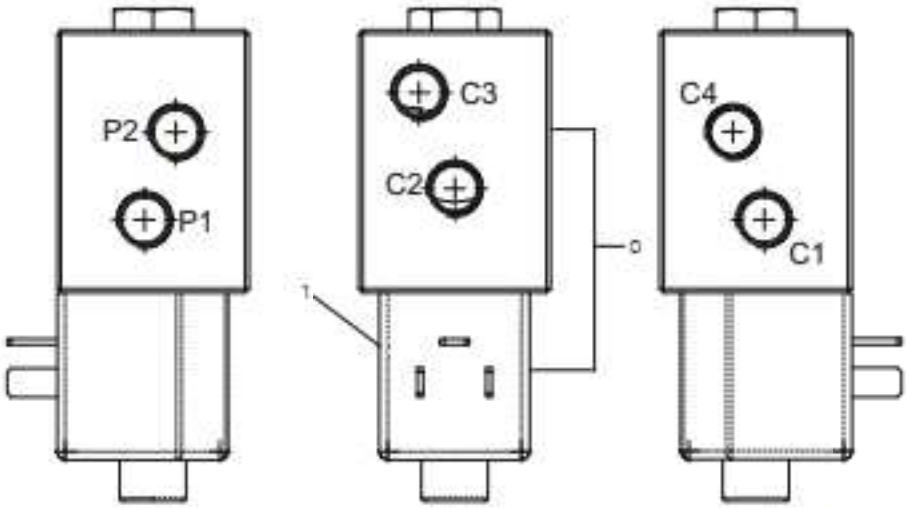
2-29-2 SHOCK LESS VALVE ASSEMBLY (NEM)



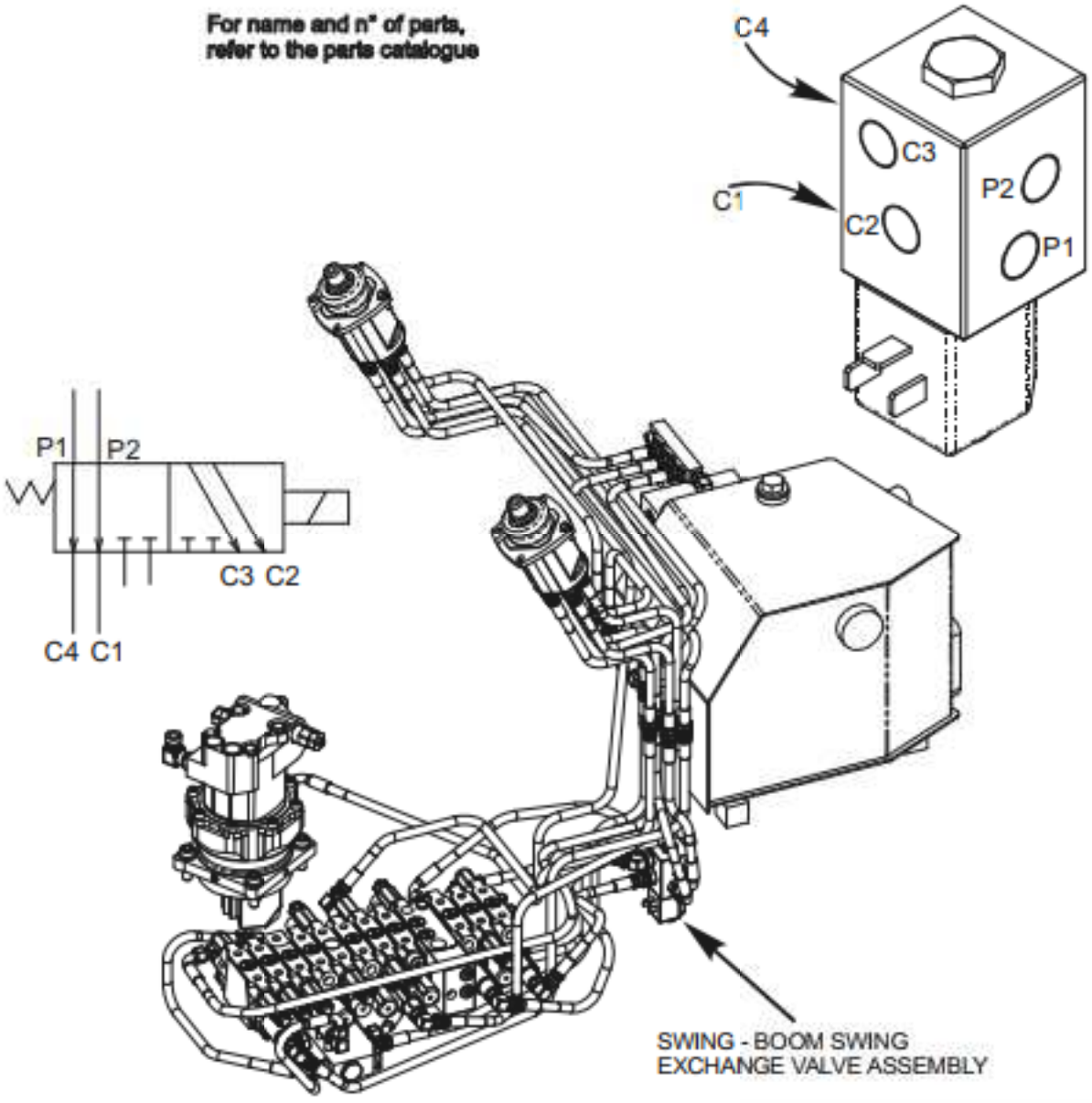
For name and n° of parts, refer to the parts catalogue



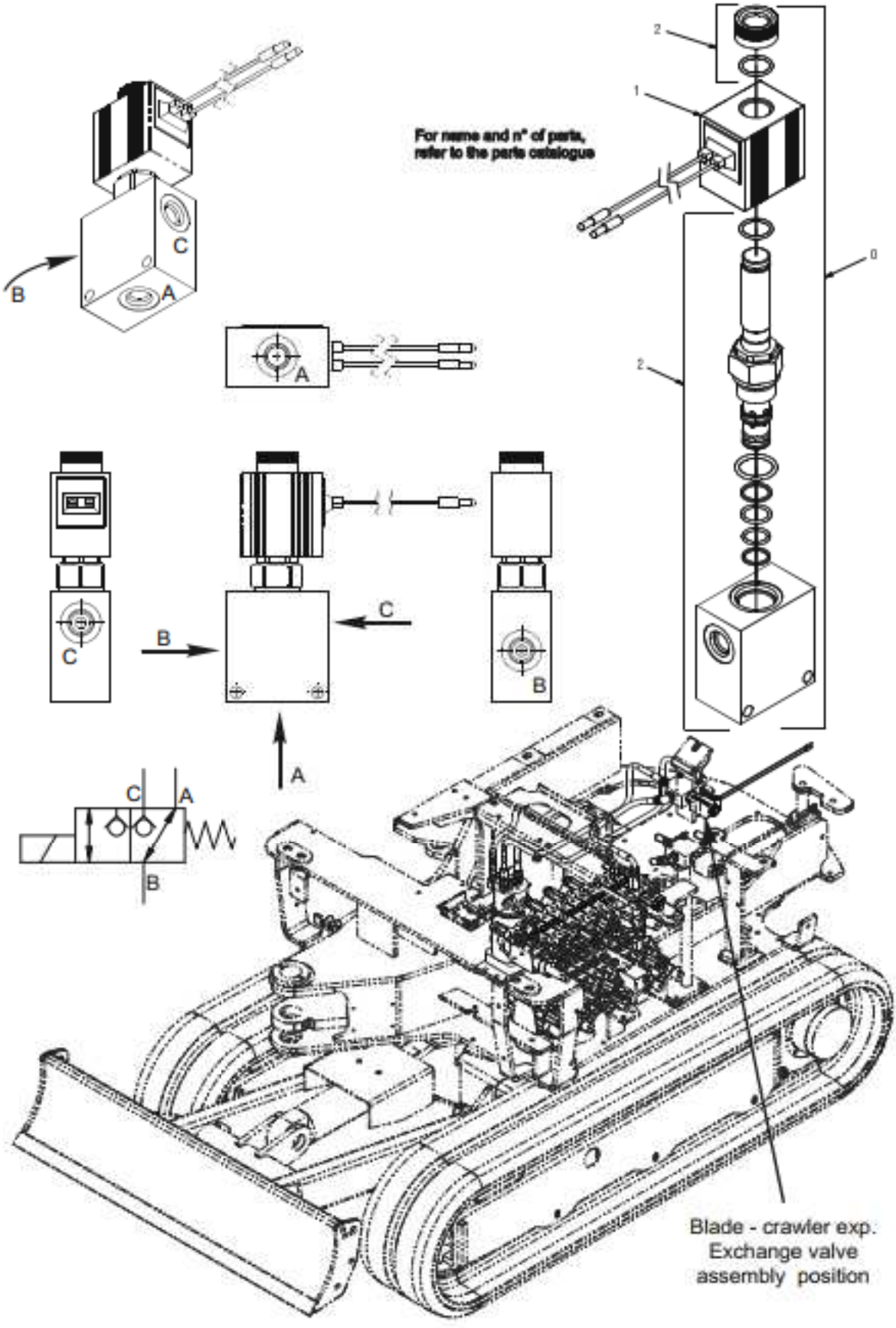
2-30-1 SWING – BOOM EXCHANGE VALVE ASSEMBLY



For name and n° of parts, refer to the parts catalogue



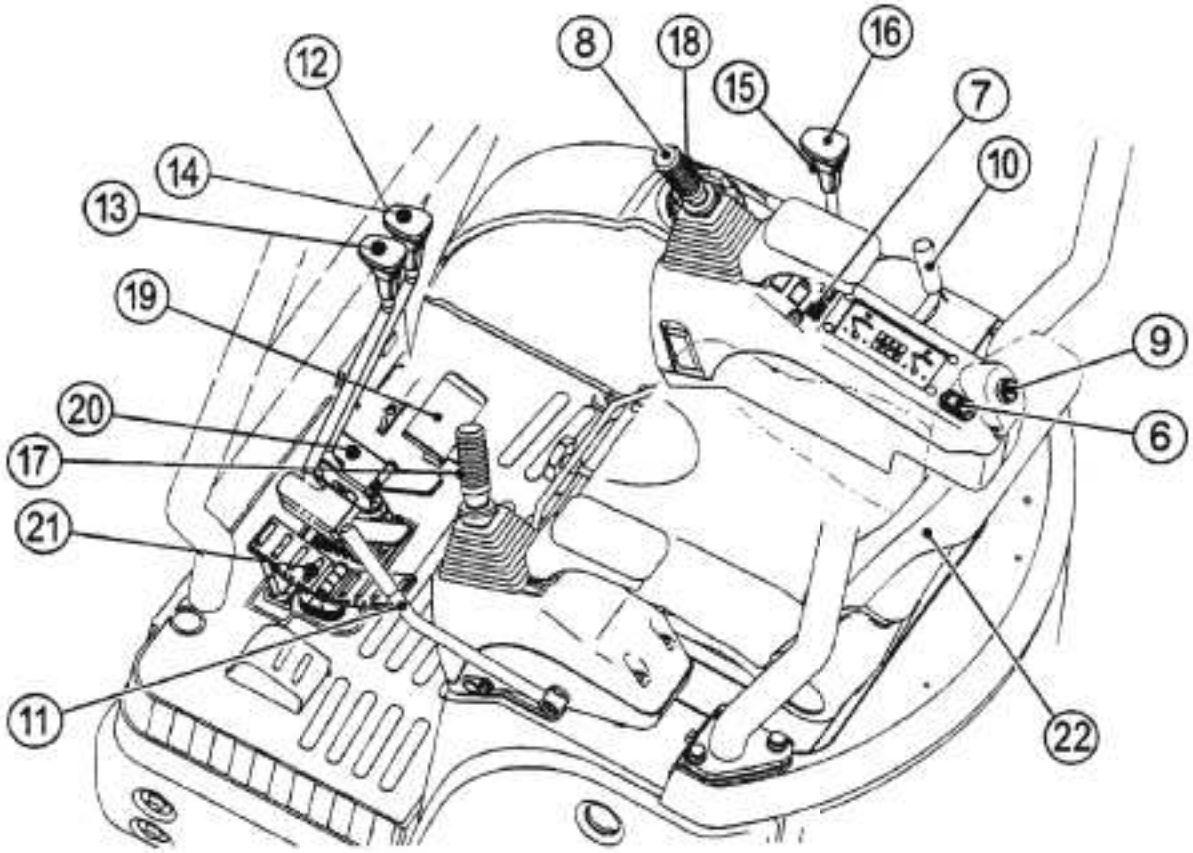
2-31-1 BLADE - CRAWLER EXP. EXCHANGE VALVE ASSEMBLY



SECTION 3 OPERATION

TABLE OF CONTENTS

CONTROL INSTRUMENTS



(6)

(7) Light Switch

(8) Horn Switch

(9)

(10)

(11) Control Shut-Off Lever

(12) High Speed Travel Button

(13) Left Travel Lever

(14) Right Travel Lever

(15) Blade - Spanner Control button

(16) Blade - Spanner lever

(17) Left Operating Lever

(18) Right Operating Lever

(19) Boom Swing Pedal

(20) Travel Pedals

(21) Operator's Seat

4. MACHINE CONTROLS

(10) Engine Throttle Lever

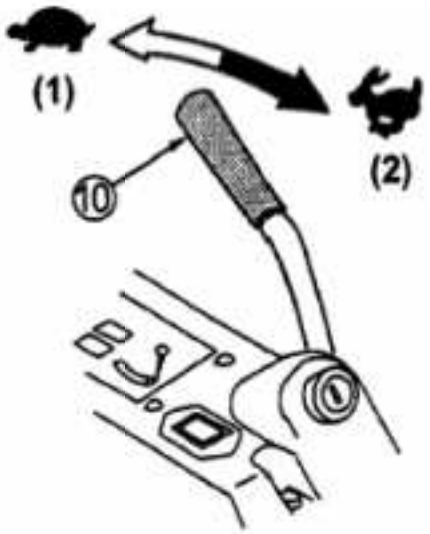
* Electric units will not have this feature

(1) Decrease ( ).

Move the lever to forward to decrease the engine speed.

(2) Increase ( ).

Move the lever to the rear to increase the engine speed.



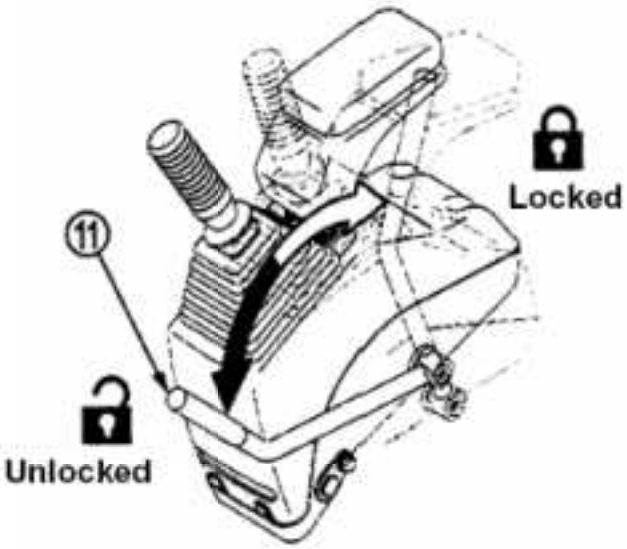
(11) CONTROL SHUT-OFF LEVERS

CAUTION

TO MOUNTING AND DISMOUNTING THE MACHINE, BE SURE TO PUT THE SHUT-OFF LEVERS IN THE LOCKED POSITION.
IF BOTH LEVERS ARE IN THE UNLOCKED POSITION, UPPER STRUCTURE CAN SWING AND CAN RESULT PERSONAL INJURIES.

"Locked": Pull the levers backward to put in "Locked" position. This make inoperative all hydraulic controls and travel.

"Unlocked": Pull the levers forward to put them in "unlocked" position. This make operative all hydraulic controls and travel.



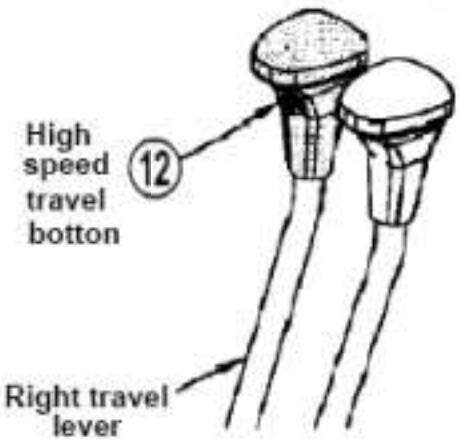
(12) HIGH SPEED TRAVEL BUTTON
Orange button on blade lever.

CAUTION

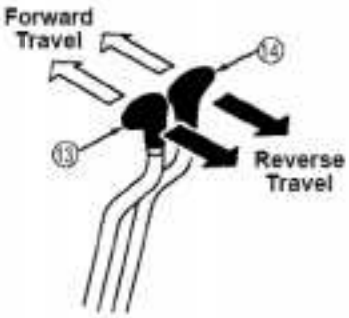
NEVER HIGH SPEED TRAVEL ON A GRADE OR LOADING AND UNLOADING THE MACHINE. * WHEN CONTROL SHUT-OFF LEVERS ARE LOCKED, DOES NOT CHANGE TO HIGH SPEED TRAVEL.

Low Speed Travel
Release the button to low speed travel. Select the LOW speed travel when driving on rough or soft surface. Low is also recommended for loading or unloading from a truck.

High Speed Travel
During push down the button to shift the high speed travel. Select the HIGH speed travel when driving on a hard even surface.



(13) - (14)TRAVEL LEVERS



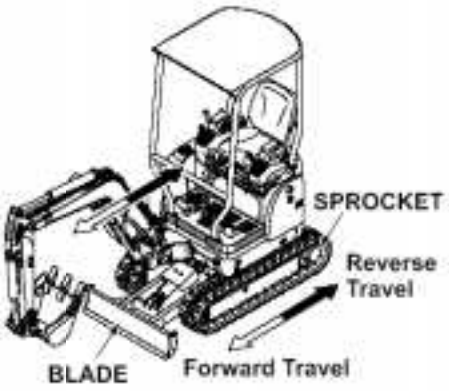
CAUTION

NORMAL TRAVELING IS WHEN THE DRIVE SPROCKET ARE UNDER THE REAR OF THE MACHINE. BLADE ARE UNDER THE FRONT OF THE CAB. REVERSE TRAVELING IS WHEN THE CAB IS OVER THE SPROCKETS. BOTH THE DIRECTIONAL AND TRAVELING FUNCTIONS WILL BE REVERSED.
ALWAYS TRAVEL WITH SPROCKETS UNDER THE REAR OF THE MACHINE.

Forward Direction Travel
Move the both travel levers forward to move the machine forward direction.

Stop
Release the travel levers to stop the machine and apply the brakes.

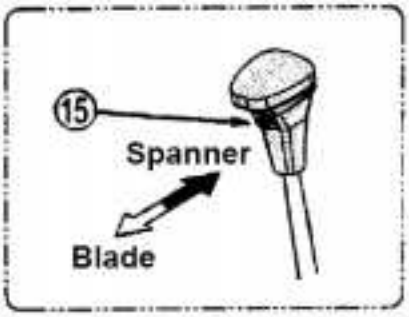
Reverse Direction Travel
Move the both travel levers rear to move the machine reverse direction.
Refer to Travelling the Machine section of this manual.



(15) BLADE – SPANNER CONTROL BUTTON
Operations that will be executed by lever (15) (Blade - Spanner Lever) must be selected through this button.

Blade operations: Release the button to selected "Blade operations" modality.

Spanner operations: Push the button to selected "Spanner operations" modality



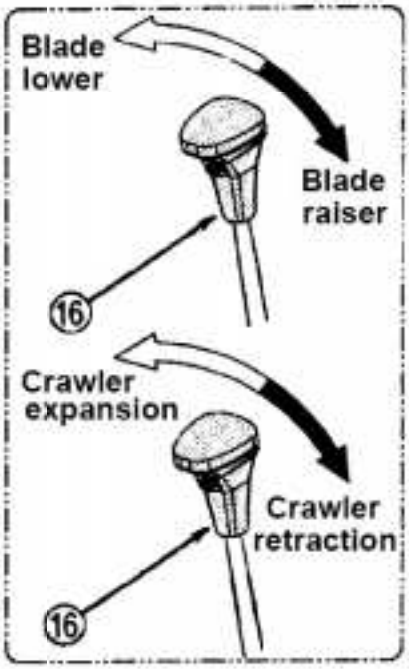
(16) BLADE – SPANNER LEVER

BLADE OPERATIONS:

Blade raise: Move the lever back to raise the blade.
Blade lower: Move the lever forward to lower the blade.

Spanner operations
With the green Blade - Spanner Control Button pusher.

Crawler expansion: push the spanner-blade lever forward.
Crawler retraction: pull the spanner-blade lever backward.



(17) LEFT OPERATING LEVER

Swing and arm controls.

1 **Arm Out:**
Move the lever forward to move the arm out.

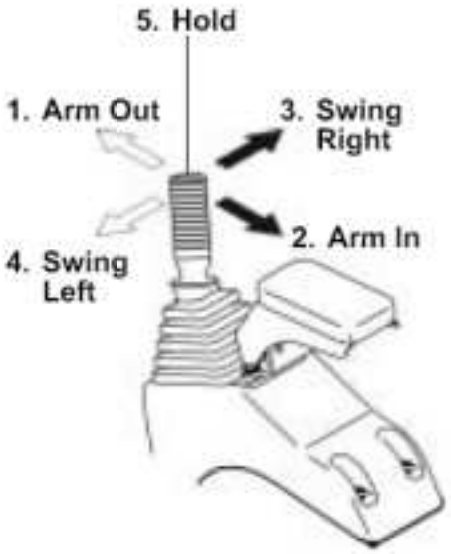
2 **Arm In:**
Move the lever rear to move the arm in.

3 **Swing Right:**
Move the lever right to swing the upper structure to the right.

4 **Swing Left:**
Move the lever left to swing the upper structure to the left.

5 **Hold :**
When the lever released from any position, the lever will return to hold (center position). Arm or swing movement will stop.

Two Functions may be performed at the same time by moving the lever diagonally.



ISO System

(18) RIGHT OPERATING LEVER

Bucket and boom controls

1. **Boom Lower:**
Move the lever forward to lower the boom.

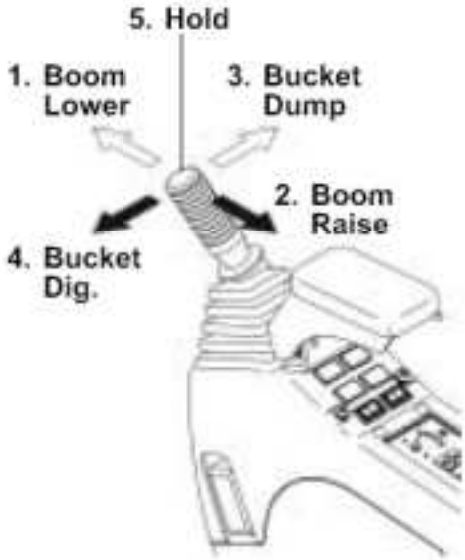
2. **Boom Raise:**
Move the lever back to raise the boom.

3. **Bucket Dump:**
Move the lever right to dump the bucket.

4. **Bucket Dig:**
Move the lever left to close the bucket.

5. **Hold:**
When the lever released from any position, the lever will return to hold(center position). Boom or bucket movement will stop.

Two functions may be performed at the same time by moving the lever diagonally.

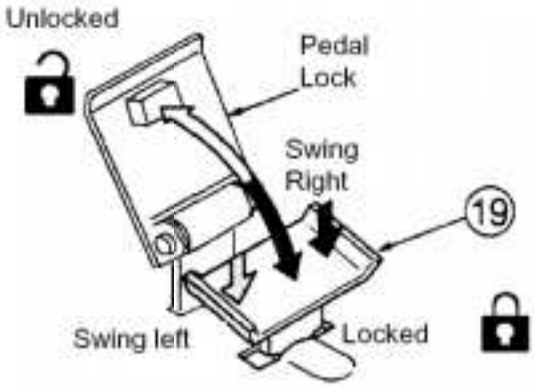


ISO System

(19) BOOM SWING PEDAL

CAUTION

ALWAYS LOCKED PEDAL WHEN IS NOT USE.



Swing selection button is located on the left operating lever. For boom swing operations use swing functions..

Boom swing Right:
Push down right on the pedal to swing the boom to the right.

Boom swing Left:
Push down left on the pedal to swing the boom to the left.

(21) OPERATOR'S SEAT

CAUTION

SEAT ADJUSTMENT SHOULD BE CHECKED AT THE BEGINNING OF EACH SHIFT OR WHEN CHANGING OPERATOR.
LOWER THE BUCKET ON THE GROUND, STOP THE ENGINE AND THEN MAKE ADJUSTMENT.

Seat Adjustment

Seat position can be adjusted forward or backward and seat back tilt. Select the desired position to allow full pedal and lever travel.

To Adjust the Seat Forward or Backward.

Pull up and hold lever 2 and move the seat to the desired position. Release the lever to hold the seat in the selected position.

To Adjust the Seat Back Tilt.

Turn knob 3 clockwise to tilt the seat back to backward. Turn knob 3 counter clockwise to tilt the seat back to forward.

To Adjust the Seat Suspension.

Turning knob 1 clockwise increases suspension stiffness and turning it counter clockwise decreases suspension stiffness.

(22) SEAT BELT

CAUTION

ALWAYS FASTEN THE SEAT BELT WHILE OPERATING THE MACHINE.
ALWAYS CHECK THE CONDITION OF THE SEAT BELT AND MOUNTING HARDWARE BEFORE OPERATING THE MACHINE. REPLACE IF DAMAGED.

To Check the Belt
Check for worn or damaged buckle, extrusion and mounting hardware. Replace them if they are worn or damaged.

To Fasten the Belt
With gripper held and insert extrusion into buckle until correctly latched. Adjust the seat belt length according to your body size. Slightly pull the belt and confirm the belt is fastened.

To Unfasten the Belt
Push in button of buckle and extrusion will be released from buckle

BEFORE STARTING THE ENGINE

The following items should be checked each day before start-up or the start operations.

Walk-Around Inspection
Inspect the loose bolts, trash build up, oil or coolant leaks, broken or worn parts. Inspect the condition of the attachments and the hydraulic components.

Inspect the operator's compartment for cleanliness. Keep it clean.

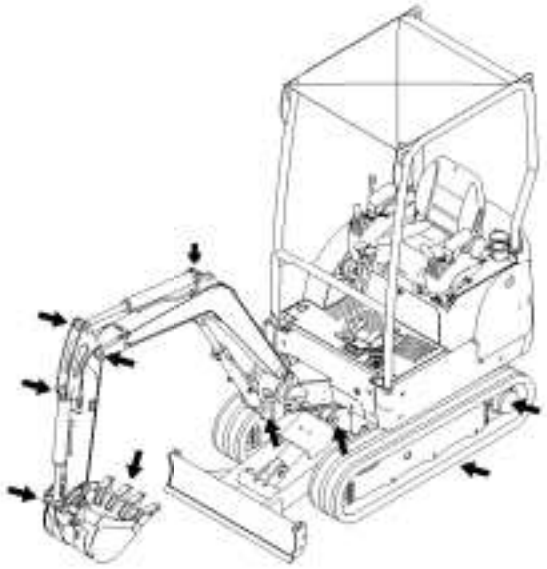
Inspect any cracks in boom and arm pivot area and cylinder mounting brackets. Repair if damaged.

Refer to Walk-Around Inspection in the Maintenance Section.

- **Lubrication**
  Perform the daily lubrication as required by the Lubrication Chart.

- **Pre-start Checks**
  Check all of oil, coolant and fuel levels.
  Refer to the Daily in the Maintenance Section for more detailed information.

- **Seat and Seat Belt Checks**
  Adjust the seat to allow full travel of the levers and pedals when the operator is seated against the seat back.
  Inspect the belt mounting hardware. Replace any damaged or worn hardware. Keep the mounting bolt tight. Fasten the seat belt before starting the engine.



AFTER STARTING THE ENGINE

CAUTION

Keep engine speed low until the engine oil pressure warning lamp goes out. If does not go out within 10 seconds, stop the engine and investigate the cause before starting the engine. Failure to do so, can cause engine damage.

With any piece of hydraulically operated equipment, it is EXTREMELY IMPORTANT that the hydraulic fluid be thoroughly warmed fluid-up BEFORE any work is begun. A warmup period is time well spent in preventive maintenance.
Practice the following warm-up procedure before attempting full load operations.

1 Allow the engine to warm up at LOW IDLE for at least five minutes. Engage and disengage attachment control levers to help speed warm-up of hydraulic components.

2 To warm up the hydraulic oil, move the engine throttle lever to medium engine speed. Run the engine for about five minutes while intermittently holding the bucket control lever in the bucket dump position.
Operate the bucket control lever for 10 to 15 seconds and then return the control lever HOLD position to ten seconds.

3 Move the engine throttle lever to maximum engine speed. Run the engine for an additional five minutes while intermittently holding the bucket dump position.
This will allow the oil to reach relief pressure, which causes it to warm more rapidly.
Cycle all controls to allow warm oil to circulate through all cylinders and lines.

4 Observe the OK warning monitor frequently during the operation.
Be sure to perform the pro-operation warm-up procedure whenever the hydraulic oil temperature is lower than 20℃ at start-up.

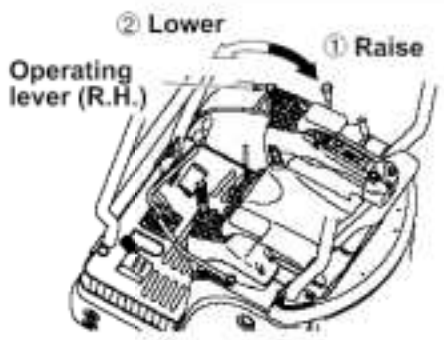
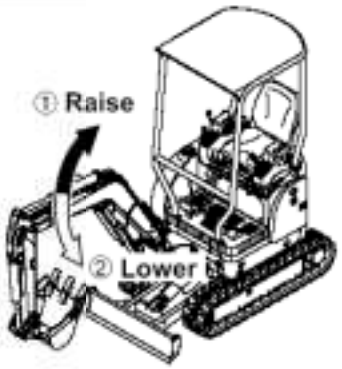
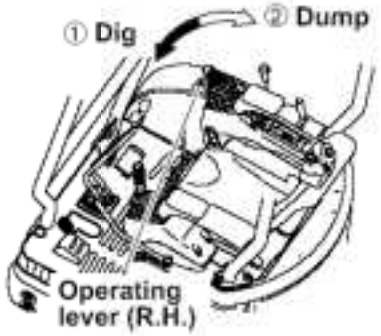
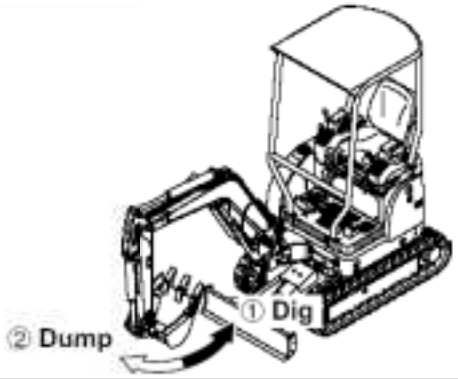
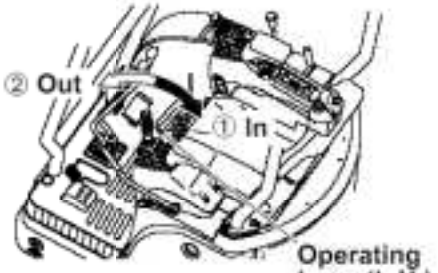
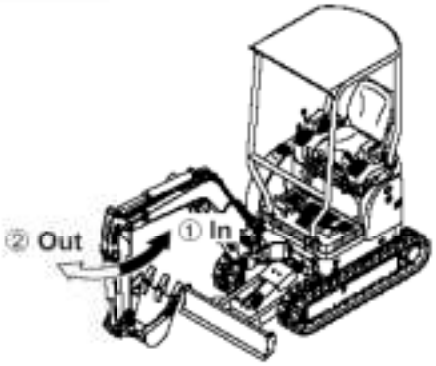
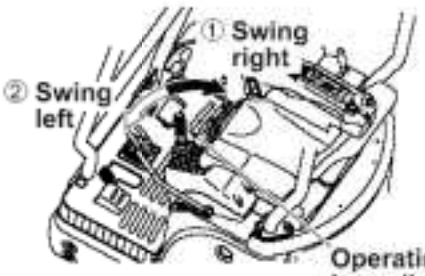
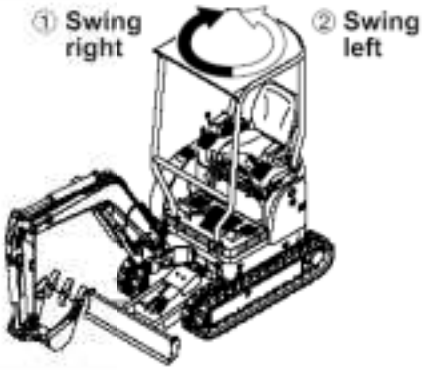
"BREAK-IN" OPERATION

In case of the new machine, as the severe operation from the beginning will have a bad influence upon the machine life, perform the enough break-in operation as described the right table.

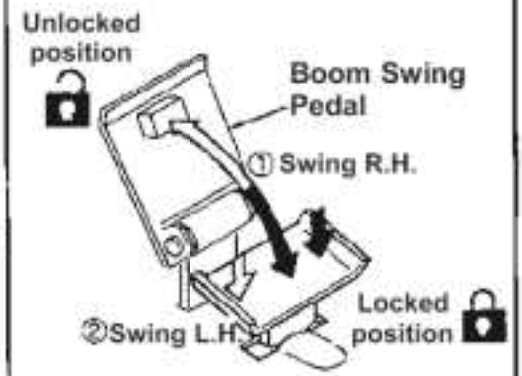
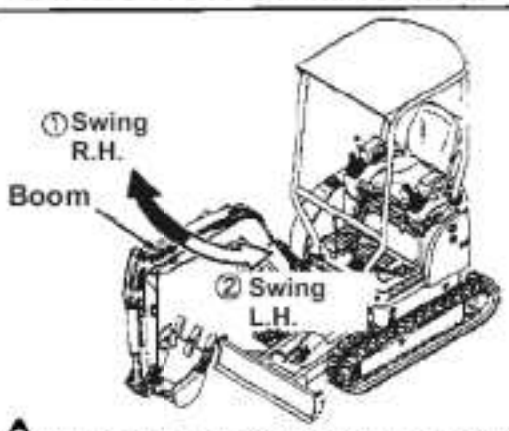
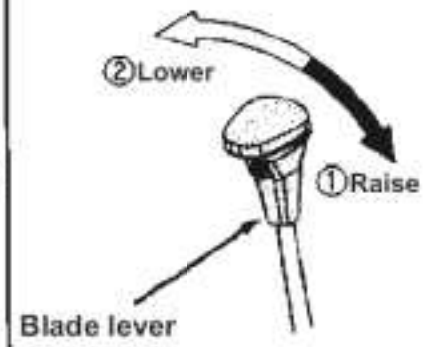
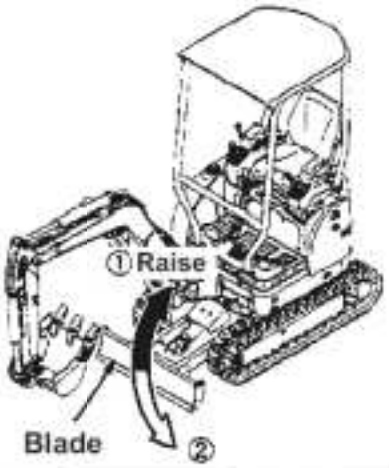
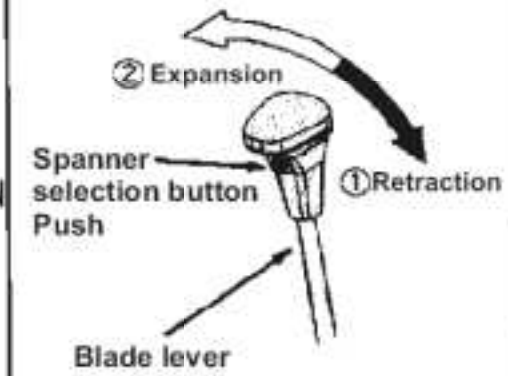
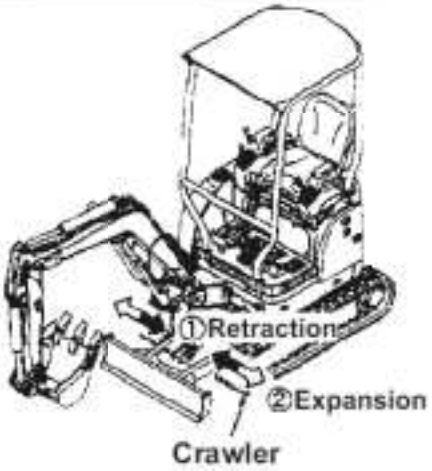
Hour meter	Load
Up to 10 hours	About 60% load
Up to 50 hours	About 80% load
After 50 hours	Full load

BACKHOE OPERATION

Lever pattern A (ISO) Function

OPERATIONS	DIRECTION OF LEVER	DIRECTTON OF MACHINE
BOOM		
BUCKET		
ARM		
SWING		

When leaving the operator's seat, stop the engine, lower the bucket and the blade on the ground.

OPERATIONS	DIRECTION OF LEVER	DIRECTION OF MACHINE
BOOM SWING		 ⚠ When no breaker operation is needed be sure to lock the pedal.
BLADE		
EXPANSION		

⚠ When leaving the operator's seat, stop the engine, lower the bucket and the blade on the ground.

OPERATING THE SPECIAL ATTACHMENTS AND ACTUATORS

CAUTION

- SELECT A HYDRAULIC BREAKER A WRECKING FORK AND SPECIAL ACTUATORS, ETC., WHITCH ARE APPLICABLE TO THE MACHINE BODY.
- CONSULT YOUR LOCAL IHIMER DEALER TO SELECT A SPECIAL ATTACHMENT AND AN ACTUATOR.
- PRECAUTIONS ON USE OF SPECIAL ATTACHMENT AND ACTUATOR.
- BEFORE USING A SPECIAL ATTACHMENT AND AN ACTUATOR, READ AND UNDERSTAND THEIR INSTRUCTION MANUALS ISSUED BY A MANUFACTURER TO OBTAIN CORRECT OPERATION AND MAINTENANCE.
- WHEN A SPECIAL ATTACHMENT AND AN ACTUATOR ARE MOUNTED, THE MACHINE SPECIFICATIONS SUCH AS STABILITY, WORKING RADIUS, TRANSPORT HEIGHT, ETC., SHOULD BE ALTERED. BEFORE STARTING OPERATION, CONFIRM EACH SPECIFICATION TO ENSURE SAFETY OF WORKERS AND THE MACHINE.

1 SINGLE ACTION OPERATION

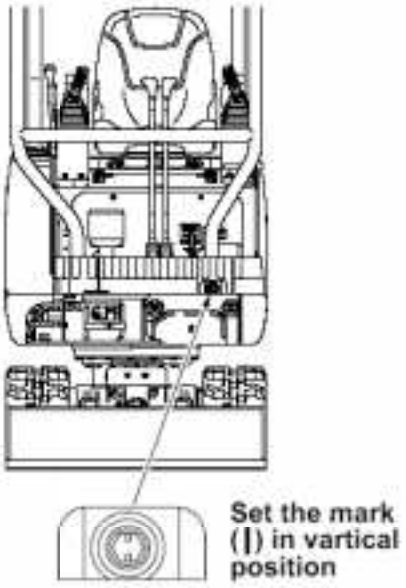
Hydraulic Breaker and Others Controls

CAUTION

IF THE MARKED (–) OF THE VALVE IS SET IN HORIZONTAL POSITION, THE PRESSURE OF RETURNED OIL BECOMES HIGHER AND THE BREAKER DOES NOT FUNCTION EFFICIENTLY.
ALWAYS SET THE MARKED (I) IN VERTICAL POSITION.
SWITCHING THE ATTACHMENT HYDRAULIC CIRCUIT.

Switching the attachment hydraulic circuit.

Check the marked position on the shift valve ①.
Turn the valve with a wrench and set the marked (I) in vertical position, if necessary.



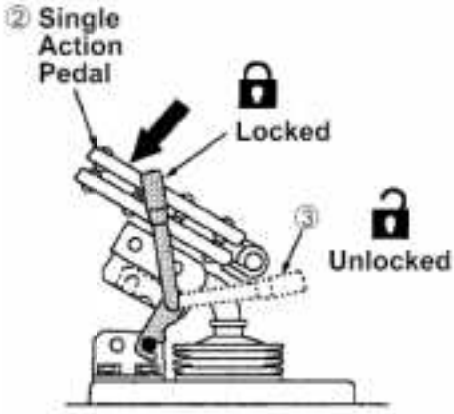
① Shift Valve

1. Fold the pedal ② into double layers.
2. Move the lock lever ③ to the unlocked position.

Breaker ON: Push down the pedal ② to activate the breaker.

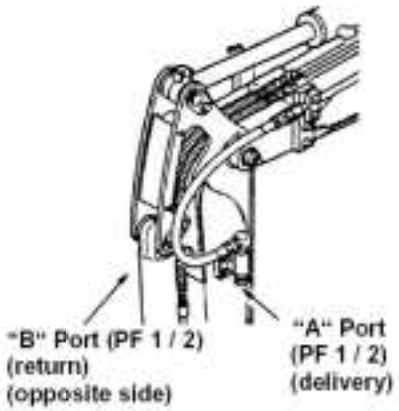
Breaker OFF: Release the pedal ② to deactivate the breaker.

NOTE: When no breaker operation is needed, be sure to lock the pedal ② by lock lever ③ to the LOCKED position.



CAUTION

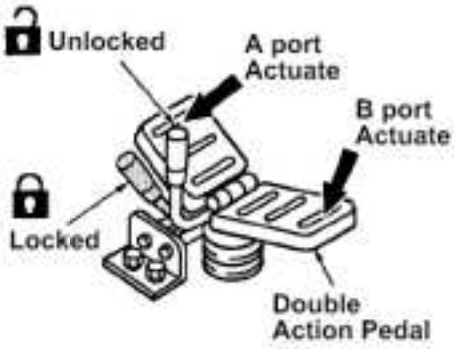
Single action connectors are located on both sides of the arm (see picture). Connect high pressure hose (delivery) to the "A" port and low pressure hose (return) to the "B" port.



2. DOUBLE ACTION OPERATION
Wrench Fork and Others Controls

WARNING

ALWAYS SET THE MARKED (–) IN HORIZONTAL POSITION. IF THE MARKED (I) OF THE VALVE IS SET IN VERTICAL POSITION, THE B PORT OF THE DOUBLE ACTION DOES NOT FUNCTION EFFICIENTLY.



Switching the attachment hydraulic circuit.

Check the marked position on the shift valve ①.
Turn the valve with a wrench and set the marked (–) in horizontal position, if necessary.

1) Unfold the pedal ②into two pedal plates.

2) Move the lock lever to the unlocked position.

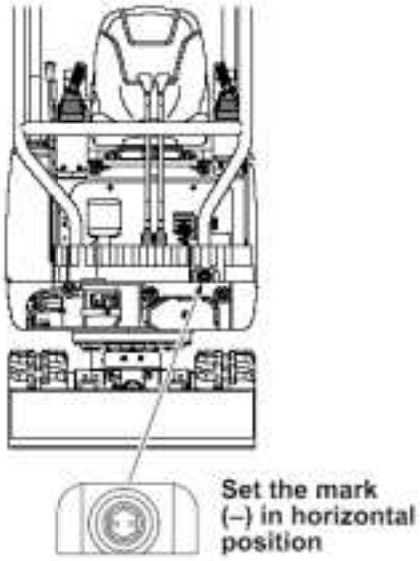
To actuate the port A:

Push down on the front of the pedal ② to actuate the ort A.

To actuate the port B:

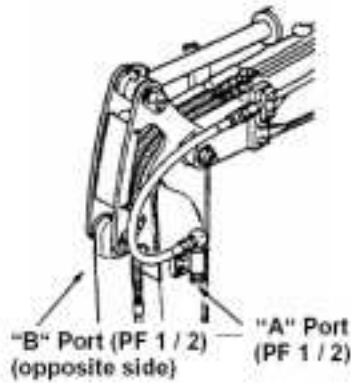
Push down on the rear of the pedal ② to actuate the port B.

NOTE: When the power port is out of service, **ALWAYS** set the pedal back to the neutral position and pedal ② lock lever ③ to the **LOCKED** position.



CAUTION

Single action connectors are located on both sides of the arm (see picture).



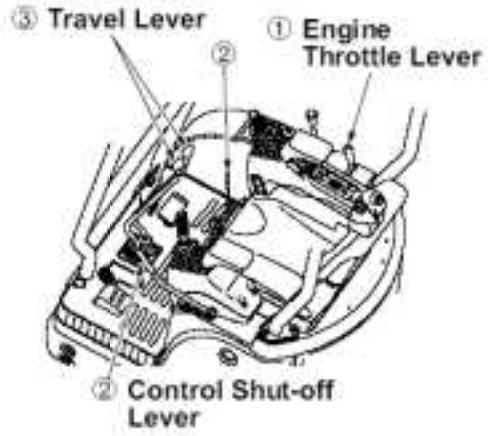
TRAVELLING THE MACHINE

WARNING

BE SURE NO ONE IS WORKING ON OR NEAR THE MACHINE TO PREVENT INJURY. KEEP THE MACHINE UNDER CONTROL AT ALL TIMES TO PREVENT INJURY.
BEFORE CONTROL LEVERS, CONFIRM WHICH DIRECTION THE TRACK FRAME FACES.
ALWAYS TRAVEL WITH SPROCKETS UNDER THE REAR OF THE MACHINE.

TRAVEL CONTROL

1. Move motor throttle lever ① to the operating range.
2. Move the control shut-off lever ② to the unlocked position.
3. Raise the boom and the blade enough to provide sufficient ground clearance.
4. Control right and left travel levers ③ as follows.



STRAIGHT TRAVEL

– **Forward Direction Travel**

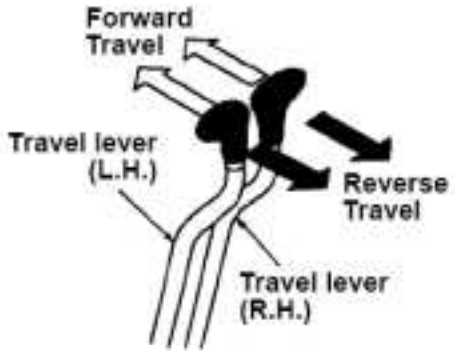
Move the both travel levers ③ forward to move the machine forward.
The machine will always travel toward the **BLADE**.

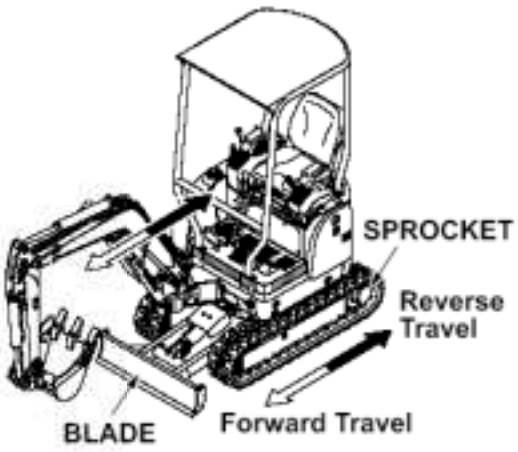
– **Stop**

Slowly move both the travel levers ③ to the stop position to stop the machine and apply the brakes.

– **Reverse Direction Travel**

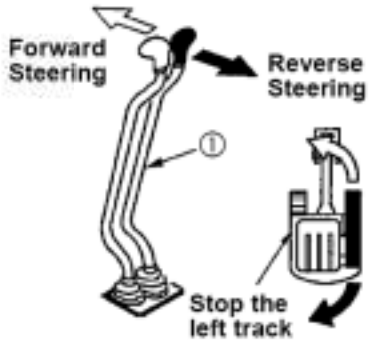
Move the both travel levers ③ rear to move the machine reverse.
The machine will always travel toward the **SPROCKETS**.





STEERING

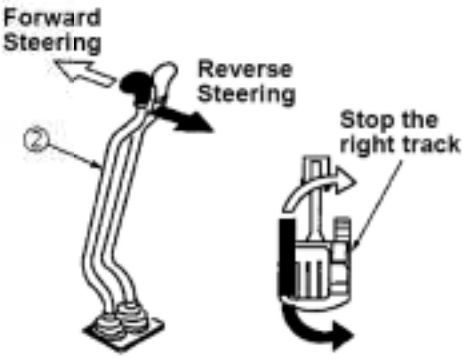
To make turns, control the travel levers control the two travel levers as follows.



PIVOT LEFT TURN

1. Pivot Left Turn

Move the right lever ① forward to travel forward and left, and move it rear to travel reverse and left, pivoting on the left track.



PIVOT RIGHT TURN

2. Pivot Right Turn

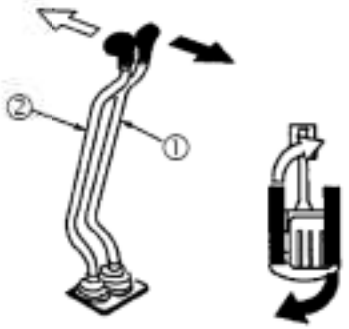
Move the left lever ② forward to travel forward and right, and move it rear to travel reverse and right, pivoting on the right track.

SPOT TURN

SPOT LEFT TURN

3. Spot Left Turn

Move the left travel lever ② rear and move the right lever ① forward at the same time. This allows a quick left turn.



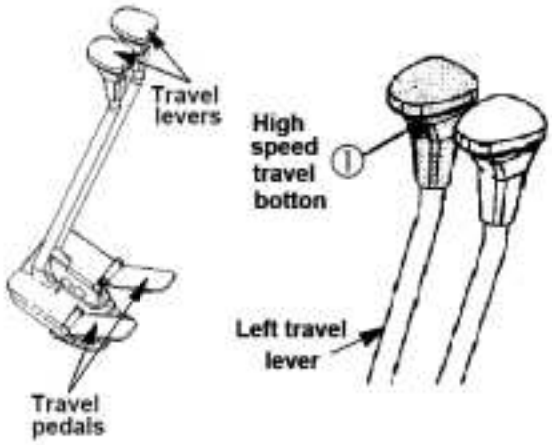
SPOT RIGHT TURN

4. Spot Right Turn

Move the right travel lever ① rear and move the left lever ② forward at the same time, allowing a quick right turn.

TRAVEL PEDALS

Travel levers are equipped of pedals that permit to drive machine without using hands. Especially useful to travel during digging operations.

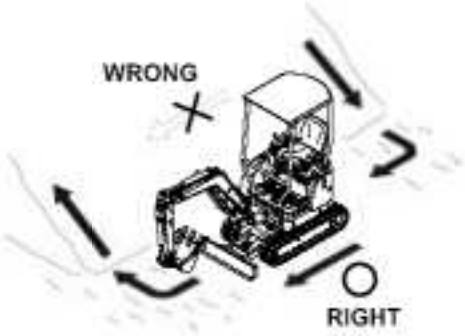


HIGH SPEED TRAVEL

CAUTION

DO NOT CHANGE TRAVEL SPEED RANGES WHILE GOING DOWNHILL.
NEVER HIGH SPEED TRAVEL ON A GRADE OR LOADING AND UNLOADING THE MACHINE. WHEN CONTROL SHUT-OFF LEVER IS LOCKED, DOES NOT SHIFT TO HIGH SPEED TRAVEL

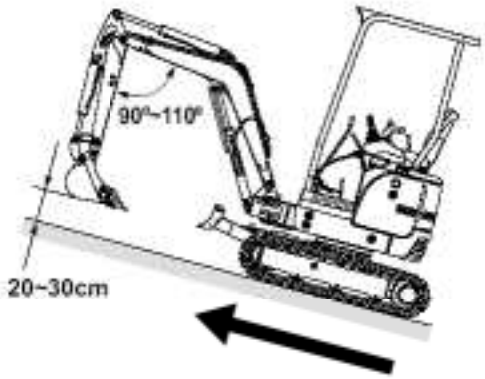
Push down the high speed travel button shift to the high speed travel.
When released button, shift to the low speed travel.



CAUTION ON TRAVEL ON A GRADE

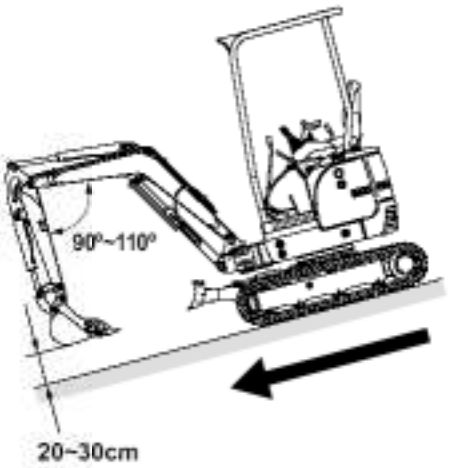
WARNING

Reduce engine speed when maneuvering in tight quarters or when breaking over a rise.
Do not change travel speed ranges while going downhill.
Work up and down slopes rather then sideways, whenever possible. Do not travel across a grade by all means.
Avoid changing the direction of travel on a slope, which could result in tipping or side slipping of the machine.
Keep the arm in and carry the boom in a low position.
When starting up a steep grade or breaking over a rise, keep the boom lowered as close to the ground as possible.



1. When travelling up on a grade inclining by greater than 15°, keep the position in the right illustration and travel with a low engine speed.

2. When travelling down on a grade inclining by greater than 15°, travel with the position in the right illustration.



CRAWLER EXTENSION/RETRACTION

This machine is equipped with the spanner mechanism (crawler extension/retraction mechanism). Take the following procedure.

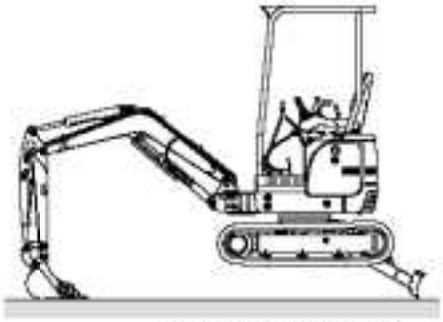
1. **Jack up the main unit.**
   Set the blade to the rear and jack up the main unit with the working device and blade cylinder till the crawler is off from the ground to extend or retract the crawler easily.

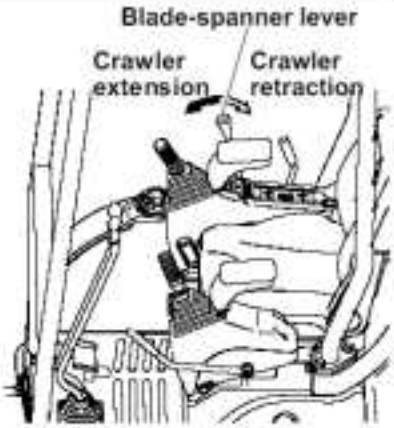
2. **Crawler extension/retraction**
   Set the engine speed at medium or higher. Push and hold the button "spanner". Move the blade-spanner lever forward or backward.

   • **Crawler extension:** Push the lever forward.

   • **Crawler retraction:** Pull the lever backward.

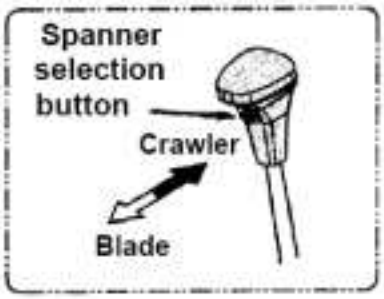
3. During expansion swing and lock blade extensions on both sides of standard blade. This is possible only if pivot is moved from position (A) to position (B). During crawler retraction put blade extensions in original position and lock them.

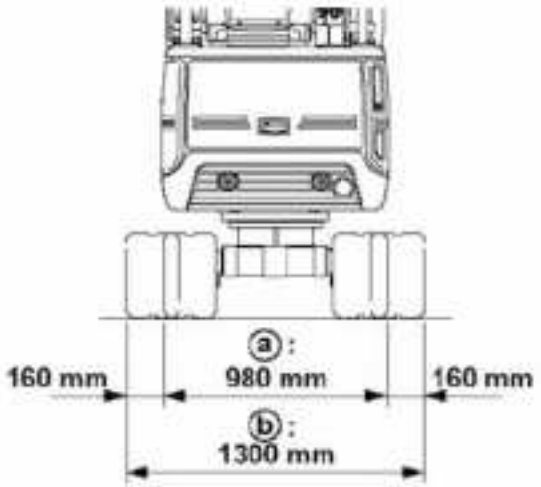




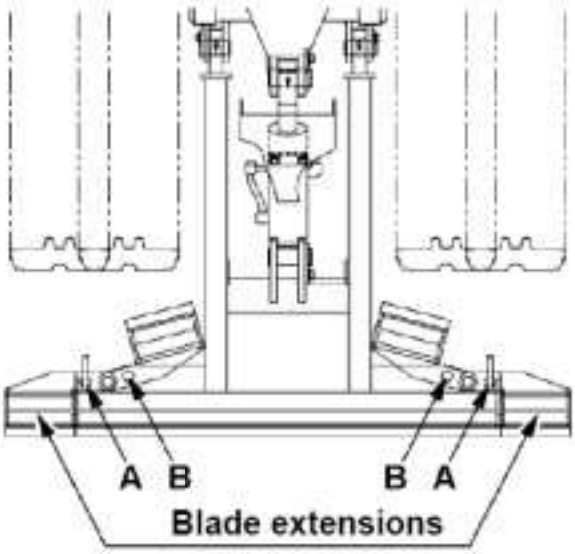
CAUTION

EXTEND OR RETRACT THE CRAWLER ON A LEVEL GROUND WITHOUT AN OBSTACLE.
EXTENSION OR RETRACTION IS POSSIBLE WITHOUT JACKING UP THE MAIN UNIT.
IF THERE IS AN OBSTACLE ON THE GROUND BESIDE THE CRAWLER, THE RESISTANCE IS LARGER AND EXTENSION OR RETRACTION IS SOMETIMES IMPOSSIBLE.





ⓐ : Dimension of crawler retraction
ⓑ : Dimension of crawler extension

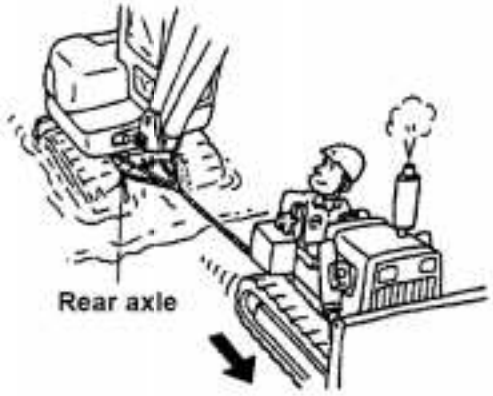


TOWING

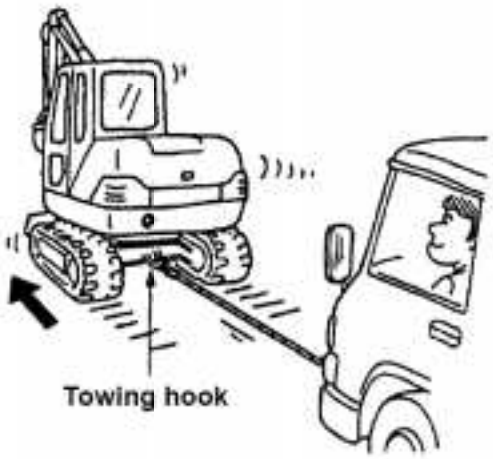
WARNING

PERSONAL INJURY OR DEATH COULD RESULT WHEN TOWING A DISABLED MACHINE INCORRECTRLY.
FOLLOW THE RECOMMENDATIONS BELOW, TO PROPERLY PERFORM THE TOWING PROCEDURE.
NEVER USE THE TOWING HOOK AT THE REAR AXLE TO TOW THE MACHINE.
DURING TOWING OPERATION, **NEVER** ALLOW ANYONE BETWEEN THE TOWING MACHINE AND THE TOWED MACHINE.
QUICK MACHINE MOVEMENT COULD OVERLOAD THE TOW LINE OR BAR AND CAUSE IT TO BREAK. GRADUAL AND SMOOTH MACHINE MOVEMENT WILL WORK BETTER.
KEEP THE TOW LINE ANGLE TO A MINIMUM. DO NOT EXCEED A 30° ANGLE FROM THE STRAIGHT AHEAD POSITION.

1. If the machine sinks down on a soft ground and cannot crawl up by itself, a wire rope should be attached to the rear axle and the machine should be towed by a towing machine.
   To prevent the damage of the wire rope, be sure to place a protector at the corner of the axle.
   Use the towing wire rope with sufficient strength to tow the machine.



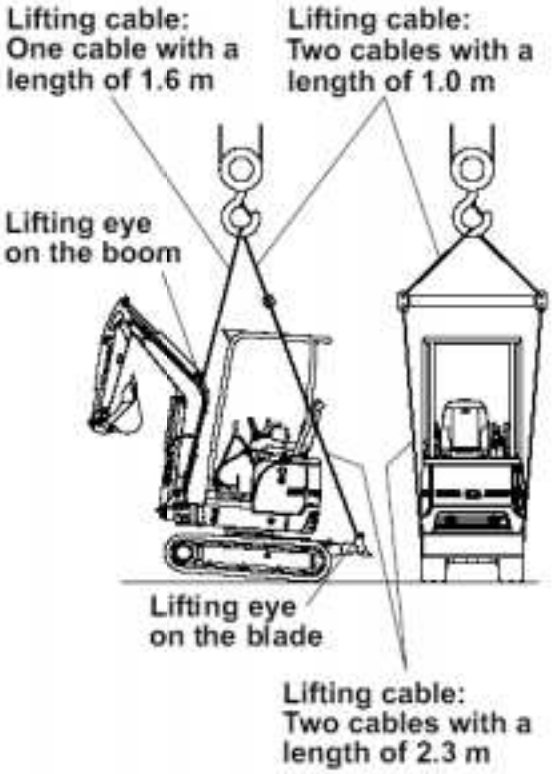
2. Use of the towing hook.
   The towing hook is used to tow for lightweight material. The maximum allowable towed weight is 500 kg.
   NEVER tow the machine with the towing hook, which may damage the towing hook and cause a personal injury.



LIFTING THE MACHINE

WARNING

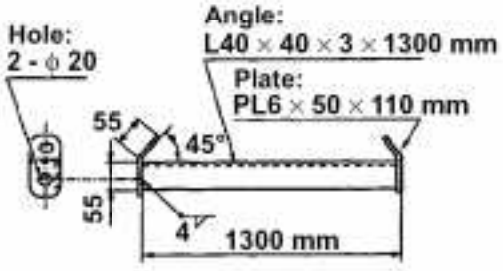
IMPROPER LIFTING OR TIE DOWNS CAN ALLOW LOAD TO SHIFT AND CAUSE INJURY OR DAMAGE.
USE PROPER RATED CABLES AND SLINGS FOR LIFTING.
LIFTING CABLES SHOULD HAVE SUFFICIENT LENGTH TO PREVENT CONTACT WITH MACHINE.
POSITION CRANE FOR LEVEL MACHINE LIFT.
NEVER LIFT THE MACHINE LOADED WITH ANY PERSONNEL.
USE GUIDE OR TAG LINES TO PREVENT THE MACHINE FROM SWINGING OR TURNING.
BE SURE TO USE ARE WIRE ROPES WITH BREAKING FORCE OF GREATER THAN 4 TONS



Lifting procedures

1. Start the engine and position the machine on the level ground with the boom, arm and bucket cylinders fully extended.
2. Position the boom at the center of the machine.
3. Stop the engine.
4. Install the cables to the four lifting points on the canopy (see the picture).
5. Install the cables to the crane hook.
6. Confirm that no obstacles nor people are around the machine and the operator has left the machine.
7. Once the machine is lifted off the ground, check that the machine is well balanced.

Shoe type	Machine mass (kg)	
	Standard	ADD Weight
Rubber	1620	1720
Steel	1680	1780



Details of a lifting jig

LOADING AND UNLOADING THE MACHINE

WARNING

CHOOSE AS FLAT GROUND AS POSSIBLE FOR LOADING THE MACHINE.
WHEN USING LOADING RAMPS, BE SURE THERE IS ADEQUATE LENGTH, WIDTH, FIRMNESS AND SLOPE.
TO PREVENT THE MACHINE FROM SLIPPING WHILE LOADING OR SHITFING TRANSIT, REMOVE ICE, SNOW OR OTHER SLIPPERY MATERIAL FROM THE LOADING RAMPS AND THE TRUCK BED BEFORE LOADING.
NEVER OPERATE THE HIGH SPEED TRAVEL SWITCH WHEN LOADING THE MACHINE ON A TRAILER OR LOADING LAMPS.
PERFORM WARM-UP THE MACHINE BEFORE LOADING AND UNLOADING UNDER COLD WEATHER.
DO NOT RAISE THE BOOM EXCESSIVELY AT LOADING AND UNLOADING.
NEVER MAKE A TURN ON A RAMP. TO MAKE A TURN, GET OFF THE MACHINE FROM THE RAMP FIRST.

MACHINE LOADING ONTO A TRUCK

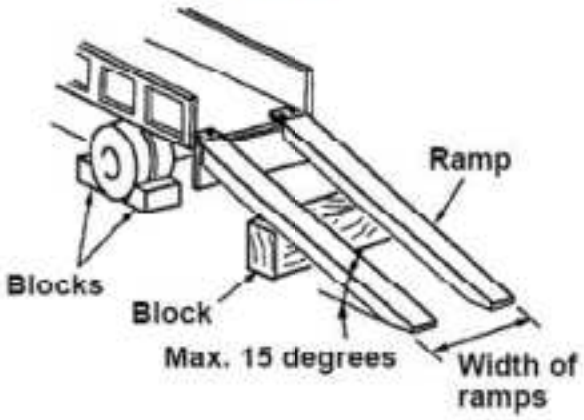
1. Block the truck wheels before loading.
2. Install the loading ramps to the truck securely. Maintain the slope of loading ramps within 15 degrees.
3. Position the machine so that it can be run straight on the loading ramps. Never operate control levers other than the travel lever while machine is on the lading ramps.
4. Maintain the machine balance point while travelling over the loading ramp joint areas.
5. Lower the attachment to the bed of truck.
6. Be sure to chock both tracks.

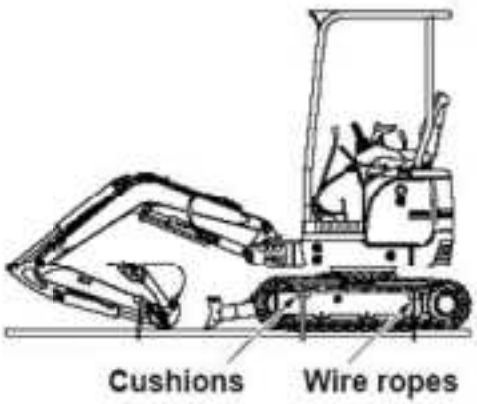
SECURING THE MACHINE

WARNING

UPPER STRUCTURE MOVEMENT CAN CAUSE PERSONAL INJURY OR DEATH.

1. Align the upper structure with the truck.
2. Move control shut-off levers to the LOCKED position.
3. Turn the engine start switch on OFF position to stop the engine and remove the key.
4. Block the tracks and secure the machine with tie-downs. Install and fasten proper rated wire rope cables located on the car body and arm point.





PRECAUTION ON USE OF RUBBER TRACK SHOE

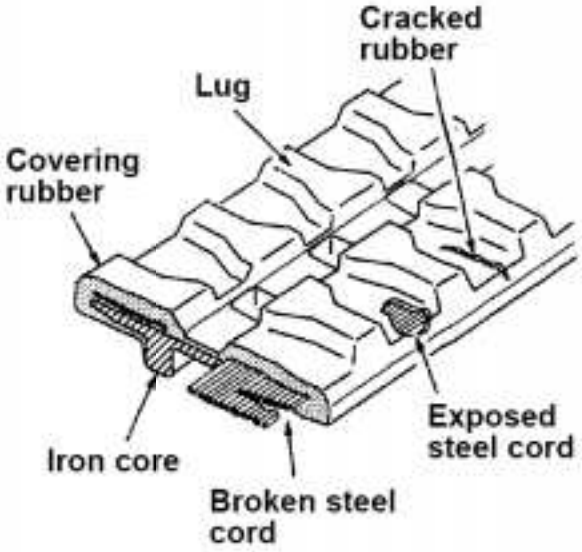
CAUTION

THE RUBBER TRACK SHOE MAY BE DAMAGED OR WORN FASTER DEPENDING ON WORKING CONDITIONS. PERFORM WORKING OPERATION PROPERLY ACCORDING TO WORKING SITE CONDITIONS AND MACHINE OPERATION.

STRUCTURE OF RUBBER TRACK SHOE

The picture on the right illustrates the structure of rubber track shoe.
It consists of:

- steel cord to substain tension.
- iron core to support it.
- covering rubber to them.



CAUTION

IF A CRACK REACHES THE STEEL CORD, MAY BE RUSTED AND CUT OFF BY MOISTURE.

WHEN ANY CRACK IS DETECTED, REPAIR IT IMMEDIATELY WITH VULCANIZER.

Precaution on Use

1. Adjust the track often enough to keep a proper tension.
   - Insufficient tension slips off the rubber track shoe and wears out the sprocket and iron core extremely.
   - Excessive tension increases travel resistance, which prevents proper travel force and speed. it also causes damages and extreme wear at undercarriage as well as over extension of the rubber track shoe.

2. To prevent damages of the rubber track shoe, avoid the following in travel as much as possible
   - Pointed rocks or quarry.
   - Craggy place such as riverbed or path through woods.
   - Steel rods or scraps.
   - Steel board or cornered objects of concrete.
   - Heat source such as acre.
   - Travel in contact with concrete path or wall.
3. Immediately wipe off spilt fuel, hydraulic oil, or grease on the rubber track shoe with a cloth.
4. Avoid sudden spot turns or pivot turns. Make slow turns several times at a low speed.
5. Do not use for long (3 months or more). Store it to avoid direct sunlight or rain.
6. Use the rubber track shoe at a temperature between –25°C and +55°C (–13°F and 131°F) because of a rubber's characteristic.

BOOM LOWERING WITH THE STOPPED ENGINE

METHOD OF BOOM LOWERING WHEN ENGINE DAMAGED

WARNING

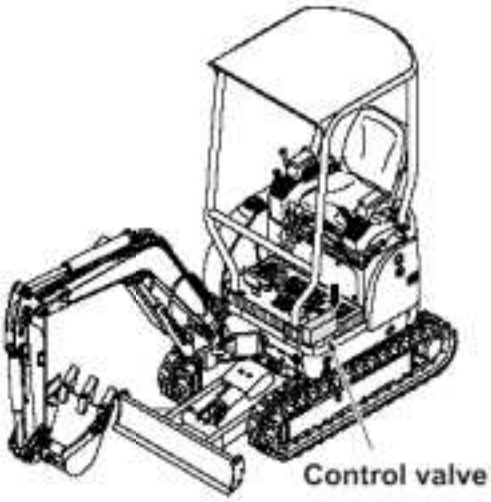
BE SURE NO ONE IS UNDER OR THE FRONT IMPLEMENTS BEFORE MANUALLY LOWERING THE BOOM.

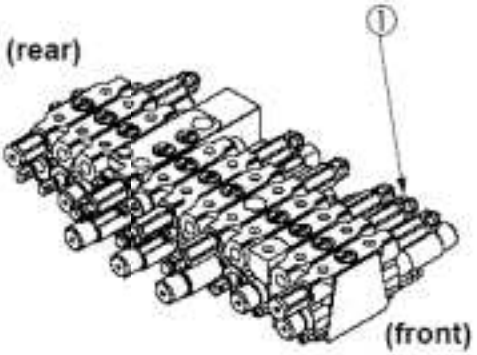
KEEP ALL PERSONNEL AWAY FROM THE BOOM AREA WHEN LOWERING THE BOOM WITH ENGINE STOPPED.

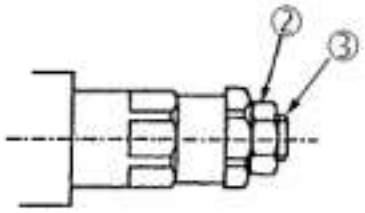
Use the following procedure when it is necessary to lower the boom while engine is shut down or the hydraulic system disabled.

1. Remove the floor cover under the operator's station floor.
2. Remove the lock nut of the boom raise relief valve located inside the control valve.
3. Slowly loosen adjusting screw until boom start lower. The boom will start to lower slowly.
4. After making sure that the front implement has lowered completely on to the ground, install the lock nut.
5. Make any necessary repairs placing the excavator back into service.

NOTE: For further information, contact your IHIMER dealer.







Boom raise relief valve

PARKING THE MACHINE

At the end of a day's work, following steps should be observed as the established machine shut-down procedure:

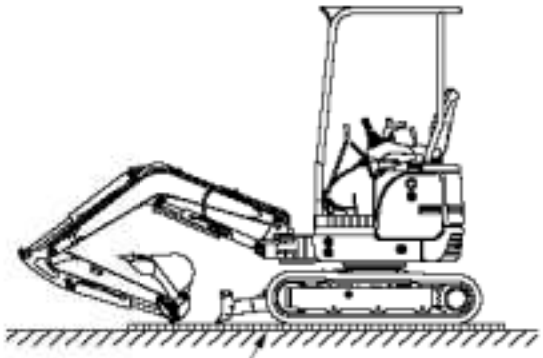
Machine Stopping

Park on a level surface, if necessary to park on a grade, block the tracks securely.

1. Move engine throttle lever forward to reduce the engine speed.
2. Release the travel lever to stop the machine.
3. Lower the bucket to the ground and apply slight down pressure.
4. Move the control shut-off lever to the LOCKED position.

Freezing Conditions

If freezing temperature are expected, each crawler frame should be cleaned of mud and dirt and the machine parked on wood planks.



Engine Stopping

1. Turn the start switch key to OFF. Remove the key.

Leaving the Machine

1. Use the steps and handhold, use both handles and face the machine, when dismounting.
2. Inspect the entire machine for leaks, loose connections, signs of wear, crack etc. Report any signs of trouble discovered during this inspection.
3. Close and lock the doors.

START SWHITCH

EMERGENCY ENGINE STOP

To stop the engine in emergency, turn the start switch key to "**OFF**" position.

SECTION 4 MAINTENANCE

TABLE OF CONTENTS

MAINTENANCE INTERVALS

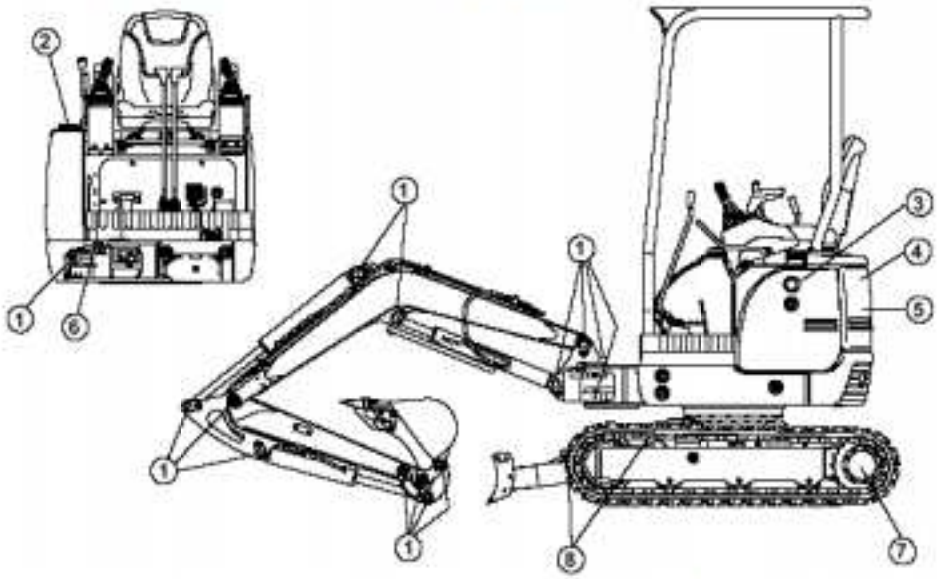
Check Point	Item	Page
When required		
Tracks	Check and adjust tension	4 - 4 - 1
Tracks	Rubber track shoe maintenance	4 - 4 - 2
Fuses	Replace	4 - 4 - 3
Fusible link	Replace	4 - 4 - 3
Bucket	Change bucket	4 - 4 - 5
Daily check (8 Service hours)		
Hydraulic tank	Check hydraulic oil level	4 - 5 - 2
Machine inspection	Check general condition	4 - 5 - 4
Every 50 Service hours (First perform previous service hour items)		
Attachment pins	Lubricate fitting with grease	4 - 2 - 1
Swing bearing	Lubricate fitting with grease	4 - 2 - 1
Hydraulic system	Change return Filter *	4 - 8 - 2
Every 250 Service hours (First perform previous service hour items)		
4 - 7 - 1		
Every 500 Service hours (First perform previous service hour items)		
Tighten bolts	Retightening bolt	4 - 8 - 1
Return filter	Change return filter	4 - 8 - 2
Travel drive	Check oil level	4 - 8 - 4
Every 1000 Service hours (First perform previous service hour items)		
Travel drive	Change gear case oil	4 - 9 - 1
Hydraulic tank	Change hydraulic oil and clean strainer	4 - 9 - 2
Every 2 years Service hours		
Engine coolant	Change coolant (When used L.L.C)	4 - 10 - 1
*** Interval to be applied only to initial period of use (Break-in)**		

CAUTION

ALWAYS USE IHIMER ORIGINAL SPARE PARTS, IN ORDER TO A PROPER WORKING OF THE MACHINE.

LUBRICATION CHART MAINTENANCE AND CHECKS

The interval of lubrication, maintenance and check is the maximum interval indicated by the hour meter. It should be shortened in service operating conditions.



CHECK POINTS		CHECK ITEMS	CHECK INTERVALS					
			Initial period of use After 50 hours	Daily	Every 50 hours	Every 250 hours	Every 500 hours	Every 1000 hours
1	Attachment pins	Lubricate with grease "G"			●			
2	Fuel tank	Drain water and Sediment			●			
3	Hydraulic tank	Check oil level "H"		●				○
		Drain water and sediment o			●			
		Wash and clean strainer						●
4	Return filter	Change filter	○				○	
5	Engine	Change engine oil "E"	○	●		○		
		Change fuel filter				●	○	
		Change oil filter	○			○		
		Clean or Change air filter		●		●		
		Check coolant level "W"		●				○
6	Swing bearing	Lubricate bearing with grease			●			
		Lubricate ring gear with grease			●			
7	Traction motor	Check oil level and change oil "L"	●				●	○
8	Blade	Lubricate with grease "G"			●			

Symbol	G	L	H	E	W	●	○
Remarks	Grease	Gear oil	Hydraulic oil	Engine oil	Coolant	Check/ Maintenance/ Supply	Change
	EP-2 lithium grease	API-GL-4, GL-5 SAE90	Wear-proof hydraulic fluid (VG-46)	API-CC o CD-SAE 10W30			

RECOMMENDED LUBRICANT TABLE

Locations	Refill capacities (approximate)	Change intervals	Use	Lubricant features
HYDRAULIC OIL	Total quantity 23 Litres Tank capacity 19 Litres	1000 hrs (600 when is used breaker)	Ambient temperature over -5℃	Wear-proof hydraulic fluid ISO N°46
			Ambient temperature below -5℃	ISO N°32
TRACK ROLLERS	0,025 Litres (each)	Occasionally	-	API, GL-4 o GL-5, SAE90
FRONT IDLER	0,07 Litres (each)	Occasionally	-	
TRACTION MOTOR	0,33 Litres (each)	1000 hrs		
LUBRICATE THE FITTING	Swing bearing, attachment pins, etc.		-	Lithium grease EP-2

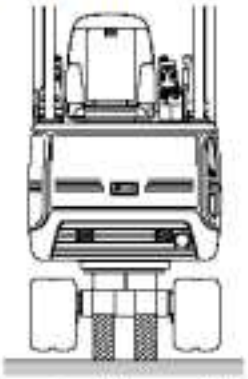
NOTE:

1) Oil in the hydraulic fluid columns marked with * should be use above 0 ℃.
2) If the oil becomes dirty or if deterioration of oil properties is excessive, replace more frequently than discribed above.
3) When oil is replaced in lower and upper rollers, disassemble them before.

WHEN MAINTENANCE AND CHECKS ARE REQUIRED

WARNING

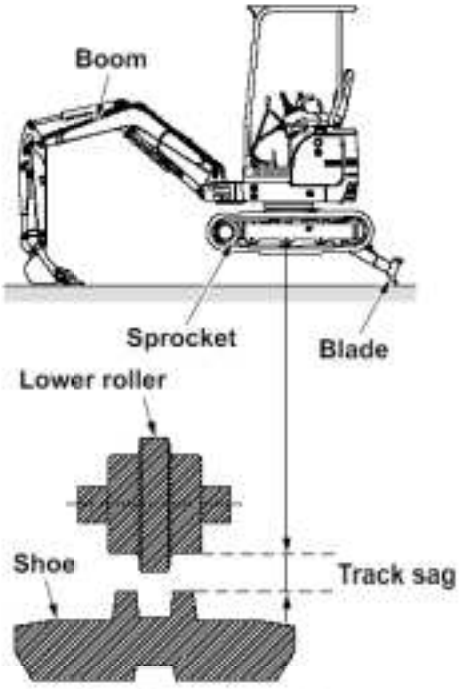
GREASE IS UNDER HIGH PRESSURE.
NEVER REMOVE THE GREASE FITTING.
GREASE COMING OUT OF THE CHECK VALVE UNDER PRESSURE CAN PENETRATE THE BODY CAUSING INJURY OR DEATH.
DO NOT WATCH THE CHECK VALVE TO SEE IF GREASE IS ESCAPING. WATCH THE TRACK OR TRACK ADJUSTMENT CYLINDER TO SEE IF THE TRACK LOOSENS GREASE.
LOOSEN THE CHECK VALVE ONE TURN ONLY.



Suported the machine

Measuring Track Tension

1. Position bucket to the sprocket side. Use boom and blade down pressure to lift the track on both side off the ground.
2. Measure the maximum amount of the track sag from the shoe upper face to the roller face. Properly adjusted track will have approximately 10 to 20 mm slack with rubber shoes. In case of steel shoes, approximately 30 to 50 mm.



Rubber shoes: 10 to 20 mm
Steel shoes: 30 to 50 mm

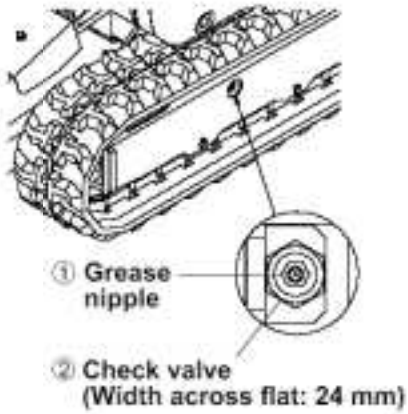
Track Tightening

1. Add grease through check valve fitting until the correct track tension is reached.
2. Move the tracks forward and reverse to equalize the pressure.
3. Check the amount of track sag again and adjust as necessary.

Track Loosening

1. Remove soil deposited on front idler bearing.
2. Loosen the check valve carefully (one turn maximum) until the track begins to loosen.
3. Tighten the check valve to 59 to 69 N • m (6 to 7 kgf • m) when the desired track tension is reached. NEVER over tighten the check valve.
4. Move the tracks forward and reverse.
5. Check the amount of track sag again and adjust as necessary.

If the correct adjustment cannot be obtained, consult your IHIMER dealer.



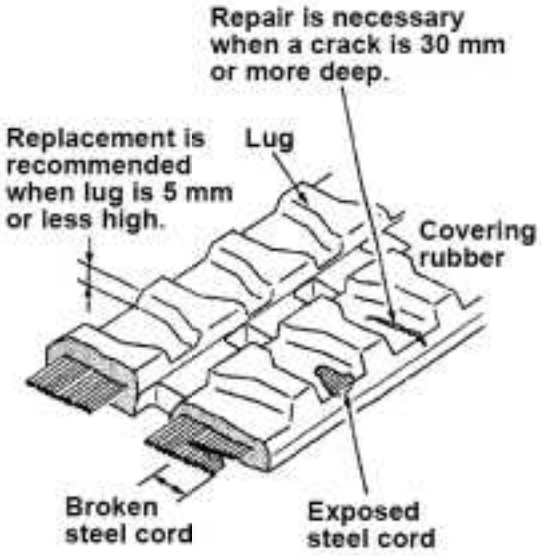
RUBBER TRACK SHOE MAINTENANCE

CAUTION

- RUBBER TRACK SHOE SHOULD BE REPAIRED OR REPLACED UNDER THE NEXT CONDITIONS.
- IF IS NECESSARY TO REPAIR OR REPLACE IT, CONSULT YOUR IHIMER DEALER.

1. Height of lugs

The rubber track shoe can be used even if it is worn, however, if it is excessively worn, the rubber track shoe is likely to be slippery and more travel force is required. If the remaining lug is less than 5 mm high, replace it with IHIMER general spare parts.



2. Exposure of Steel Cords

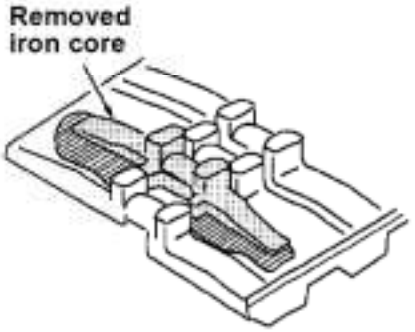
If steel cord is exposed because of weary rubber or damage, replace it with IHIMER general spare parts.

3. Break of Steel Cords

When break of steel cord is detected, replace it immediately. If you leave it as it is, the rubber track shoe can be break without expectation, which causes a serious accident.

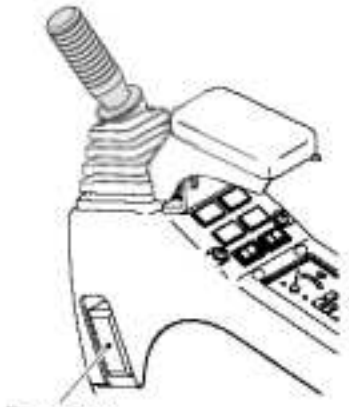
4. Crack of Covering Rubber

If a crack is 30 mm or more long and 8 mm or more deep, repair the cover immediately. If Steel cord appears even if a crack is small, repair it immediately. Otherwise, water may come into a crack, which rusts steel cords and break the rubber track shoe.



FUSES

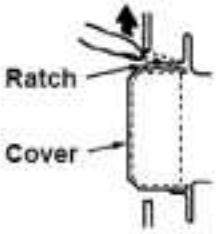
The fuse box is located on the front of the instrument panel.
Fuses will protect the electrical system from damage caused by overloaded circuits.
Replace fuses with the same type and size only. Otherwise, electrical damage can result. Change a fuse, have the circuit checked and repaired.



REPLACE

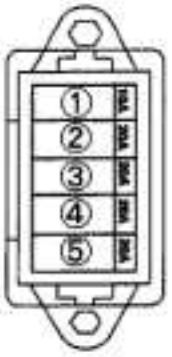
1. Pull the latch and remove the cover for fuse access.

2. Change the damaged fuse to new one.



The following circuit protected by each fuse includes the fuse amperage:

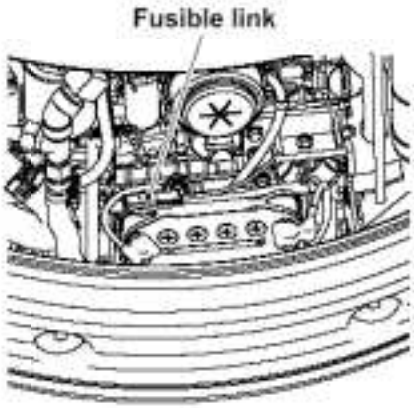
(1) Fuel pump, Control shut-off and Travel speed shift solenoid – 10 A
(2) Horn, Lighter plug and Cab dome light – 20 A
(3) Front light – 20 A
(4) Monitor, Radio, Heater and Wiper – 20 A
(5) Engine stop and QOS timer, – 30 A



Fuse amperage

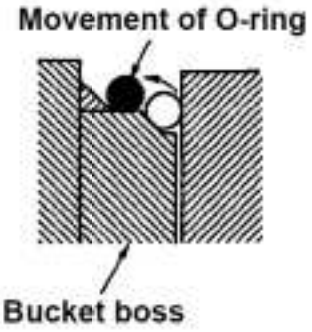
FUSIBLE LINK *Does not apply to electric unit

The fusible link is provided between the positive terminal of the battery and the starter switch to prevent electrical circuit wires from being burned because of short circuit. When the power is turned off by short circuit, check the fusible link.
When it is blown out, replace it with new one after repairing the wires.



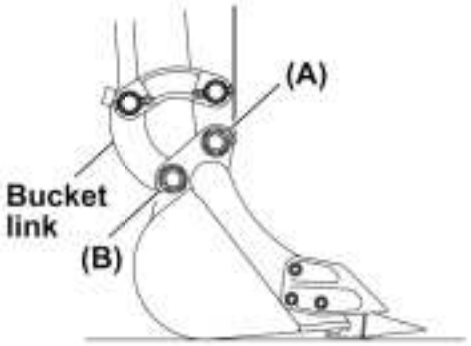

Replaceable fuse

CHANGE THE BUCKET



CAUTION

BUCKET PINS, WHEN STRUCK WITH FORCE, CAN FLY OUT AND INJURE NEARBY PERSONS.
MAKE SURE THE AREA IS CLEAR OF PEOPLE WHEN DRIVING BUCKET PINS.
WEAR PROTECTIVE GLASSES WHEN STRIKING A BUCKET PIN TO AVOID INJURY TO YOUR EYES.
CHIPS OR OTHER DEBRIS CAN FLY OFF OBJECTS WHEN STRUCK. MAKE SURE NO ONE CAN BE INJURED BY FLYING DEBRIS BEFORE STRIKING ANY OBJECT.

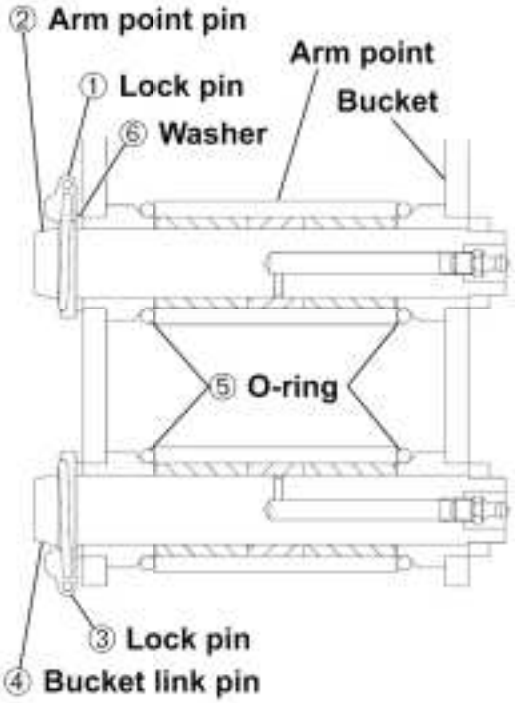


Change the bucket

1. Bucket pins, when struck with force, can fly out and injure nearby persons. Make sure the area is clear of people when driving bucket pins.
2. Wear protective glasses when striking a bucket pin to avoid injury to your eyes.
3. Chips or other debris can fly off objects when struck. Make sure no one can be injured by flying debris before striking any object.

Remove the bucket

1. Place the bucket in a stable position.
2. Move the O-rings from the regular position to the bucket boss.
3. Remove the pins of section (A) and (B), then remove the arm and the bucket.



Install the bucket

1. Clean the removed pins and pin holes and apply coat the grease to them surface.
2. Place a new bucket in a stable position as illustrated.
3. Connect the arm into the hole (A), and the link into the hole (B) with pins.
4. Install a stopper bolt to each pin securely.
5. Move the O-rings for sealing into the regular position.
6. Lubricate each pins with grease.
7. After install the bucket, start the engine and low speed rotate the bucket to the stroke end. Check if anything interrupts the bucket rotation.

WALK-AROUND INSPECTION

Inspect the operator's compartment for cleanliness. Keep it clean.

Inspect the loose bolts. Tighten any loose bolts. Repair if necessary.

Inspect any cracks in boom and arm pivot area and cylinder mounting brackets. Repair if damaged.

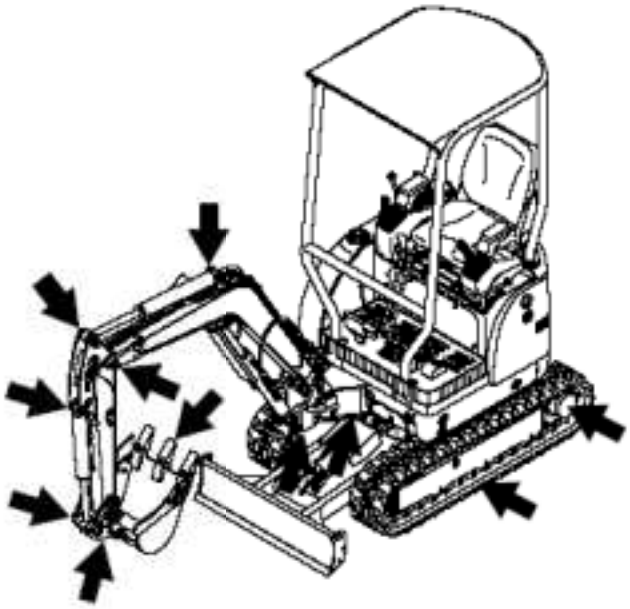
Inspect attachment cylinders, linkage and bucket for damage or excessive wear. Repair if damaged.

Inspect and remove any trash build up in the engine compartment.

Inspect the cooling system for leaks, faulty hose and trash built up. Correct any leaks and remove any trash from the radiator.

Inspect the hydraulic system for leaks. Inspect the tank, cylinder rod seals. tubes, plugs, joints and fittings. Correct any leaks.

Inspect and repair travel drive leaks. Check oil level if leakage is noticed.



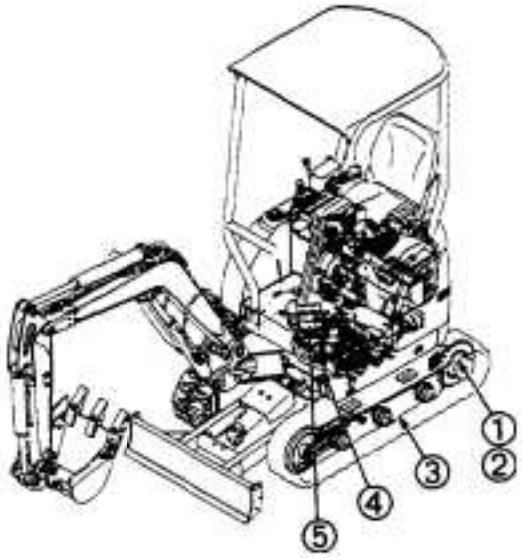
DAILY LUBRICATION

Perform the daily lubrication as required by the lubrication chart.

500 HOURS MAINTENANCE AND CHECKS

CHECK THE FIXED BOLT TORQUE

When loosened bolt or nut is found at daily check, tighten it with torque specifications table.



1. Special torque specifications

Special tighten is applied for main bolts as illustrated below. When replacing bolts, apply molybdenum grease to bolts, nuts, and bearing surface of nuts.

Items	Tighten point	Wrench size (mm)	Thread size (mm)	Tighten torque	
				N · m	Kgf · m
1	Travel drive	Bar 8	M10	55	5,6
2	Sprocket	Bar 8	M10	55	5,6
3	Lower roller	19	M12	108	11,0
4	Swing bearing	19	M12	108	11,0
5	Swing motor	Bar 10	M12	108	11,0

2. General torque specifications

Other than above-mentioned, refer the next table for torques.

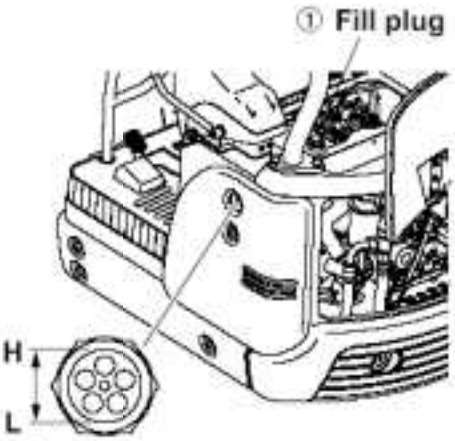
Thread size (mm)	Wrench size (mm)	Tighten torque			
		Metric coarse H.T. bolt		Metric fine H.T. bolt	
		N · m	Kgf · m	N · m	Kgf · m
M8	13	23	2,3	25	2,5
M10	17	47	4,8	50	5,1
M12	19	83	8,5	91	9,3
M14	22	134	13,7	135	13,8
M16	24	206	21,0	220	22,5
M20	30	412	42,0	450	46,0
M24	36	715	73,0	813	83,0

High pressure-hose union nut		
Hose size (inch)	Tighten torque	
	N · m	Kgf · m
1/4"	25	2,5
3/8"	49	5,0
1/2"	59	6,0
3/4"	118	12,0
1"	137	14,0
1-1/4"	167	17,0

CHANGE THE RETURN FILTER

CAUTION

HOT OIL AND COMPONENTS CAN CAUSE PERSONAL INJURY. DO NOT ALLOW HOT OIL OR COMPONENTS TO CONTACT THE SKIN.
AT OPERATING TEMPERATURE, THE HYDRAULIC TANK IS HOT AND CAN BE UNDER PRESSURE.
TO RELIEVE THE PRESSURE FROM THE HYDRAULIC TANK, LOOSEN THE OIL FILL PLUG (1) ON THE HYDRAULIC TANK.
REMOVE THE RETURN FILTER (3) ONLY AFTER THE ENGINE HAS BEEN STOPPED AND THE RETURN FILTER IS COLD ENOUGH TO TOUCH WITH YOUR BARE HANDS.



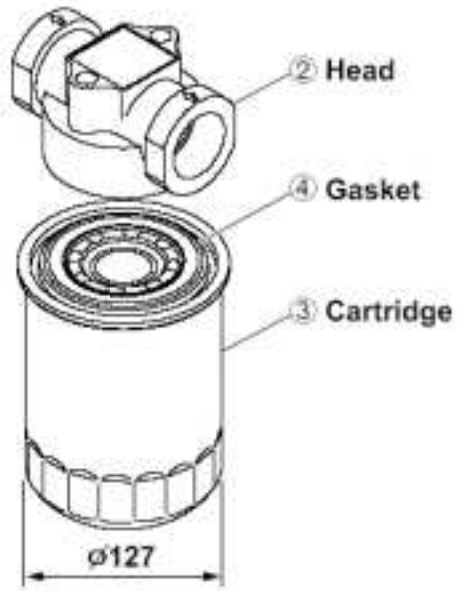
Level gauge

1. Lower the bucket on the ground and stop the engine.
2. Relieve the internal pressure from the hydraulic tank by loosening oil fill plug (1).
3. Clean the area to keep dirt out of the filter base (2).
4. Remove the used filter (3) by filter wrench. Clean the filter base (2).

NOTE: *This is a cartridge type element. It cannot be reused. Always dispose of drained fluids as established by local regulations.*

5. Coat the gasket (4) of new finer with clean hydraulic oil.
6. Install the new filter (3) by hand. When the seal contacts the base. tighten an additional 3/4 turn by filter wrench.
7. Start and run the engine to fill the filter. Stop the engine. Maintain the oil level between marks on the level gauge. Add oil if necessary.
8. Pressurize the hydraulic tank. After extending all the cylinders and loosen oil plug (1) to supply air to the hydraulic tank, tighten the plug again.
9. Start and operate the engine. Inspect for leaks on the oil filter (3).

☆ When operation breaker works, replace the return filter every **100** hours operation.
☆ Replace this filter in **50** hours for the initial time only.



Return filter

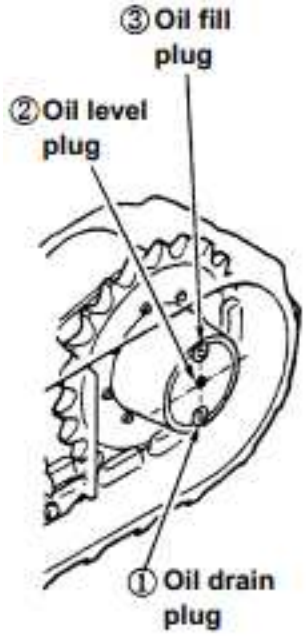

Bucket position at the time of sealing off hydraulic tank.

CHECK THE TRAVEL DRIVES OIL LEVEL

CAUTION

WHEN THE QUANTITY OF OIL IS FOUND TO HAVE INCREASED ABNORMALLY, IT IS NECESSARY TO CHECK HE OIL SEAL OF THE TRAVEL MOTOR.
IF THE SEAL IS LEAKING, CONTACT A IHIMER DEALER.

1. Position one travel drive with oil drain plug (1) at the bottom.
2. Remove the oil level plug (2) and fill plug (3). Oil should be to the bottom of the level plug opening.
3. Add oil through the opening of oil level/fill plug if necessary.
4. Clean the plugs. Install the plugs.
5. Perform procedure on the other travel drive.



1000 HOURS MAINTENANCE AND CHECKS

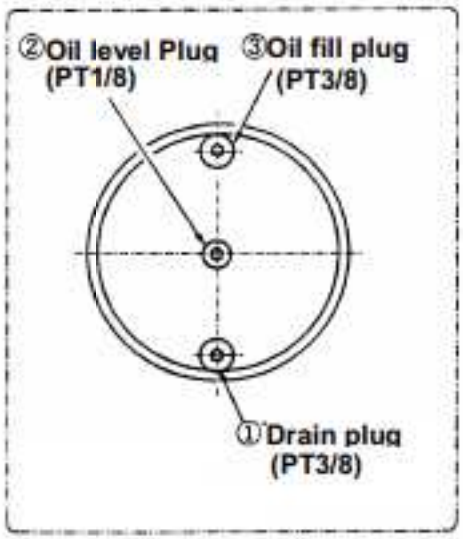
CHANGE THE TRAVEL DRIVE OIL

1. Position one travel drive with drain plug (1) at the bottom.
2. Remove drain plug (1), oil level plug (2) and oil fill plug (3). Allow the oil to drain into a container.

NOTE: *Dispose drained material according to local regulation.*

3. Clean the plugs.
4. Install drain plug (1).
5. Fill the travel drive to bottom of level plug opening.

RECOMENDED OIL	REFILL CAPACITIES
Engine oil ISO - VG320 (SAE [illegible]	0.33 litres



6. Install oil level plug (2) and oil fill plug (3).
7. Perform procedure on the other travel reduction.
8. Start the engine and allow the travel drive to turn through several cycles.
9. Stop the engine, check the oil level.
10. Check the drained oil for metal chips or particles. If there are any, consult your IHIMER dealer.

CHANGE HYDRAULIC OIL AND CLEAN THE STRAINER

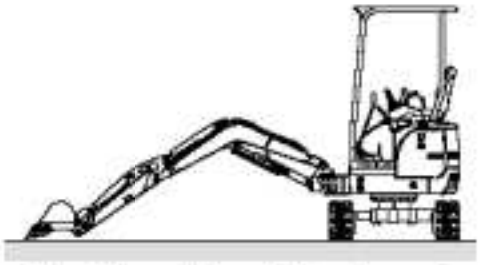
⚠ CAUTION

HOT OIL AND COMPONENTS CAN CAUSE PERSONAL INJURY. DO NOT ALLOW HOT OIL OR COMPONENTS TO CONTACT THE SKIN.
AT OPERATING TEMPERATURE. THE HYDRAULIC TANK IS HOT AND CAN BE UNDER PRESSURE.
TO RELIEVE THE PRESSURE FROM THE HYDRAULIC TANK, LOOSEN THE OIL FILL PLUG (1) ON THE HYDRAULIC TANK. RELIEVE THE TANK PRESSURE WITH ENGINE OFF BY REMOVING FILL PLUG SLOWLY TO PREVENT BURNS FROM HOT OIL.

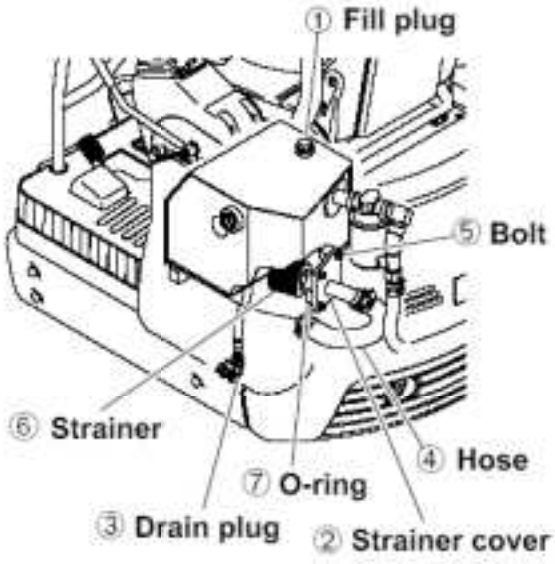
1. Place the machine on level ground, with the arm and bucket cylinder fully retracted and attachments lowered, as shown. Stop the engine.
2. Relieve the internal pressure from the hydraulic tank by loosening the fill plug (1).
3. Clean area thoroughly to keep dirt out of strainer cover unit (2) and fill plug.
4. Remove the oil drain plug. Drain oil into a container. Drain oil in all parts of the hydraulic system there after.

NOTE: Always dispose of used oil as established by local regulation.

5. Remove the suction hoses (4). Remove the bolts (5) and the strainer cover unit (2) and the strainer (6) from the hydraulic tank.
6. Inspect the O ring (7) and replace it if damaged.
7. Clean the inside of the tank with the clean oil.
8. Clean and install the strainer cover unit (2), the strainer (6) and the suction hoses (4).
9. Clean and install the drain plug (3).



Bucket position at the time of drain the hydraulic oil.



10. Fill the hydraulic tank with oil. See Recommended lubricant table.

11. Start and operate the engine at idling speed for 5 minuets.

12. Operate the control levers to allow the hydraulic oil to circulate through all hydraulic circuits.

13. Lower the bucket to the ground with the arm and bucket cylinder fully retracted and stop the engine.

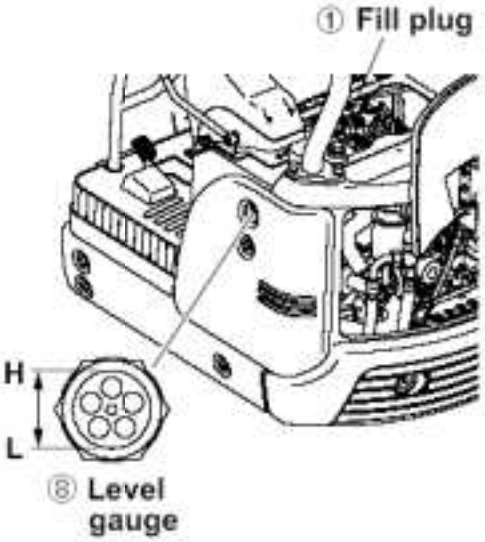
14. Maintain the oil level between **FULL** and **ADD** marks on the level gauge.

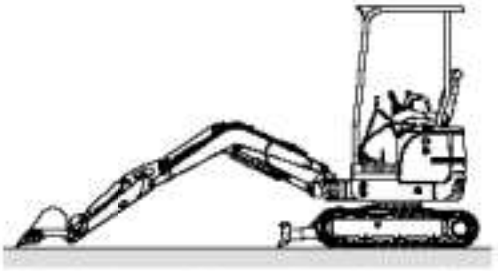
15. Pressurize the hydraulic tank. Raise the boom with the arm, boom and bucket cylinder fully extended. Remove the fill plug (1) and then install fill plug again.

16. Lower the bucket on the ground and stop the engine.

CAUTION

HYDRAULIC OIL CHANGE INTERVALS FOR BREAKER WORKS.
HYDRAULIC OIL SHOULD BE CHANGED IN EVERY 600 SERVICE HOURS.





Bucket position at the time of checking the hydraulic oil level

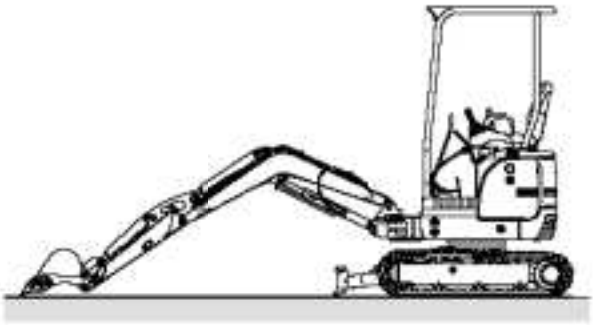
Bucket position at the time of sealing off hydraulic tank

LONG TERM STORAGE

BEFORE STORAGE

To protect the cylinder rods, set the machine position in the right illustration. (To prevent the cylinder rods from being rusted). To store the machine from long term, follow the next procedures:

- Clean parts of the machine and store indoors. If you have to place the machine outdoors, choose a flat place and cover the machine.
- Be sure to perform fill the fuel, lubrication, and oil change.
- Apply grease on the exposed part of the hydraulic cylinder piston rods.
- Store the battery after move the negative terminal and covering it or dismounting the battery from the machine.
- Lock the control levers and pedals with the lock lever and pedal lock.



Bucket position at the time of long term storage

DURING STORAGE

WARNING

IF YOU HAVE TO OPERATE THE MACHINE INDOORS TO PREVENT RUST AND GAS POISONING, KEEP GOOD VENTILATION BY OPENING THE WINDOW OR THE ENTRANCE.

During storage, operate the machine once a month to maintain films of oil at the lubrication section and charge the battery at the same time.

AFTER STORAGE

After long term storage, follow the next procedures before operating the machine:

- Wipe away grease on the hydraulic cylinder rods.
- Be sure to perform fill the fuel and lubrication.

SECTION 5 HYDRAULIC COMPONENTS

TABLE OF CONTENTS

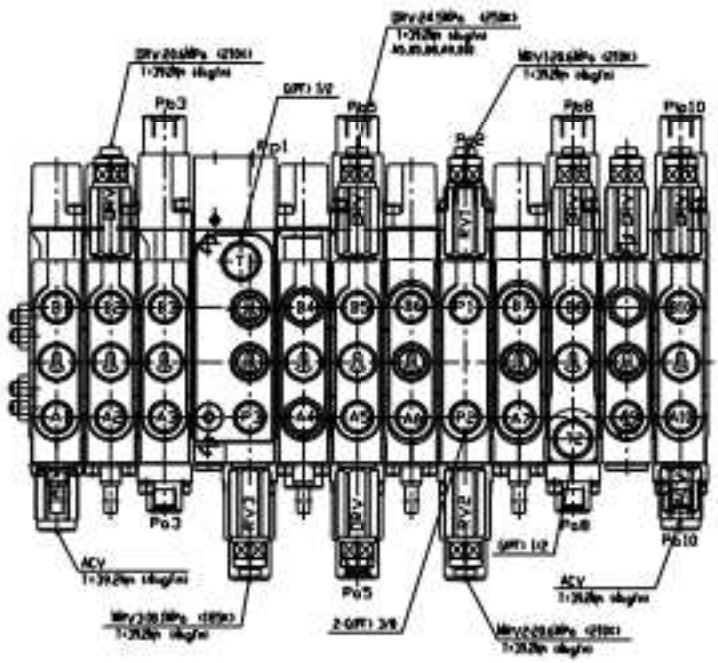
HYDRAULIC SYSTEM PRESSURE SETTINGS

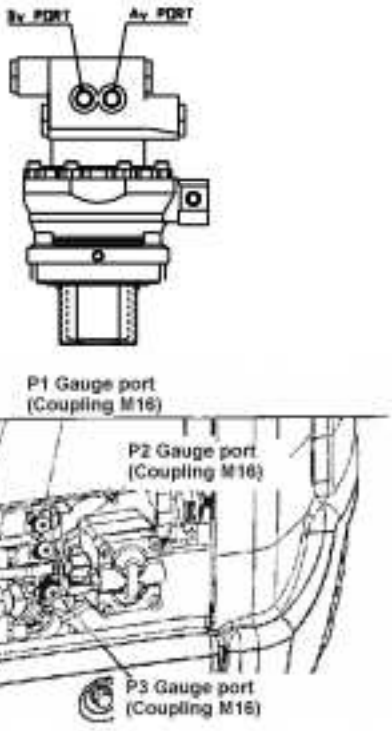
1. SET PRESSURE

Hyd. Oil Temp. :50 to 60℃

Relief Valves		Gauge Ports	Valve Locations	Maintenance Std. MPa (kgf/cm2)	Note
Main	Boom - Bucket - Travel (R.H)	P1	MR1	20.6 $^{+0.49}_{0}$ (210 $^{+5}_{0}$)	Max. Engine RPM
	Arm Travel (L.H) Service	P2	MR2	20.6 $^{+0.49}_{0}$ (210 $^{+5}_{0}$)	Max. Engine RPM
	Swing – Blade - Boom Swing – Service	P3	MR3	18.1 $^{+0.49}_{0}$ (185 $^{+5}_{0}$)	Max. Engine RPM
Overload	Boom (Raise)	P1	OR1 OR1	24.5 $^{+0.49}_{0}$ (250 $^{+5}_{0}$) at 5L / min	Min. Engine RPM
	Boom (Lower)				
	Arm (In)	P2	OR2 OR2		
	Arm (Out)				
	Bucket (Dig)	P1	OR3		
	Blade (Lower)	P3	OR4	20.6 $^{+0.49}_{0}$ (210 $^{+5}_{0}$) at 5L/min	
Brake	Swing	P3	SWR	15.2 (155)	Min. Engine RPM
	Travel	P1 (LH) P2 (RH)	Not Equipped		

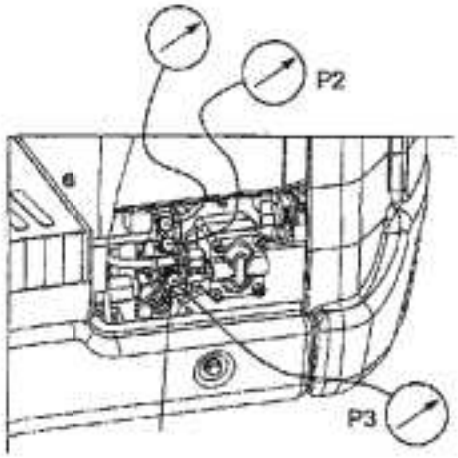
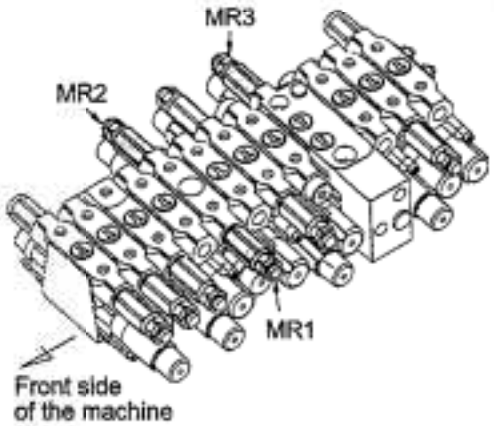
2. GAUGE PORT & RELIEF VALVE LOCATION





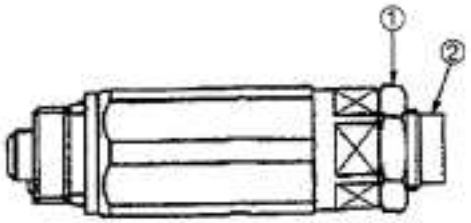
3. MAIN RELIEF VALVE

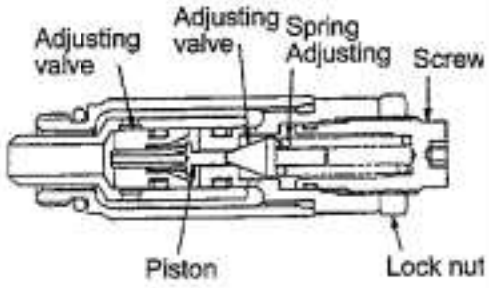
3-1. Measuring procedures

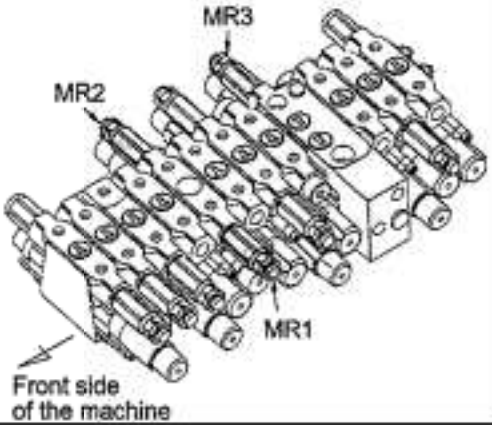
	Procedures	Note
Conditions	1. Engine speed: Maximum 2. Oil temperature: 45 - 55℃ 3. Installation of a gauge: Remove the cap for the coupling assembly, and install a gauge coupling. For the gauge coupling, see page 4-13-4. * When no gauge coupling is available, stop the engine to release the pressurized air from the hydraulic tank. Then remove the coupling assembly and mount the gauge. After installation of the gauge, pressurize the air in the hydraulic tank.	⚠ WARNING Do not remove the gauge port plug until air pressure has been relieved in hydraulic tank.
Measuring procedures	**A. Main relief valve MR1 (P1) and MR2(P2)** 1. Start the engine and move the arm cylinder to the stroke end. 2. Set the engine speed to the maximum. 3. Operate the arm lever at the full stroke and hold it there. 4. Read out the pressure indicated on the gauge during air release. * If the pressure is 20.6 MPa (210 kgf/cm2) or lower, pressure adjustment is required. **B. MR3 (P3) Main relief valve** 1. Start the engine and move the boom swing cylinder to the stroke end. 2. Run the engine at the maximum speed. 3. Operate the boom swing pedal at the full stroke and hold it there. 4. Read out the pressure indicated on the gauge during air release. * If the pressure is 18.1 MPa (185 kgf/cm2) or lower, pressure adjustment is required. [Caution] If the cylinder internal leakage is severe, the relief pressure will decline. In such a case, release the air at the both sides of the cylinder. Also check other cylinders. (P1 for the boom and bucket; P2 for the arm; and P3 for the blade or swing)	 

3-2. Adjusting procedures

<table>
<tr><th></th><th>Procedures</th><th>Note</th></tr>
<tr><td>Conditions</td><td>1. Engine speed: Maximum
2. Oil temperature: 45 - 55℃
3. Installation of a gauge: For coupling assembly M16, a sheet-type adaptor is used. For pressure measurement, the parts shown on the right column are required.
• When no gauge coupling is available, stop the engine to release the pressurized air from the hydraulic tank. Then, remove the coupling assembly and mount the gauge.</td><td>⚠ WARNING
Do not remove the gauge port plug until air pressure has been relieved in hydraulic tank.</td></tr>
<tr><td>Adjusting procedures</td><td>Procedures for Main Relief Valve MR1, MR2 and MR3.
1. Loosen Lock Nut ①.
2. Turn adjusting screw ② using a hexagon wrench to adjust the screw.
* When the screw is tightened: the pressure will increase.
* When the screw is loosened: the pressure will decrease.
[The amount of pressure change for one turn of the adjusting screw: approx. 9.8 MPa (100 kgf/cm2)]
3. 3. Fix adjusting screw ② using a hexagon wrench and tighten lock nut ①.
4. Measure the pressure.
Take the above procedures 1 to 4 until the specified pressure is obtained.

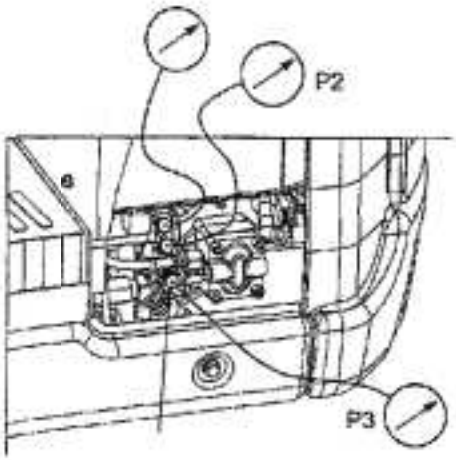
* When there is no change in the pressure even after adjustment:
1. This is not caused by the wear-out of the spring, but by the biased wear of the adjusting valve and the pressure regulating valve, the inclusion of dust or clogging. Therefore, remove the valve to disassemble and check it</td><td>Hose (Gauge coupling)
1-m type: 200-16,100
4-m type: 200-16,400
Gauge connector : 300 - 42.000
(Gauge)
 
The parts for gauge connection shown above are handled as parts
 

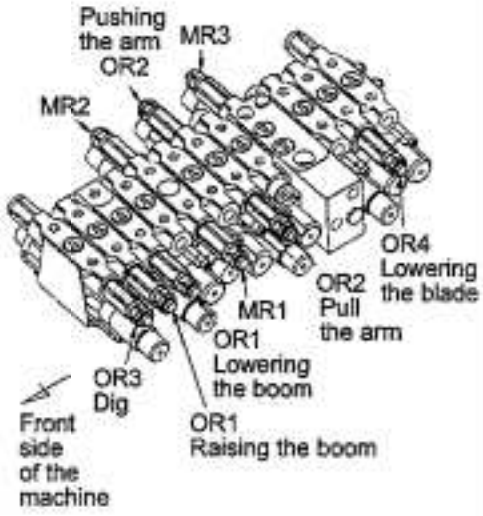
 

Main Relief Valve section
 
</td></tr>
</table>

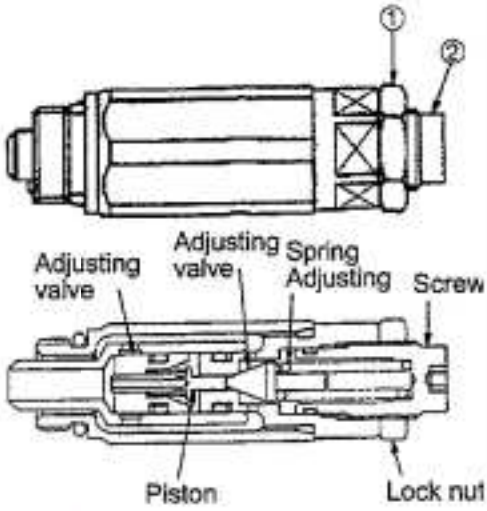
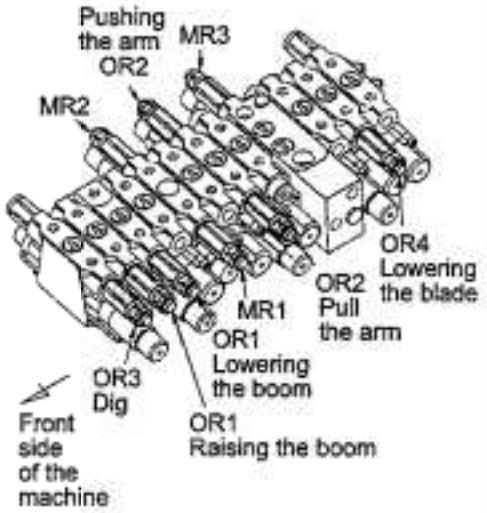
4. OVER LOAD RELIEF VALVE

4-1. Measuring procedures

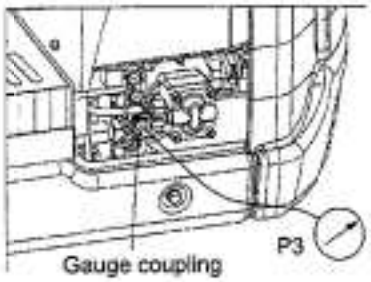
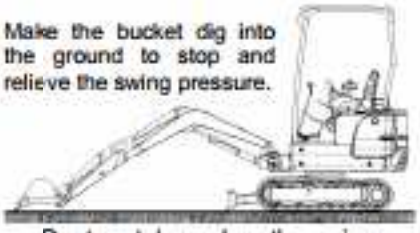
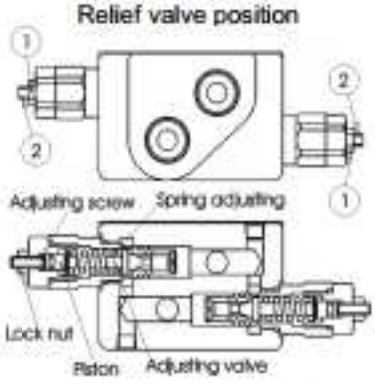
	Procedures	Note
Conditions	1. Engine speed: Low idling The set flow rate of this valve is 5 liters/min, and the flow rate becomes higher than the set value at a high engine speed, in which case higher pressures are indicated. Be sure to run the engine at a low speed. 2. Oil temperature: 45 - 55℃ 3. Installation of a gauge: Remove the cap for the coupling assembly, and install a gauge coupling. • When no gauge coupling is available, stop the engine to release the pressurized air from the hydraulic tank. Then, remove the coupling assembly and mount the gauge. After installation of the gauge, pressurize the air in the hydraulic tank. 4. Set pressures: See the table for the set pressures. 5. Set the main relief pressure temporarily. The overload relief pressure is set higher than the main relief pressure. Therefore, the main relief pressure needs to be set higher than the overload relief pressure. Temporary setting of the main relief pressure 1) Loosen the lock nut for main relief pressure and tighten the adjusting screw by 180°, tighten the tightening lock nut. 2) After adjusting the overload relief pressure, loosen the lock nut for main relief pressure, loosen the adjusting screw by 180° or more. Return the pressure to the set value or less and thereafter make adjustments at the tightening side.	**WARNING** Do not remove the gauge port plug until air pressure has been relieved in hydraulic tank. 

Measuring procedures	Overload relief for raising the boom (OR1) is explained below. Take the same procedures also for other valves. 1. Set the main relief pressure temporarily. 2. Start the engine and run it at a low speed. 3. Raise the boom to the stroke end of the cylinder and operate the control lever at the full stroke. Hold the lever with the pressure relieved and read the gauge. 4. When the pressure is 22.6 MPa (230 kgf/cm2) or lower, pressure adjustment is required. (See the next page) * The pressure is 24.5 MPa (250 kgf/cm2) only for the bucket. 5. When the pressure is normal, return the main relief pressure to the set value. (For the adjusting procedures, see the above-mentioned item for Conditions). 6. Remove the gauge coupling, and fix the cap on the coupling assembly. * In the case of a gauge adaptor, stop the engine and remove the pressurized air from the hydraulic tank. Remove the gauge adaptor and wind a seal tape around the thread portion of the coupling assembly. After installation, pressurize the air in the hydraulic tank. (See Page 4-8-2.)	

4-2. Adjusting procedures

	Procedures	Note
Adjusting procedures	**Procedures for Over load Relief Valve OR1, OR2 and OR3.** 1. Set the main relief pressure temporarily (See last page). 2. Start the engine and run it at a low speed. 3. Operate the control lever of the valve to be measured at the full stroke. Hold the lever when the cylinder comes to the stroke end (relief). 4. Remove the cap nut ①. Turn adjusting screw ③ using a screwdriver to adjust the screw to the set pressure at the tightening side (the pressure increasing side). If the pressure is higher than the set value, or when the adjusting screw is tightened more than the set pressure, loosen it until the pressure becomes the set value or lower. Then, adjust it again at the tightening side. 5. After adjustment, install the cap ① by a hexagon spanner. 6. After locking, check the pressure. 7. Repeat the procedures starting from item 3 above until the set pressure is obtained. 8. When the pressure is normal, return the main relief pressure to the set value. (For the adjusting procedures, see the item for Conditions.) 9. Remove the gauge coupling and fix the cap to the coupling assembly. • In the case of gauge adaptor, stop the engine and remove the pressurized air from the hydraulic tank. Remove the gauge adaptor and wind a seal tape around the thread portion of the coupling assembly. After installation, pressurize the air in the hydraulic tank.	**WARNING** Do not remove the gauge port plug until air pressure has been relieved in hydraulic tank.  **Over load Relief Valve section** 

5. SWING RELIEF VALVE

	Procedures	Note
Conditions	1. Engine speed: Low 2. Oil temperature: 45-55℃ 3. Installation of a gauge: Remove the cap for the coupling assembly P3, and install a gauge coupling. • When no gauge coupling is available, stop the engine to release the pressurized air from the hydraulic tank. Then, remove the coupling assembly and mount the gauge. After installation of the gauge, pressurize the air in the hydraulic tank.	**WARNING** Upper structure movement can cause personal injury or death. Prevent structure movement Do not remove the gauge port plug until air pressure has been relieved in hydraulic tank.
Measuring procedures	1. Make the bucket dig into the ground in the posture shown in the right column. Then, operating the swing lever slowly, relieve the pressure and hold it. Make measurements by performing right or left swing. [Notes] 1. Be sure beforehand that the pressure of the main relief valve is normal. 2. The pressure changes depending on the engine speed. • When the engine runs idling: the pressure is nearly the set value. • When the engine runs at the maximum speed: a pressure higher by 5 -15 kgf/cm2 is detected. (This also differs depending on the oil temperature.)	 Gauge coupling  Posture taken when the swing pressure is being measured
Adjusting procedures	If the pressure is lower than the specified value, adjust it according the following procedure. (Same procedures as right and left) 1. Loosen the lock nut①. 2. Start the engine, Move the engine throttle lever to low idle. 3. Move the lever to measuring relief valve, fully stroke to hold it, and adjust the pressure by turning the adjusting screw ② with a hexagon bar spanner, while measuring the pressure. Adjusting screw ② turn clockwise to raise the pressure. 4. When adjusted property, fix the adjusting screw ② and tighten the lock nut①. 5. Check the pressure again and adjust as necessary.	 Relief valve position  Relief valve assembly

SECTION 6 PERFORMANCE STANDARDS

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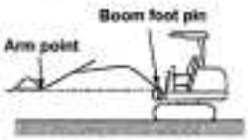
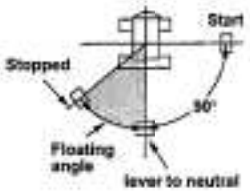
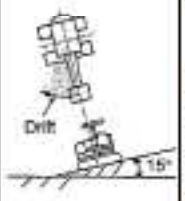
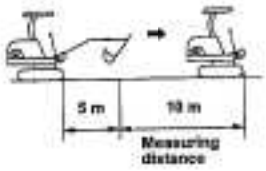
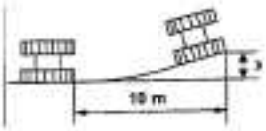
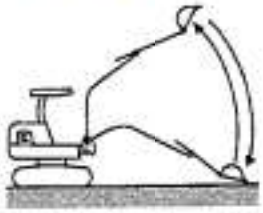
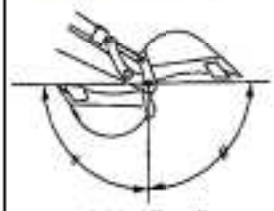
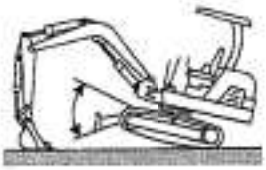
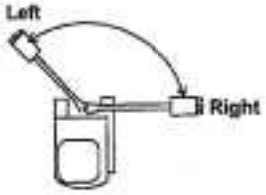
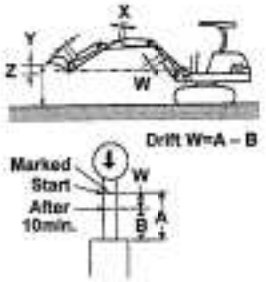
	ITEM	UNIT	STANDARD	ALLOW	NOTE
ENGINE	Rated R.P.M.	Min^{-1} (rpm)	2300	-	
	Rated Output	kw (ps)	9,7 (13,2)	-5%	
	Max. Torque	N•m (kgf•m)	47,5 / 1800 (4,85 / 1800)	-5%	
	High Idle (No load)	Min^{-1} (rpm)	2460^{+0}_{-50}	$2460_{\pm 50}$	
	Low Idle (No load)	Min^{-1} (rpm)	1250^{+0}_{-50}	$1250_{\pm 50}$	
HIDRAULIC PRESSURE	Boom	MPa (kgf/cm^2)	$20,6^{+0,5}_{-1,0}$ (210^{+5}_{-10})	$20.6^{+0,5}_{-1,0}$ (210^{+5}_{-10})	• At hydraulic temperature 50 to 60 ℃
	Arm		↑	↑	
	Bucket		↑	↑	
	Swing		$15,2^{+0,5}_{-1,0}$ (155^{+5}_{-10})	$15.2^{+0,5}_{-1,0}$ (155^{+5}_{-10})	
	Travel		$20,6^{+0,5}_{-1,0}$ (210^{+5}_{-10})	$20.6^{+0,5}_{-1,0}$ (210^{+5}_{-10})	
	Boom Swing		$18,1^{+0,5}_{-1,0}$ (185^{+5}_{-10})	$18.1^{+0,5}_{-1,0}$ (185^{+5}_{-10})	
	Blade		↑	↑	
LEVER FORCE	Boom: Raise / Lower	kg	$1,2_{\pm 0,3}$	$1,2_{\pm 0,5}$	• At engine stopped
	Arm: In / Out		$1,2_{\pm 0,3}$	$1,2_{\pm 0,5}$	
	Bucket		$1,0_{\pm 0,3}$	$1,0_{\pm 0,5}$	
	Swing: Right / Left		$1,0_{\pm 0,3}$	$1,0_{\pm 0,5}$	
	Travel: Forward / Reverse		$1,8_{\pm 0,4}$	$1,8_{\pm 0,7}$	
	Boom Swing: Right / Left		$1,0_{\pm 0,3}$	$1,0_{\pm 0,5}$	
	Blade: Raise / Lower		$2,3_{\pm 0,4}$	$2,3_{\pm 1,0}$	
	Throttle		$4,0_{\pm 0,4}$	$4,0_{\pm 1,0}$	
SPOOL STROKE	Boom	mm	7	←	• Measurement from the outside is not allowable due to the hydraulic remote control type. (For measurement, remove the spool case.)
	Arm				
	Bucket				
	Swing				
	Boom Swing				
	Travel		7	←	• Mechanical type Check and adjust the control lever beforehand.
	Service				
	Blade				

ITEM	CONDITION	Standard	Allow
SWING Upper floats when swing operation is stopped. (Brake working angle)	Engine: Rated R.P.M. Oil temp.: 50°to 60℃ Fully retracted bucket cylinder and arm cylinder. Arm point pin positioned to be horizontal with boom foot pin.  Return lever to neutral after rotating 90° with no load. Measure floating angle after stop the machine. 	20 ±10°	Bellow 35°
Operating Speed	Engine: Rated R.P.M. Oil temp.: 50°to 60℃ Fully retracted bucket cylinder and arm cylinder. Arm point pin positioned to be horizontal with boom foot pin. Measure time required for two turns after one turn is made.	12,6 sec ±0,5 sec	Bellow 14 sec
Natural drift 	Engine: Low idling Oiltemp.:50℃o60℃ Incline angle:15 Fully retracted bucket cylinder and arm cylinder. Arm point pin positioned to be horizontal with boom foot pin. Slant surface crosswise. Measure drift angle after 5 minutes	Bellow 5°	Bellow 10°

ITEM	CONDITION	Standard	Allow
TRAVEL	Engine: Rated R.P.M. Oil temp.: 50°to 60℃	Rubber shoe	
Travel speed	Level solid ground Time required for 10 m travel after 5 m take off. 	High Speed 9.3 sec ± 1.0 sec Low Speed 17.0 sec ± 1.0 sec	High Speed Below 11 sec Low Speed Below 19 sec
		Steel shoe	
		High Speed 9.3 sec ± 1.0 sec Low Speed 17.5 sec ± 1.0 sec	High Speed Below 11 sec Low Speed Below 20 sec
Travel alignment	Engine: Rated R.P.M. Oil temp.: 50°to 60℃ Measure turning distance (x) after 10m travel. 	Below 500 mm	Below 700 mm
Natural drift 	Engine: Low idling Oil temp.: 50°to 60℃ Measure drift gravity in 5 minutes.	100 mm /5 min	300 mm /5 min
Time for crawler belt	Engine: Rated R.P.M. Oil temp.: 50°to 60℃ Measure time required for five turns after one turn. 	High Speed 15.0 sec ±1.0 sec Low Speed 28.5 sec ±1.0 sec	High Speed below 18.0 sec Low Speed Below 32.0 sec

ITEM	CONDITION	Standard	Allow
BOOM CYLINDER SPEED	Engine: Rated R.P.M. Oil temp.: 50°to 60℃  Arm and bucket cylinder fully retracted. Without measure cushion stroke. 1. Measure time to raise boom from ground level to maximum height. 2. Measure time to lower boom from maximum height to ground level.	With canopy	
		Raise 2,5 sec ±0,5 sec Lower 2,3 sec ±0,5 sec	Below 3,5 sec Below 3,3 sec
		With cabin	
		Raise 2,5 sec ±0,5 sec Lower 2,3 sec ±0,5 sec	Below 3,5 sec Below 3,3 sec
ARM CYLINDER SPEED	Engine: Rated R.P.M. Oil temp.: 50°to 60℃  Divided Equally Measure time for full extension or retraction of cylinder.	Arm In 3,3 sec ±0,5 sec Arm Out 3,5 sec ±0,5 sec	Below 4,0 sec Below 4,0 sec
BUCKET CYLINDER SPEED	Engine: Low idling Oil temp.: 50°to 60℃  Divided Equally Measure time for full extension or retraction of cylinder.	Dig 2,8 sec ±0,3 sec Dig 2,1 sec ±0,3 sec	Below 3,5 sec Below 2,6 sec

ITEM	CONDITION	Standard	Allow
BLADE CYLINDER SPEED	Engine: Rated R.P.M. Oil temp.: 50°to 60℃  Measure time for full	Hoist 1,8 sec ±0,5 sec Lower 2,5 sec ±0,5 sec	Below 2,4 sec Below 3,1 sec
BOOM SWING CYLINDER SPEED	Engine: Rated R.P.M. Oil temp.: 50°to 60℃  Measure time for full extension or retraction of cylinder.	Left 5,3 sec ±0,6 sec Right 4,0 sec ±0,6 sec	Below 6,4 sec Below 5,1 sec
NATURAL DRIFT	Engine: Low idling Oil temp.: 50°to 60℃ Bucket load: Non load. Fully retracted bucket cylinder and arm cylinder. Arm point pin positioned to be horizontal with boom foot pin. Measure the variation of rod length in 10 minutes, 	Boom Cylinder: below 10 mm Arm Cylinder: below 10 mm Bucket Cylinder: below 5 mm Bucket Tooth Point: below 200 mm	Below 20 mm Below 20 mm Below 10 mm Below 300 mm

SECTION 7 TROUBLE SHOOTING

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TROUBLE / PRESUMABLE REASON / SOLUTION

Detect the occurrence of anything unusual in its early stages by well getting hold of the normal performance and condition of the machine while at daily operation.
When detecting anything unusual, investigate the cause, and make the repair.
When keeping the operation continue by neglecting anything unusual, it is in danger of relating with further big trouble.

SYMPTOM	PROBABLE CAUSE	REMEDY
Operating lever is felt hard or does not return automatically..	• Failed of lubricating aver working part. • Control valve damaged.	• Lubricate • Repair or replace.
All operation are fail or force and speed decrease.	• Low hydraulic oil. • Suction Strainer clogged. • Engine output drop. • Pump or coupling damaged. • Improper viscosity hydraulic oil. • Main relief valve pressure too tow. • Control valve damaged.	• Replenish hydraulic oil. • Clean filter element. • Clean air cleaner and inspect fuel system. • Repair or replace. • Replace hydraulic on with recommended viscosity. • Check and adjust pressure. • Repair or replace.
Travel of left, right, or both sides are inoperable.	• Clogging foreign matter such as stone. • Defective travel motor or reduction. • Defective brake valve.	• Remove foreign matter. • Repair or replace. • Repair or replace.
Straight travel defective.	• Clogging foreign matter. • Shoe tension unequal. • Defective pump. • Loosen travel lever stopper. • Defective motor or brake valve.	• Remove foreign matter. • Adjust to properly tension on both sides. • Repair or replace. • Adjust and tighten nut. • Repair or replace.
Swing is inoperable or smooth swing is inoperable.	• Fail lubricate of swing bearing. • Defective motor. • Defective brake valve. • Defective cushion valve.	• Lubricate swing bearing. • Repair or replace. • Repair or replace. • Repair or replace.
Digging force defective.	• Low hydraulic oil. • Improper viscosity hydraulic oil. • Main relief valve pressure too low. • Control valve damaged. • Internal leakage of hydraulic cylinder.	• Replenish hydraulic oil. • Replace hydraulic oil with recommended viscosity. • Check and adjust pressure. • Repair or replace. • Repair or replace.

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