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1. STRUCTURE

This service manual has been prepared as an aid to improve the quality of repairs by giving the serviceman an accurate understanding of the product and by showing him the correct way to perform repairs and make judgements. Make sure you understand the contents of this manual and use it to full effect at every opportunity.

This service manual mainly contains the necessary technical information for operations performed in a service workshop.

For ease of understanding, the manual is divided into the following sections.

SECTION 1 GENERAL

This section explains the safety hints and gives the specification of the machine and major components.

SECTION 2 STRUCTURE AND FUNCTION

This section explains the structure and function of each component. It serves not only to give an understanding of the structure, but also serves as reference material for troubleshooting.

SECTION 3 HYDRAULIC SYSTEM

This section explains the hydraulic circuit, single and combined operation.

SECTION 4 ELECTRICAL SYSTEM

This section explains the electrical circuit, monitoring system and each component. It serves not only to give an understanding electrical system, but also serves as reference material for trouble shooting.

SECTION 5 TROUBLESHOOTING

This section explains the troubleshooting charts correlating problems to causes.

SECTION 6 MAINTENANCE STANDARD

This section gives the judgement standards when inspecting disassembled parts.

SECTION 7 DISASSEMBLY AND ASSEMBLY

This section explains the order to be followed when removing, installing, disassembling or assembling each component, as well as precautions to be taken for these operations.

SECTION 8 COMPONENT MOUNTING TORQUE

This section shows bolt specifications and standard torque values needed when mounting components to the machine.

The specifications contained in this shop manual are subject to change at any time and without any advance notice. Contact your HYUNDAI distributor for the latest information.

2. HOW TO READ THE SERVICE MANUAL

Distribution and updating

Any additions, amendments or other changes will be sent to HYUNDAI distributors.
Get the most up-to-date information before you start any work.

Filing method

1. See the page number on the bottom of the page.
   File the pages in correct order.
2. Following examples shows how to read the page number.
   Example 1
   2 - 3
   Item number (2. Structure and Function)
   Consecutive page number for each item.
3. Additional pages : Additional pages are indicated by a hyphen(-) and number after the page number. File as in the example.
   5 - 4
   5 - 4 - 1 ⎤ Added pages
   5 - 4 - 2 ⎦
   5 - 5

Revised edition mark (①②③…)

When a manual is revised, an edition mark is recorded on the bottom outside corner of the pages.

Revisions

Revised pages are shown at the list of revised pages on the between the contents page and section 1 page.

Symbols

So that the shop manual can be of ample practical use, important places for safety and quality are marked with the following symbols.

Symbol	Item	Remarks
	Safety	Special safety precautions are necessary when performing the work.
		Extra special safety precautions are necessary when performing the work because it is under internal pressure.
※	Caution	Special technical precautions or other precautions for preserving standards are necessary when performing the work.

3. CONVERSION TABLE

Method of using the Conversion Table
The Conversion Table in this section is provided to enable simple conversion of figures.
For details of the method of using the Conversion Table, see the example given below.

Example

1. **Method of using the Conversion Table to convert from millimeters to inches**
   Convert 55mm into inches.
   (1) Locate the number 50in the vertical column at the left side, take this as ⓐ, then draw a horizontal line from ⓐ.
   (2) Locate the number 5 in the row across the top, take this as ⓑ, then draw a perpendicular line down from ⓑ.
   (3) Take the point where the two lines cross as ⓒ. This point ⓒ gives the value when converting from millimeters to inches. Therefore, 55 mm = 2.165 inches.

2. Convert 550mm into inches.
   (1) The number 550 does not appear in the table, so divide by 10(Move the decimal point one place to the left) to convert it to 55 mm.
   (2) Carry out the same procedure as above to convert 55 mm to 2.165 inches.
   (3) The original value (550 mm) was divided by 10, so multiply 2.165 inches by 10 (Move the decimal point one place to the right) to return to the original value.
   This gives 550 mm = 21.65 inches.

Millimeters to inches ⓑ

1 mm = 0.03937 in

	0	1	2	3	4	5	6	7	8	9
0		0.039	0.079	0.118	0.157	0.197	0.236	0.276	0.315	0.354
10	0.394	0.433	0.472	0.512	0.551	0.591	0.630	0.669	0.709	0.748
20	0.787	0.827	0.866	0.906	0.945	0.984	1.024	1.063	1.102	1.142
30	1.181	1.220	1.260	1.299	1.339	1.378	1.417	1.457	1.496	1.536
40	1.575	1.614	1.654	1.693	1.732	1.772	1.811	1.850	1.890	1.929
ⓐ 50	1.969	2.008	2.047	2.087	2.126	ⓒ 2.165	2.205	2.244	2.283	2.323
60	2.362	2.402	2.441	2.480	2.520	2.559	2.598	2.638	2.677	2.717
70	2.756	2.795	2.835	2.874	2.913	2.953	2.992	3.032	3.071	3.110
80	3.150	3.189	3.228	3.268	3.307	3.346	3.386	3.425	3.465	3.504
90	3.543	3.583	3.622	3.661	3.701	3.740	3.780	3.819	3.858	3.898

Millimeters to inches

1 mm = 0.03937 in

	0	1	2	3	4	5	6	7	8	9
0		0.039	0.079	0.118	0.157	0.197	0.236	0.276	0.315	0.354
10	0.394	0.433	0.472	0.512	0.551	0.591	0.630	0.669	0.709	0.748
20	0.787	0.827	0.866	0.906	0.945	0.984	1.024	1.063	1.102	1.142
30	1.181	1.220	1.260	1.299	1.339	1.378	1.417	1.457	1.496	1.536
40	1.575	1.614	1.654	1.693	1.732	1.772	1.811	1.850	1.890	1.929
50	1.969	2.008	2.047	2.087	2.126	2.165	2.205	2.244	2.283	2.323
60	2.362	2.402	2.441	2.480	2.520	2.559	2.598	2.638	2.677	2.717
70	2.756	2.795	2.835	2.874	2.913	2.953	2.992	3.032	3.071	3.110
80	3.150	3.189	3.228	3.268	3.307	3.346	3.386	3.425	3.465	3.504
90	3.543	3.583	3.622	3.661	3.701	3.740	3.780	3.819	3.858	3.898

Kilogram to Pound

1 kg = 2.2046 lb

	0	1	2	3	4	5	6	7	8	9
0		2.20	4.41	6.61	8.82	11.02	13.23	15.43	17.64	19.84
10	22.05	24.25	26.46	28.66	30.86	33.07	35.27	37.48	39.68	41.89
20	44.09	46.30	48.50	50.71	51.91	55.12	57.32	59.5.	61.73	63.93
30	66.14	68.34	70.55	72.75	74.96	77.16	79.37	81.57	83.78	85.98
40	88.18	90.39	92.59	94.80	97.00	99.21	101.41	103.62	105.82	108.03
50	110.23	112.44	114.64	116.85	119.05	121.25	123.46	125.66	127.87	130.07
60	132.28	134.48	136.69	138.89	141.10	143.30	145.51	147.71	149.91	152.12
70	154.32	156.53	158.73	160.94	163.14	165.35	167.55	169.76	171.96	174.17
80	176.37	178.57	180.78	182.98	185.19	187.39	189.60	191.80	194.01	196.21
90	198.42	200.62	202.83	205.03	207.24	209.44	211.64	213.85	216.05	218.26

Liter to U.S. Gallon

1 ℓ = 0.2642 U.S.Gal

	0	1	2	3	4	5	6	7	8	9
0		0.264	0.528	0.793	1.057	1.321	1.585	1.849	2.113	2.378
10	2.642	2.906	3.170	3.434	3.698	3.963	4.227	4.491	4.755	5.019
20	5.283	5.548	5.812	6.6076	6.340	6.604	6.869	7.133	7.397	7.661
30	7.925	8.189	8.454	8.718	8.982	9.246	9.510	9.774	10.039	10.303
40	10.567	10.831	11.095	11.359	11.624	11.888	12.152	12.416	12.680	12.944
50	13.209	13.473	13.737	14.001	14.265	14.529	14.795	15.058	15.322	15.586
60	15.850	16.115	16.379	16.643	16.907	17.171	17.435	17.700	17.964	18.228
70	18.492	18.756	19.020	19.285	19.549	19.813	20.077	20.341	20.605	20.870
80	21.134	21.398	21.662	21.926	22.190	22.455	22.719	22.983	23.247	23.511
90	23.775	24.040	24.304	24.568	24.832	25.096	25.631	25.625	25.889	26.153

Liter to U.K. Gallon

1 ℓ = 0.21997 U.K.Gal

	0	1	2	3	4	5	6	7	8	9
0		0.220	0.440	0.660	0.880	1.100	1.320	1.540	1.760	1.980
10	2.200	2.420	2.640	2.860	3.080	3.300	3.520	3.740	3.950	4.179
20	4.399	4.619	4.839	5.059	5.279	5.499	5.719	5.939	6.159	6.379
30	6.599	6.819	7.039	7.259	7.479	7.969	7.919	8.139	8.359	8.579
40	8.799	9.019	9.239	9.459	9.679	9.899	10.119	10.339	10.559	10.778
50	10.998	11.281	11.438	11.658	11.878	12.098	12.318	12.528	12.758	12.978
60	13.198	13.418	13.638	13.858	14.078	14.298	14.518	14.738	14.958	15.178
70	15.398	15.618	15.838	16.058	16.278	16.498	16.718	16.938	17.158	17.378
80	17.598	17.818	18.037	18.257	18.477	18.697	18.917	19.137	19.357	19.577
90	19.797	20.017	20.237	20.457	20.677	20.897	21.117	21.337	21.557	21.777

kgf · m to lbf · ft

1 kgf · m = 7.233 lbf · ft

	0	1	2	3	4	5	6	7	8	9
		7.2	14.5	21.7	28.9	36.2	43.4	50.6	57.9	65.1
10	72.3	79.6	86.8	94.0	101.3	108.5	115.7	123.0	130.2	137.4
20	144.7	151.9	159.1	166.4	173.6	180.8	188.1	195.3	202.5	209.8
30	217.0	224.2	231.5	238.7	245.9	253.2	260.4	267.6	274.9	282.1
40	289.3	396.6	303.8	311.0	318.3	325.5	332.7	340.0	347.2	354.4
50	361.7	368.9	376.1	383.4	390.6	397.8	405.1	412.3	419.5	426.8
60	434.0	441.2	448.5	455.7	462.9	470.2	477.4	484.6	491.8	499.1
70	506.3	513.5	520.8	528.0	535.2	542.5	549.7	556.9	564.2	571.4
80	578.6	585.9	593.1	600.3	607.6	614.8	622.0	629.3	636.5	643.7
90	651.0	658.2	665.4	672.7	679.9	687.1	694.4	701.6	708.8	716.1
100	723.3	730.5	737.8	745.0	752.2	759.5	766.7	773.9	781.2	788.4
110	795.6	802.9	810.1	817.3	824.6	831.8	839.0	846.3	853.5	860.7
120	868.0	875.2	882.4	889.7	896.9	904.1	911.4	918.6	925.8	933.1
130	940.3	947.5	954.8	962.0	969.2	976.5	983.7	990.9	998.2	10005.4
140	1012.6	1019.9	1027.1	1034.3	1041.5	1048.8	1056.0	1063.2	1070.5	1077.7
150	1084.9	1092.2	1099.4	1106.6	1113.9	1121.1	1128.3	1135.6	1142.8	1150.0
160	1157.3	1164.5	1171.7	1179.0	1186.2	1193.4	1200.7	1207.9	1215.1	1222.4
170	1129.6	1236.8	1244.1	1251.3	1258.5	1265.8	1273.0	1280.1	1287.5	1294.7
180	1301.9	1309.2	1316.4	1323.6	1330.9	1338.1	1345.3	1352.6	1359.8	1367.0
190	1374.3	1381.5	1388.7	1396.0	1403.2	1410.4	1417.7	1424.9	1432.1	1439.4

kgf/cm² to lbf/in²

1 kgf / cm² = 14.2233 lbf / in²

	0	1	2	3	4	5	6	7	8	9
		14.2	28.4	42.7	56.9	71.1	85.3	99.6	113.8	128.0
10	142.2	156.5	170.7	184.9	199.1	213.4	227.6	241.8	256.0	270.2
20	284.5	298.7	312.9	327.1	341.4	355.6	369.8	384.0	398.3	412.5
30	426.7	440.9	455.1	469.4	483.6	497.8	512.0	526.3	540.5	554.7
40	568.9	583.2	597.4	611.6	625.8	640.1	654.3	668.5	682.7	696.9
50	711.2	725.4	739.6	753.8	768.1	782.3	796.5	810.7	825.0	839.2
60	853.4	867.6	881.8	896.1	910.3	924.5	938.7	953.0	967.2	981.4
70	995.6	1010	1024	1038	1053	1067	1081	1095	1109	1124
80	1138	1152	1166	1181	1195	1209	1223	1237	1252	1266
90	1280	1294	1309	1323	1337	1351	1365	1380	1394	1408
100	1422	1437	1451	1465	1479	1493	1508	1522	1536	1550
110	1565	1579	1593	1607	1621	1636	1650	1664	1678	1693
120	1707	1721	1735	1749	1764	1778	1792	1806	1821	1835
130	1849	2863	1877	1892	1906	1920	1934	1949	1963	1977
140	1991	2005	2020	2034	2048	2062	2077	2091	2105	2119
150	2134	2148	2162	2176	2190	2205	2219	2233	2247	2262
160	2276	2290	2304	2318	2333	2347	2361	2375	2389	2404
170	2418	2432	2446	2460	2475	2489	2503	2518	2532	2546
180	2560	2574	2589	5603	2617	2631	2646	2660	2674	2688
200	2845	2859	2873	2887	2901	2916	2930	2944	2958	2973
210	2987	3001	3015	3030	3044	3058	3072	3086	3101	3115
220	3129	3143	3158	3172	3186	3200	3214	3229	3243	3257
230	3271	3286	3300	3314	3328	3343	3357	3371	3385	3399
240	3414	3428	3442	3456	3470	3485	3499	3513	3527	3542

TEMPERATURE

Fahrenheit-Centigrade Conversion.

A simple way to convert a fahrenheit temperature reading into a centigrade temperature reading or vice verse is to enter the accompanying table in the center or boldface column of figures.

These figures refer to the temperature in either Fahrenheit or Centigrade degrees.

If it is desired to convert from Fahrenheit to Centigrade degrees, consider the center column as a table of Fahrenheit temperatures and read the corresponding Centigrade temperature in the column at the left.

If it is desired to convert from Centigrade to Fahrenheit degrees, consider the center column as a table of Centigrade values, and read the corresponding Fahrenheit temperature on the right.

˚C		˚F	˚C		˚F	˚C		˚F	˚C		˚F
-40.4	-40	-40.0	-11.7	11	51.8	7.8	46	114.8	27.2	81	117.8
-37.2	-35	-31.0	-11.1	12	53.6	8.3	47	116.6	27.8	82	179.6
-34.4	-30	-22.0	-10.6	13	55.4	8.9	48	118.4	28.3	83	181.4
-31.7	-25	-13.0	-10.0	14	57.2	9.4	49	120.2	28.9	84	183.2
-28.9	-20	-4.0	-9.4	15	59.0	10.0	50	122.0	29.4	85	185.0
-28.3	-19	-2.2	-8.9	16	60.8	10.6	51	123.8	30.0	86	186.8
-27.8	-18	-0.4	-8.3	17	62.6	11.1	52	125.6	30.6	87	188.6
-27.2	-17	1.4	-7.8	18	64.4	11.7	53	127.4	31.1	88	190.4
-26.7	-16	3.2	-6.7	20	68.0	12.8	55	131.0	32.2	90	194.0
-26.1	-15	5.0	-6.7	20	68.0	12.8	55	131.0	32.2	90	194.0
-25.6	-14	6.8	-6.1	21	69.8	13.3	56	132.8	32.8	91	195.8
-25.0	-13	8.6	-5.6	22	71.6	13.9	57	134.6	33.3	92	197.6
-24.4	-12	10.4	-5.0	23	73.4	14.4	58	136.4	33.9	93	199.4
-23.9	-11	12.2	-4.4	24	75.2	15.0	59	138.2	34.4	94	201.2
-23.3	-10	14.0	-3.9	25	77.0	15.6	60	140.0	35.0	95	203.0
-22.8	-9	15.8	-3.3	26	78.8	16.1	61	141.8	35.6	96	204.8
-22.2	-8	17.6	-2.8	27	80.6	16.7	62	143.6	36.1	97	206.6
-21.7	-7	19.4	-2.2	28	82.4	17.2	63	145.4	36.7	98	208.4
-21.1	-6	21.2	-1.7	29	84.2	17.8	64	147.2	37.2	99	210.2
-20.6	-5	23.0	-1.1	35	95.0	21.1	70	158.0	51.7	125	257.0
-20.0	-4	24.8	-0.6	31	87.8	18.9	66	150.8	40.6	105	221.0
-19.4	-3	26.6	0	32	89.6	19.4	67	152.6	43.3	110	230.0
-18.9	-2	28.4	0.6	33	91.4	20.0	68	154.4	46.1	115	239.0
-18.3	-1	30.2	1.1	34	93.2	20.6	69	156.2	48.9	120	248.0
-17.8	0	32.0	1.7	35	95.0	21.1	70	158.0	51.7	125	257.0
-17.2	1	33.8	2.2	36	96.8	21.7	71	159.8	54.4	130	266.0
-16.7	2	35.6	2.8	37	98.6	22.2	72	161.6	57.2	135	275.0
-16.1	3	37.4	3.3	38	100.4	22.8	73	163.4	60.0	140	284.0
-15.6	4	39.2	3.9	39	102.2	23.3	74	165.2	62.7	145	293.0
-15.0	5	41.0	4.4	40	104.0	23.9	75	167.0	65.6	150	302.0
-14.4	6	42.8	5.0	41	105.8	24.4	76	168.8	68.3	155	311.0
-13.9	7	44.6	5.6	42	107.6	25.0	77	170.6	71.1	160	320.0
-13.3	8	46.4	6.1	43	109.4	25.6	78	172.4	73.9	165	329.0
-12.8	9	48.2	6.7	44	111.2	26.1	79	174.2	76.7	170	338.0
-12.2	10	50.0	7.2	45	113.0	26.7	80	176.0	79.4	172	347.0

SECTION 1 GENERAL

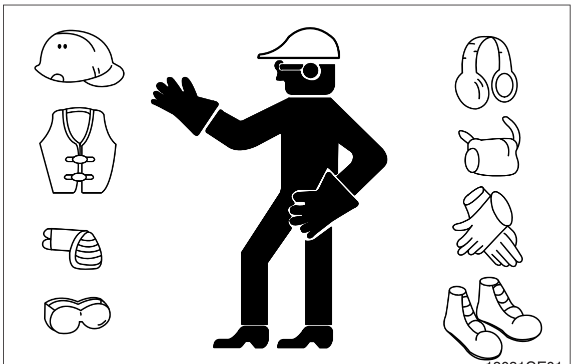
GROUP 1 SAFETY

FOLLOW SAFE PROCEDURE

Unsafe work practices are dangerous. Understand service procedure before doing work; Do not attempt shortcuts.

WEAR PROTECTIVE CLOTHING

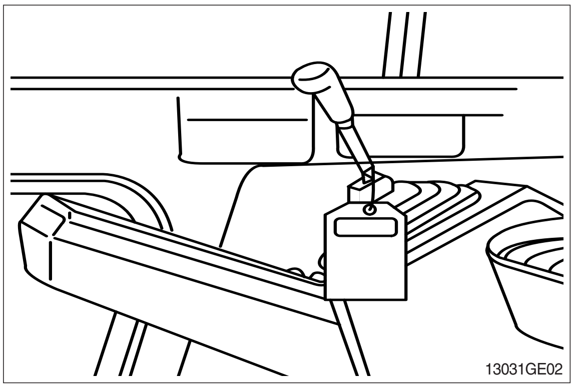
Wear close fitting clothing and safety equipment appropriate to the job.



13031GE01

WARN OTHERS OF SERVICE WORK

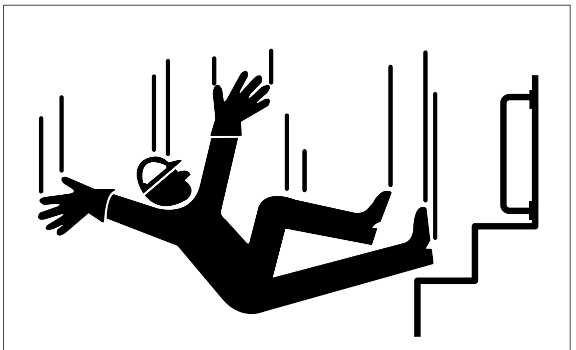
Unexpected machine movement can cause serious injury.
Before performing any work on the excavator, attach a 「**Do Not Operate**」 tag on the right side control lever.



13031GE02

USE HANDHOLDS AND STEPS

Falling is one of the major causes of personal injury.
When you get on and off the machine, always maintain a three point contact with the steps and handrails and face the machine. Do not use any controls as handholds.
Never jump on or off the machine. Never mount or dismount a moving machine.
Be careful of slippery conditions on platforms, steps, and handrails when leaving the machine.



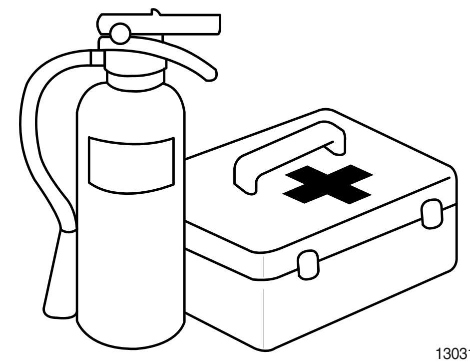
13031GE03

PREPARE FOR EMERGENCIES

Be prepared if a fire starts.

Keep a first aid kit and fire extinguisher handy.

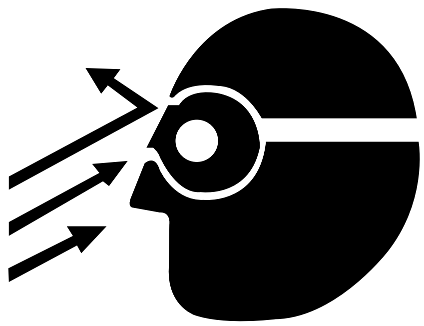
Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.



13031GE04

PROTECT AGAINST FLYING DEBRIS

Guard against injury from flying pieces of metal or debris; Wear goggles or safety glasses.



13031GE05

PROTECT AGAINST NOISE

Prolonged exposure to loud noise can cause impairment or loss of hearing.

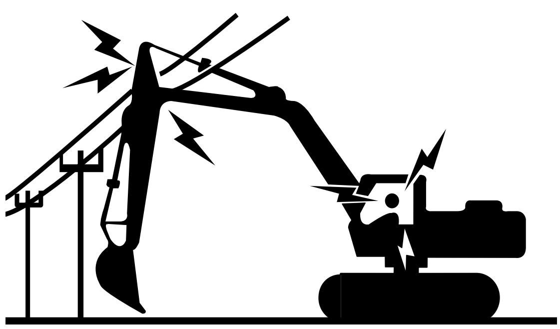
Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.

13031GE06

AVOID POWER LINES

Serious injury or death can result from contact with electric lines.

Never move any part of the machine or load closer to electric line than 3m(10ft) plus twice the line insulator length.

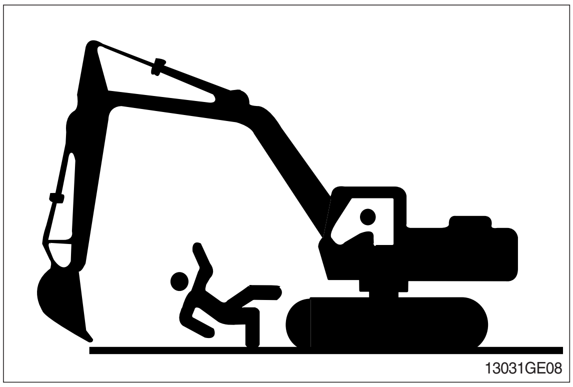


13031GE07

KEEP RIDERS OFF EXCAVATOR

Only allow the operator on the excavator.
Keep riders off.

Riders on excavator are subject to injury such as being struck by foreign objects and being thrown off the excavator. Riders also obstruct the operator's view resulting in the excavator being operated in an unsafe manner.

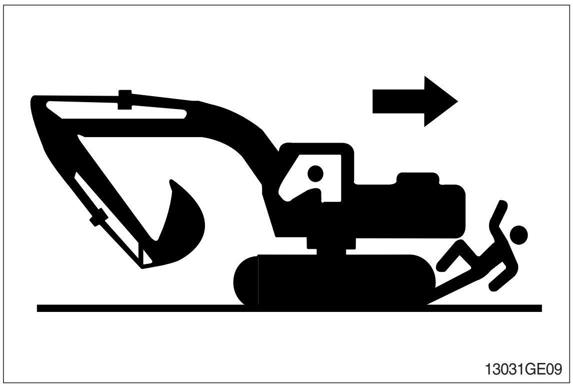


MOVE AND OPERATE MACHINE SAFELY

Bystanders can be run over. Know the location of bystanders before moving, swinging, or operating the machine.

Always keep the travel alarm in working condition. It warns people when the excavator starts to move.

Use a signal person when moving, swinging, or operating the machine in congested areas. Coordinate hand signals before starting the excavator.



OPERATE ONLY FORM OPERATOR'S SEAT

Avoid possible injury machine damage. Do not start engine by shorting across starter terminals.

NEVER start engine while standing on ground. Start engine only from operator's seat.

PARK MACHINE SAFELY

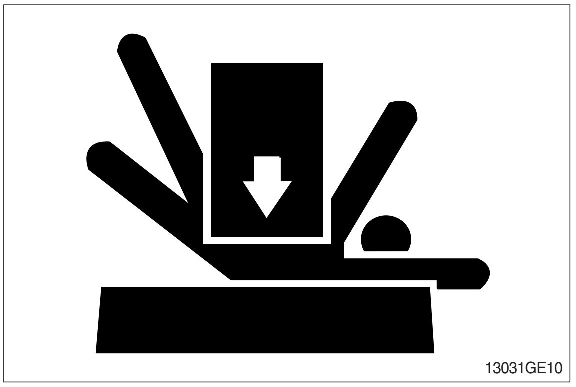
Before working on the machine:

· Park machine on a level surface.
· Lower bucket to the ground.
· Turn auto idle switch off.
· Run engine at 1/2 speed without load for 2 minutes.
· Turn key switch to OFF to stop engine.
  Remove key from switch.
· Move pilot control shutoff lever to locked position.
· Allow engine to cool.

SUPPORT MACHINE PROPERLY

Always lower the attachment or implement to the ground before you work on the machine. If you must work on a lifted machine or attachment, securely support the machine or attachment.

Do not support the machine on cinder blocks, hollow tiles, or props that may crumble under continuous load.
Do not work under a machine that is supported solely by a jack.Follow recommended procedures in this manual.

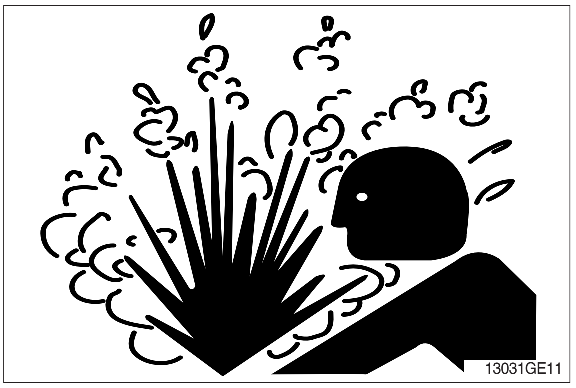


13031GE10

SERVICE COOLING SYSTEM SAFELY

Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove filler cap when cool enough to touch with bare hands.



13031GE11

HANDLE FLUIDS SAFELY-AVOID FIRES

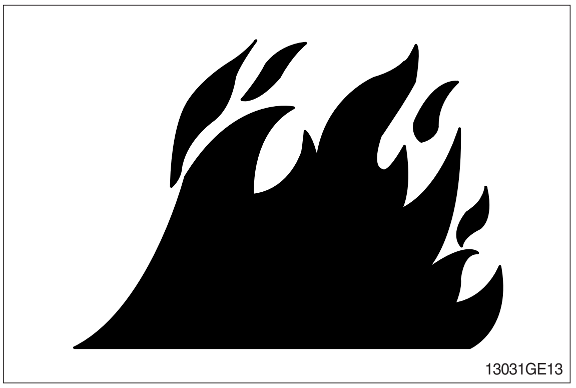
Handle fuel with care; It is highly flammable. Do not refuel the machine while smoking or when near open flame or sparks.
Always stop engine before refueling machine.
Fill fuel tank outdoors.

13031GE12

Store flammable fluids away from fire hazards. Do not incinerate or puncture pressurized containers.

Make sure machine is clean of trash, grease, and debris.

Do not store oily rags; They can ignite and burn spontaneously.

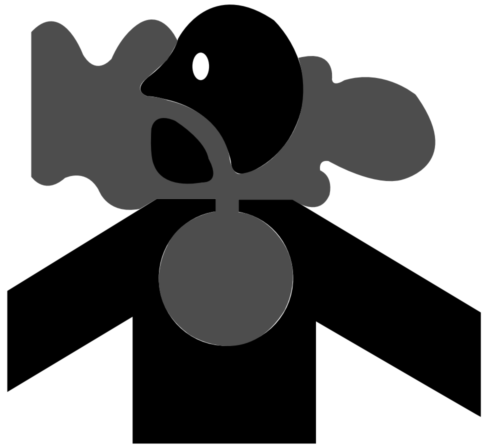


13031GE13

BEWARE OF EXHAUST FUMES

Prevent asphyxiation. Engine exhaust fumes can cause sickness or death.

If you must operate in a building, be positive there is adequate ventilation. Either use an exhaust pipe extension to remove the exhaust fumes or open doors and windows to bring enough outside air into the area.



13031GE14

REMOVE PAINT BEFORE WELDING OR HEATING

Avoid potentially toxic fumes and dust.

Hazardous fumes can be generated when paint is heated by welding, soldering, or using a torch.

Do all work outside or in a well ventilated area. Dispose of paint and solvent properly.

Remove paint before welding or heating:

- · If you sand or grind paint, avoid breathing the dust. Wear an approved respirator.
- · If you use solvent or paint stripper, remove stripper with soap and water before welding. Remove solvent or paint stripper containers and other flammable material from area. Allow fumes to disperse at least 15 minutes before welding or heating.

ILLUMINATE WORK AREA SAFELY

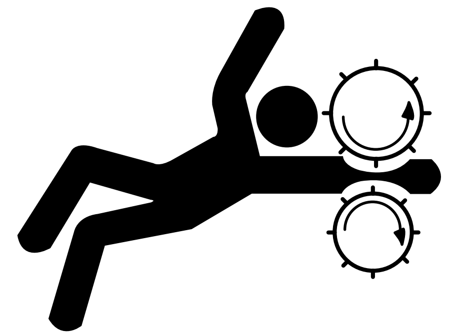
Illuminate your work area adequately but safely. Use a portable safety light for working inside or under the machine. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.

13031GE15

SERVICE MACHINE SAFELY

Tie long hair behind your head. Do not wear a necktie, scarf, loose clothing or necklace when you work near machine tools or moving parts. If these items were to get caught, severe injury could result.

Remove rings and other jewelry to prevent electrical shorts and entanglement in moving parts.

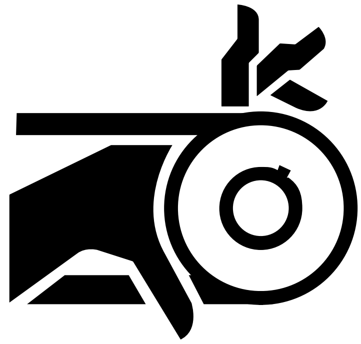


13031GE16

STAY CLEAR OF MOVING PARTS

Entanglements in moving parts can cause serious injury.

To prevent accidents, use care when working around rotating parts.



13031GE17

AVOID HIGH PRESSURE FLUIDS

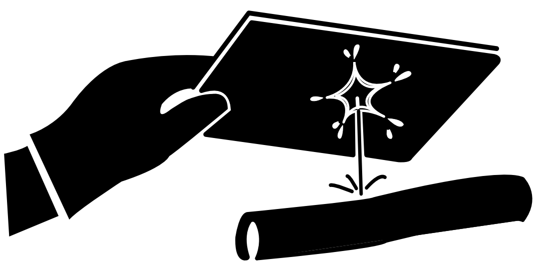
Escaping fluid under pressure can penetrate the skin causing serious injury.

Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure.

Search for leaks with a piece of cardboard. Protect hands and body from high pressure fluids.

If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result.

13031GE18



13031GE19

AVOID HEATING NEAR PRESSURIZED FLUID LINES

Flammable spray can be generated by heating near pressurized fluid lines, resulting in severe burns to yourself and bystanders. Do not heat by welding, soldering, or using a torch near pressurized fluid lines or other flammable materials.

Pressurized lines can be accidentally cut when heat goes beyond the immediate flame area. Install fire resisting guards to protect hoses or other materials.

13031GE20

PREVENT BATTERY EXPLOSIONS

Keep sparks, lighted matches, and flame away from the top of battery. Battery gas can explode.

Never check battery charge by placing a metal object across the posts. Use a volt-meter or hydrometer.

Do not charge a frozen battery; It may explode. Warm battery to 16°C (60°F).

13031GE21

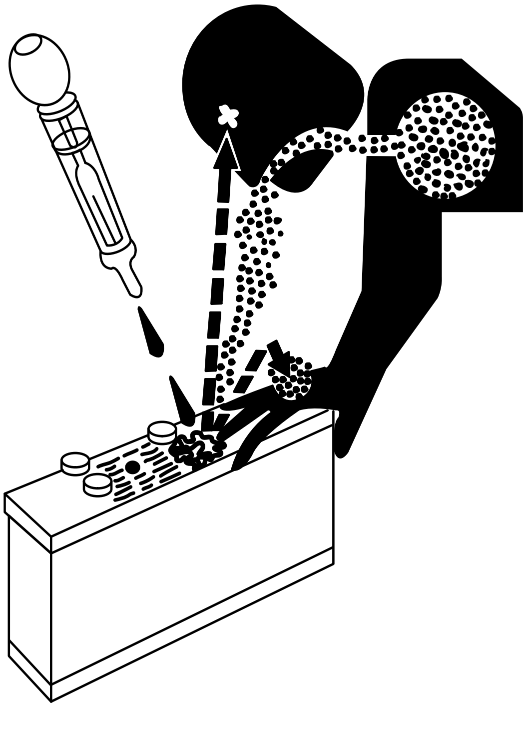
PREVENT ACID BURNS

Sulfuric acid in battery electrolyte is poisonous.
It is strong enough to burn skin, eat holes in clothing, and cause blindness if splashed into eyes.

Avoid the hazard by:
1. Filling batteries in a well-ventilated area.
2. Wearing eye protection and rubber gloves.
3. Avoiding breathing fumes when electrolyte is added.
4. Avoiding spilling of dripping electrolyte.
5. Use proper jump start procedure.

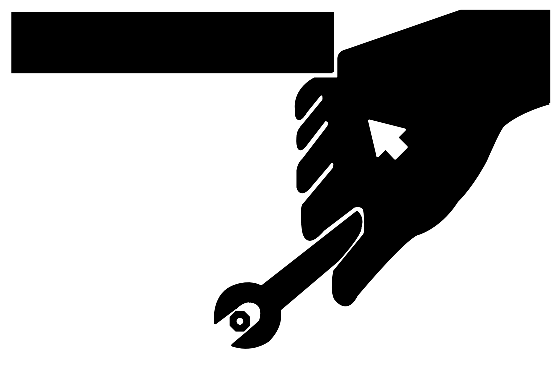
If you spill acid on yourself:
1. Flush your skin with water.
2. Apply baking soda or lime to help neutralize the acid.
3. Flush your eyes with water for 10-15 minutes. Get medical attention immediately.

If acid is swallowed:
1. Drink large amounts of water or milk.
2. Then drink milk of magnesia, beaten eggs, or vegetable oil.
3. Get medical attention immediately.



13031GE22

USE TOOLS PROPERLY


13031GE23

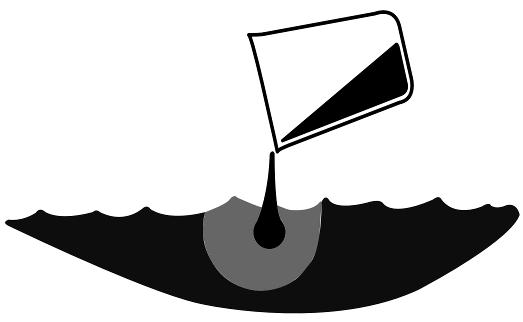
Use tools appropriate to the work.
Makeshift tools, parts, and procedures can create safety hazards.

Use power tools only to loosen threaded tools and fasteners.

For loosening and tightening hardware, use the correct size tools.
DO NOT use U.S. measurement tools on metric fasteners. Avoid bodily injury caused by slipping wrenches.

Use only recommended replacement parts. (See Parts manual)

DISPOSE OF FLUIDS PROPERLY

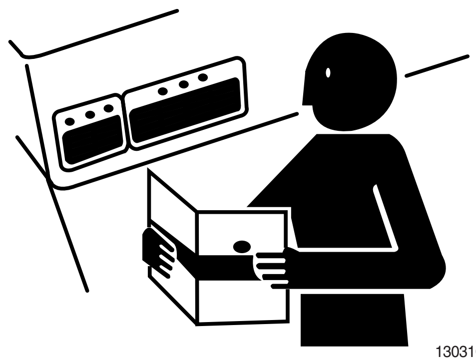

13031GE24

Improperly disposing of fluids can harm the environment and ecology. Before draining any fluids, find out the proper way to dispose of waste from your local environmental agency.

Use proper containers when draining fluids.
Do not use food or beverage containers that may mislead someone into drinking from them.

DO NOT pour oil into the ground, down a drain, or into a stream, pond, or lake. Observe relevant environmental protection regulations when disposing of oil, fuel, coolant, brake fluid, filters, batteries, and other harmful waste.

REPLACE SAFETY SIGNS


13031GE25

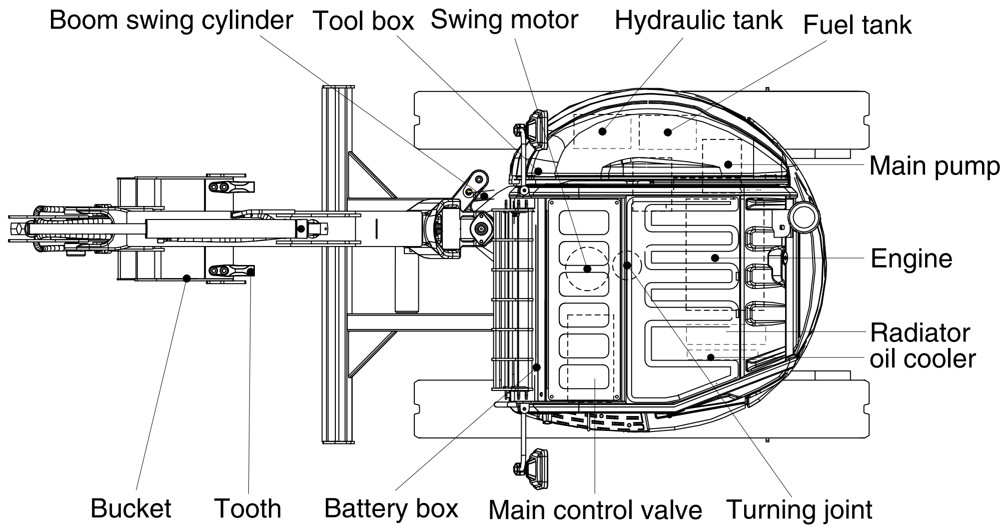
Replace missing or damaged safety signs. See the machine operator's manual for correct safety sign placement.

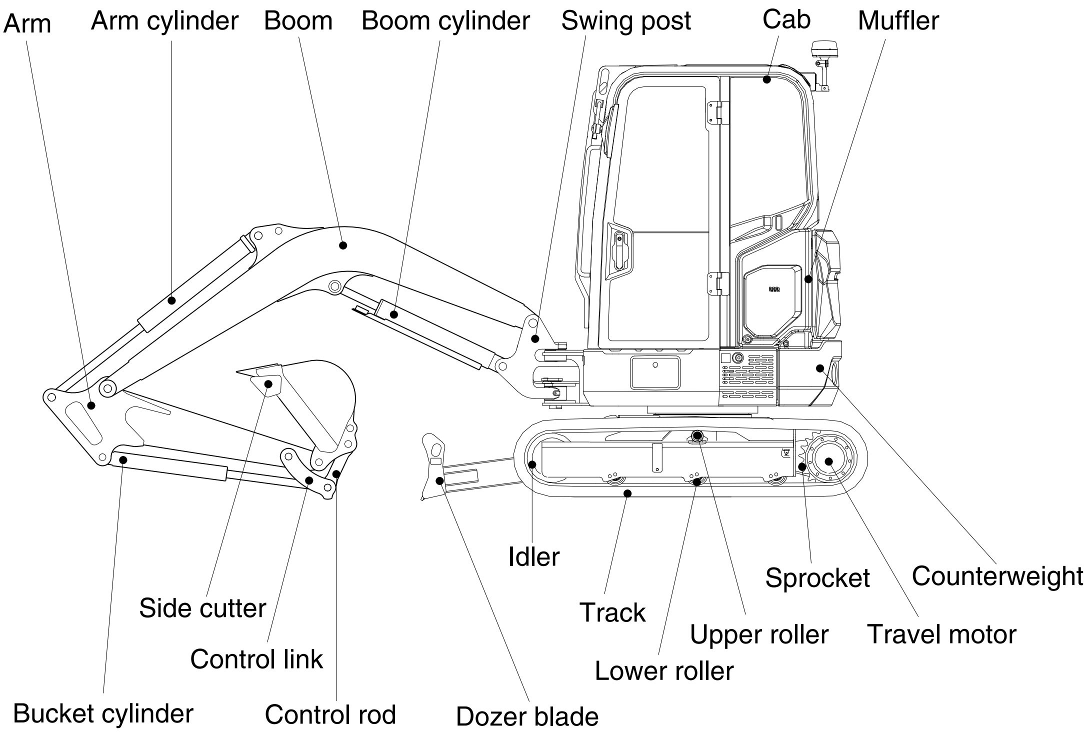
LIVE WITH SAFETY

Before returning machine to customer, make sure machine is functioning properly, especially the safety systems.
Install all guards and shields.

GROUP 2 SPECIFICATIONS

1. MAJOR COMPONENT

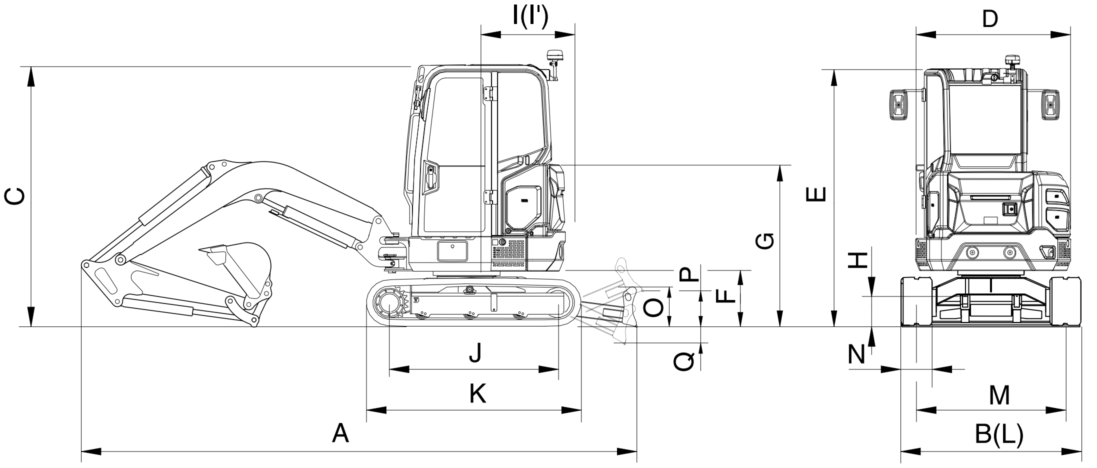




25AZ2SP01

2. SPECIFICATIONS

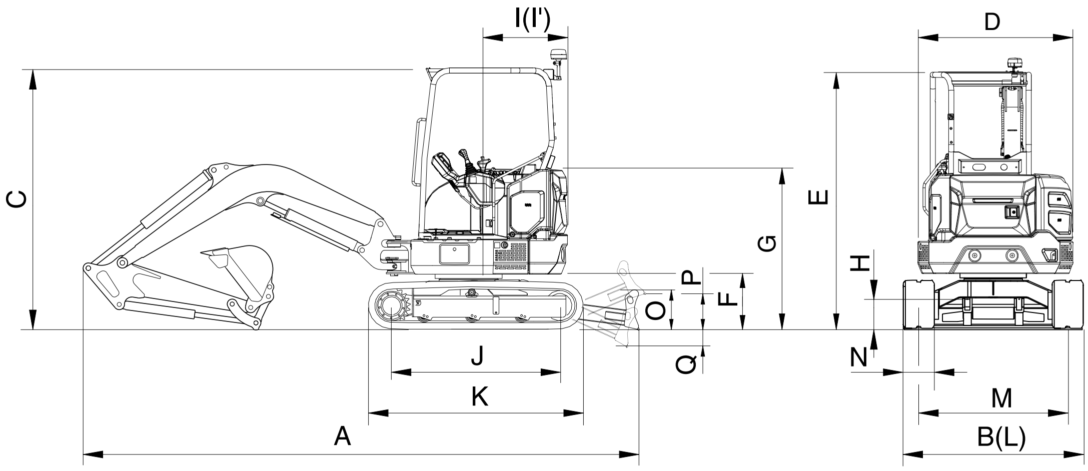
1) 2.03 m (6' 8") mono boom, 1.12 m (3' 8") arm, 130 kg CWT, with cab



25AZ2SP02

Description		Unit	Specification
Operating weight		kg (lb)	2675 (5900)
Bucket capacity (SAE heaped), standard		m^3 (yd^3)	0.07 (0.10)
Overall length	A	mm (ft-in)	4150 (13' 7")
Overall width	B		1534 (5' 0")
Overall width (dozer blade)	B'		1550 (5' 1")
Overall height	C		2452 (8' 1")
Overall width of upperstructure	D		1490 (4' 11")
Overall height of cab	E		2452 (8' 1")
Ground clearance of counterweight	F		504 (1' 8")
Overall height of engine hood	G		1500 (4' 11")
Minimum ground clearance	H		183 (0' 7")
Rear-end distance	I		775 (2' 7")
Rear-end swing radius	I'		775 (2' 7")
Distance between tumblers	J		1550 (5' 1")
Undercarriage length (without grouser)	K		1975 (6' 6")
Undercarriage width	L		1534 (5' 0")
Track gauge	M		1250 (4' 1")
Track shoe width, standard	N		250 (0' 10")
Height of blade	O		300 (1' 0")
Ground clearance of blade up	P		328 (1' 1")
Depth of blade down	Q		348 (1' 2")
Travel speed (low/high)		km/hr (mph)	2.38/4.35 (1.48/2.70)
Swing speed		rpm	9.16
Gradeability		Degree (%)	35 (70)
Ground pressure 250 mm		kgf/cm^2 (psi)	0.32 (4.48)
Max traction force		kg (lb)	2266 (5000)

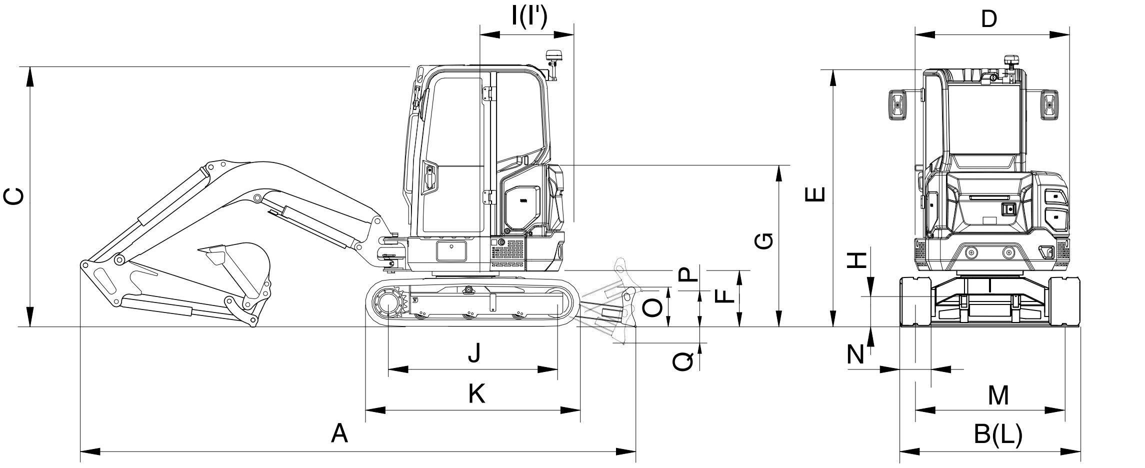
2) 2.03 m (6' 8") mono boom, 1.12 m (3' 8") arm, 130 kg CWT, with canopy



25AZ2SP03

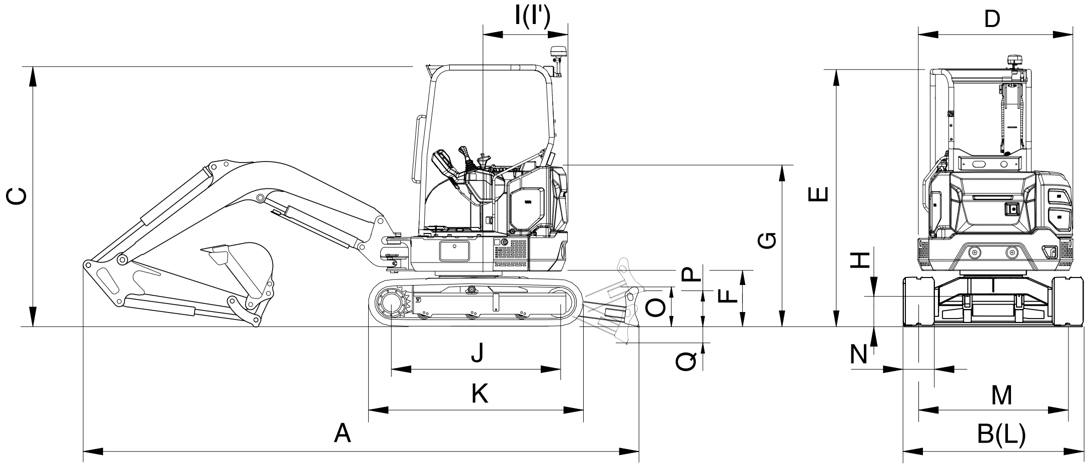
Description		Unit	Specification
Operating weight		kg (lb)	2540 (5600)
Bucket capacity (SAE heaped), standard		m^3 (yd^3)	0.07 (0.10)
Overall length	A	mm (ft-in)	4150 (13' 7")
Overall width	B		1534 (5' 0")
Overall width (dozer blade)	B'		1550 (5' 1")
Overall height	C		2452 (8' 1")
Overall width of upperstructure	D		1490 (4' 11")
Overall height of canopy	E		2452 (8' 1")
Ground clearance of counterweight	F		504 (1' 8")
Overall height of engine hood	G		1500 (4' 11")
Minimum ground clearance	H		183 (0' 7")
Rear-end distance	I		775 (2' 7")
Rear-end swing radius	I'		775 (2' 7")
Distance between tumblers	J		1550 (5' 1")
Undercarriage length (without grouser)	K		1975 (6' 6")
Undercarriage width	L		1534 (5' 0")
Track gauge	M		1250 (0' 10")
Track shoe width, standard	N		250 (1' 0")
Height of blade	O		300 (1' 0")
Ground clearance of blade up	P		328 (1' 1")
Depth of blade down	Q		348 (1' 2")
Travel speed (low/high)		km/hr (mph)	2.38/4.35 (1.48/2.70)
Swing speed		rpm	9.16
Gradeability		Degree (%)	35 (70)
Ground pressure 250 mm		kgf/cm^2 (psi)	0.30 (4.03)
Max traction force		kg (lb)	2266 (5000)

3) 2.03 m (6' 8") mono boom, 1.3 m (4' 3") long arm, 270 kg CWT, with cab



Description		Unit	Specification
Operating weight		kg (lb)	2825 (6230)
Bucket capacity (SAE heaped), standard		m^3 (yd^3)	0.07 (0.10)
Overall length	A	mm (ft-in)	4170 (13' 8")
Overall width	B		1534 (5' 0")
Overall width (dozer blade)	B'		1550 (5' 1")
Overall height	C		2452 (8' 1")
Overall width of upperstructure	D		1490 (4' 11")
Overall height of cab	E		2452 (8' 1")
Ground clearance of counterweight	F		504 (1' 8")
Overall height of engine hood	G		1500 (4' 11")
Minimum ground clearance	H		183 (0' 7")
Rear-end distance	I		875 (2' 10")
Rear-end swing radius	I'		875 (2' 10")
Distance between tumblers	J		1550 (5' 1")
Undercarriage length (without grouser)	K		1975 (6' 6")
Undercarriage width	L		1534 (5' 0")
Track gauge	M		1250 (4' 1")
Track shoe width, standard	N		250 (0' 10")
Height of blade	O		300 (1' 0")
Ground clearance of blade up	P		328 (1' 1")
Depth of blade down	Q		348 (1' 2")
Travel speed (low/high)		km/hr (mph)	2.38/4.35 (1.48/2.70)
Swing speed		rpm	9.16
Gradeability		Degree (%)	35 (70)
Ground pressure 300 mm		kgf/cm^2 (psi)	0.33 (4.74)
Max traction force		kg (lb)	2266 (5000)

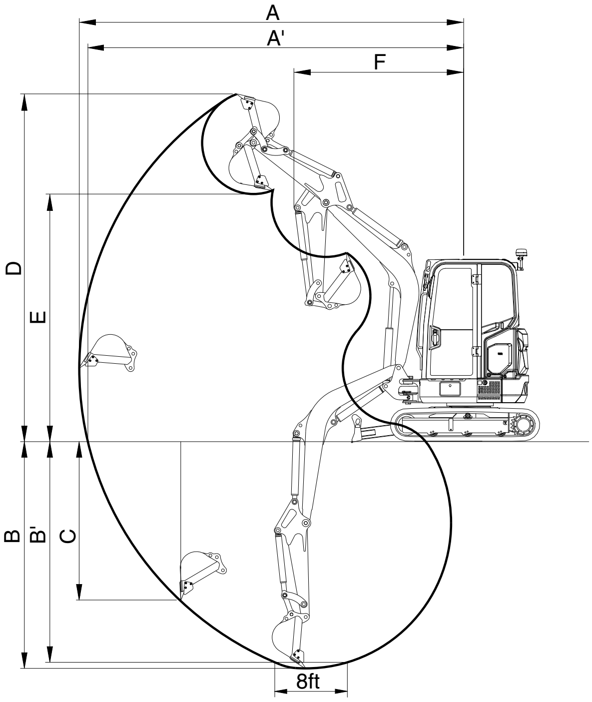
4) 2.03 m (6' 8") mono boom, 1.3 m (4' 3") long arm, 270 kg CWT, with canopy



Description		Unit	Specification
Operating weight		kg (lb)	2690 (5930)
Bucket capacity (SAE heaped), standard		m^3 (yd^3)	0.07 (0.10)
Overall length	A	mm (ft-in)	4170 (13' 8")
Overall width	B		1534 (5' 0")
Overall width (dozer blade)	B'		1550 (5' 1")
Overall height	C		2452 (8' 1")
Overall width of upperstructure	D		1490 (4' 11")
Overall height of canopy	E		2452 (8' 1")
Ground clearance of counterweight	F		504 (1' 8")
Overall height of engine hood	G		1500 (4' 11")
Minimum ground clearance	H		183 (0' 7")
Rear-end distance	I		875 (2' 10")
Rear-end swing radius	I'		875 (2' 10")
Distance between tumblers	J		1550 (5' 1")
Undercarriage length (without grouser)	K		1975 (6' 6")
Undercarriage width	L		1534 (5' 0")
Track gauge	M		1250 (4' 1")
Track shoe width, standard	N		250 (0' 10")
Height of blade	O		300 (1' 0")
Ground clearance of blade up	P		328 (1' 1")
Depth of blade down	Q		348 (1' 2")
Travel speed (low/high)		km/hr (mph)	2.38/4.35 (1.48/2.70)
Swing speed		rpm	9.16
Gradeability		Degree (%)	35 (70)
Ground pressure 300 mm		kgf/cm^2 (psi)	0.32 (4.51)
Max traction force		kg (lb)	2266 (5000)

3. WORKING RANGE

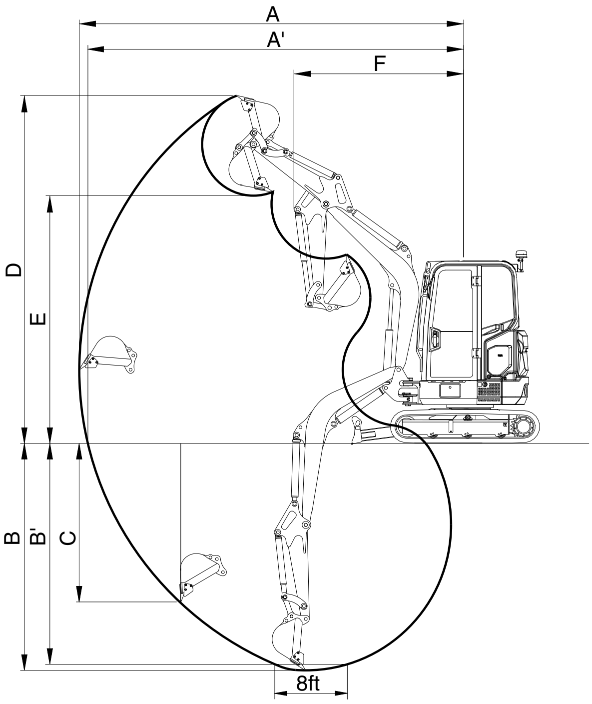
1) 2.03 m (6' 8") mono boom, 1.12 m (3' 8") arm, with cab and canopy



25AZ2SP10

Description		1.12 m (3' 8") Arm
Max digging reach	A	4560 mm (15' 0")
Max digging reach on ground	A'	4420 mm (14' 6")
Max digging depth	B	2515 mm (8' 3")
Max digging depth (8 ft level)	B'	1970 mm (6' 6")
Max vertical wall digging depth	C	2000 mm (6' 7")
Max digging height	D	4175 mm (13' 8")
Max dumping height	E	2870 mm (9' 5")
Min swing radius	F	2050 mm (6' 9")
Boom swing radius (left/right)		70°/50°
Bucket digging force	SAE	18 kN
		1859 kgf
		4097 lbf
	ISO	20 kN
		2079 kgf
		4584 lbf
Arm crowd force	SAE	14 kN
		1397 kgf
		3079 lbf
	ISO	14 kN
		1451 kgf
		3199 lbf

2) 2.03 m (6' 8") mono boom, 1.3 m (4' 3") long arm, with cab and canopy



25AZ2SP10

Description		1.3 m (4' 3") Long arm
Max digging reach	A	4725 mm (15' 6")
Max digging reach on ground	A'	4600 mm (15' 1")
Max digging depth	B	2695 mm (8' 10")
Max digging depth (8 ft level)	B'	2000 mm (6' 7")
Max vertical wall digging depth	C	2230 mm (7' 4")
Max digging height	D	4290 mm (14' 1")
Max dumping height	E	2975 mm (9' 9")
Min swing radius	F	2100 mm (6' 11")
Boom swing radius (left/right)		70°/50°
Bucket digging force	SAE	18 kN
		1859 kgf
		4097 lbf
	ISO	20 kN
		2079 kgf
		4584 lbf
Arm crowd force	SAE	12 kN
		1267 kgf
		2794 lbf
	ISO	13 kN
		1313 kgf
		2894 lbf

4. WEIGHT

Item	kg	lb
Upperstructure assembly		
· Main frame weld assembly	366	807
· Engine assembly (including DPF)	95	209
· Main pump assembly	19	42
· Main control valve assembly	25	55
· Swing motor assembly	34	75
· Hydraulic oil tank wa	41	90
· Fuel tank wa	5	11
· Counterweight	130	287
· Counterweight (add type)	270	595
· Cab assembly	234	516
Lower chassis assembly		
· Track frame weld assembly	254	560
· Dozer blade assembly	95	209
· Swing bearing	47	104
· Travel motor assembly (2EA)	72	159
· Turning joint	11	24
· Sprocket (2EA)	14	31
· Track recoil spring (2EA)	22	48
· Idler (2EA)	44	97
· Upper roller (2EA)	5	10
· Lower roller (6EA)	41	90
· Track-chain assembly-250 mm rubber, (2EA)	220	485
Front attachment assembly		
· Boom assembly	101	222
· Arm assembly-1.12 m	46	101
· Arm assembly-1.3 m	52	115
· Arm assembly-1.12 m thumb bracket	49	107
· Arm assembly-1.3 m thumb bracket	55	120
· Bucket assembly	55	120
· Boom cylinder assembly	29	63
· Arm cylinder assembly	26	57
· Bucket cylinder assembly	15	32
· Dozer cylinder assembly	21	46
· Boom swing cylinder	19	42
· Bucket control linkage total	23	51

※ This information is different with operating weight and transportation weight because it is not including harness, pipe, oil, fuel so on.

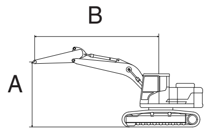
※ Refer to transportation for actual weight information and specifications for operating weight.

5. LIFTING CAPACITIES

1) Rubber track 250 mm, cab type

Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX27AZ	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2030	1120	130	250	-	Up	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)												At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		Capacity		Reach
		Over-front	Over-side	Over-front	Over-side	Over-front	Over-side	Over-front	Over-side	Over-front	Over-side	Over-front	Over-side	Over-front	Over-side	m (ft)
3.5 m	kg													720	560	2.57
(11.5 ft)	lb													1590	1230	(8.4)
3.0 m	kg									550	430			510	400	3.13
(9.8 ft)	lb									1210	950			1120	880	(10.3)
2.5 m	kg									550	430			420	330	3.49
(8.2 ft)	lb									1210	950			930	730	(11.4)
2.0m	kg							740	570	540	420	420	330	380	290	3.72
(6.6 ft)	lb							1630	1260	1190	930	930	730	840	640	(12.2)
1.5m	kg							710	540	530	410	410	320	350	270	3.85
(4.9 ft)	lb							1570	1190	1170	900	900	710	770	600	(12.6)
1.0m	kg							680	520	510	390	400	310	340	260	3.89
(3.3 ft)	lb							1500	1150	1120	860	880	680	750	570	(12.8)
0.5m	kg							660	500	500	380	400	300	340	260	3.85
(1.6 ft)	lb							1460	1100	1100	840	880	660	750	570	(12.6)
0.0m	kg					930	680	650	490	490	370	390	300	360	280	3.72
(0.0 ft)	lb					2050	1500	1430	1080	1080	820	860	660	790	620	(12.2)
-0.5m	kg	*1190	*1190	*1420	1130	930	680	640	480	490	370			390	300	3.50
(-1.6 ft)	lb	*2620	*2620	*3130	2,490	2050	1500	1410	1060	1080	820			860	660	(11.5)
-1.0m	kg	*1750	*1750	1670	1150	940	690	650	490	490	380			460	350	3.14
(-3.3 ft)	lb	*3860	*3860	3680	2540	2070	1520	1430	1080	1080	840			1010	770	(10.3)
-1.5m	kg			1700	1170	960	710	660	500					630	480	2.59
(-4.9 ft)	lb			3750	2580	2120	1570	1460	1100					1390	1060	(8.5)

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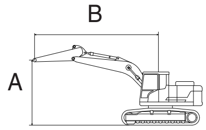
Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX27AZ	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2030	1120	130	250	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)												At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		Capacity		Reach
																m (ft)
3.5 m	kg													*740	600	2.57
(11.5 ft)	lb													*1630	1320	(8.4)
3.0 m	kg									*690	470			*710	430	3.13
(9.8 ft)	lb									*1520	1040			*1570	950	(10.3)
2.5 m	kg									*680	470			*670	360	3.49
(8.2 ft)	lb									*1500	1040			*1480	790	(11.4)
2.0m	kg							*810	610	*750	460	*720	350	*660	320	3.72
(6.6 ft)	lb							*1790	1340	*1650	1010	*1590	770	*1460	710	(12.2)
1.5m	kg							*1020	590	*850	440	*760	350	*670	300	3.85
(4.9 ft)	lb							*2250	1300	*1870	970	*1680	770	*1480	660	(12.6)
1.0m	kg							*1240	560	*960	430	*820	340	*710	290	3.89
(3.3 ft)	lb							*2730	1230	*2120	950	*1810	750	*1570	640	(12.8)
0.5m	kg							*1390	540	*1050	410	*860	330	*770	290	3.85
(1.6 ft)	lb							*3060	1190	*2310	900	*1900	730	*1700	640	(12.6)
0.0m	kg					*1590	750	*1440	530	*1090	410	*880	330	*800	300	3.72
(0.0 ft)	lb					*3510	1650	*3170	1170	*2400	900	*1940	730	*1760	660	(12.2)
-0.5m	kg	*1190	*1190	*1420	1260	*1930	750	*1400	530	*1070	400			*820	330	3.50
(-1.6 ft)	lb	*2620	*2620	*3130	2780	*4250	1650	*3090	1170	*2360	880			*1810	730	(11.5)
-1.0m	kg	*1750	*1750	*2170	1270	*1690	760	*1250	530	*930	410			*840	380	3.14
(-3.3 ft)	lb	*3860	*3860	*4780	2800	*3730	1680	*2760	1170	*2050	900			*1850	840	(10.3)
-1.5m	kg			*1810	1300	*1270	770	*900	550					*830	520	2.59
(-4.9 ft)	lb			*3990	2870	*2800	1700	*1980	1210					*1830	1150	(8.5)

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Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX27AZ	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2030	1120	270	250	-	Up	-	-	-

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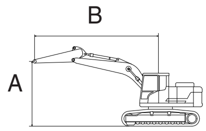

Load point height (A)		Load radius (B)												At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		Capacity		Reach
																m (ft)
3.5 m	kg													*740	640	2.57
(11.5 ft)	lb													*1630	1410	(8.4)
3.0 m	kg									630	500			580	460	3.13
(9.8 ft)	lb									1390	1100			1280	1010	(10.3)
2.5 m	kg									630	500			490	390	3.49
(8.2 ft)	lb									1390	1100			1080	860	(11.4)
2.0m	kg							*810	650	620	490	480	380	440	340	3.72
(6.6 ft)	lb							*1790	1430	1370	1080	1060	840	970	750	(12.2)
1.5m	kg							810	630	600	470	470	370	410	320	3.85
(4.9 ft)	lb							1790	1390	1320	1040	1040	820	900	710	(12.6)
1.0m	kg							780	600	590	460	470	370	400	310	3.89
(3.3 ft)	lb							1720	1320	1300	1010	1040	820	880	680	(12.8)
0.5m	kg							750	580	570	450	460	360	400	310	3.85
(1.6 ft)	lb							1650	1280	1260	990	1010	790	880	680	(12.6)
0.0m	kg					1070	790	740	570	570	440	450	350	420	320	3.72
(0.0 ft)	lb					2360	1740	1630	1260	1260	970	990	770	930	710	(12.2)
-0.5m	kg	*1190	*1190	*1420	1320	1070	800	740	570	560	440			450	350	3.50
(-1.6 ft)	lb	*2620	*2620	*3130	2910	2360	1760	1630	1260	1230	970			990	770	(11.5)
-1.0m	kg	*1750	*1750	1900	1330	1080	800	750	570	570	440			530	410	3.14
(-3.3 ft)	lb	*3860	*3860	4190	2930	2380	1760	1650	1260	1260	970			1170	900	(10.3)
-1.5m	kg			*1810	1350	1100	820	760	580					720	560	2.59
(-4.9 ft)	lb			*3990	2980	2430	1810	1680	1280					1590	1230	(8.5)

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Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX27AZ	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2030	1120	270	250	-	Down	-	-	-

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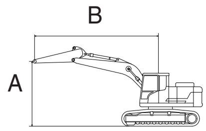

Load point height (A)		Load radius (B)												At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		Capacity		Reach
																m (ft)
3.5 m	kg													*740	680	2.57
(11.5 ft)	lb													*1630	1500	(8.4)
3.0 m	kg									*690	530			*710	500	3.13
(9.8 ft)	lb									*1520	1170			*1570	1100	(10.3)
2.5 m	kg									*680	530			*670	410	3.49
(8.2 ft)	lb									*1500	1170			*1480	900	(11.4)
2.0m	kg							*810	700	*750	520	*720	410	*660	370	3.72
(6.6 ft)	lb							*1790	1540	*1650	1150	*1590	900	*1460	820	(12.2)
1.5m	kg							*1020	670	*850	510	*760	400	*670	350	3.85
(4.9 ft)	lb							*2250	1480	*1870	1120	*1680	880	*1480	770	(12.6)
1.0m	kg							*1240	650	*960	490	*820	390	*710	330	3.89
(3.3 ft)	lb							*2730	1430	*2120	1080	*1810	860	*1570	730	(12.8)
0.5m	kg							*1390	630	*1050	480	*860	390	*770	340	3.85
(1.6 ft)	lb							*3060	1390	*2310	1060	*1900	860	*1700	750	(12.6)
0.0m	kg					*1590	860	*1440	610	*1090	470	*880	380	*800	350	3.72
(0.0 ft)	lb					*3510	1900	*3170	1340	*2400	1040	*1940	840	*1760	770	(12.2)
-0.5m	kg	*1190	*1190	*1420	*1420	*1930	870	*1400	610	*1070	470			*820	380	3.50
(-1.6 ft)	lb	*2620	*2620	*3130	*3130	*4250	1920	*3090	1340	*2360	1040			*1810	840	(11.5)
-1.0m	kg	*1750	*1750	*2170	1460	*1690	870	*1250	620	*930	480			*840	450	3.14
(-3.3 ft)	lb	*3860	*3860	*4780	3220	*3730	1920	*2760	1370	*2050	1060			*1850	990	(10.3)
-1.5m	kg			*1810	1490	*1270	890	*900	630					*830	600	2.59
(-4.9 ft)	lb			*3990	3280	*2800	1960	*1980	1390					*1830	1320	(8.5)

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Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX27AZ	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2030	1300	130	250	-	Up	-	-	-

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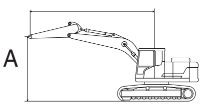

Load point height (A)		Load radius (B) 1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		4.0 m (13.1 ft)		At max. reach Capacity		Reach m (ft)
3.5 m	kg															610	470	2.85
(11.5 ft)	lb															1340	1040	(9.4)
3.0 m	kg									560	440					460	360	3.35
(9.8 ft)	lb									1230	970					1010	790	(11.0)
2.5 m	kg									560	440	430	340			390	310	3.68
(8.2 ft)	lb									1230	970	950	750			860	680	(12.1)
2.0m	kg									550	430	420	330			350	270	3.89
(6.6 ft)	lb									1210	950	930	730			770	600	(12.8)
1.5m	kg					1050	790	720	550	530	410	420	320	330	260	330	260	4.02
(4.9 ft)	lb					2310	1740	1590	1210	1170	900	930	710	730	570	730	570	(13.2)
1.0m	kg							690	520	520	400	410	310	330	250	320	250	4.06
(3.3 ft)	lb							1520	1150	1150	880	900	680	730	550	710	550	(13.3)
0.5m	kg					940	690	660	500	500	380	400	310	320	250	320	250	4.02
(1.6 ft)	lb					2070	1520	1460	1100	1100	840	880	680	710	550	710	550	(13.2)
0.0m	kg					930	680	650	490	490	370	390	300			330	260	3.90
(0.0 ft)	lb					2050	1500	1430	1080	1080	820	860	660			730	570	(12.8)
-0.5m	kg	*1040	*1040	*1280	1120	930	680	640	480	490	370	390	300			360	280	3.69
(-1.6 ft)	lb	*2290	*2290	*2820	2470	2050	1500	1410	1060	1080	820	860	660			790	620	(12.1)
-1.0m	kg	*1500	*1500	1650	1130	930	680	640	480	490	370					420	320	3.36
(-3.3 ft)	lb	*3310	*3310	3640	2490	2050	1500	1410	1060	1080	820					930	710	(11.0)
-1.5m	kg	*2090	*2090	1680	1160	950	700	650	490							530	410	2.87
(-4.9 ft)	lb	*4610	*4610	3700	2560	2090	1540	1430	1080							1170	900	(9.4)
-2.0m	kg					*740	730									*740	730	2.00
(-6.6 ft)	lb					*1630	1610									*1630	1610	(6.6)

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Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX27AZ	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2030	1300	130	250	-	Down	-	-	-

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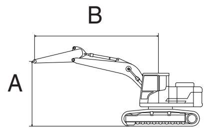

Load point height (A)		Load radius (B)														At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		4.0 m (13.1 ft)		Capacity		Reach
		Rating over-front	Rating over-side or 360 degree	Rating over-front	Rating over-side or 360 degree	Rating over-front	Rating over-side or 360 degree	Rating over-front	Rating over-side or 360 degree	Rating over-front	Rating over-side or 360 degree	Rating over-front	Rating over-side or 360 degree	Rating over-front	Rating over-side or 360 degree	Rating over-front	Rating over-side or 360 degree	m (ft)
3.5 m	kg															*670	510	2.85
(11.5 ft)	lb															*1480	1120	(9.4)
3.0 m	kg									*600	480					*600	390	3.35
(9.8 ft)	lb									*1320	1060					*1320	860	(11.0)
2.5 m	kg									*610	470	*640	360			*570	330	3.68
(8.2 ft)	lb									*1340	1040	*1410	790			*1260	730	(12.1)
2.0m	kg									*680	460	*670	360			*560	300	3.89
(6.6 ft)	lb									*1500	1010	*1480	790			*1230	660	(12.8)
1.5m	kg					*1230	860	*930	600	*790	450	*720	350	*610	280	*570	280	4.02
(4.9 ft)	lb					*2710	1900	*2050	1320	*1740	990	*1590	770	*1340	620	*1260	620	(13.2)
1.0m	kg							*1170	570	*920	430	*790	340	*710	280	*590	270	4.06
(3.3 ft)	lb							*2580	1260	*2030	950	*1740	750	*1570	620	*1300	600	(13.3)
0.5m	kg					*1350	760	*1340	540	*1020	420	*850	330	*700	270	*640	270	4.02
(1.6 ft)	lb					*2980	1680	*2950	1190	*2250	930	*1870	730	*1540	600	*1410	600	(13.2)
0.0m	kg					*1580	740	*1430	530	*1080	410	*880	330			*720	280	3.90
(0.0 ft)	lb					*3480	1630	*3150	1170	*2380	900	*1940	730			*1590	620	(12.8)
-0.5m	kg	*1040	*1040	*1280	1240	*2000	740	*1420	520	*1080	400	*860	320			*780	300	3.69
(-1.6 ft)	lb	*2290	*2290	*2820	2730	*4410	1630	*3130	1150	*2380	880	*1900	710			*1720	660	(12.1)
-1.0m	kg	*1500	*1500	*1880	1260	*1810	750	*1310	530	*1000	400					*800	350	3.36
(-3.3 ft)	lb	*3310	*3310	*4140	2780	*3990	1650	*2890	1170	*2200	880					*1760	770	(11.0)
-1.5m	kg	*2090	*2090	*2190	1280	*1460	760	*1060	540							*810	440	2.87
(-4.9 ft)	lb	*4610	*4610	*4830	2820	*3220	1680	*2340	1190							*1790	970	(9.4)
-2.0m	kg					*740	*740									*740	*740	2.00
(-6.6 ft)	lb					*1630	*1630									*1630	*1630	(6.6)

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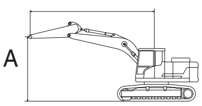
Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
		Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
HX27AZ	Cab	2030	1300	270	250	-	Up	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)														At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		4.0 m (13.1 ft)		Capacity		Reach
		over-front	over-side	over-front	over-side	over-front	over-side	over-front	over-side	over-front	over-side	over-front	over-side	over-front	over-side	over-front	over-side	m (ft)
3.5 m	kg															*670	540	2.85
(11.5 ft)	lb															*1480	1190	(9.4)
3.0 m	kg									*600	510					530	420	3.35
(9.8 ft)	lb									*1320	1120					1170	930	(11.0)
2.5 m	kg									*610	500	490	390			450	360	3.68
(8.2 ft)	lb									*1340	1100	1080	860			990	790	(12.1)
2.0m	kg									630	490	490	390			410	320	3.89
(6.6 ft)	lb									1390	1080	1080	860			900	710	(12.8)
1.5m	kg					1190	900	820	640	610	480	480	380	390	300	380	300	4.02
(4.9 ft)	lb					2620	1980	1810	1410	1340	1060	1060	840	860	660	840	660	(13.2)
1.0m	kg							780	610	590	460	470	370	380	300	370	290	4.06
(3.3 ft)	lb							1720	1340	1300	1010	1040	820	840	660	820	640	(13.3)
0.5m	kg					1080	810	760	580	580	450	460	360	380	290	370	290	4.02
(1.6 ft)	lb					2380	1790	1680	1280	1280	990	1010	790	840	640	820	640	(13.2)
0.0m	kg					1070	790	740	570	570	440	450	350			390	300	3.90
(0.0 ft)	lb					2360	1740	1630	1260	1260	970	990	770			860	660	(12.8)
-0.5m	kg	*1040	*1040	*1280	*1280	1070	790	740	560	560	430	450	350			420	330	3.69
(-1.6 ft)	lb	*2290	*2290	*2820	*2820	2360	1740	1630	1230	1230	950	990	770			930	730	(12.1)
-1.0m	kg	*1500	*1500	*1880	1320	1070	800	740	570	560	440					480	370	3.36
(-3.3 ft)	lb	*3310	*3310	*4140	2910	2360	1760	1630	1260	1230	970					1060	820	(11.0)
-1.5m	kg	*2090	*2090	1910	1340	1090	810	750	580							610	480	2.87
(-4.9 ft)	lb	*4610	*4610	4210	2950	2400	1790	1650	1280							1340	1060	(9.4)
-2.0m	kg					*740	*740									*740	*740	2.00
(-6.6 ft)	lb					*1630	*1630									*1630	*1630	(6.6)

Note 1. Lifting capacity are based on ISO 10567.
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4. *Indicates load limited by hydraulic capacity.

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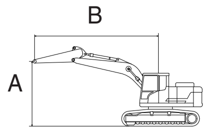
Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX27AZ	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2030	1300	270	250	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)														At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		4.0 m (13.1 ft)		Capacity		Reach
																		m (ft)
3.5 m	kg															*670	580	2.85
(11.5 ft)	lb															*1480	1280	(9.4)
3.0 m	kg									*600	540					*600	450	3.35
(9.8 ft)	lb									*1320	1190					*1320	990	(11.0)
2.5 m	kg									*610	540	*640	420			*570	380	3.68
(8.2 ft)	lb									*1340	1190	*1410	930			*1260	840	(12.1)
2.0m	kg									*680	530	*670	410			*560	340	3.89
(6.6 ft)	lb									*1500	1170	*1480	900			*1230	750	(12.8)
1.5m	kg					*1230	980	*930	680	*790	520	*720	410	*610	330	*570	320	4.02
(4.9 ft)	lb					*2710	2160	*2050	1500	*1740	1150	*1590	900	*1340	730	*1260	710	(13.2)
1.0m	kg							*1170	650	*920	500	*790	400	*710	320	*590	310	4.06
(3.3 ft)	lb							*2580	1430	*2030	1100	*1740	880	*1570	710	*1300	680	(13.3)
0.5m	kg					*1350	880	*1340	630	*1020	480	*850	390	*700	320	*640	320	4.02
(1.6 ft)	lb					*2980	1940	*2950	1390	*2250	1060	*1870	860	*1540	710	*1410	710	(13.2)
0.0m	kg					*1580	860	*1430	620	*1080	470	*880	380			*720	330	3.90
(0.0 ft)	lb					*3480	1900	*3150	1370	*2380	1040	*1940	840			*1590	730	(12.8)
-0.5m	kg	*1040	*1040	*1280	*1280	*2000	860	*1420	610	*1080	470	*860	380			*780	350	3.69
(-1.6 ft)	lb	*2290	*2290	*2820	*2820	*4410	1900	*3130	1340	*2380	1040	*1900	840			*1720	770	(12.1)
-1.0m	kg	*1500	*1500	*1880	1450	*1810	870	*1310	610	*1000	470					*800	400	3.36
(-3.3 ft)	lb	*3310	*3310	*4140	3200	*3990	1920	*2890	1340	*2200	1040					*1760	880	(11.0)
-1.5m	kg	*2090	*2090	*2190	1470	*1460	880	*1060	620							*810	510	2.87
(-4.9 ft)	lb	*4610	*4610	*4830	3240	*3220	1940	*2340	1370							*1790	1120	(9.4)
-2.0m	kg					*740	*740									*740	*740	2.00
(-6.6 ft)	lb					*1630	*1630									*1630	*1630	(6.6)

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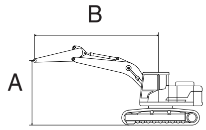
2) Rubber track 250 mm, canopy type

Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX27AZ	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2030	1120	130	250	-	Up	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)												At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		Capacity		Reach
																m (ft)
3.5 m	kg													680	530	2.57
(11.5 ft)	lb													1500	1170	(8.4)
3.0 m	kg									520	410			480	380	3.13
(9.8 ft)	lb									1150	900			1060	840	(10.3)
2.5 m	kg									520	410			400	310	3.49
(8.2 ft)	lb									1150	900			880	680	(11.4)
2.0m	kg							700	540	510	400	400	310	360	280	3.72
(6.6 ft)	lb							1540	1190	1120	880	880	680	790	620	(12.2)
1.5m	kg							670	520	500	390	390	300	330	260	3.85
(4.9 ft)	lb							1480	1150	1100	860	860	660	730	570	(12.6)
1.0m	kg							640	490	480	370	380	290	320	250	3.89
(3.3 ft)	lb							1410	1080	1060	820	840	640	710	550	(12.8)
0.5m	kg							620	470	470	360	370	290	320	250	3.85
(1.6 ft)	lb							1370	1040	1040	790	820	640	710	550	(12.6)
0.0m	kg					880	640	610	460	460	350	370	280	340	260	3.72
(0.0 ft)	lb					1940	1410	1340	1010	1010	770	820	620	750	570	(12.2)
-0.5m	kg	*1190	*1190	*1420	1070	880	640	600	460	460	350			370	280	3.50
(-1.6 ft)	lb	*2620	*2620	*3130	2360	1940	1410	1320	1010	1010	770			820	620	(11.5)
-1.0m	kg	*1750	*1750	1570	1090	890	650	610	460	460	350			430	330	3.14
(-3.3 ft)	lb	*3860	*3860	3460	2400	1960	1430	1340	1010	1010	770			950	730	(10.3)
-1.5m	kg			1600	1110	910	670	630	470					590	450	2.59
(-4.9 ft)	lb			3530	2450	2010	1480	1390	1040					1300	990	(8.5)

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Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX27AZ	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2030	1120	130	250	-	Down	-	-	-

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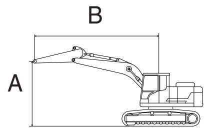

Load point height (A)		Load radius (B)												At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		Capacity		Reach
																m (ft)
3.5 m	kg													*740	570	2.57
(11.5 ft)	lb													*1630	1260	(8.4)
3.0 m	kg									*690	440			*710	410	3.13
(9.8 ft)	lb									*1520	970			*1570	900	(10.3)
2.5 m	kg									*680	440			*670	340	3.49
(8.2 ft)	lb									*1500	970			*1480	750	(11.4)
2.0m	kg							*810	580	*750	430	*720	330	*660	300	3.72
(6.6 ft)	lb							*1790	1280	*1650	950	*1590	730	*1460	660	(12.2)
1.5m	kg							*1020	560	*850	420	*760	330	*670	280	3.85
(4.9 ft)	lb							*2250	1230	*1870	930	*1680	730	*1480	620	(12.6)
1.0m	kg							*1240	530	*960	400	*820	320	*710	270	3.89
(3.3 ft)	lb							*2730	1170	*2120	880	*1810	710	*1570	600	(12.8)
0.5m	kg							*1390	510	*1050	390	*860	310	*770	270	3.85
(1.6 ft)	lb							*3060	1120	*2310	860	*1900	680	*1700	600	(12.6)
0.0m	kg					*1590	700	*1440	500	*1090	380	*880	310	*800	280	3.72
(0.0 ft)	lb					*3510	1540	*3170	1100	*2400	840	*1940	680	*1760	620	(12.2)
-0.5m	kg	*1190	*1190	*1420	1190	*1930	710	*1400	500	*1070	380			*820	310	3.50
(-1.6 ft)	lb	*2620	*2620	*3130	2620	*4250	1570	*3090	1100	*2360	840			*1810	680	(11.5)
-1.0m	kg	*1750	*1750	*2170	1200	*1690	710	*1250	500	*930	380			*840	360	3.14
(-3.3 ft)	lb	*3860	*3860	*4780	2650	*3730	1570	*2760	1100	*2050	840			*1850	790	(10.3)
-1.5m	kg			*1810	1230	*1270	730	*900	520					*830	490	2.59
(-4.9 ft)	lb			*3990	2710	*2800	1610	*1980	1150					*1830	1080	(8.5)

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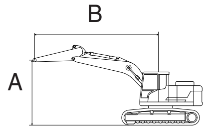
Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX27AZ	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2030	1120	270	250	-	Up	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)												At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		Capacity		Reach
																m (ft)
3.5 m	kg													*740	610	2.57
(11.5 ft)	lb													*1630	1340	(8.4)
3.0 m	kg									600	480			560	440	3.13
(9.8 ft)	lb									1320	1060			1230	970	(10.3)
2.5 m	kg									600	480			460	370	3.49
(8.2 ft)	lb									1320	1060			1010	820	(11.4)
2.0m	kg							800	620	590	470	460	360	410	330	3.72
(6.6 ft)	lb							1760	1370	1300	1040	1010	790	900	730	(12.2)
1.5m	kg							770	600	570	450	450	360	390	300	3.85
(4.9 ft)	lb							1700	1320	1260	990	990	790	860	660	(12.6)
1.0m	kg							740	570	560	440	440	350	370	300	3.89
(3.3 ft)	lb							1630	1260	1230	970	970	770	820	660	(12.8)
0.5m	kg							720	550	540	420	430	340	380	300	3.85
(1.6 ft)	lb							1590	1210	1190	930	950	750	840	660	(12.6)
0.0m	kg					1010	760	710	540	540	420	430	340	390	310	3.72
(0.0 ft)	lb					2230	1680	1570	1190	1190	930	950	750	860	680	(12.2)
-0.5m	kg	*1190	*1190	*1420	1250	1020	760	700	540	530	410			430	340	3.50
(-1.6 ft)	lb	*2620	*2620	*3130	2760	2250	1680	1540	1190	1170	900			950	750	(11.5)
-1.0m	kg	*1750	*1750	1810	1270	1020	770	710	540	540	420			500	390	3.14
(-3.3 ft)	lb	*3860	*3860	3990	2800	2250	1700	1570	1190	1190	930			1100	860	(10.3)
-1.5m	kg			*1810	1290	1040	780	720	560					690	530	2.59
(-4.9 ft)	lb			*3990	2840	2290	1720	1590	1230					1520	1170	(8.5)

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Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
HX27AZ	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2030	1120	270	250	-	Down	-	-	-

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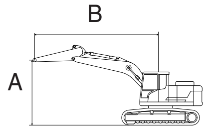

Load point height (A)		Load radius (B)												At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		Capacity		Reach
																m (ft)
3.5 m	kg													*740	660	2.57
(11.5 ft)	lb													*1630	1460	(8.4)
3.0 m	kg									*690	510			*710	470	3.13
(9.8 ft)	lb									*1520	1120			*1570	1040	(10.3)
2.5 m	kg									*680	510			*670	390	3.49
(8.2 ft)	lb									*1500	1120			*1480	860	(11.4)
2.0m	kg							*810	670	*750	500	*720	390	*660	350	3.72
(6.6 ft)	lb							*1790	1480	*1650	1100	*1590	860	*1460	770	(12.2)
1.5m	kg							*1020	640	*850	490	*760	380	*670	330	3.85
(4.9 ft)	lb							*2250	1410	*1870	1080	*1680	840	*1480	730	(12.6)
1.0m	kg							*1240	620	*960	470	*820	370	*710	320	3.89
(3.3 ft)	lb							*2730	1370	*2120	1040	*1810	820	*1570	710	(12.8)
0.5m	kg							*1390	590	*1050	460	*860	370	*770	320	3.85
(1.6 ft)	lb							*3060	1300	*2310	1010	*1900	820	*1700	710	(12.6)
0.0m	kg					*1590	820	*1440	580	*1090	450	*880	360	*800	330	3.72
(0.0 ft)	lb					*3510	1810	*3170	1280	*2400	990	*1940	790	*1760	730	(12.2)
-0.5m	kg	*1190	*1190	*1420	1380	*1930	820	*1400	580	*1070	450			*820	360	3.50
(-1.6 ft)	lb	*2620	*2620	*3130	3040	*4250	1810	*3090	1280	*2360	990			*1810	790	(11.5)
-1.0m	kg	*1750	*1750	*2170	1400	*1690	830	*1250	590	*930	450			*840	420	3.14
(-3.3 ft)	lb	*3860	*3860	*4780	3090	*3730	1830	*2760	1300	*2050	990			*1850	930	(10.3)
-1.5m	kg			*1810	1420	*1270	850	*900	600					*830	570	2.59
(-4.9 ft)	lb			*3990	3130	*2800	1870	*1980	1320					*1830	1260	(8.5)

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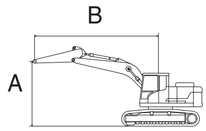
Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
		Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
HX27AZ	Canopy	2030	1300	130	250	-	Up	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)														At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		4.0 m (13.1 ft)		Capacity		Reach
																		m (ft)
3.5 m	kg															580	450	2.85
(11.5 ft)	lb															1280	990	(9.4)
3.0 m	kg									530	420					440	340	3.35
(9.8 ft)	lb									1170	930					970	750	(11.0)
2.5 m	kg									530	420	410	320			370	290	3.68
(8.2 ft)	lb									1170	930	900	710			820	640	(12.1)
2.0m	kg									520	410	400	310			330	260	3.89
(6.6 ft)	lb									1150	900	880	680			730	570	(12.8)
1.5m	kg					1000	750	680	530	500	390	390	310	310	240	310	240	4.02
(4.9 ft)	lb					2200	1650	1500	1170	1100	860	860	680	680	530	680	530	(13.2)
1.0m	kg							650	500	490	380	380	300	310	240	300	230	4.06
(3.3 ft)	lb							1430	1100	1080	840	840	660	680	530	660	510	(13.3)
0.5m	kg					890	650	620	470	470	360	370	290	300	230	300	230	4.02
(1.6 ft)	lb					1960	1430	1370	1040	1040	790	820	640	660	510	660	510	(13.2)
0.0m	kg					880	640	610	460	460	350	370	280			310	240	3.90
(0.0 ft)	lb					1940	1410	1340	1010	1010	770	820	620			680	530	(12.8)
-0.5m	kg	*1040	*1040	*1280	1060	870	640	600	450	460	350	360	280			340	260	3.69
(-1.6 ft)	lb	*2290	*2290	*2820	2340	1920	1410	1320	990	1010	770	790	620			750	570	(12.1)
-1.0m	kg	*1500	*1500	1560	1070	880	650	610	460	460	350					390	300	3.36
(-3.3 ft)	lb	*3310	*3310	3440	2360	1940	1430	1340	1010	1010	770					860	660	(11.0)
-1.5m	kg	*2090	*2090	1580	1100	890	660	620	470							500	380	2.87
(-4.9 ft)	lb	*4610	*4610	3480	2430	1960	1460	1370	1040							1100	840	(9.4)
-2.0m	kg					*740	690									*740	690	2.00
(-6.6 ft)	lb					*1630	1520									*1630	1520	(6.6)

Note 1. Lifting capacity are based on ISO 10567.
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4. *Indicates load limited by hydraulic capacity.

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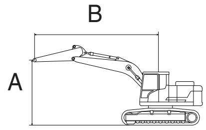
Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
		Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
HX27AZ	Canopy	2030	1300	130	250	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)														At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		4.0 m (13.1 ft)		Capacity		Reach
		Over-front	Over-side	Over-front	Over-side	Over-front	Over-side	Over-front	Over-side	Over-front	Over-side	Over-front	Over-side	Over-front	Over-side	Over-front	Over-side	m (ft)
3.5 m	kg															*670	490	2.85
(11.5 ft)	lb															*1480	1080	(9.4)
3.0 m	kg									*600	450					*600	370	3.35
(9.8 ft)	lb									*1320	990					*1320	820	(11.0)
2.5 m	kg									*610	450	*640	340			*570	310	3.68
(8.2 ft)	lb									*1340	990	*1410	750			*1260	680	(12.1)
2.0m	kg									*680	440	*670	340			*560	280	3.89
(6.6 ft)	lb									*1500	970	*1480	750			*1230	620	(12.8)
1.5m	kg					*1230	820	*930	570	*790	420	*720	330	*610	260	*570	260	4.02
(4.9 ft)	lb					*2710	1810	*2050	1260	*1740	930	*1590	730	*1340	570	*1260	570	(13.2)
1.0m	kg							*1170	540	*920	410	*790	320	*710	260	*590	250	4.06
(3.3 ft)	lb							*2580	1190	*2030	900	*1740	710	*1570	570	*1300	550	(13.3)
0.5m	kg					*1350	720	*1340	510	*1020	390	*850	310	*700	250	*640	250	4.02
(1.6 ft)	lb					*2980	1590	*2950	1120	*2250	860	*1870	680	*1540	550	*1410	550	(13.2)
0.0m	kg					*1580	700	*1430	500	*1080	380	*880	310			*720	260	3.90
(0.0 ft)	lb					*3480	1540	*3150	1100	*2380	840	*1940	680			*1590	570	(12.8)
-0.5m	kg	*1040	*1040	*1280	1180	*2000	700	*1420	490	*1080	380	*860	300			*780	280	3.69
(-1.6 ft)	lb	*2290	*2290	*2820	2600	*4410	1540	*3130	1080	*2380	840	*1900	660			*1720	620	(12.1)
-1.0m	kg	*1500	*1500	*1880	1190	*1810	710	*1310	500	*1000	380					*800	320	3.36
(-3.3 ft)	lb	*3310	*3310	*4140	2620	*3990	1570	*2890	1100	*2200	840					*1760	710	(11.0)
-1.5m	kg	*2090	*2090	*2190	1210	*1460	720	*1060	510							*810	420	2.87
(-4.9 ft)	lb	*4610	*4610	*4830	2670	*3220	1590	*2340	1120							*1790	930	(9.4)
-2.0m	kg					*740	*740									*740	*740	2.00
(-6.6 ft)	lb					*1630	*1630									*1630	*1630	(6.6)

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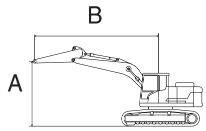
Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
		Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
HX27AZ	Canopy	2030	1300	270	250	-	Up	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)														At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		4.0 m (13.1 ft)		Capacity		Reach
																		m (ft)
3.5 m	kg															660	520	2.85
(11.5 ft)	lb															1460	1150	(9.4)
3.0 m	kg									*600	480					500	400	3.35
(9.8 ft)	lb									*1320	1060					1100	880	(11.0)
2.5 m	kg									610	480	470	370			430	340	3.68
(8.2 ft)	lb									1340	1060	1040	820			950	750	(12.1)
2.0m	kg									600	470	460	370			390	310	3.89
(6.6 ft)	lb									1320	1040	1010	820			860	680	(12.8)
1.5m	kg					1140	860	780	610	580	460	450	360	370	290	360	290	4.02
(4.9 ft)	lb					2510	1900	1720	1340	1280	1010	990	790	820	640	790	640	(13.2)
1.0m	kg							750	580	560	440	440	350	360	280	350	280	4.06
(3.3 ft)	lb							1650	1280	1230	970	970	770	790	620	770	620	(13.3)
0.5m	kg					1030	770	720	550	550	430	440	340	360	280	350	280	4.02
(1.6 ft)	lb					2270	1700	1590	1210	1210	950	970	750	790	620	770	620	(13.2)
0.0m	kg					1010	760	710	540	540	420	430	340			370	290	3.90
(0.0 ft)	lb					2230	1680	1570	1190	1190	930	950	750			820	640	(12.8)
-0.5m	kg	*1040	*1040	*1280	1240	1010	750	700	540	530	410	430	330			400	310	3.69
(-1.6 ft)	lb	*2290	*2290	*2820	2730	2230	1650	1540	1190	1170	900	950	730			880	680	(12.1)
-1.0m	kg	*1500	*1500	1790	1250	1020	760	700	540	530	410					450	360	3.36
(-3.3 ft)	lb	*3310	*3310	3950	2760	2250	1680	1540	1190	1170	900					990	790	(11.0)
-1.5m	kg	*2090	*2090	1820	1280	1030	770	710	550							580	450	2.87
(-4.9 ft)	lb	*4610	*4610	4010	2820	2270	1700	1570	1210							1280	990	(9.4)
-2.0m	kg					*740	*740									*740	*740	2.00
(-6.6 ft)	lb					*1630	*1630									*1630	*1630	(6.6)

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Model	Type	Boom	Arm	Counterweight	Rubber shoe	Wheel	Dozer		Outtriger	
		Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
HX27AZ	Canopy	2030	1300	270	250	-	Down	-	-	-

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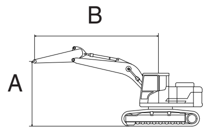

Load point height (A)		Load radius (B)														At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		4.0 m (13.1 ft)		Capacity		Reach
																		m (ft)
3.5 m	kg															*670	560	2.85
(11.5 ft)	lb															*1480	1230	(9.4)
3.0 m	kg									*600	520					*600	430	3.35
(9.8 ft)	lb									*1320	1150					*1320	950	(11.0)
2.5 m	kg									*610	520	*640	400			*570	360	3.68
(8.2 ft)	lb									*1340	1150	*1410	880			*1260	790	(12.1)
2.0m	kg									*680	510	*670	390			*560	330	3.89
(6.6 ft)	lb									*1500	1120	*1480	860			*1230	730	(12.8)
1.5m	kg					*1230	930	*930	650	*790	490	*720	390	*610	310	*570	310	4.02
(4.9 ft)	lb					*2710	2050	*2050	1430	*1740	1080	*1590	860	*1340	680	*1260	680	(13.2)
1.0m	kg							*1170	620	*920	470	*790	380	*710	310	*590	300	4.06
(3.3 ft)	lb							*2580	1370	*2030	1040	*1740	840	*1570	680	*1300	660	(13.3)
0.5m	kg					*1350	830	*1340	600	*1020	460	*850	370	*700	300	*640	300	4.02
(1.6 ft)	lb					*2980	1830	*2950	1320	*2250	1010	*1870	820	*1540	660	*1410	660	(13.2)
0.0m	kg					*1580	820	*1430	590	*1080	450	*880	360			*720	310	3.90
(0.0 ft)	lb					*3480	1810	*3150	1300	*2380	990	*1940	790			*1590	680	(12.8)
-0.5m	kg	*1040	*1040	*1280	*1280	*2000	820	*1420	580	*1080	450	*860	360			*780	330	3.69
(-1.6 ft)	lb	*2290	*2290	*2820	*2820	*4410	1810	*3130	1280	*2380	990	*1900	790			*1720	730	(12.1)
-1.0m	kg	*1500	*1500	*1880	1380	*1810	830	*1310	580	*1000	450					*800	380	3.36
(-3.3 ft)	lb	*3310	*3310	*4140	3040	*3990	1830	*2890	1280	*2200	990					*1760	840	(11.0)
-1.5m	kg	*2090	*2090	*2190	1400	*1460	840	*1060	590							*810	490	2.87
(-4.9 ft)	lb	*4610	*4610	*4830	3090	*3220	1850	*2340	1300							*1790	1080	(9.4)
-2.0m	kg					*740	*740									*740	*740	2.00
(-6.6 ft)	lb					*1630	*1630									*1630	*1630	(6.6)

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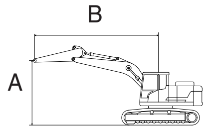
3) Steel track 300 mm, cab type

Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX27AZ	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2030	1120	130	300	-	Up	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)												At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		Capacity		Reach
																m (ft)
3.5 m	kg													*740	600	2.55
(11.5 ft)	lb													*1630	1320	(8.4)
3.0 m	kg									590	460			550	430	3.12
(9.8 ft)	lb									1300	1010			1210	950	(10.2)
2.5 m	kg									590	460			450	360	3.48
(8.2 ft)	lb									1300	1010			990	790	(11.4)
2.0m	kg							780	610	580	450	450	350	400	320	3.71
(6.6 ft)	lb							1720	1340	1280	990	990	770	880	710	(12.2)
1.5m	kg							750	580	560	440	440	340	380	290	3.84
(4.9 ft)	lb							1650	1280	1230	970	970	750	840	640	(12.6)
1.0m	kg							720	550	550	420	430	340	370	280	3.89
(3.3 ft)	lb							1590	1210	1210	930	950	750	820	620	(12.8)
0.5m	kg							700	530	530	410	420	330	370	290	3.85
(1.6 ft)	lb							1540	1170	1170	900	930	730	820	640	(12.6)
0.0m	kg					990	730	690	520	520	400	420	320	380	300	3.73
(0.0 ft)	lb					2180	1610	1520	1150	1150	880	930	710	840	660	(12.2)
-0.5m	kg	*1180	*1180	*1400	1210	990	730	680	520	520	400	420	320	420	320	3.50
(-1.6 ft)	lb	*2600	*2600	*3090	2670	2180	1610	1500	1150	1150	880	930	710	930	710	(11.5)
-1.0m	kg	*1730	*1730	1760	1220	1000	740	690	520	520	400			490	380	3.16
(-3.3 ft)	lb	*3810	*3810	3880	2690	2200	1630	1520	1150	1150	880			1080	840	(10.4)
-1.5m	kg			1790	1250	1020	760	700	540					660	510	2.61
(-4.9 ft)	lb			3950	2760	2250	1680	1540	1190					1460	1120	(8.6)

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Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX27AZ	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2030	1120	130	300	-	Down	-	-	-

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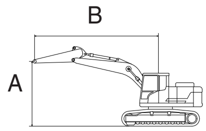

Load point height (A)		Load radius (B)												At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		Capacity		Reach
																m (ft)
3.5 m	kg													*740	650	2.55
(11.5 ft)	lb													*1630	1430	(8.4)
3.0 m	kg									*690	500			*710	460	3.12
(9.8 ft)	lb									*1520	1100			*1570	1010	(10.2)
2.5 m	kg									*680	500			*670	390	3.48
(8.2 ft)	lb									*1500	1100			*1480	860	(11.4)
2.0m	kg							*800	660	*740	490	*710	380	*660	340	3.71
(6.6 ft)	lb							*1760	1460	*1630	1080	*1570	840	*1460	750	(12.2)
1.5m	kg							*1020	630	*850	470	*760	370	*670	320	3.84
(4.9 ft)	lb							*2250	1390	*1870	1040	*1680	820	*1480	710	(12.6)
1.0m	kg							*1240	600	*960	460	*820	360	*700	310	3.89
(3.3 ft)	lb							*2730	1320	*2120	1010	*1810	790	*1540	680	(12.8)
0.5m	kg							*1390	580	*1050	450	*860	360	*760	310	3.85
(1.6 ft)	lb							*3060	1280	*2310	990	*1900	790	*1680	680	(12.6)
0.0m	kg					*1580	800	*1440	570	*1090	440	*880	350	*800	320	3.73
(0.0 ft)	lb					*3480	1760	*3170	1260	*2400	970	*1940	770	*1760	710	(12.2)
-0.5m	kg	*1180	*1180	*1400	1340	*1940	800	*1400	570	*1070	440	*820	350	*820	350	3.50
(-1.6 ft)	lb	*2600	*2600	*3090	2950	*4280	1760	*3090	1260	*2360	970	*1810	770	*1810	770	(11.5)
-1.0m	kg	*1730	*1730	*2150	1360	*1700	810	*1250	570	*940	440			*840	410	3.16
(-3.3 ft)	lb	*3810	*3810	*4740	3000	*3750	1790	*2760	1260	*2070	970			*1850	900	(10.4)
-1.5m	kg			*1840	1380	*1280	830	*920	590					*830	550	2.61
(-4.9 ft)	lb			*4060	3040	*2820	1830	*2030	1300					*1830	1210	(8.6)

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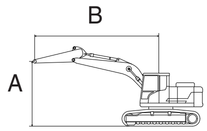
Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX27AZ	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2030	1120	270	300	-	Up	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)												At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		Capacity		Reach
																m (ft)
3.5 m	kg													*740	680	2.55
(11.5 ft)	lb													*1630	1500	(8.4)
3.0 m	kg									660	530			620	490	3.12
(9.8 ft)	lb									1460	1170			1370	1080	(10.2)
2.5 m	kg									660	530			520	410	3.48
(8.2 ft)	lb									1460	1170			1150	900	(11.4)
2.0m	kg							*800	690	650	520	510	400	460	370	3.71
(6.6 ft)	lb							*1760	1520	1430	1150	1120	880	1010	820	(12.2)
1.5m	kg							850	660	640	500	500	400	430	340	3.84
(4.9 ft)	lb							1870	1460	1410	1100	1100	880	950	750	(12.6)
1.0m	kg							820	630	620	490	490	390	420	330	3.89
(3.3 ft)	lb							1810	1390	1370	1080	1080	860	930	730	(12.8)
0.5m	kg							800	610	610	480	480	380	420	330	3.85
(1.6 ft)	lb							1760	1340	1340	1060	1060	840	930	730	(12.6)
0.0m	kg					1120	840	780	600	600	470	480	380	440	350	3.73
(0.0 ft)	lb					2470	1850	1720	1320	1320	1040	1060	840	970	770	(12.2)
-0.5m	kg	*1180	*1180	*1400	1390	1130	840	780	600	600	460	480	380	480	380	3.50
(-1.6 ft)	lb	*2600	*2600	*3090	3060	2490	1850	1720	1320	1320	1010	1060	840	1060	840	(11.5)
-1.0m	kg	*1730	*1730	1990	1400	1130	850	790	610	600	470			560	440	3.16
(-3.3 ft)	lb	*3810	*3810	4390	3090	2490	1870	1740	1340	1320	1040			1230	970	(10.4)
-1.5m	kg			*1840	1430	1150	870	800	620					750	590	2.61
(-4.9 ft)	lb			*4060	3150	2540	1920	1760	1370					1650	1300	(8.6)

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Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX27AZ	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2030	1120	270	300	-	Down	-	-	-

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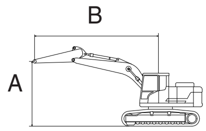

Load point height (A)		Load radius (B)												At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		Capacity		Reach
																m (ft)
3.5 m	kg													*740	730	2.55
(11.5 ft)	lb													*1630	1610	(8.4)
3.0 m	kg									*690	570			*710	530	3.12
(9.8 ft)	lb									*1520	1260			*1570	1170	(10.2)
2.5 m	kg									*680	560			*670	440	3.48
(8.2 ft)	lb									*1500	1230			*1480	970	(11.4)
2.0m	kg							*800	740	*740	560	*710	430	*660	390	3.71
(6.6 ft)	lb							*1760	1630	*1630	1230	*1570	950	*1460	860	(12.2)
1.5m	kg							*1020	710	*850	540	*760	430	*670	370	3.84
(4.9 ft)	lb							*2250	1570	*1870	1190	*1680	950	*1480	820	(12.6)
1.0m	kg							*1240	690	*960	530	*820	420	*700	360	3.89
(3.3 ft)	lb							*2730	1520	*2120	1170	*1810	930	*1540	790	(12.8)
0.5m	kg							*1390	670	*1050	510	*860	410	*760	360	3.85
(1.6 ft)	lb							*3060	1480	*2310	1120	*1900	900	*1680	790	(12.6)
0.0m	kg					*1580	920	*1440	650	*1090	500	*880	410	*800	370	3.73
(0.0 ft)	lb					*3480	2030	*3170	1430	*2400	1100	*1940	900	*1760	820	(12.2)
-0.5m	kg	*1180	*1180	*1400	*1400	*1940	920	*1400	650	*1070	500	*820	410	*820	410	3.50
(-1.6 ft)	lb	*2600	*2600	*3090	*3090	*4280	2030	*3090	1430	*2360	1100	*1810	900	*1810	900	(11.5)
-1.0m	kg	*1730	*1730	*2150	1550	*1700	930	*1250	660	*940	510			*840	470	3.16
(-3.3 ft)	lb	*3810	*3810	*4740	3420	*3750	2050	*2760	1460	*2070	1120			*1850	1040	(10.4)
-1.5m	kg			*1840	1580	*1280	950	*920	670					*830	630	2.61
(-4.9 ft)	lb			*4060	3480	*2820	2090	*2030	1480					*1830	1390	(8.6)

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Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX27AZ	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2030	1300	130	300	-	Up	-	-	-

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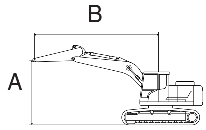

Load point height (A)		Load radius (B) 1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		4.0 m (13.1 ft)		At max. reach Capacity		Reach
		Over-front	Over-side / 360°	Over-front	Over-side / 360°	Over-front	Over-side / 360°	Over-front	Over-side / 360°	Over-front	Over-side / 360°	Over-front	Over-side / 360°	Over-front	Over-side / 360°	Over-front	Over-side / 360°	m (ft)
3.5 m	kg															650	510	2.83
(11.5 ft)	lb															1430	1120	(9.3)
3.0 m	kg									600	470					490	390	3.34
(9.8 ft)	lb									1320	1040					1080	860	(11.0)
2.5 m	kg									590	470	460	360			420	330	3.67
(8.2 ft)	lb									1300	1040	1010	790			930	730	(12.1)
2.0m	kg									580	460	450	360			380	300	3.89
(6.6 ft)	lb									1280	1010	990	790			840	660	(12.8)
1.5m	kg					1110	840	760	590	570	440	440	350	360	280	350	280	4.01
(4.9 ft)	lb					2450	1850	1680	1300	1260	970	970	770	790	620	770	620	(13.2)
1.0m	kg							730	560	550	430	430	340	350	270	340	270	4.06
(3.3 ft)	lb							1610	1230	1210	950	950	750	770	600	750	600	(13.3)
0.5m	kg					1000	740	700	540	530	410	420	330	350	270	340	270	4.02
(1.6 ft)	lb					2200	1630	1540	1190	1170	900	930	730	770	600	750	600	(13.2)
0.0m	kg					990	730	690	520	520	400	420	320			360	280	3.90
(0.0 ft)	lb					2180	1610	1520	1150	1150	880	930	710			790	620	(12.8)
-0.5m	kg	*1020	*1020	*1260	1200	990	730	680	520	520	400	420	320			390	300	3.70
(-1.6 ft)	lb	*2250	*2250	*2780	2650	2180	1610	1500	1150	1150	880	930	710			860	660	(12.1)
-1.0m	kg	*1480	*1480	1740	1210	990	730	690	520	520	400					440	340	3.37
(-3.3 ft)	lb	*3260	*3260	3840	2670	2180	1610	1520	1150	1150	880					970	750	(11.1)
-1.5m	kg	*2070	*2070	1770	1230	1010	750	700	530							560	430	2.88
(-4.9 ft)	lb	*4560	*4560	3900	2710	2230	1650	1540	1170							1230	950	(9.5)
-2.0m	kg					*770	*770									*740	*740	2.04
(-6.6 ft)	lb					*1700	*1700									*1630	*1630	(6.7)

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Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX27AZ	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2030	1300	130	300	-	Down	-	-	-

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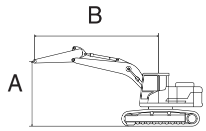

Load point height (A)		Load radius (B)														At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		4.0 m (13.1 ft)		Capacity		Reach
																		m (ft)
3.5 m	kg															*670	550	2.83
(11.5 ft)	lb															*1480	1210	(9.3)
3.0 m	kg									*600	510					*600	420	3.34
(9.8 ft)	lb									*1320	1120					*1320	930	(11.0)
2.5 m	kg									*610	500	*640	390			*570	360	3.67
(8.2 ft)	lb									*1340	1100	*1410	860			*1260	790	(12.1)
2.0m	kg									*680	490	*660	380			*560	320	3.89
(6.6 ft)	lb									*1500	1080	*1460	840			*1230	710	(12.8)
1.5m	kg					*1210	910	*920	640	*790	480	*720	380	*600	300	*570	300	4.01
(4.9 ft)	lb					*2670	2010	*2030	1410	*1740	1060	*1590	840	*1320	660	*1260	660	(13.2)
1.0m	kg							*1160	610	*920	460	*790	370	*710	300	*590	290	4.06
(3.3 ft)	lb							*2560	1340	*2030	1010	*1740	820	*1570	660	*1300	640	(13.3)
0.5m	kg					*1350	810	*1340	580	*1020	450	*840	360	*700	290	*640	290	4.02
(1.6 ft)	lb					*2980	1790	*2950	1280	*2250	990	*1850	790	*1540	640	*1410	640	(13.2)
0.0m	kg					*1570	800	*1430	570	*1080	440	*880	350			*710	300	3.90
(0.0 ft)	lb					*3460	1760	*3150	1260	*2380	970	*1940	770			*1570	660	(12.8)
-0.5m	kg	*1020	*1020	*1260	*1260	*2010	800	*1420	570	*1080	430	*860	350			*780	320	3.70
(-1.6 ft)	lb	*2250	*2250	*2780	*2780	*4430	1760	*3130	1260	*2380	950	*1900	770			*1720	710	(12.1)
-1.0m	kg	*1480	*1480	*1860	1340	*1820	800	*1320	570	*1000	440					*800	370	3.37
(-3.3 ft)	lb	*3260	*3260	*4100	2950	*4010	1760	*2910	1260	*2200	970					*1760	820	(11.1)
-1.5m	kg	*2070	*2070	*2210	1370	*1480	820	*1070	580							*810	470	2.88
(-4.9 ft)	lb	*4560	*4560	*4870	3020	*3260	1810	*2360	1280							*1790	1040	(9.5)
-2.0m	kg					*770	*770									*740	*740	2.04
(-6.6 ft)	lb					*1700	*1700									*1630	*1630	(6.7)

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Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX27AZ	Cab	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2030	1300	270	300	-	Up	-	-	-

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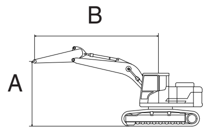

Load point height (A)		Load radius (B) 1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		4.0 m (13.1 ft)		At max. reach Capacity		Reach
		Over-front	Over-side or 360°	Over-front	Over-side or 360°	Over-front	Over-side or 360°	Over-front	Over-side or 360°	Over-front	Over-side or 360°	Over-front	Over-side or 360°	Over-front	Over-side or 360°	Over-front	Over-side or 360°	m (ft)
3.5 m	kg															*670	580	2.83
(11.5 ft)	lb															*1480	1280	(9.3)
3.0 m	kg									*600	540					560	440	3.34
(9.8 ft)	lb									*1320	1190					1230	970	(11.0)
2.5 m	kg									*610	530	520	410			480	380	3.67
(8.2 ft)	lb									*1340	1170	1150	900			1060	840	(12.1)
2.0m	kg									660	520	510	410			430	340	3.89
(6.6 ft)	lb									1460	1150	1120	900			950	750	(12.8)
1.5m	kg					*1210	950	860	670	640	510	500	400	410	320	410	320	4.01
(4.9 ft)	lb					*2670	2090	1900	1480	1410	1120	1100	880	900	710	900	710	(13.2)
1.0m	kg							830	640	620	490	490	390	400	320	390	310	4.06
(3.3 ft)	lb							1830	1410	1370	1080	1080	860	880	710	860	680	(13.3)
0.5m	kg					1140	860	800	620	610	480	490	380	400	320	400	310	4.02
(1.6 ft)	lb					2510	1900	1760	1370	1340	1060	1080	840	880	710	880	680	(13.2)
0.0m	kg					1120	840	790	610	600	470	480	380			410	320	3.90
(0.0 ft)	lb					2470	1850	1740	1340	1320	1040	1060	840			900	710	(12.8)
-0.5m	kg	*1020	*1020	*1260	*1260	1120	840	780	600	590	460	480	370			440	350	3.70
(-1.6 ft)	lb	*2250	*2250	*2780	*2780	2470	1850	1720	1320	1300	1010	1060	820			970	770	(12.1)
-1.0m	kg	*1480	*1480	*1860	1390	1130	850	780	600	600	460					510	400	3.37
(-3.3 ft)	lb	*3260	*3260	*4100	3060	2490	1870	1720	1320	1320	1010					1120	880	(11.1)
-1.5m	kg	*2070	*2070	2000	1410	1140	860	790	610							640	500	2.88
(-4.9 ft)	lb	*4560	*4560	4410	3110	2510	1900	1740	1340							1410	1100	(9.5)
-2.0m	kg					*770	*770									*740	*740	2.04
(-6.6 ft)	lb					*1700	*1700									*1630	*1630	(6.7)

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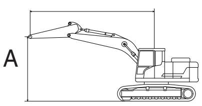
		2030	1300	270	300	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)														At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		4.0 m (13.1 ft)		Capacity		Reach
																		m (ft)
3.5 m	kg															*670	620	2.83
(11.5 ft)	lb															*1480	1370	(9.3)
3.0 m	kg									*600	570					*600	480	3.34
(9.8 ft)	lb									*1320	1260					*1320	1060	(11.0)
2.5 m	kg									*610	570	*640	440			*570	410	3.67
(8.2 ft)	lb									*1340	1260	*1410	970			*1260	900	(12.1)
2.0m	kg									*680	560	*660	440			*560	370	3.89
(6.6 ft)	lb									*1500	1230	*1460	970			*1230	820	(12.8)
1.5m	kg					*1210	1030	*920	720	*790	550	*720	430	*600	350	*570	350	4.01
(4.9 ft)	lb					*2670	2270	*2030	1590	*1740	1210	*1590	950	*1320	770	*1260	770	(13.2)
1.0m	kg							*1160	690	*920	530	*790	420	*710	340	*590	340	4.06
(3.3 ft)	lb							*2560	1520	*2030	1170	*1740	930	*1570	750	*1300	750	(13.3)
0.5m	kg					*1350	930	*1340	670	*1020	520	*840	410	*700	340	*640	340	4.02
(1.6 ft)	lb					*2980	2050	*2950	1480	*2250	1150	*1850	900	*1540	750	*1410	750	(13.2)
0.0m	kg					*1570	920	*1430	660	*1080	510	*880	410			*710	350	3.90
(0.0 ft)	lb					*3460	2030	*3150	1460	*2380	1120	*1940	900			*1570	770	(12.8)
-0.5m	kg	*1020	*1020	*1260	*1260	*2010	920	*1420	650	*1080	500	*860	400			*780	380	3.70
(-1.6 ft)	lb	*2250	*2250	*2780	*2780	*4430	2030	*3130	1430	*2380	1100	*1900	880			*1720	840	(12.1)
-1.0m	kg	*1480	*1480	*1860	1540	*1820	920	*1320	650	*1000	500					*800	430	3.37
(-3.3 ft)	lb	*3260	*3260	*4100	3400	*4010	2030	*2910	1430	*2200	1100					*1760	950	(11.1)
-1.5m	kg	*2070	*2070	*2210	1560	*1480	940	*1070	660							*810	540	2.88
(-4.9 ft)	lb	*4560	*4560	*4870	3440	*3260	2070	*2360	1460							*1790	1190	(9.5)
-2.0m	kg					*770	*770									*740	*740	2.04
(-6.6 ft)	lb					*1700	*1700									*1630	*1630	(6.7)

Note 1. Lifting capacity are based on ISO 10567.
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3. The lift-point is bucket pivot mounting pin on the arm (without bucket mass).
4. *Indicates load limited by hydraulic capacity.

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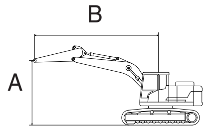
4) Steel track 300 mm, canopy type

Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX27AZ	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2030	1120	130	300	-	Up	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)												At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		Capacity		Reach
																m (ft)
3.5 m	kg													730	570	2.55
(11.5 ft)	lb													1610	1260	(8.4)
3.0 m	kg									560	440			520	410	3.12
(9.8 ft)	lb									1230	970			1150	900	(10.2)
2.5 m	kg									560	440			430	340	3.48
(8.2 ft)	lb									1230	970			950	750	(11.4)
2.0m	kg							740	580	550	430	420	330	380	300	3.71
(6.6 ft)	lb							1630	1280	1210	950	930	730	840	660	(12.2)
1.5m	kg							710	550	530	420	420	330	360	280	3.84
(4.9 ft)	lb							1570	1210	1170	930	930	730	790	620	(12.6)
1.0m	kg							680	520	520	400	410	320	350	270	3.89
(3.3 ft)	lb							1500	1150	1150	880	900	710	770	600	(12.8)
0.5m	kg							660	500	500	390	400	310	350	270	3.85
(1.6 ft)	lb							1460	1100	1100	860	880	680	770	600	(12.6)
0.0m	kg					930	690	650	490	490	380	390	310	360	280	3.73
(0.0 ft)	lb					2050	1520	1430	1080	1080	840	860	680	790	620	(12.2)
-0.5m	kg	*1180	*1180	*1400	1150	940	690	650	490	490	380	390	310	390	310	3.50
(-1.6 ft)	lb	*2600	*2600	*3090	2540	2070	1520	1430	1080	1080	840	860	680	860	680	(11.5)
-1.0m	kg	*1730	*1730	1670	1160	940	700	650	500	500	380			460	360	3.16
(-3.3 ft)	lb	*3810	*3810	3680	2560	2070	1540	1430	1100	1100	840			1010	790	(10.4)
-1.5m	kg			1700	1190	960	720	670	510					630	480	2.61
(-4.9 ft)	lb			3750	2620	2120	1590	1480	1120					1390	1060	(8.6)

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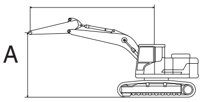
Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX27AZ	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2030	1120	130	300	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)												At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		Capacity		Reach
																m (ft)
3.5 m	kg													*740	620	2.55
(11.5 ft)	lb													*1630	1370	(8.4)
3.0 m	kg									*690	470			*710	440	3.12
(9.8 ft)	lb									*1520	1040			*1570	970	(10.2)
2.5 m	kg									*680	470			*670	370	3.48
(8.2 ft)	lb									*1500	1040			*1480	820	(11.4)
2.0m	kg							*800	630	*740	470	*710	360	*660	330	3.71
(6.6 ft)	lb							*1760	1390	*1630	1040	*1570	790	*1460	730	(12.2)
1.5m	kg							*1020	600	*850	450	*760	350	*670	300	3.84
(4.9 ft)	lb							*2250	1320	*1870	990	*1680	770	*1480	660	(12.6)
1.0m	kg							*1240	570	*960	440	*820	340	*700	290	3.89
(3.3 ft)	lb							*2730	1260	*2120	970	*1810	750	*1540	640	(12.8)
0.5m	kg							*1390	550	*1050	420	*860	340	*760	290	3.85
(1.6 ft)	lb							*3060	1210	*2310	930	*1900	750	*1680	640	(12.6)
0.0m	kg					*1580	760	*1440	540	*1090	410	*880	330	*800	300	3.73
(0.0 ft)	lb					*3480	1680	*3170	1190	*2400	900	*1940	730	*1760	660	(12.2)
-0.5m	kg	*1180	*1180	*1400	1280	*1940	760	*1400	540	*1070	410	*820	330	*820	330	3.50
(-1.6 ft)	lb	*2600	*2600	*3090	2820	*4280	1680	*3090	1190	*2360	900	*1810	730	*1810	730	(11.5)
-1.0m	kg	*1730	*1730	*2150	1290	*1700	770	*1250	540	*940	420			*840	390	3.16
(-3.3 ft)	lb	*3810	*3810	*4740	2840	*3750	1700	*2760	1190	*2070	930			*1850	860	(10.4)
-1.5m	kg			*1840	1320	*1280	790	*920	560					*830	520	2.61
(-4.9 ft)	lb			*4060	2910	*2820	1740	*2030	1230					*1830	1150	(8.6)

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Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX27AZ	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2030	1120	270	300	-	Up	-	-	-

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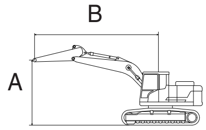

Load point height (A)		Load radius (B)												At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		Capacity		Reach
																m (ft)
3.5 m	kg													*740	660	2.55
(11.5 ft)	lb													*1630	1460	(8.4)
3.0 m	kg									630	500			590	470	3.12
(9.8 ft)	lb									1390	1100			1300	1040	(10.2)
2.5 m	kg									630	500			490	390	3.48
(8.2 ft)	lb									1390	1100			1080	860	(11.4)
2.0m	kg							*800	660	620	500	480	390	440	350	3.71
(6.6 ft)	lb							*1760	1460	1370	1100	1060	860	970	770	(12.2)
1.5m	kg							810	630	610	480	480	380	410	330	3.84
(4.9 ft)	lb							1790	1390	1340	1060	1060	840	900	730	(12.6)
1.0m	kg							780	610	590	470	470	370	400	320	3.89
(3.3 ft)	lb							1720	1340	1300	1040	1040	820	880	710	(12.8)
0.5m	kg							760	590	580	450	460	360	400	320	3.85
(1.6 ft)	lb							1680	1300	1280	990	1010	790	880	710	(12.6)
0.0m	kg					1070	800	750	580	570	450	460	360	420	330	3.73
(0.0 ft)	lb					2360	1760	1650	1280	1260	990	1010	790	930	730	(12.2)
-0.5m	kg	*1180	*1180	*1400	1330	1070	810	740	570	570	440	460	360	450	360	3.50
(-1.6 ft)	lb	*2600	*2600	*3090	2930	2360	1790	1630	1260	1260	970	1010	790	990	790	(11.5)
-1.0m	kg	*1730	*1730	1900	1340	1080	810	750	580	570	450			530	420	3.16
(-3.3 ft)	lb	*3810	*3810	4190	2950	2380	1790	1650	1280	1260	990			1170	930	(10.4)
-1.5m	kg			*1840	1370	1100	830	760	590					720	560	2.61
(-4.9 ft)	lb			*4060	3020	2430	1830	1680	1300					1590	1230	(8.6)

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Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX27AZ	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2030	1120	270	300	-	Down	-	-	-

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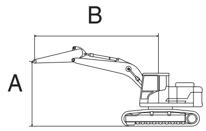

Load point height (A)		Load radius (B)												At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		Capacity		Reach
																m (ft)
3.5 m	kg													*740	700	2.55
(11.5 ft)	lb													*1630	1540	(8.4)
3.0 m	kg									*690	540			*710	510	3.12
(9.8 ft)	lb									*1520	1190			*1570	1120	(10.2)
2.5 m	kg									*680	540			*670	420	3.48
(8.2 ft)	lb									*1500	1190			*1480	930	(11.4)
2.0m	kg							*800	710	*740	530	*710	420	*660	380	3.71
(6.6 ft)	lb							*1760	1570	*1630	1170	*1570	930	*1460	840	(12.2)
1.5m	kg							*1020	680	*850	520	*760	410	*670	350	3.84
(4.9 ft)	lb							*2250	1500	*1870	1150	*1680	900	*1480	770	(12.6)
1.0m	kg							*1240	660	*960	500	*820	400	*700	340	3.89
(3.3 ft)	lb							*2730	1460	*2120	1100	*1810	880	*1540	750	(12.8)
0.5m	kg							*1390	640	*1050	490	*860	390	*760	340	3.85
(1.6 ft)	lb							*3060	1410	*2310	1080	*1900	860	*1680	750	(12.6)
0.0m	kg					*1580	880	*1440	620	*1090	480	*880	390	*800	360	3.73
(0.0 ft)	lb					*3480	1940	*3170	1370	*2400	1060	*1940	860	*1760	790	(12.2)
-0.5m	kg	*1180	*1180	*1400	*1400	*1940	880	*1400	620	*1070	480	*820	390	*820	390	3.50
(-1.6 ft)	lb	*2600	*2600	*3090	*3090	*4280	1940	*3090	1370	*2360	1060	*1810	860	*1810	860	(11.5)
-1.0m	kg	*1730	*1730	*2150	1480	*1700	890	*1250	630	*940	480			*840	450	3.16
(-3.3 ft)	lb	*3810	*3810	*4740	3260	*3750	1960	*2760	1390	*2070	1060			*1850	990	(10.4)
-1.5m	kg			*1840	1510	*1280	900	*920	640					*830	600	2.61
(-4.9 ft)	lb			*4060	3330	*2820	1980	*2030	1410					*1830	1320	(8.6)

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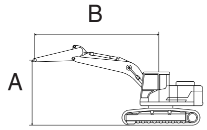
Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX27AZ	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2030	1300	130	300	-	Up	-	-	-

· Front : Rating over-front · Side : Rating over-side or 360 degree



Load point height (A)		Load radius (B) 1.0 m (3.3 ft) Front	1.0 m (3.3 ft) Side	1.5 m (4.9 ft) Front	1.5 m (4.9 ft) Side	2.0 m (6.6 ft) Front	2.0 m (6.6 ft) Side	2.5 m (8.2 ft) Front	2.5 m (8.2 ft) Side	3.0 m (9.8 ft) Front	3.0 m (9.8 ft) Side	3.5 m (11.5 ft) Front	3.5 m (11.5 ft) Side	4.0 m (13.1 ft) Front	4.0 m (13.1 ft) Side	At max. reach Capacity Front	At max. reach Capacity Side	Reach m (ft)
3.5 m	kg															620	490	2.83
(11.5 ft)	lb															1370	1080	(9.3)
3.0 m	kg									570	450					470	370	3.34
(9.8 ft)	lb									1260	990					1040	820	(11.0)
2.5 m	kg									560	450	430	340			400	310	3.67
(8.2 ft)	lb									1230	990	950	750			880	680	(12.1)
2.0m	kg									550	440	430	340			360	280	3.89
(6.6 ft)	lb									1210	970	950	750			790	620	(12.8)
1.5m	kg					1060	800	720	560	540	420	420	330	340	260	330	260	4.01
(4.9 ft)	lb					2340	1760	1590	1230	1190	930	930	730	750	570	730	570	(13.2)
1.0m	kg							690	530	520	410	410	320	330	260	320	250	4.06
(3.3 ft)	lb							1520	1170	1150	900	900	710	730	570	710	550	(13.3)
0.5m	kg					950	700	670	510	510	390	400	310	330	250	320	250	4.02
(1.6 ft)	lb					2090	1540	1480	1120	1120	860	880	680	730	550	710	550	(13.2)
0.0m	kg					930	690	650	500	490	380	390	310			340	260	3.90
(0.0 ft)	lb					2050	1520	1430	1100	1080	840	860	680			750	570	(12.8)
-0.5m	kg	*1020	*1020	*1260	1140	930	690	650	490	490	380	390	300			360	280	3.70
(-1.6 ft)	lb	*2250	*2250	*2780	2510	2050	1520	1430	1080	1080	840	860	660			790	620	(12.1)
-1.0m	kg	*1480	*1480	1650	1150	940	690	650	490	490	380					420	320	3.37
(-3.3 ft)	lb	*3260	*3260	3640	2540	2070	1520	1430	1080	1080	840					930	710	(11.1)
-1.5m	kg	*2070	*2070	1680	1170	950	710	660	500							530	410	2.88
(-4.9 ft)	lb	*4560	*4560	3700	2580	2090	1570	1460	1100							1170	900	(9.5)
-2.0m	kg					*770	740									*740	720	2.04
(-6.6 ft)	lb					*1700	1630									*1630	1590	(6.7)

Note 1. Lifting capacity are based on ISO 10567.
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3. The lift-point is bucket pivot mounting pin on the arm (without bucket mass).
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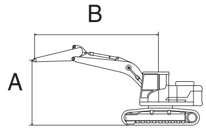
※ Please be aware of the local regulations and instructions for lifting operations.

⚠ Failure to comply to the rated load can cause serious injury, death, or property damage. Make adjustments to the rated load as necessary for non-standard configurations.

Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX27AZ	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2030	1300	130	300	-	Down	-	-	-

· : Rating over-front · : Rating over-side or 360 degree



Load point height (A)		Load radius (B)														At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		4.0 m (13.1 ft)		Capacity		Reach
																		m (ft)
3.5 m	kg															*670	520	2.83
(11.5 ft)	lb															*1480	1150	(9.3)
3.0 m	kg									*600	480					*600	400	3.34
(9.8 ft)	lb									*1320	1060					*1320	880	(11.0)
2.5 m	kg									*610	480	*640	370			*570	340	3.67
(8.2 ft)	lb									*1340	1060	*1410	820			*1260	750	(12.1)
2.0m	kg									*680	470	*660	370			*560	300	3.89
(6.6 ft)	lb									*1500	1040	*1460	820			*1230	660	(12.8)
1.5m	kg					*1210	870	*920	610	*790	460	*720	360	*600	290	*570	280	4.01
(4.9 ft)	lb					*2670	1920	*2030	1340	*1740	1010	*1590	790	*1320	640	*1260	620	(13.2)
1.0m	kg							*1160	580	*920	440	*790	350	*710	280	*590	270	4.06
(3.3 ft)	lb							*2560	1280	*2030	970	*1740	770	*1570	620	*1300	600	(13.3)
0.5m	kg					*1350	770	*1340	550	*1020	430	*840	340	*700	280	*640	270	4.02
(1.6 ft)	lb					*2980	1700	*2950	1210	*2250	950	*1850	750	*1540	620	*1410	600	(13.2)
0.0m	kg					*1570	760	*1430	540	*1080	420	*880	330			*710	280	3.90
(0.0 ft)	lb					*3460	1680	*3150	1190	*2380	930	*1940	730			*1570	620	(12.8)
-0.5m	kg	*1020	*1020	*1260	*1260	*2010	760	*1420	540	*1080	410	*860	330			*780	310	3.70
(-1.6 ft)	lb	*2250	*2250	*2780	*2780	*4430	1680	*3130	1190	*2380	900	*1900	730			*1720	680	(12.1)
-1.0m	kg	*1480	*1480	*1860	1280	*1820	760	*1320	540	*1000	410					*800	350	3.37
(-3.3 ft)	lb	*3260	*3260	*4100	2820	*4010	1680	*2910	1190	*2200	900					*1760	770	(11.1)
-1.5m	kg	*2070	*2070	*2210	1300	*1480	780	*1070	550							*810	450	2.88
(-4.9 ft)	lb	*4560	*4560	*4870	2870	*3260	1720	*2360	1210							*1790	990	(9.5)
-2.0m	kg					*770	*770									*740	*740	2.04
(-6.6 ft)	lb					*1700	*1700									*1630	*1630	(6.7)

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3. The lift-point is bucket pivot mounting pin on the arm (without bucket mass).
4. *Indicates load limited by hydraulic capacity.

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Lifting capacities will vary with different work tools, ground conditions and attachments.
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⚠ Failure to comply to the rated load can cause serious injury, death, or property damage. Make adjustments to the rated load as necessary for non-standard configurations.

Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX27AZ	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2030	1300	270	300	-	Up	-	-	-

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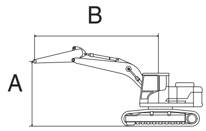

Load point height (A)		Load radius (B)														At max. reach		
		1.0 m (3.3 ft)		1.5 m (4.9 ft)		2.0 m (6.6 ft)		2.5 m (8.2 ft)		3.0 m (9.8 ft)		3.5 m (11.5 ft)		4.0 m (13.1 ft)		Capacity		Reach
																		m (ft)
3.5 m	kg															*670	560	2.83
(11.5 ft)	lb															*1480	1230	(9.3)
3.0 m	kg									*600	510					530	430	3.34
(9.8 ft)	lb									*1320	1120					1170	950	(11.0)
2.5 m	kg									*610	510	490	400			450	360	3.67
(8.2 ft)	lb									*1340	1120	1080	880			990	790	(12.1)
2.0m	kg									630	500	490	390			410	330	3.89
(6.6 ft)	lb									1390	1100	1080	860			900	730	(12.8)
1.5m	kg					1190	920	820	640	610	490	480	380	390	310	390	310	4.01
(4.9 ft)	lb					2620	2030	1810	1410	1340	1080	1060	840	860	680	860	680	(13.2)
1.0m	kg							790	620	600	470	470	370	380	300	370	300	4.06
(3.3 ft)	lb							1740	1370	1320	1040	1040	820	840	660	820	660	(13.3)
0.5m	kg					1090	820	760	590	580	460	460	370	380	300	380	300	4.02
(1.6 ft)	lb					2400	1810	1680	1300	1280	1010	1010	820	840	660	840	660	(13.2)
0.0m	kg					1070	800	750	580	570	450	460	360			390	310	3.90
(0.0 ft)	lb					2360	1760	1650	1280	1260	990	1010	790			860	680	(12.8)
-0.5m	kg	*1020	*1020	*1260	*1260	1070	800	740	570	560	440	450	360			420	330	3.70
(-1.6 ft)	lb	*2250	*2250	*2780	*2780	2360	1760	1630	1260	1230	970	990	790			930	730	(12.1)
-1.0m	kg	*1480	*1480	*1860	1330	1070	810	740	570	570	440					480	380	3.37
(-3.3 ft)	lb	*3260	*3260	*4100	2930	2360	1790	1630	1260	1260	970					1060	840	(11.1)
-1.5m	kg	*2070	*2070	1910	1350	1090	820	750	580							610	480	2.88
(-4.9 ft)	lb	*4560	*4560	4210	2980	2400	1810	1650	1280							1340	1060	(9.5)
-2.0m	kg					*770	*770									*740	*740	2.04
(-6.6 ft)	lb					*1700	*1700									*1630	*1630	(6.7)

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Model	Type	Boom	Arm	Counterweight	Steel shoe	Wheel	Dozer		Outtriger	
HX27AZ	Canopy	Length [mm]	Length [mm]	weight [kg]	width [mm]	width [mm]	Front	Rear	Front	Rear
		2030	1300	270	300	-	Down	-	-	-

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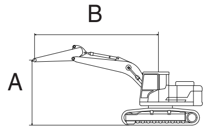

Load point height (A)		Load radius (B)														At max. reach		
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		Over-front	Over-side	Over-front	Over-side	Over-front	Over-side	Over-front	Over-side	Over-front	Over-side	Over-front	Over-side	Over-front	Over-side	Over-front	Over-side	m (ft)
3.5 m	kg															*670	600	2.83
(11.5 ft)	lb															*1480	1320	(9.3)
3.0 m	kg									*600	550					*600	460	3.34
(9.8 ft)	lb									*1320	1210					*1320	1010	(11.0)
2.5 m	kg									*610	550	*640	420			*570	390	3.67
(8.2 ft)	lb									*1340	1210	*1410	930			*1260	860	(12.1)
2.0m	kg									*680	540	*660	420			*560	350	3.89
(6.6 ft)	lb									*1500	1190	*1460	930			*1230	770	(12.8)
1.5m	kg					*1210	990	*920	690	*790	520	*720	410	*600	330	*570	330	4.01
(4.9 ft)	lb					*2670	2180	*2030	1520	*1740	1150	*1590	900	*1320	730	*1260	730	(13.2)
1.0m	kg							*1160	660	*920	510	*790	400	*710	330	*590	320	4.06
(3.3 ft)	lb							*2560	1460	*2030	1120	*1740	880	*1570	730	*1300	710	(13.3)
0.5m	kg					*1350	890	*1340	640	*1020	490	*840	390	*700	320	*640	320	4.02
(1.6 ft)	lb					*2980	1960	*2950	1410	*2250	1080	*1850	860	*1540	710	*1410	710	(13.2)
0.0m	kg					*1570	880	*1430	630	*1080	480	*880	390			*710	330	3.90
(0.0 ft)	lb					*3460	1940	*3150	1390	*2380	1060	*1940	860			*1570	730	(12.8)
-0.5m	kg	*1020	*1020	*1260	*1260	*2010	880	*1420	620	*1080	480	*860	390			*780	360	3.70
(-1.6 ft)	lb	*2250	*2250	*2780	*2780	*4430	1940	*3130	1370	*2380	1060	*1900	860			*1720	790	(12.1)
-1.0m	kg	*1480	*1480	*1860	1470	*1820	880	*1320	620	*1000	480					*800	410	3.37
(-3.3 ft)	lb	*3260	*3260	*4100	3240	*4010	1940	*2910	1370	*2200	1060					*1760	900	(11.1)
-1.5m	kg	*2070	*2070	*2210	1490	*1480	890	*1070	630							*810	520	2.88
(-4.9 ft)	lb	*4560	*4560	*4870	3280	*3260	1960	*2360	1390							*1790	1150	(9.5)
-2.0m	kg					*770	*770									*740	*740	2.04
(-6.6 ft)	lb					*1700	*1700									*1630	*1630	(6.7)

Note
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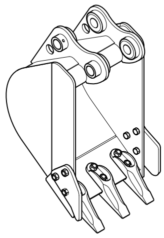
6. BUCKET SELECTION GUIDE



0.04 m^3 SAE
heaped bucket

Capacity		Width		Weight	Recommendation	
					2.03 m (6' 8") boom	
SAE heaped	CECE heaped	Without side cutter	With side cutter		1.12 m (3' 8") arm	1.30 m (4' 3") arm
0.07 m^3 (0.10 yd^3)	0.06 m^3 (0.08 yd^3)	432 mm (17.0")	474 mm (18.7")	55 kg (120 lb)	●	●

● Applicable for materials with density of 2100 kg/m^3 (3500 lb/yd^3) or less

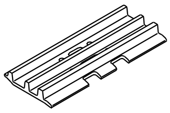
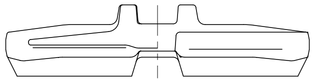
※ These recommendations are for general conditions and average use.
Work tools and ground conditions have effects on machine performance.
Select an optimum combination according to the working conditions and the type of work that is being done.
Consult with your local HD Hyundai Construction Equipment dealer for information on selecting the correct boom-arm-bucket combination.

7. UNDERCARRIAGE

1) TRACKS

X-leg type center frame is integrally welded with reinforced box-section track frames. The design includes dry tracks, lubricated rollers, idlers, sprockets, hydraulic track adjusters with shock absorbing springs and assembled track-type tractor shoes with triple grousers.

2) TYPES OF SHOES

Model	Shapes		Steel track	Rubber track	
					
HX27AZ	Shoe width	mm (in)	300 (12")	250 (10")	300 (10")
	Operating weight (canopy / cabin)	kg (lb)	2860 (6310)	2710 (5970)	2770 (6110)
	Ground pressure	kgf/cm² (psi)	0.28 (4.00)	0.32 (4.54)	0.32 (4.55)
	Overall width	mm (ft-in)	1550 (5' 1")	1500 (4' 11")	1550 (5' 1")

3) SELECTION OF TRACK SHOE

Suitable track shoes should be selected according to operating conditions.

Method of selecting shoes

Confirm the category from the list of applications in **table 2**, then use **table 1** to select the shoe. Wide shoes (categories B and C) have limitations on applications. Before using wide shoes, check the precautions, then investigate and study the operating conditions to confirm if these shoes are suitable.

Select the narrowest shoe possible to meet the required flotation and ground pressure. Application of wider shoes than recommendations will cause unexpected problem such as bending of shoes, crack of link, breakage of pin, loosening of shoe bolts and the other various problems.

Table 1

Model	Track shoe	Specification	Category
HX27AZ	T/chain-rubber for rail interlocking (250 mm)	Standard	B
	T/chain-rubber for rail interlocking (300 mm)	Option	B
	T/chain-triple for mini (300 mm)	Option	A

Table 2

Category	Applications	Precautions
A	Rocky ground, river beds, normal soil	· Travel at low speed on rough ground with large obstacles such as boulders or fallen trees or a wide range of general civil engineering work
B	Normal soil, soft ground	· These shoes cannot be used on rough ground with large obstacles such as boulders or fallen trees · Travel at high speed only on flat ground · Travel slowly at low speed if it is impossible to avoid going over obstacles
C	Extremely soft ground (swampy ground)	· Use the shoes only in the conditions that the machine sinks and it is impossible to use the shoes of category A or B · These shoes cannot be used on rough ground with large obstacles such as boulders or fallen trees · Travel at high speed only on flat ground · Travel slowly at low speed if it is impossible to avoid going over obstacles

8. SPECIFICATIONS FOR MAJOR COMPONENTS

1) ENGINE

Item	Specification
Model	KUBOTA D1305-E4B
Type	4-cycle vertical, IDI diesel fuel
Cooling method	Water cooling
Number of cylinders and arrangement	3 cylinders, in-line
Firing order	1-2-3
Combustion chamber type	Direct injection
Cylinder bore × stroke	78 × 88 mm (3.07" × 3.46")
Piston displacement	1261 cc (77 cu in)
Compression ratio	24 : 1
Gross power	18.5 hp (24.8 kW)
Net power	18.2 hp (24.4 kW)
Max. power	18.5 hp (24.8 kW)
Peak torque at 1900 rpm	8.3 kgf · m (60 lbf · ft)
Engine oil quantity	5.7 ℓ (2.3 U.S. gal)
Dry weight	95 kg (209 lb)
Starting motor	12V-1.4 kW
Alternator	12V-40 A

2) MAIN PUMP

Item	Specification
Type	Variable displacement tandem axis piston pumps
Maximum pressure	220 kgf/cm^2 (3130 psi)
Capacity	2 × 12 cc/rev
Rated oil flow	2 × 28.2 ℓ/min (7.4 U.S. gpm / 6.2 U.K. gpm)
Rated speed	2350 rpm

3) GEAR PUMP

Item	Specification
Type	Fixed displacement gear pump single stage
Capacity	8.5/4.5 cc/rev
Maximum pressure	175/30 kgf/cm^2 (2489/427 psi)
Rated oil flow	20/10.5 ℓ/min (5.3/2.8 U.S. gpm, 4.4/2.3 U.K. gpm)

4) MAIN CONTROL VALVE

Item	Specification
Type	Sectional, 10 spools
Operating method	Hydraulic pilot system
Main relief valve pressure	220 kgf/cm^2 (3130 psi)
Overload relief valve pressure	240 kgf/cm^2 (3414 psi)
2way (breaker piping) flow rate	48 ℓ/min (12.7 U.S. gpm / 10.6 U.K. gpm)

5) SWING MOTOR

Item	Specification
Type	Fixed displacement axial piston motor
Capacity	12.5 cc/rev
Relief pressure	170 kgf/cm^2 (2420 psi)
Braking system	Automatic, spring applied hydraulic released
Braking torque	7 kgf·m (50.6 lbf·ft)
Brake release pressure	25~50 kgf/cm^2 (356~711 psi)
Reduction gear type	2 - stage planetary

6) TRAVEL MOTOR

Item	Specification
Type	Two fixed displacement axial piston motor
Capacity	20.7/10.9 cc/rev
Relief pressure	-
Braking torque	5.7 kgf·m (41.2 lbf·ft)
Brake release pressure	19 kgf/cm^2 (270 psi)
Reduction gear type	2-stage planetary

7) CYLINDER

Item		Specification
Boom cylinder	Bore dia × Rod dia × Stroke	Ø45 × Ø75 × 569 mm
	Cushion	Extend only
Arm cylinder	Bore dia × Rod dia × Stroke	Ø45 × Ø70 × 486 mm
	Cushion	Extend and retract
Bucket cylinder	Bore dia × Rod dia × Stroke	Ø35 × Ø60 × 431 mm
	Cushion	-
Boom swing cylinder	Bore dia × Rod dia × Stroke	Ø75 × Ø40 × 380 mm
	Cushion	-
Dozer cylinder	Bore dia × Rod dia × Stroke	Ø95 × Ø50 × 125 mm
	Cushion	-
Dozer cylinder-DPC	Bore dia × Rod dia × Stroke	Ø95 × Ø50 × 125 mm
	Cushion	-

※ Discoloration of cylinder rod can occur when the friction reduction additive of lubrication oil spreads on the rod surface.

※ Discoloration does not cause any harmful effect on the cylinder performance.

9. RECOMMENDED OILS

HD Hyundai Construction Equipment genuine lubricating oils have been developed to offer the best performance and service life for your equipment. These oils have been tested according to the specifications of HD Hyundai Construction Equipment and, therefore, will meet the highest safety and quality requirements.

We recommend that you use only HD Hyundai Construction Equipment genuine lubricating oils and grease officially approved by HD Hyundai Construction Equipment.

Service point	Kind of fluid	Capacity ℓ (U.S. gal)	Ambient temperature ˚C(˚F) -50 (-58), -30 (-22), -20 (-4), -10 (14), 0 (32), 10 (50), 20 (68), 30 (86), 40 (104)
Engine oil pan	Engine oil	5.7 (1.5)	★0W-40 SAE 5W-30 SAE 5W-40 SAE 15W-40
Final drive	Gear oil	0.6×2 (0.16×2)	★SAE 75W-90 SAE 80W-90
Hydraulic tank	Hydraulic oil	Tank: 27 (7.1) System:	★ISO VG 15 ISO VG 32 ISO VG 46, HBHO VG 46 ★3 ISO VG 68
Fuel tank	Diesel fuel★1	30 (7.9)	★ASTM D975 NO.1 ASTM D975 NO.2
Fitting (grease nipple)	Grease	As required	★NLGI NO.1 NLGI NO.2
Radiator (reservoir tank)	Mixture of antifreeze and soft water★2	6.8 (1.8)	Ethylene glycol base permanent type (50 : 50) ★Ethylene glycol base permanent type (60 : 40)

※ Using any lubricating oils other than HD Hyundai Construction Equipment genuine products may lead to a deterioration of performance and cause damage to major components.

※ Do not mix HD Hyundai Construction Equipment genuine oil with any other lubricating oil as it may result in damage to the systems of major components.

※ For HD Hyundai Construction Equipment genuine lubricating oils and grease for use in regions with extremely low temperatures, please contact your local HD Hyundai Construction Equipment dealer.

SAE : Society of Automotive Engineers
API : American Petroleum Institute
ISO : International Organization for Standardization
NLGI : National Lubricating Grease Institute
ASTM : American Society of Testing and Material

★ : Cold region
Russia, CIS, Mongolia
★1 : Ultra low sulfur diesel
- sulfur content ≤ 10 ppm
★2 : Soft water
City water or distilled water
★3 : HD Hyundai Construction Equipment Bio Hydraulic Oil

SECTION 2 STRUCTURE AND FUNCTION

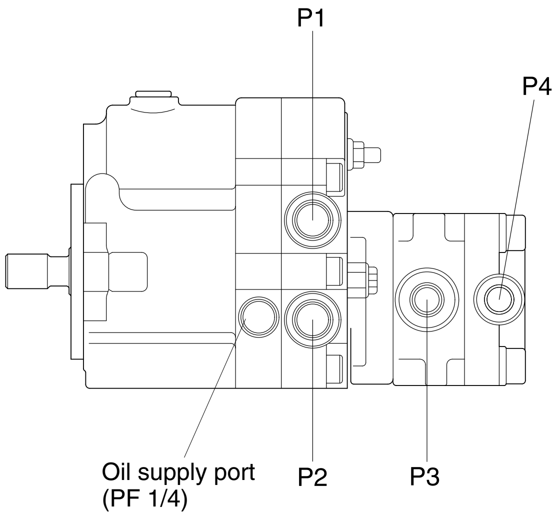
GROUP 1 HYDRAULIC PUMP

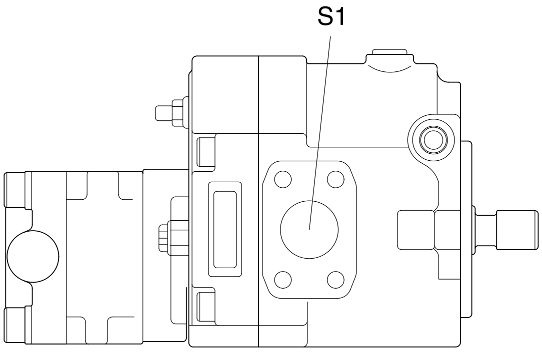
1. GENERAL

This is a variable displacement double-piston pump for discharge with equal displacements from one cylinder block. This pump is so compact as to appear a single pump though this is actually a double pump.

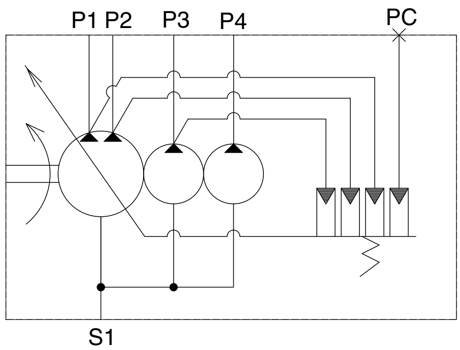
Because this pump has one swash plate, the tilting angle is the same for two pumps. Tilting of the pump changes in response to the total pressure of P1 + P2. Namely, the output is controlled to the constant value so that the relationship between the discharge pressure and flow rate Q becomes constant, (P1 + P2) * Q =Constant.

The third pump and pilot pump can be connected to the same shaft via a coupling.





REAR VIEW



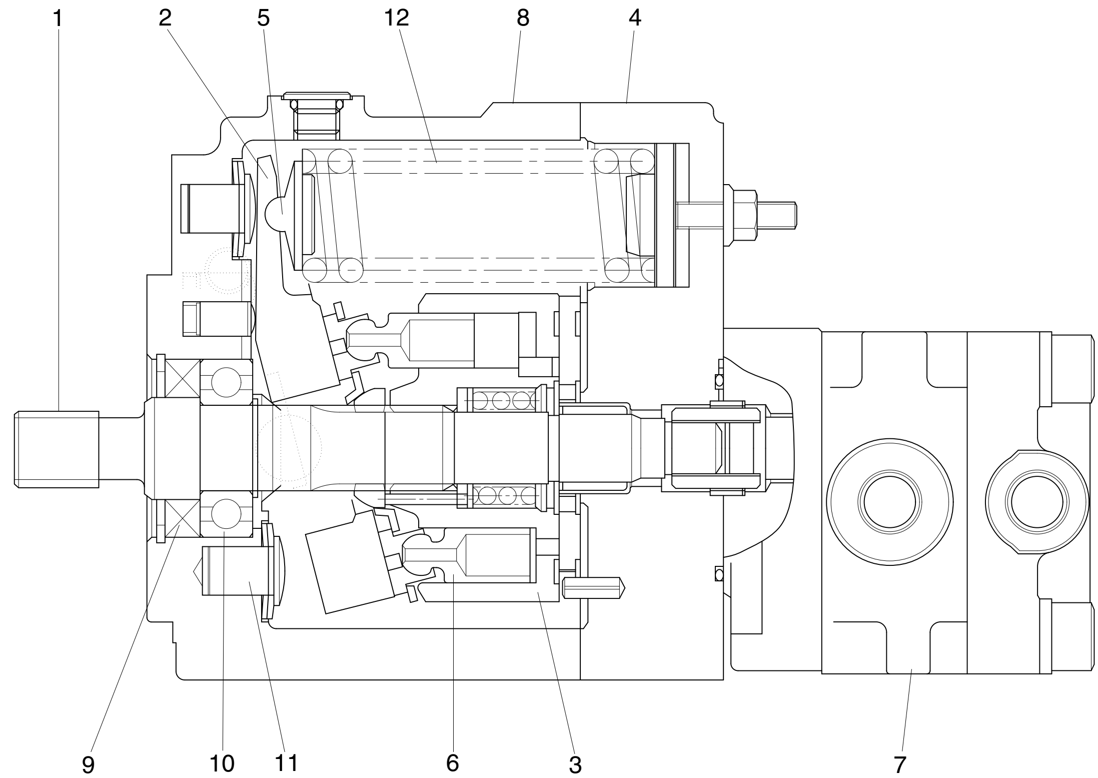
Hydraulic circuit

25AZ2MP01

Description of the ports

Port	Port name	Port size
S1	Suction port	SAE 1 1/4
P1, P2	Discharge port	PF 1/2
P3, P4	Discharge port	PF 3/8

2. MAJOR COMPONENTS AND FUNCTIONS



R27Z92MP03

1	Drive shaft assembly	7	Gear pump
2	Swash plate assembly	8	Housing
3	Cylinder barrel	9	Oil seal
4	Port plate assembly	10	Bearing
5	Spring seat assembly	11	Stopper assembly
6	Piston	12	Spring

This is a variable displacement double-piston pump for discharge with two equal displacements from one cylinder block. Because this is one cylinder barrel, there is only one suction port.

The oil is divided into two equal flows by the control plate in the cover and directed to two discharge ports provided in the cover.

The discharge pressure directed to the piston tilts the hanger by overcoming the spring force.

Since the piston stroke changes according to the tilting angle of the hanger, the flow can be changed.

The simultaneous tilting angle constant-output control method is employed.

The pilot pump can be connected to the same shaft via a coupling.

1) PRINCIPLE OF OPERATION

(1) Function of pump

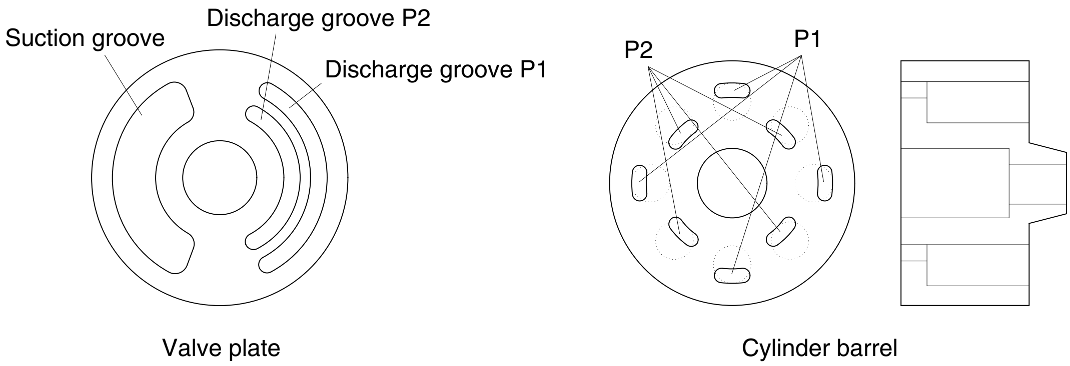


Figure 1 Working principle of PVD pump

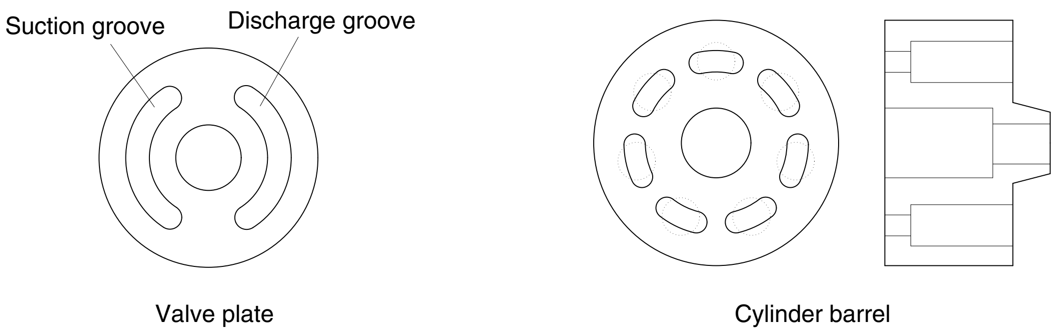


Figure 2 Working principle of Conventional type

25AZ2MP04

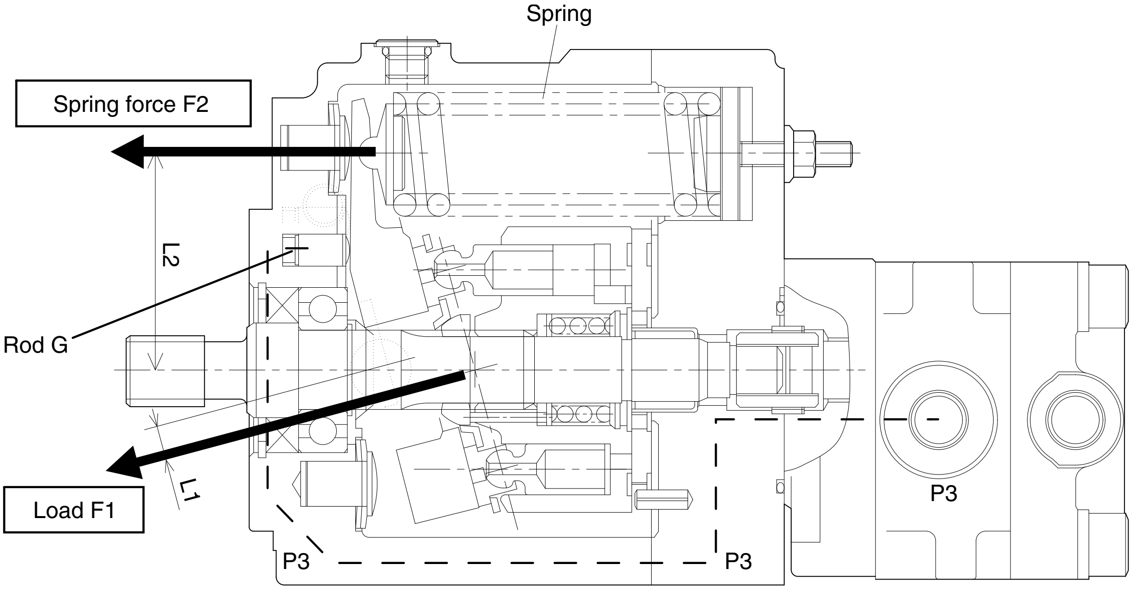
This pump adopts a new method using even numbered pistons to make functions of two same volume pumps available in one casing of a swash plate type variable volume piston pump.

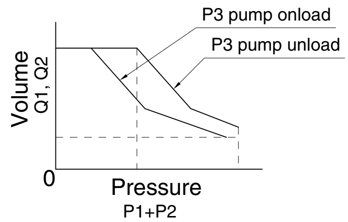
Conventional valve plate has one suction groove and one discharge groove respectively as shown in figure 2. But this method adopts one common suction groove and two discharge grooves on the outer side (P1) and the inner side (P2) as shown in figure 1, the piston room in the cylinder barrel opens to either the outer side (P1) or the inner side (P2) discharge groove of the valve plate alternately, and the discharges are performed independently on the inner side and the outer side.

Since this model has even numbered pistons, same No of pistons open to the outer side and the inner side of the valve plate. All pistons are of same swash plate, so the discharges from the outer side (P1) and the inner side (P2) are equal.

Also, since only one swash plate is used, the discharges from P1 and P2 ports changes equally when the swash plate angle of rake changes in variable controls. So, there is no difference between the two discharges.

2) CONTROL FUNCTIONS





P-Q characteristic

25AZ2MP05

(1) Constant horse power variable structure

The pump output flow rate is variable depending on an angle of the swash plate which is controlled according to the pump output pressure. This control enables the pump consumption horse power to be sustained at the maximum. The tilt point of the swash plate is the balls located behind the swash plate. The load F1 from the pistons is in the direction shown in the illustration and generates a clockwise moment against the swash plate. Against this force the spring (force F2) is located in the opposite direction to keep the horse power constant and set at the appointed load. As the pressure increases, the above clockwise moment increases, and when it overcomes the counter-clockwise moment created by the spring force, the spring is sagged and the swash plate angle gets smaller. Then the output flow rate is reduced to keep the horse power constant.

This prevents engine stall and the engine horse power can be utilized at the maximum.

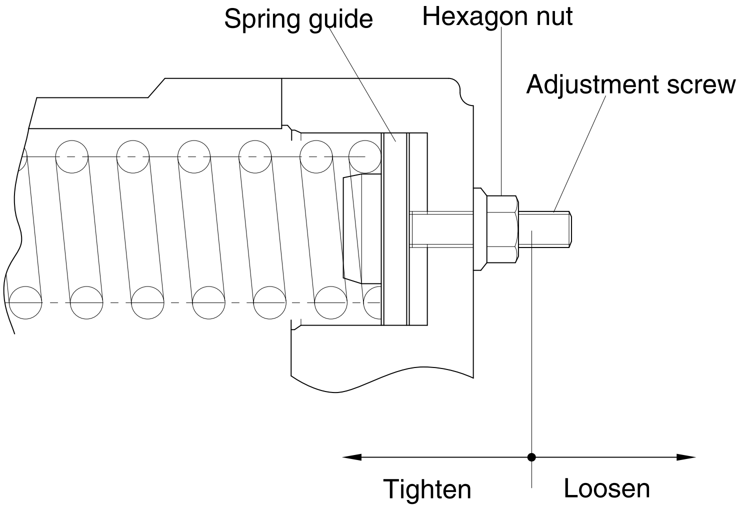
(2) Power shift mode (Reduced horse power control by P3 pressure)

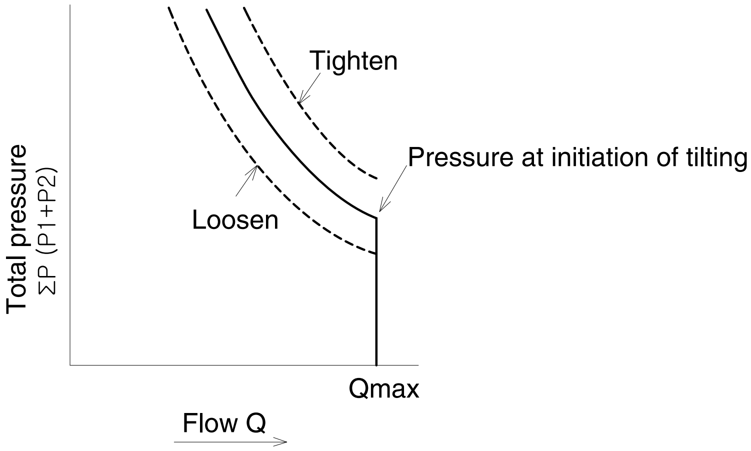
This control keeps the maximum value of the pump consumption horse power including the third pump (gear pump) constant. When the P3 (gear pump) pressure acts on the rod G, a clockwise moment proportion to the pressure acts on the swash plate and the A-Q characteristic shifts so that the total pump consumption horse power including the gear pump horse power is kept constant.

3) CONTROL / ADJUSTMENT PROCEDURE

(1) Loosen the hexagonal nut.

(2) Tighten or loosen the adjusting screw to set the power shifting line.

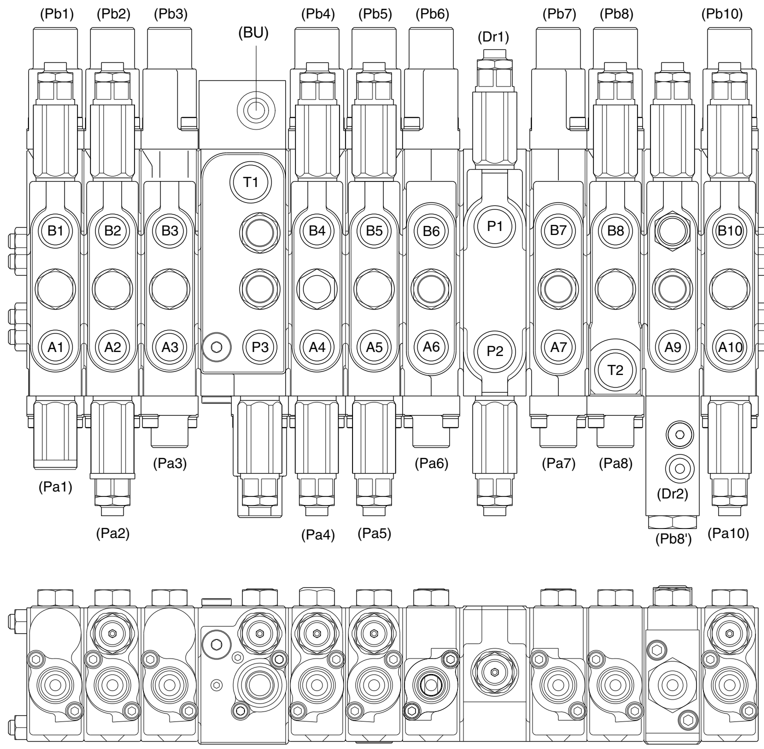




25AZ2MP07

GROUP 2 MAIN CONTROL VALVE

1. OUTLINE

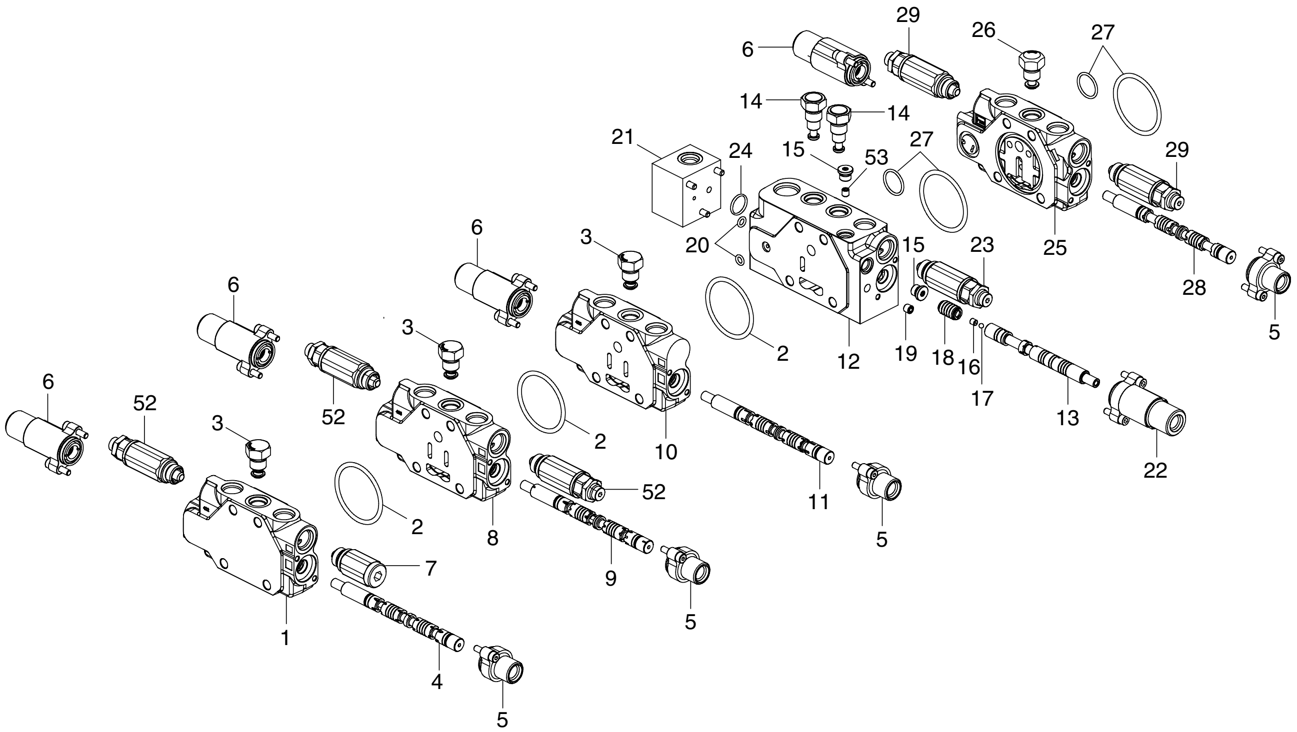


25AZ2MCV01

Mark	Port name	Port size	Tightening torque
P1	P1 pump port	PF 1/2	6~7 kgf · m
P2	P2 pump port		
T1	Tank return port		
T2	Tank return port		
P3	P3 pump port	PF 3/8	4.0~5.0 kgf · m
A1	Dozer up		
B1	Dozer down		
A2	Boom swing (LH) port		
B2	Boom swing (RH) port		
A3	Swing (LH) port		
B3	Swing (RH) port		
A4	Option port		
B4	Option port		
A5	Arm out port		
B5	Arm in port		
A6	Travel [LH/RR] port		
B6	Travel [LH/FW] port		
A7	Travel [RH/RR] port		
B7	Travel [RH/FW] port		
A9	Boom up port		
B8	Boom down port		

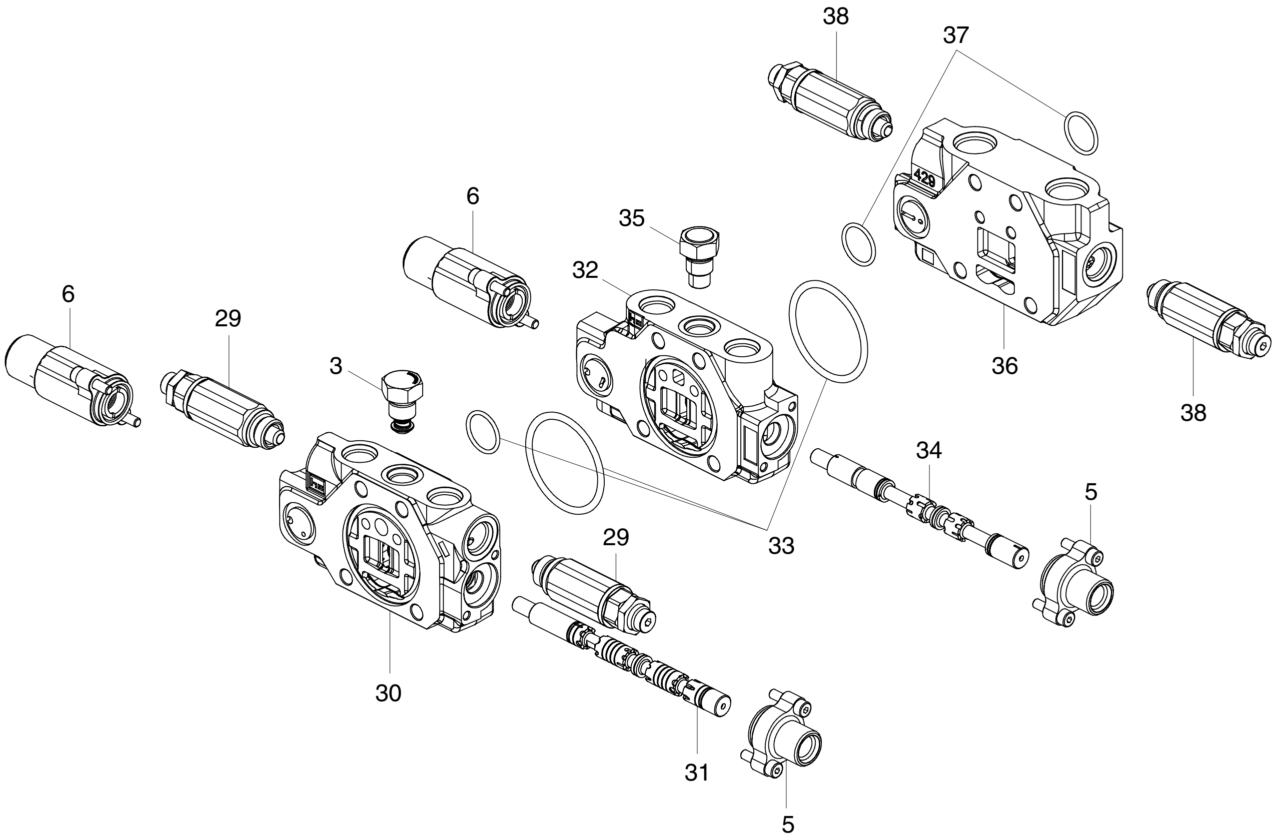
Mark	Port name	Port size	Tightening torque
A10	Bucket out port	PF 3/8	4.0~5.0 kgf · m
B10	Bucket in port		
Pa1	Dozer up pilot port	PF 1/4	2.5~3.0 kgf · m
Pb1	Dozer down pilot port		
Pa2	Boom swing (LH) pilot port		
Pb2	Boom swing (RH) pilot port		
Pa3	Swing (LH) pilot port		
Pb3	Swing (RH) pilot port		
Pa5	Arm out pilot port		
Pb5	Arm in pilot port		
Pa6	Travel [LH/RR] pilot port		
Pb6	Travel [LH/FW] pilot port		
Pa7	Travel [RH/RR] pilot port		
Pb7	Travel [RH/FW] pilot port		
Pa8	Boom up pilot port		
Pb8	Boom down pilot port		
Pa10	Bucket out pilot port		
Pb10	Bucket in pilot port		
Bu	Boom up pilot port		
PP1	Travel independent pilot port		

2. STRUCTURE (1/3)



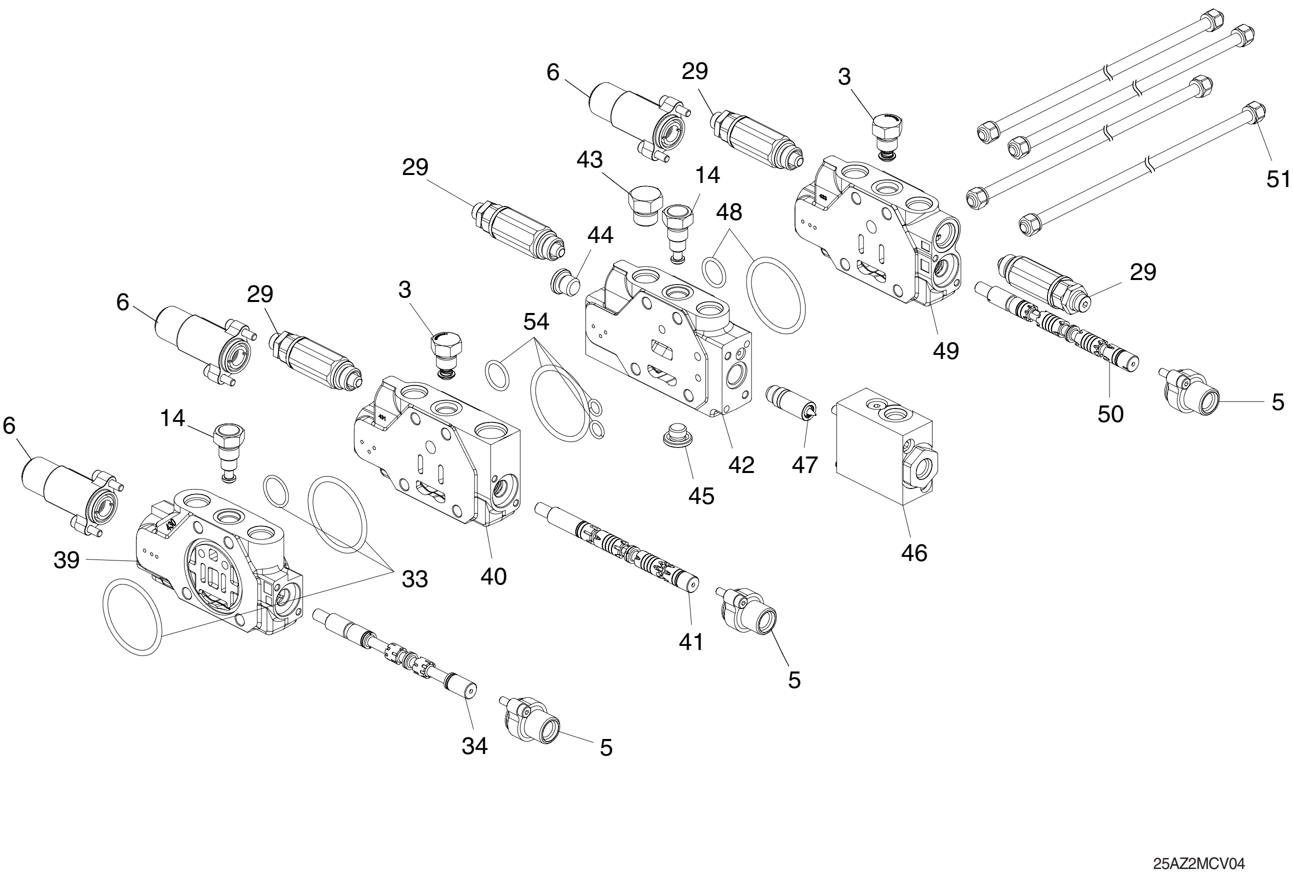
1	Dozer block assy	11	Swing spool assy	21	Pilot body
2	O-ring	12	Confluence block body	22	Pilot cover
3	Plug	13	Confluence spool assy	23	Relief valve assy
4	Dozer spool assy	14	Plug	24	O-ring
5	Pilot cover	15	Plug	25	PTO block body
6	Pilot cover	16	Piston	26	Plug
7	Relief valve assy	17	Ball	27	O-ring
8	Boom swing block	18	Spring	28	PTO 1 spool assy
9	Boom swing spool assy	19	Piston	29	Relief valve assy
10	Swing block assy	20	O-ring	52	Relief valve assy

STRUCTURE (2/3)



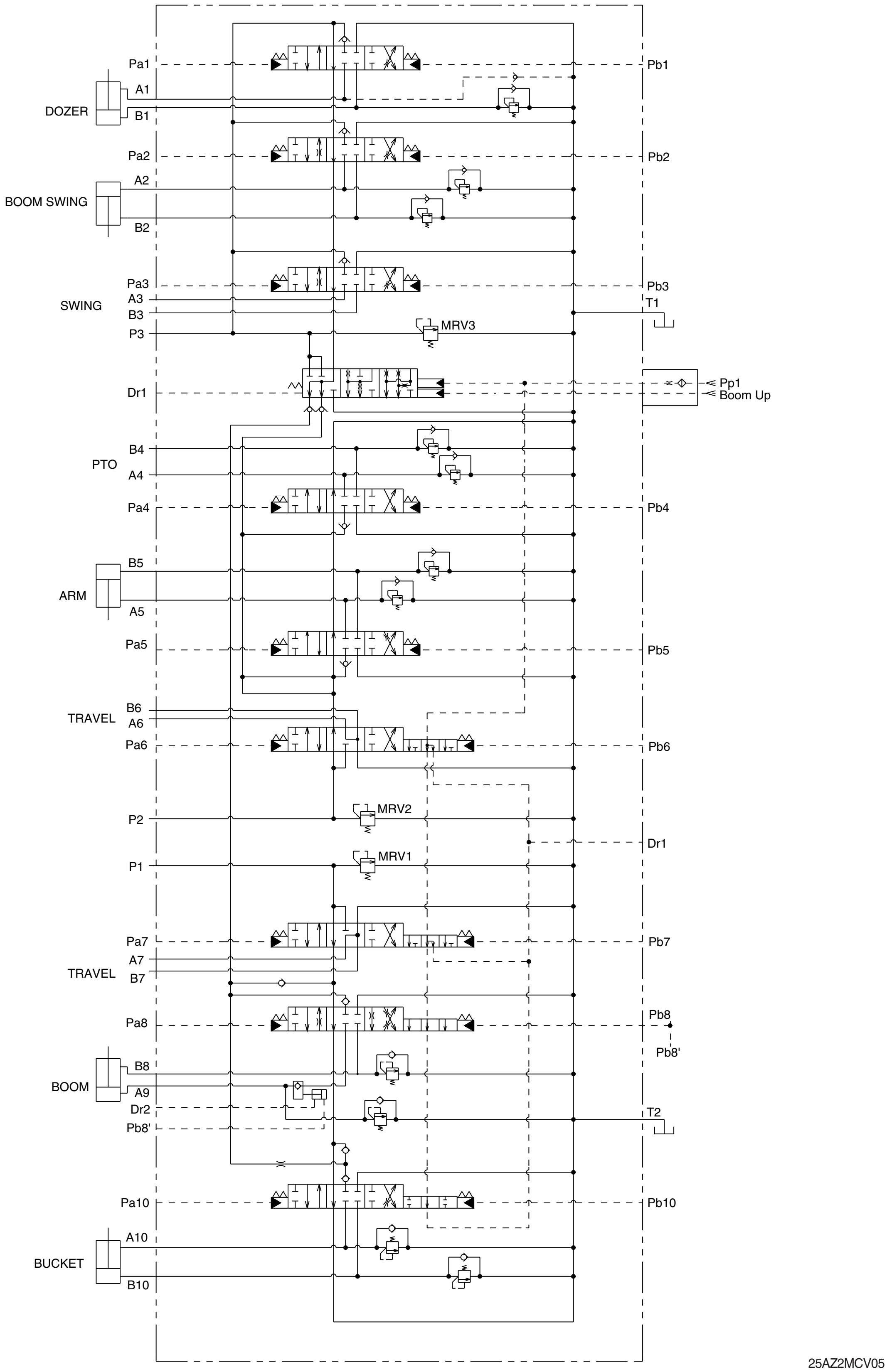
3	Plug	31	Arm spool assy	35	Plug
5	Pilot cover	32	LH travel block assy	36	Inlet block assy
6	Pilot cover	33	O-ring	37	O-ring
29	Relief valve assy	34	Travel spool assy	38	Relief valve assy
30	Arm block assy				

STRUCTURE (3/3)



3	Plug	39	RH travel block assy	46	Lock valve cover
5	Pilot cover	40	Boom block body	47	Lock valve
6	Pilot cover	41	Boom spool assy	48	O-ring
14	Plug	42	Boom lock block assy	49	Bucket block assy
29	Relief valve assy	43	Plug	50	Bucket spool assy
33	O-ring	44	Plug	51	Socket bolt
34	Travel spool assy	45	Plug	54	O-ring

3. HYDRAULIC CIRCUIT



4. FUNCTION

1) IN NEUTRAL (When all spools are in neutral position)

P1 : The oil discharged from the hydraulic pump flows into control valve P1 port, and then flows through P1 and P2 supply body the P1 side travel spool. The oil flows through the bypass passage in the direction of travel → boom → bucket spool, and then flows from the bypass passage to the tank passage in the bucket section.

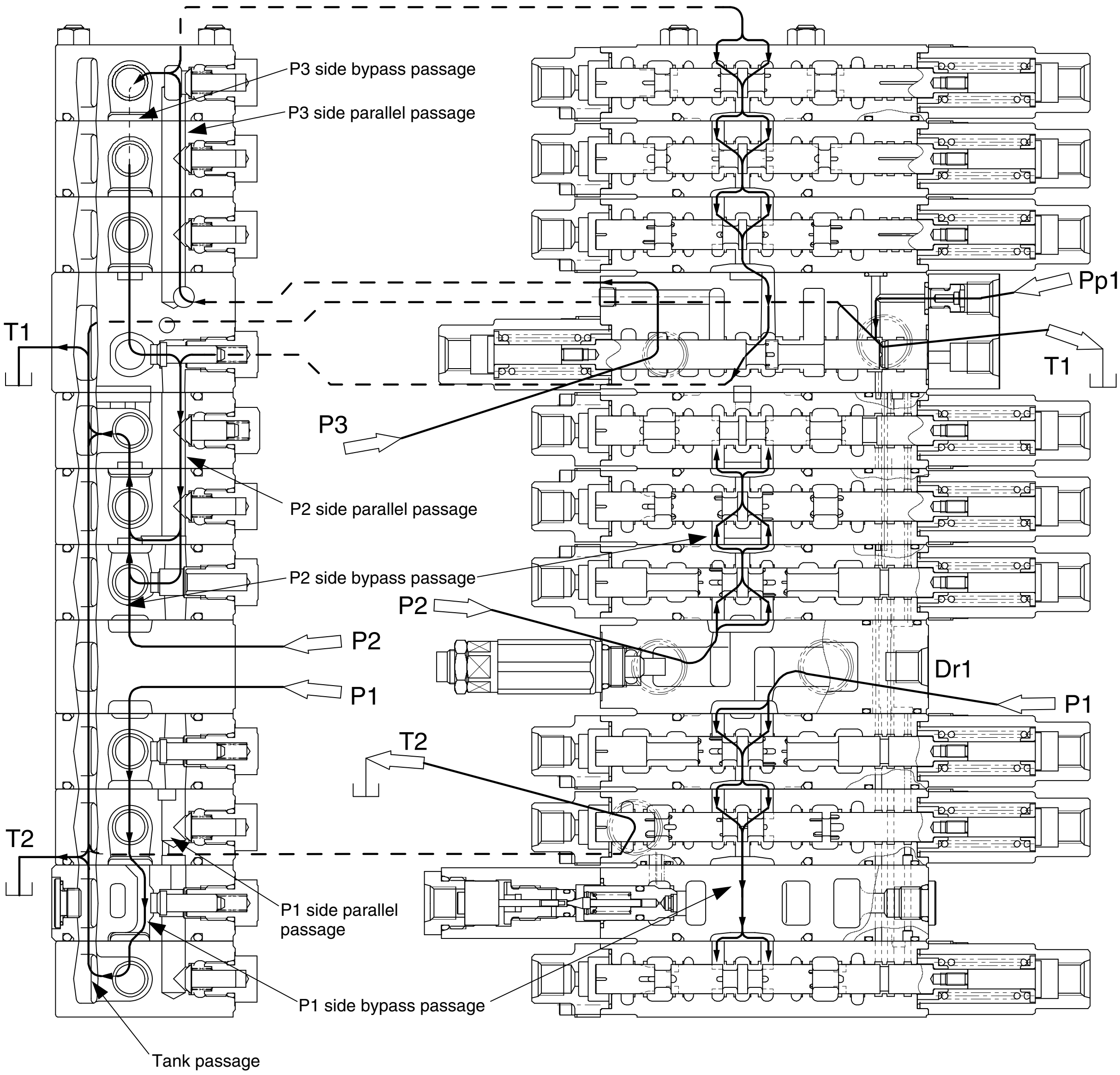
P2 : The oil discharged for the hydraulic pump flows into the control valve from P2 port, and then flows through P1 and P2 supply body to the P2 side travel spool. The oil flows through the bypass passage in the direction of travel → arm → PTO spool, and the flows from the bypass passage to the tank passage in the PTO section.

P3 : The oil discharged from the hydraulic pump flows into the control valve from P3 port, and then flows through the parallel passage of dozer, boom swing, and swing. The oil that has followed into the parallel passage flows through the bypass passage in the direction of dozer → Boom swing → swing spool, the connecting spool land, the P2 side parallel passage, the bypass passage from arm to PTO spool, the bypass passage in the PTO section, and then to the tank passage.

※ **Since each line (P1, P2, P3) is supplied with oil from the pump, the section is operatable; therefore, do not operate the control valve except the working time.**

- · P1 line : Travel, boom, bucket
- · P2 line : Travel, arm, PTO
- · P3 line : Dozer, boom swing, arm, PTO, boom (up only)

P_P1 : When P_P1 port is applied with pilot pressure, the oil flows into the travel independent passage via an orifice.
With the spool in neutral, the oil flows into Dr1 port provided in the P1 and P2 supply body.



Hydraulic oil flow in neutral

R35Z72MCV11

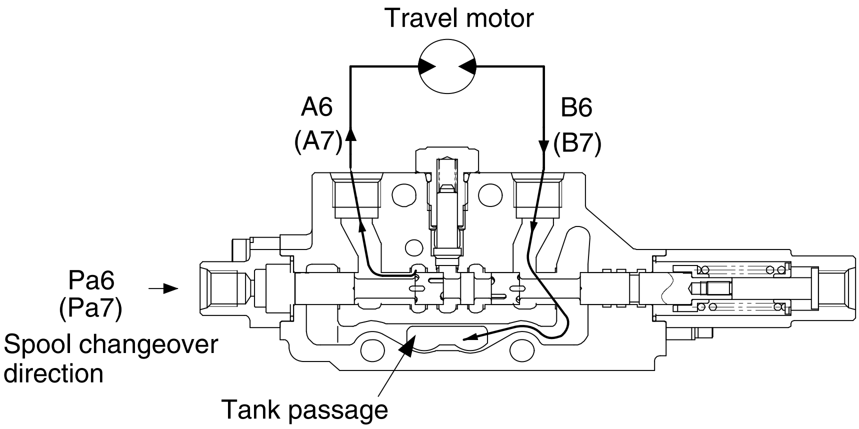
2) TRAVEL OPERATION

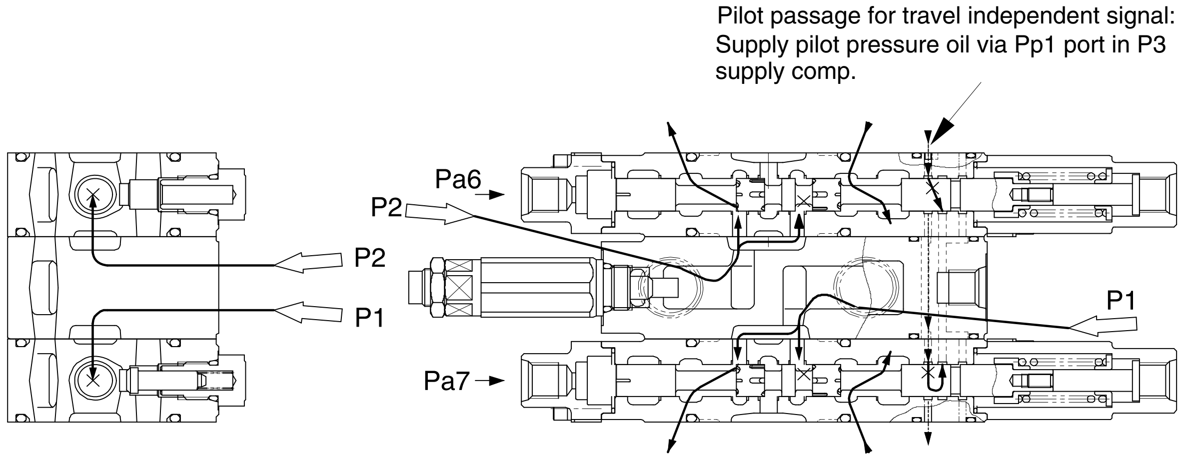
For the travel operation, both Pa pressurization and Pb pressurization are the same on operation so that only Pa pressurization is explained as follows.

When left (right) travel reverse is operated, the secondary pressure from the remote control valve is applied to Pa6 [Pa7] port to change over the travel spool. The oil flowed from P2 [P1] port flows through the supply body into the P2 [P1] side bypass passage. The oil flowed into the P2 [P1] side bypass passage flows through A6 [A7] port that has been opened by the spool changeover to the travel motor. On the other hand, the oil returned from the travel motor flows into the control valve from B6 [B7] port and then to the tank passage has been opened after the spool changeover.

The oil flowed from P_P1 port flows through the orifice passage provided in the P3 supply section into the travel independent signal passage.

Although the travel independent passage (see page 2-14) in the travel section that has been opened during neutral is blocked after the both travel spools changeover, the travel independent signal passage is connected to the drain port via the bucket section Accordingly, when the bucket section has not changed over, the connecting spool in the P3 supply section does not change over because the pressure in the travel independent signal passage is equal to the drain pressure.





Operation during travel(Forward)

R35Z72MCV12

3) BOOM OPERATION

Boom up operation

When the boom up operation is carried out, the secondary pressure from the remote control valve is applied to Pa8 port to change over the boom spool. Since Pa8 port is connected to boom up port through the piping, the pressure oil supplied to boom up port changes over the connecting spool through the connecting piston in the P3 supply section

Also, since the P1 side bypass passage is shut off at the boom section after the boom spool changeover, the oil flowed from P1 port flows through the check valve provided above the bypass passage in the travel section into the P1 side parallel passage.

On the other side, after the connecting spool changeover the oil flowed into P3 port.

① Flows through the internal passage in connecting spool and the check valve in the P3 supply section into the P1 side parallel passage.

② The oil flows through the P3 side parallel passage and P3 side bypass passage and then:

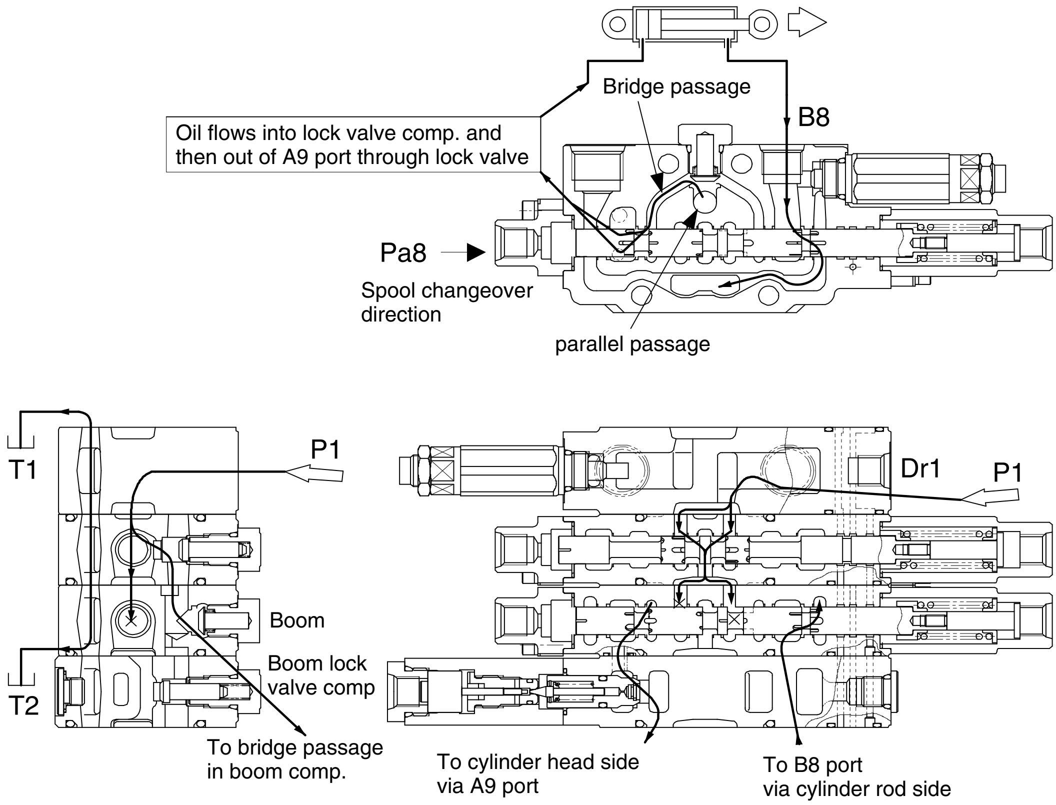
a. Flows through the check valve in the P3 supply section into the P1 side parallel passage.
b. Some oil flows through the orifice passage provided in the connecting spool and the check valve in the P3 supply section into the P2 side parallel passage.

The oil flowed into the P1 side parallel passage is connected with the oil from P1 pump.
The oil flowed into the P2 side parallel passage flows through the bypass passages in the arm section and PTO section to the tank passage.

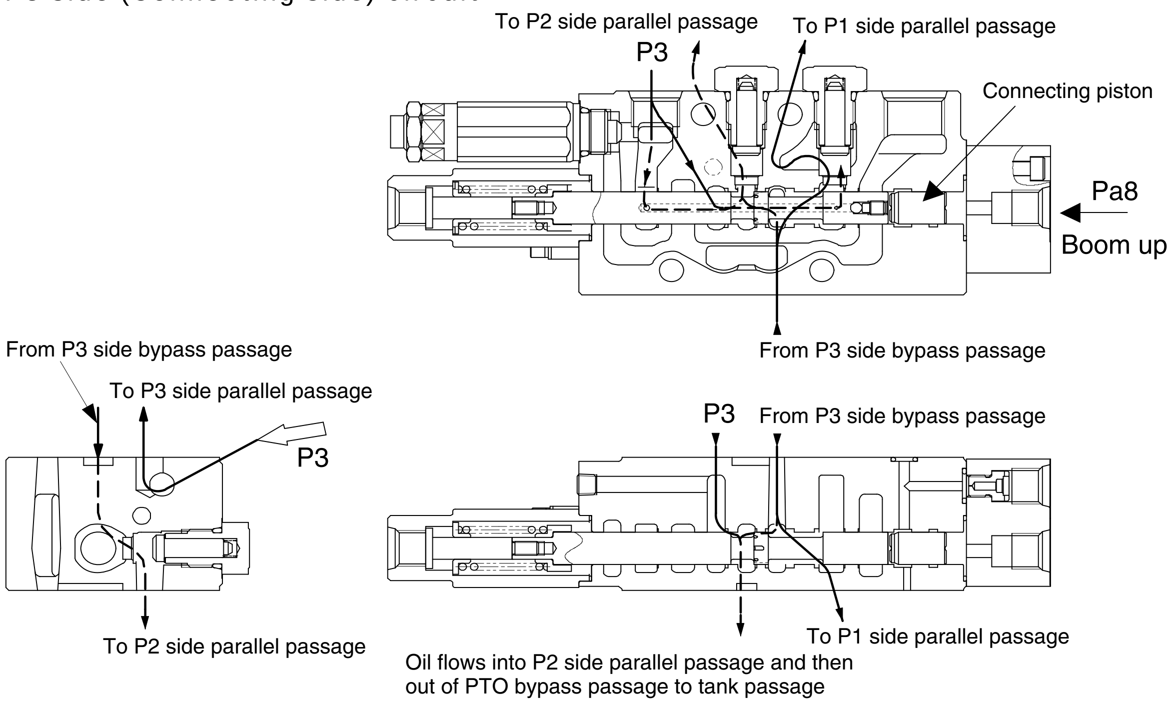
Since the passage connected to the boom lock valve and the bridge passage are opened after the boom spool changeover, the oil flowed into the P1 side parallel passage flows through the load check valve in the boom section and the bridge passage into the boom lock valve section
The oil flowed into the boom lock valve section opens the lock valve (free flow condition), flows into A9 port, and the to the head side of the boom cylinder.

On the other hand, the oil returned from the rod side of the boom cylinder flows into B8 port to the tank passage that has opened with the spool's notch after the spool changeover. Then, the boom cylinder extends to raise the boom.

P1 side circuit



P3 side (Connecting side) circuit



Boom up operation

R35Z72MCV13

Boom down operation

When the boom down operation is carried out, the secondary pressure from the remote control valve is applied to Pb8 port to change over the boom spool.

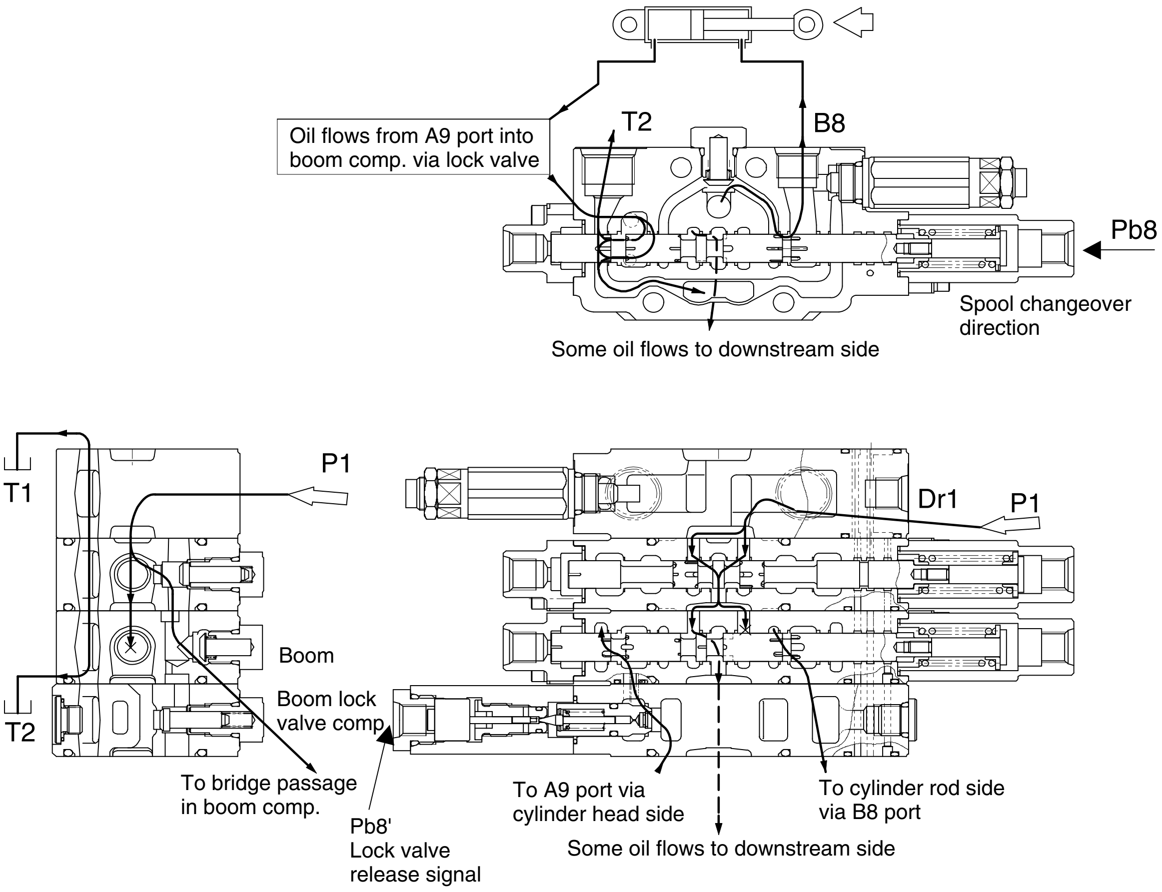
Since Pb8 port is connected to Pb8' port through the piping, the pressure is also applied to pb8' port (Boom lock valve release port) to release the boom lock valve.

(For the explanation of boom lock valve operation, see pages 2-19, 20)

Since the bypass passage is shut off at the boom section after the spool changeover (some oil flows through the orifice passage provided in the boom spool's bypass passage to the downstream side of the bypass passage), the oil flowed from P1 port flows through the check valve provided above the bypass passage in the travel section into the P1 side parallel passage.

Also, since a passage between B8 port and bridge passage is opened with the spool's notch after the spool changeover, the oil flowed into the P1 side parallel passage flows through the load check valve in the boom section into B8 port via the bridge passage and then into the rod side of the boom cylinder.

On the other side, the oil returned from the head side of the boom cylinder flows into A9 port to the tank passage that has been opened with the spool's notch after the spool changeover through the boom lock valve that has been released by Pb8' port pressure. Then, the boom cylinder retracts to lower the boom.



Boom down operation

R35Z72MCV14

4) Operation of boom lock valve

(1) Holding

In the boom spool neutral condition,

· The pilot piston chamber (a) is connected to the drain passage through the pilot port (Pb8') for releasing the boom lock valve.

· The piston chamber (b) is also connected to the drain passage through the drain port (Dr2).

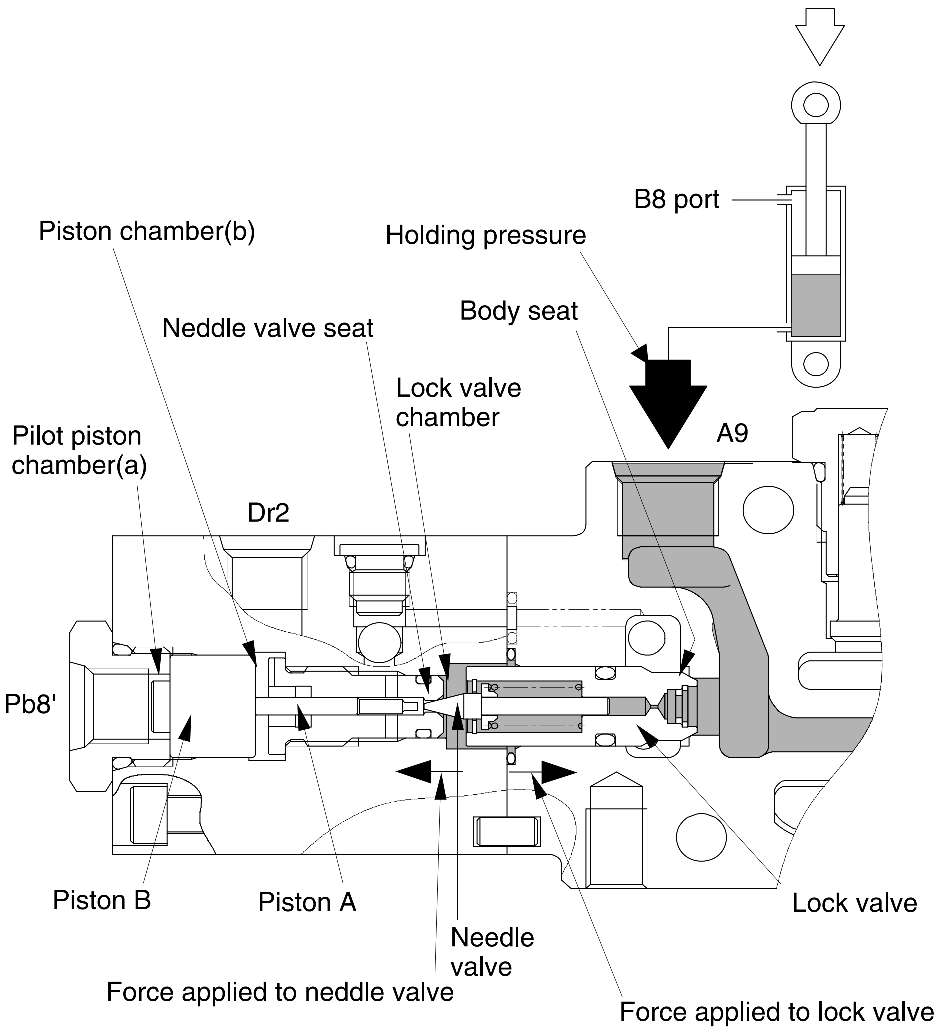
Therefore, the piston (B) maintains the condition shown in the figure.

The boom cylinder holding pressure (shown in half-tone dot meshing) is applied to the lock valve chamber as shown in the figure to :

· Press the needle valve against the needle valve seat.

· Press the lock valve against the body seat.

Then, oil leakage from the boom cylinder head side is prevented to stop the movement of the boom cylinder due to leakage.



Operation of boom lock valve (holding)

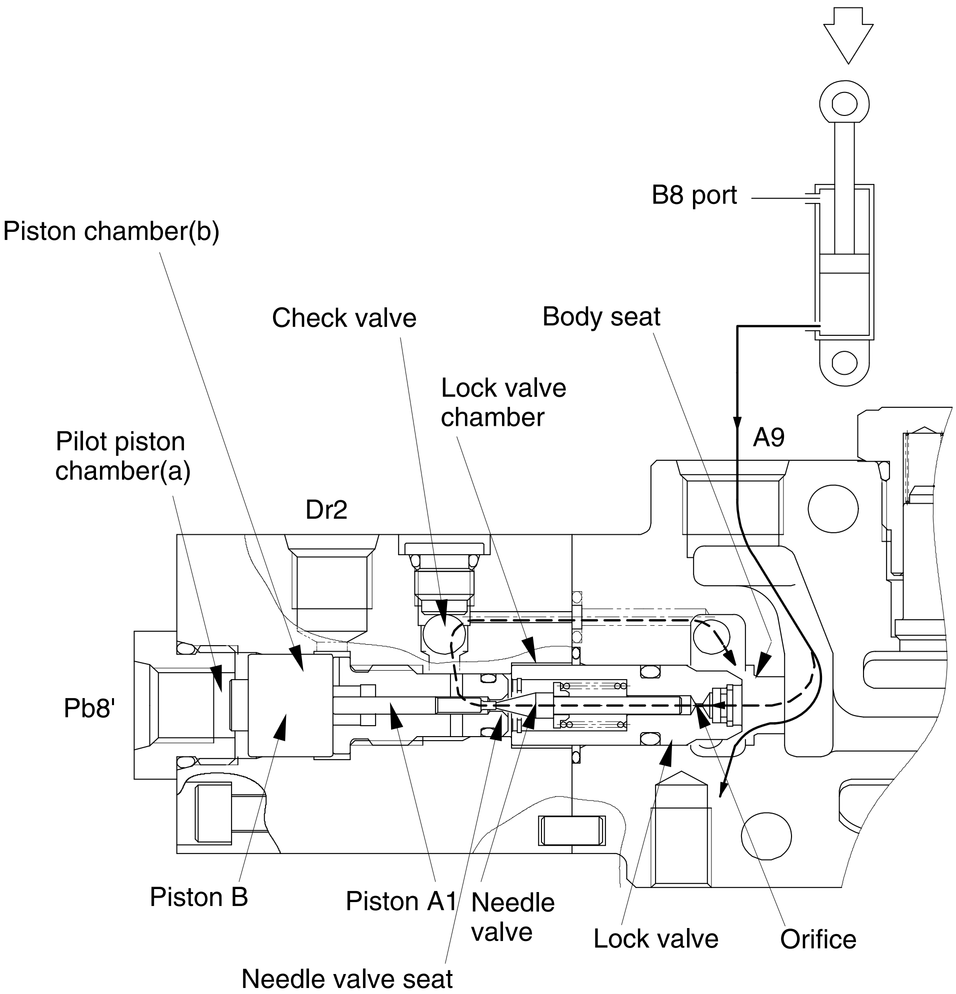
R35Z72MCV15

(2) Release

When the pilot pressure is applied to the pilot port (Pb8') for boom lock valve release, the piston (B) moves rightward to open the needle valve through the piston (A1).

Then, the oil returned from the boom cylinder flows through the passage in the direction of lock valve's orifice → lock valve chamber → needle valve seat → check valve into the lock valve's downstream side chamber (boom section).

When the lock valve's downstream chamber is connected to the tank passage after the boom spool changeover and the needle valve is released, the pressure in the lock valve chamber decreases to open the lock valve by the oil returned from the boom cylinder. The returned oil flows into the tank passage with the boom spool's notch to operate the cylinder.



Operation of boom lock valve (release)

R35Z72MCV16

5) BUCKET OPERATION

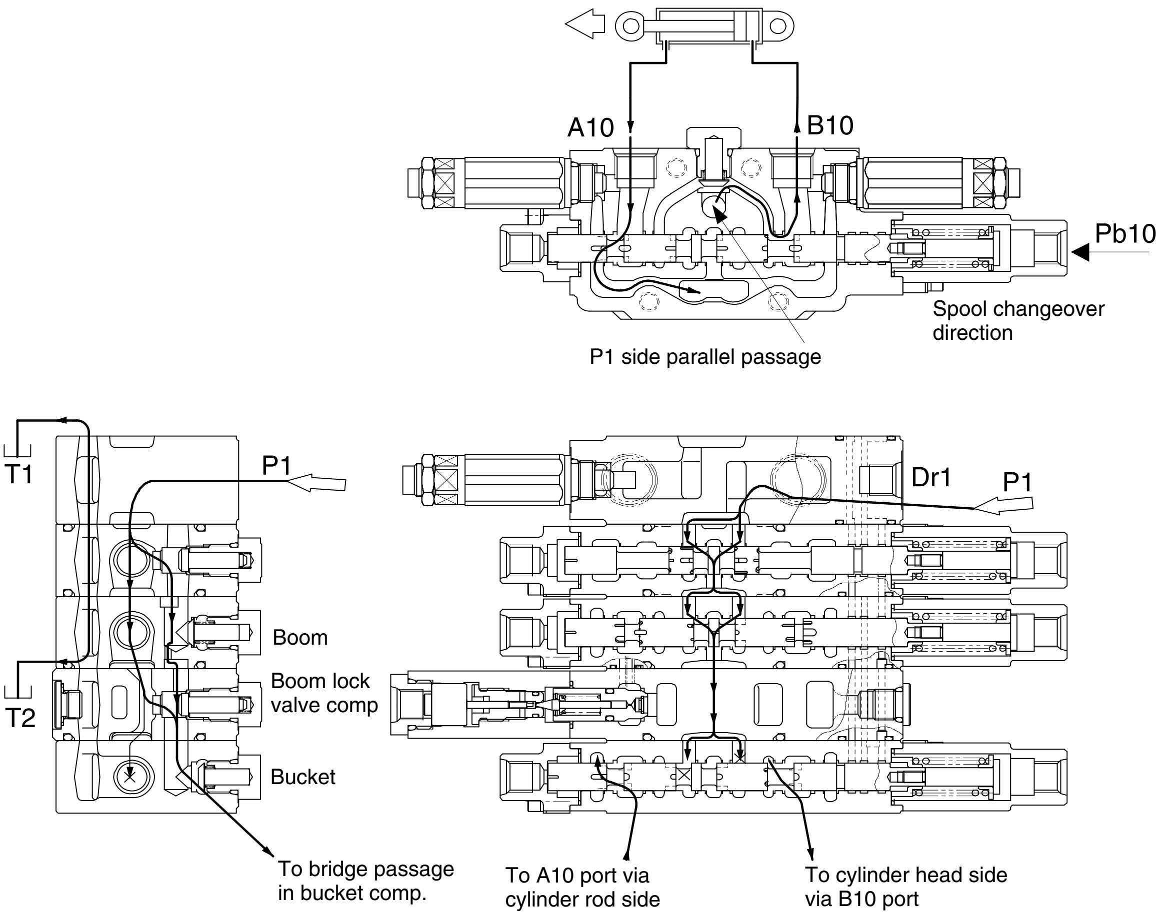
Bucket in operation

When the bucket in operation is carried out, the secondary pressure from the remote control valve flows into Pb10 port to change over the bucket spool.

Since the P1 side bypass passage is shut off at the bucket section after the bucket spool changeover, the oil flowed from P1 port flows through the check valve provided above the bypass passage in the travel section into the P1 side parallel passage.

Also, since a passage between B10 port and the bridge passage is opened after the spool changeover, the oil flowed into the P1 side parallel passage flows through the load check valve in the bucket section into B10 port via the bridge passage and then the head side of the bucket cylinder.

On the other hand, the oil returned from the rod side of the bucket cylinder flows into A10 port to the tank passage that has opened with the spool's notch after the spool changeover. Then, the bucket cylinder extends to make the bucket in.



Bucket in operation

R35Z72MCV17

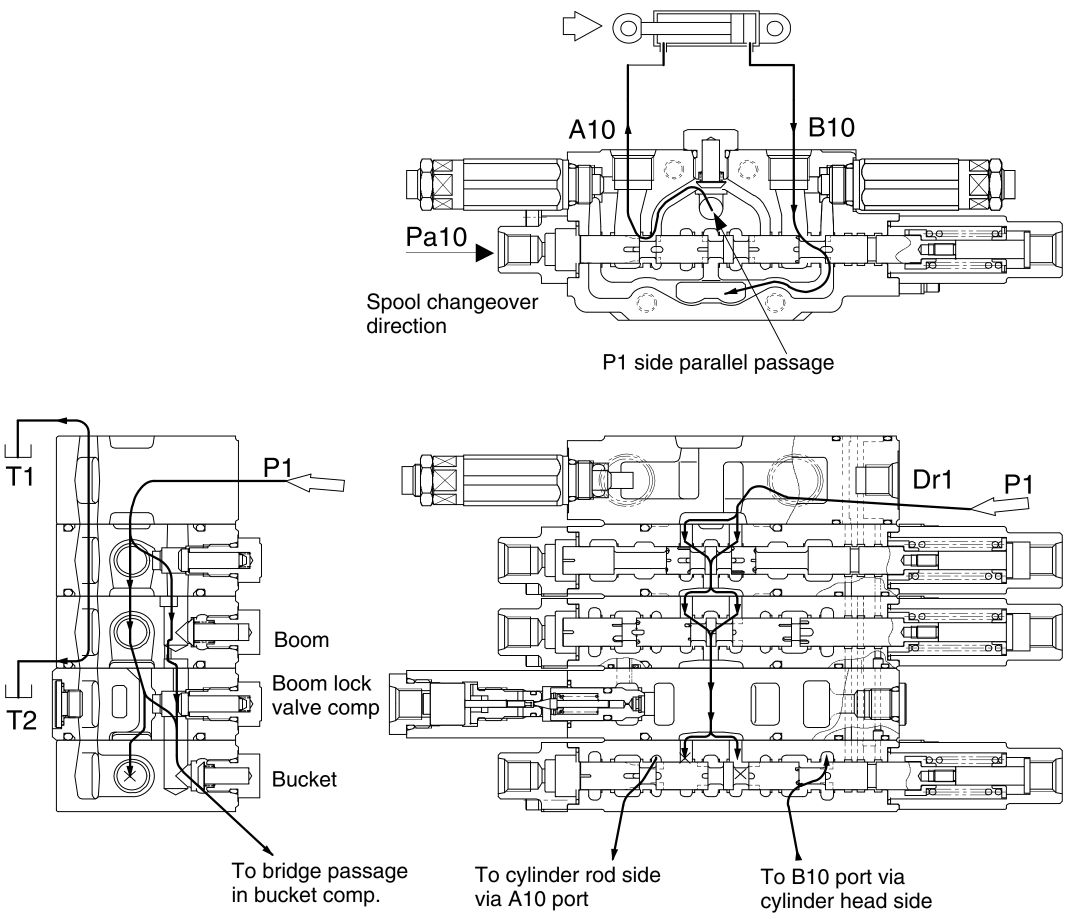
Bucket out operation

When the bucket out operation is carried out, the secondary pressure from the remote control valve flows into Pa10 port to change over the bucket spool.

Since the P1 side bypass passage is shut off at the bucket section after the bucket spool changeover, the oil flowed from P1 port flows through the check valve provided above the bypass passage in the travel section into the P1 side parallel passage.

Also, since a passage between A10 port and the bridge passage is opened after the spool changeover, the oil flowed into the P1 side parallel passage flows through the load check valve in the bucket section into A10 port via the bridge passage and then the head side of the bucket cylinder.

On the other hand, the oil returned from the head side of the bucket cylinder flows into B10 port to the tank passage that has opened after the spool changeover.



Bucket out operation

R35Z72MCV18

6) ARM OPERATION

Arm in operation

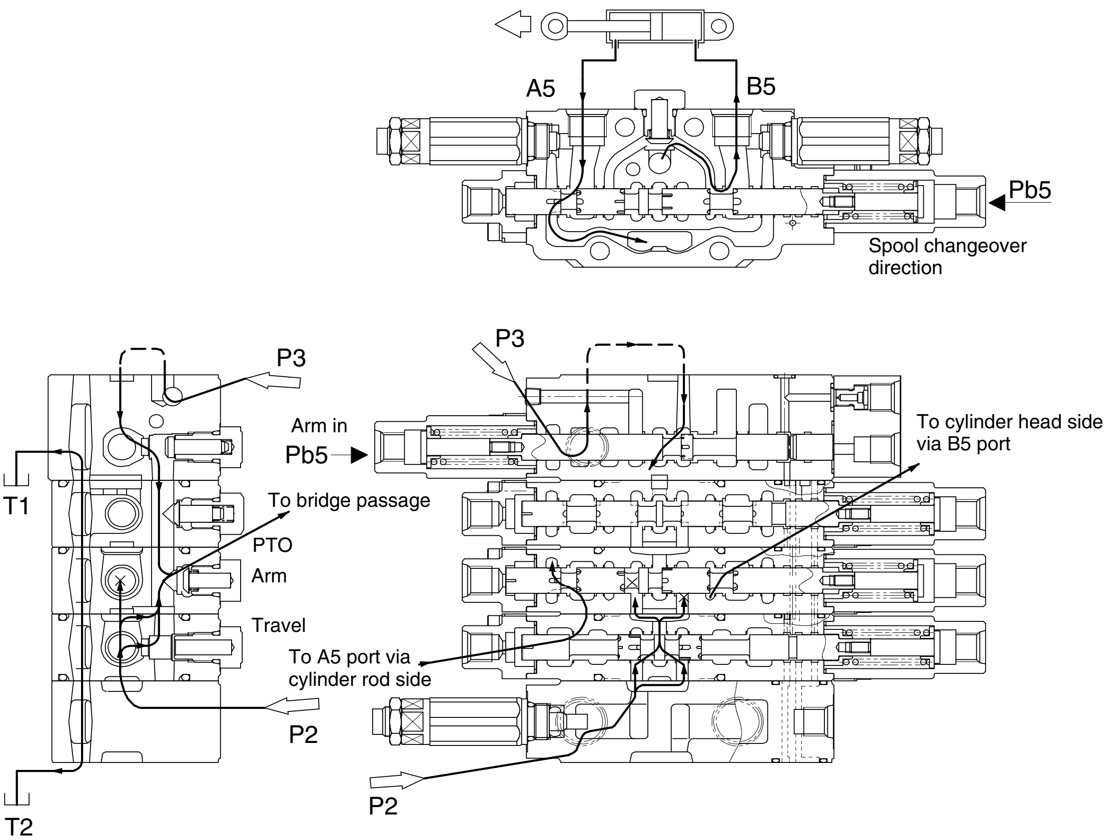
When the arm in operation is carried out, the secondary pressure from the remote control valve is applied to Pb5 port to change over the arm spool. The secondary pressure is also applied to the pilot chamber (arm in port) on the connecting section spring chamber side that has been connected through the piping. Therefore, when the operation is carried out together with the boom up operation at the same time, the connecting spool is hard to change over against the pilot pressure for arm in operation.

Since the P2 port bypass passage is shut off at the arm section after the arm spool change over, the oil flowed from P2 port flows through the travel section and a passage between travel section and arm section into the P2 side parallel passage.

Also, since the oil flowed from P3 port flows through the direction of dozer → boom swing → swing section and then into the P2 side parallel passage via the check valve in the P3 supply section, the connecting flow of P2 pump and P3 pump is supplied to the P2 side parallel passage. [Although the P3 side bypass passage is also connected to the P1 side parallel passage through the check valve in the P3 section, there is no oil flow into the P1 side as long as the P1 side sections (boom , bucket) are not operated.]

Since a passage between B5 port and the bridge passage is opened after the spool changeover, the oil flowed into the P2 side parallel passage flows through the load check valve in the arm section into B5 port via the bridge passage and then into the head side of the arm cylinder.

On the other hand, the oil returned from the rod side of the arm cylinder flows into A5 port to the tank passage that has opened with the spool's notch after the spool changeover. Then, the arm cylinder extends to make the arm in.



Arm in operation

R35Z72MCV19

Arm out operation

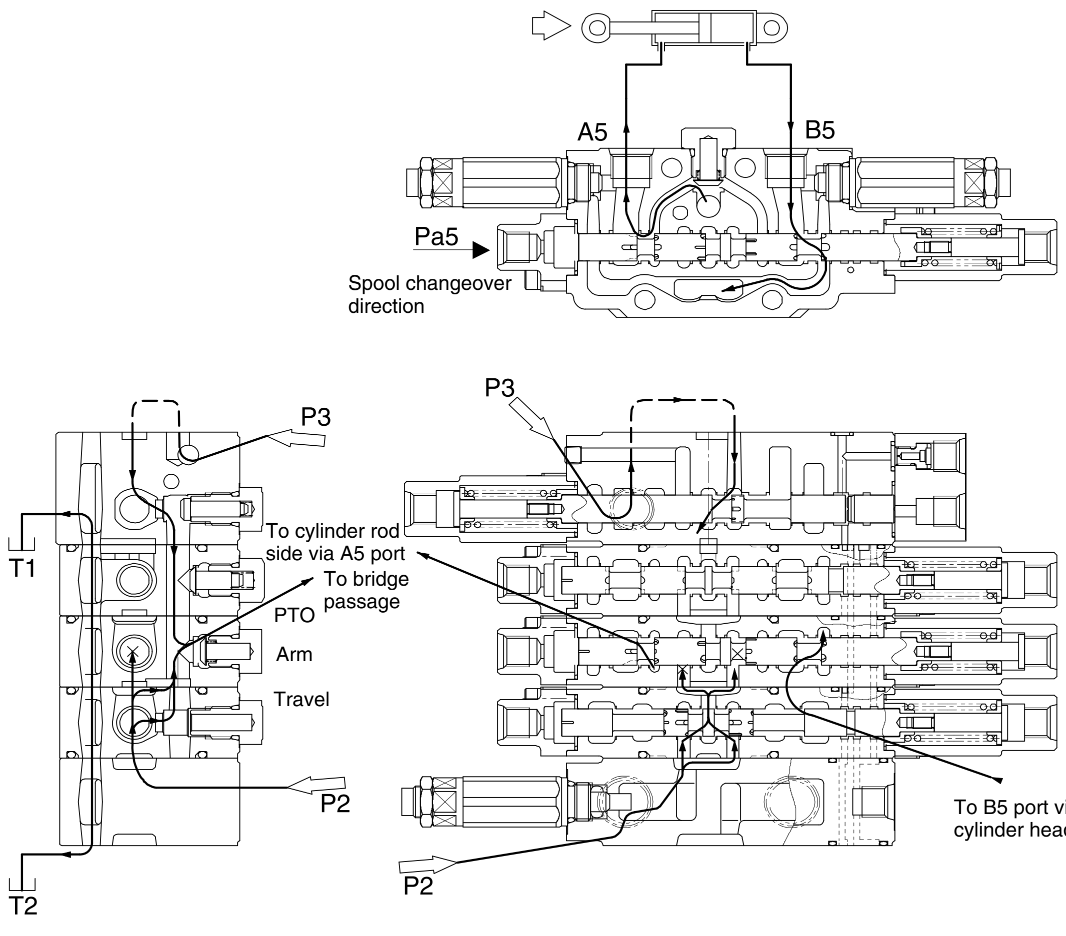
When the arm out operation is carried out, the secondary pressure from the remote control valve is applied to Pa5 port to change over the arm spool.

Since the P2 side bypass passage is shut off at the arm section after the arm spool changeover, the oil flowed from P2 port flows through the travel section and a passage between travel section and arm section into the P2 side parallel passage.

Also, since the oil flowed from P3 port flows through the direction of dozer → boom swing → swing section and then into the P2 side parallel passage via the check valve in the P3 supply section, the connecting flow of P2 pump and P3 pump is supplied to the P2 side parallel passage. [Although the P3 side bypass passage is also connected to the P1 side parallel passage through the check valve in the P3 section, there is no oil flow into the P1 side as long as the P1 side sections (boom , bucket) are not operated.]

Since a passage between A5 port and the bridge passage is opened after the spool changeover, the oil flowed into the P2 side parallel passage flows through the load check valve in the arm section into A5 port via the bridge passage and then into the rod side of the arm cylinder.

On the other hand, the oil returned from the head side of the arm cylinder flows into B5 port to the tank passage that has opened after the spool changeover. Then, the arm cylinder retracts to make the arm out.



Arm out operation

R35Z72MCV20

7) PTO OPERATION

For the PTO operation, both Pa pressurization and Pb pressurization are the same on operation so that only Pa pressurization is explained as follows.

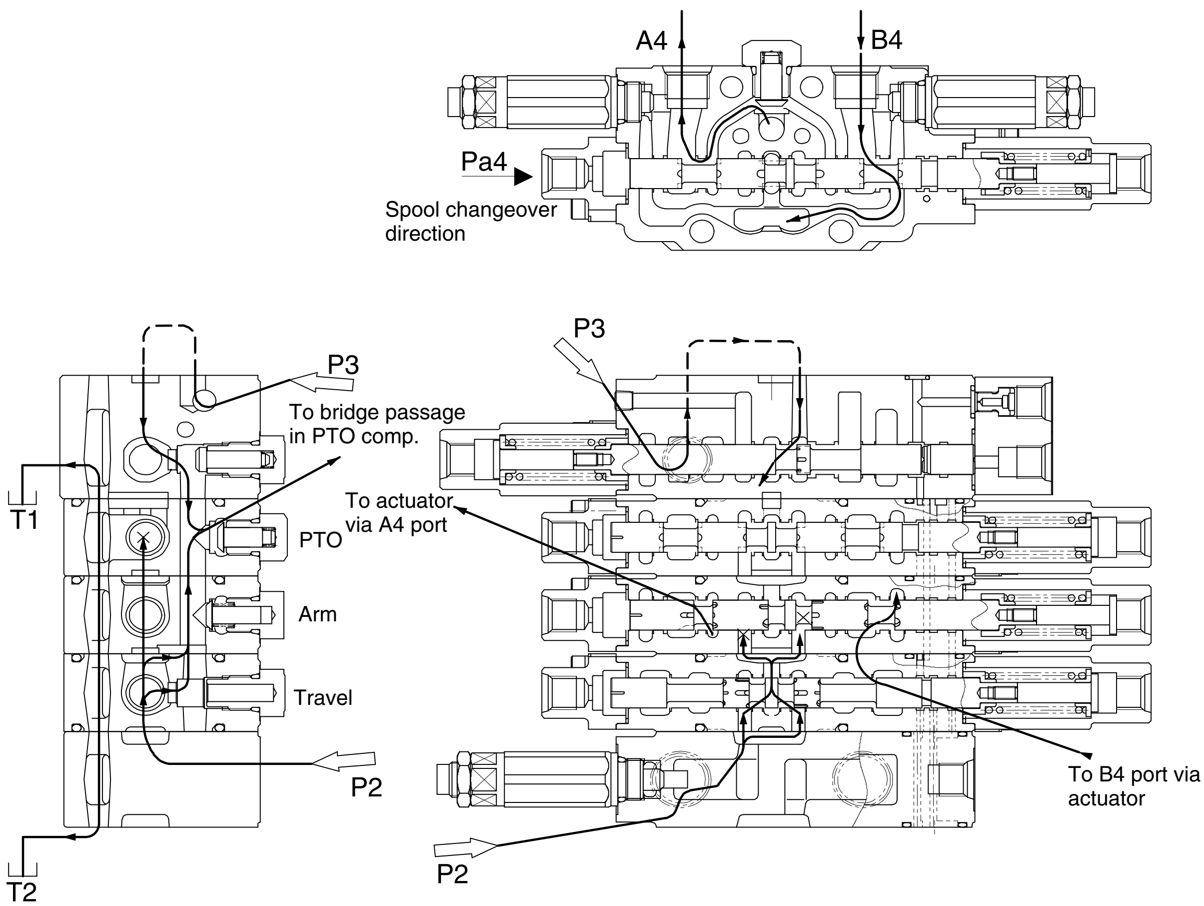
When the PTO operation (Pa4 pressurization) is carried out, the secondary pressure from the remote control valve is applied to Pa4 port to change over the PTO spool. Since the P2 side bypass passage is shut off at the PTO section after the PTO spool changeover, the oil flowed from P2 port flows through the travel section and a passage between travel section and arm section into the P2 side parallel passage.

Also, since the oil flowed from P3 port flows through the direction of dozer → boom swing → swing section and then into the P2 side parallel passage via the check valve in the P3 supply section, the connecting flow of P2 pump and P3 pump is supplied to the P2 parallel passage.

[Although the P3 side bypass passage is also connected to the P1 side parallel passage through the check valve in the P3 section, there is no oil flow into the P1 side as long as the P1 side sections (boom , bucket) are not operated.]

Since a passage between A4 port and the bridge passage is opened after the spool changeover, the oil flowed into the P2 side parallel passage flows through the load check valve in the PTO section into A4 port via the bridge passage and then into the actuator for PTO.

On the other hand, the oil returned from actuator for PTO flows into B4 port to the tank passage that has opened after the spool changeover.



PTO operation

R27Z92MCV21

8) DOZER OPERATION

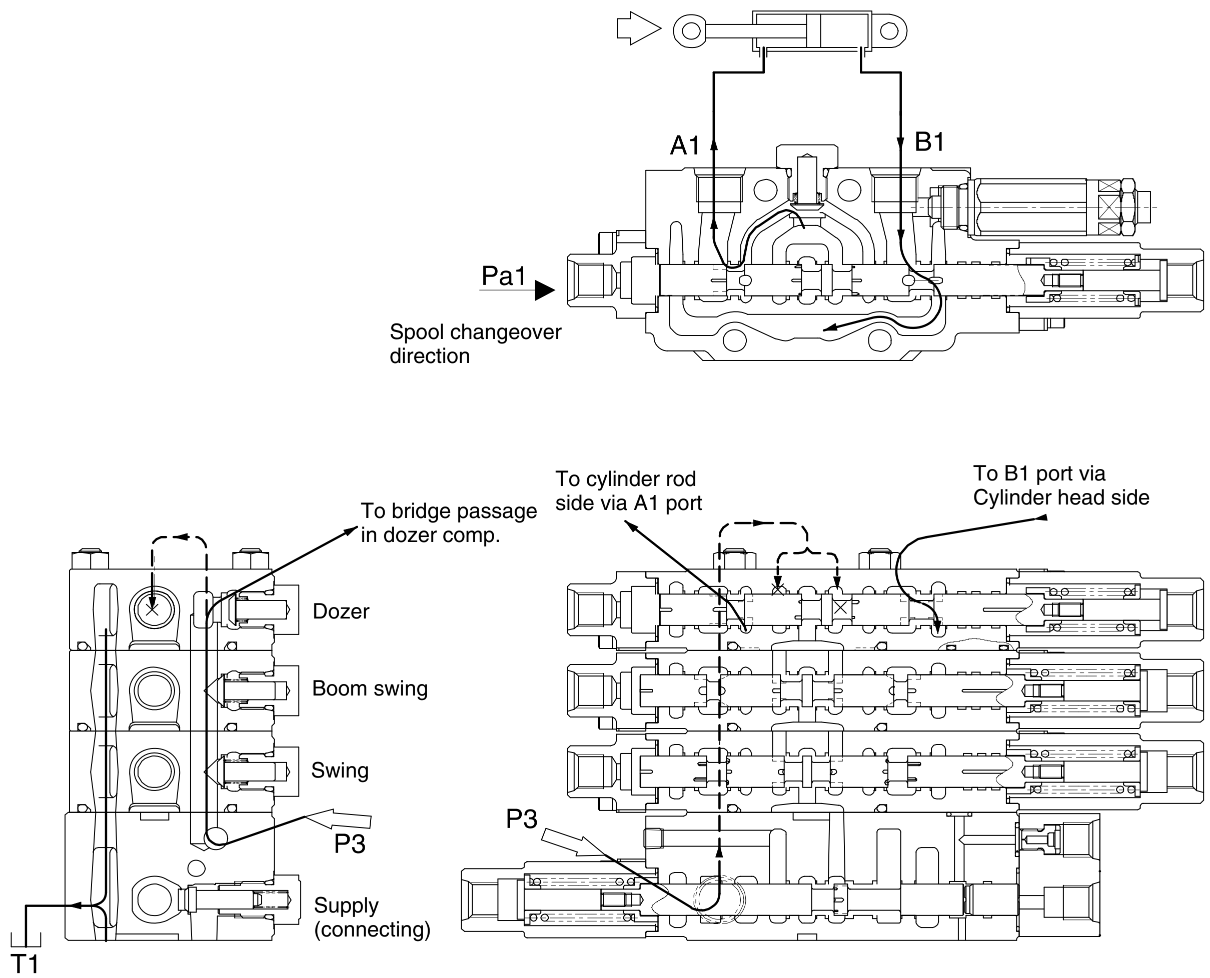
Dozer up operation

When the dozer up operation is carried out, the secondary pressure from the remote control valve is applied to Pa1 port to change over the dozer spool.

Since the P3 side bypass passage is shut off at the dozer section after the dozer spool changeover, the oil flowed from P3 port through the P3 side parallel passage flows into A1 port through the load check valve in the dozer section and the bridge passage since A1 port and the bridge passage have been opened after the spool changeover and then into the rod side of the dozer cylinder.

On the other hand, the oil returned from the head side of the dozer cylinder flows into B1 port to the tank passage that has opened after the spool changeover.

Then, the dozer cylinder retracts to raise the dozer.



Dozer up operation

R35Z72MCV22

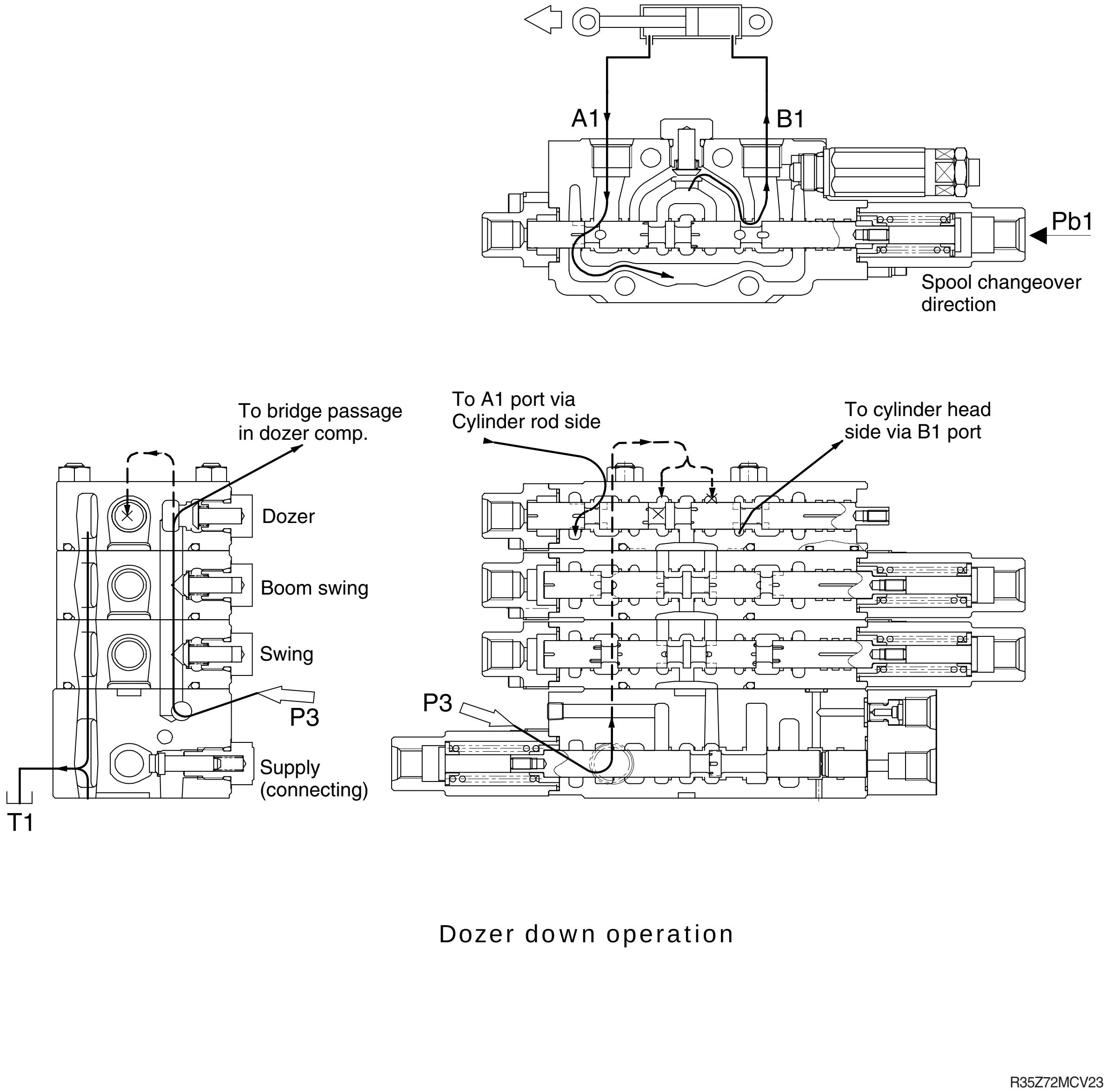
Dozer down operation

When the dozer down operation is carried out, the secondary pressure from the remote control valve is applied to Pb1 port to change over the dozer spool.

Since the P3 side bypass passage is shut off at the dozer section after the dozer spool changeover, the oil flowed from P3 port through the P3 side parallel passage flows into B1 port through the load check valve in the dozer section and the bridge passage since B1 port and the bridge passage have been opened after the spool changeover and then into the head side of the dozer cylinder.

On the other hand, the oil returned from the rod side of the dozer cylinder flows into A1 port to the tank passage that has opened with the spool's notch after the spool changeover.

Then, the dozer cylinder extends to lower the dozer.



Dozer down operation

9) BOOM SWING OPERATION

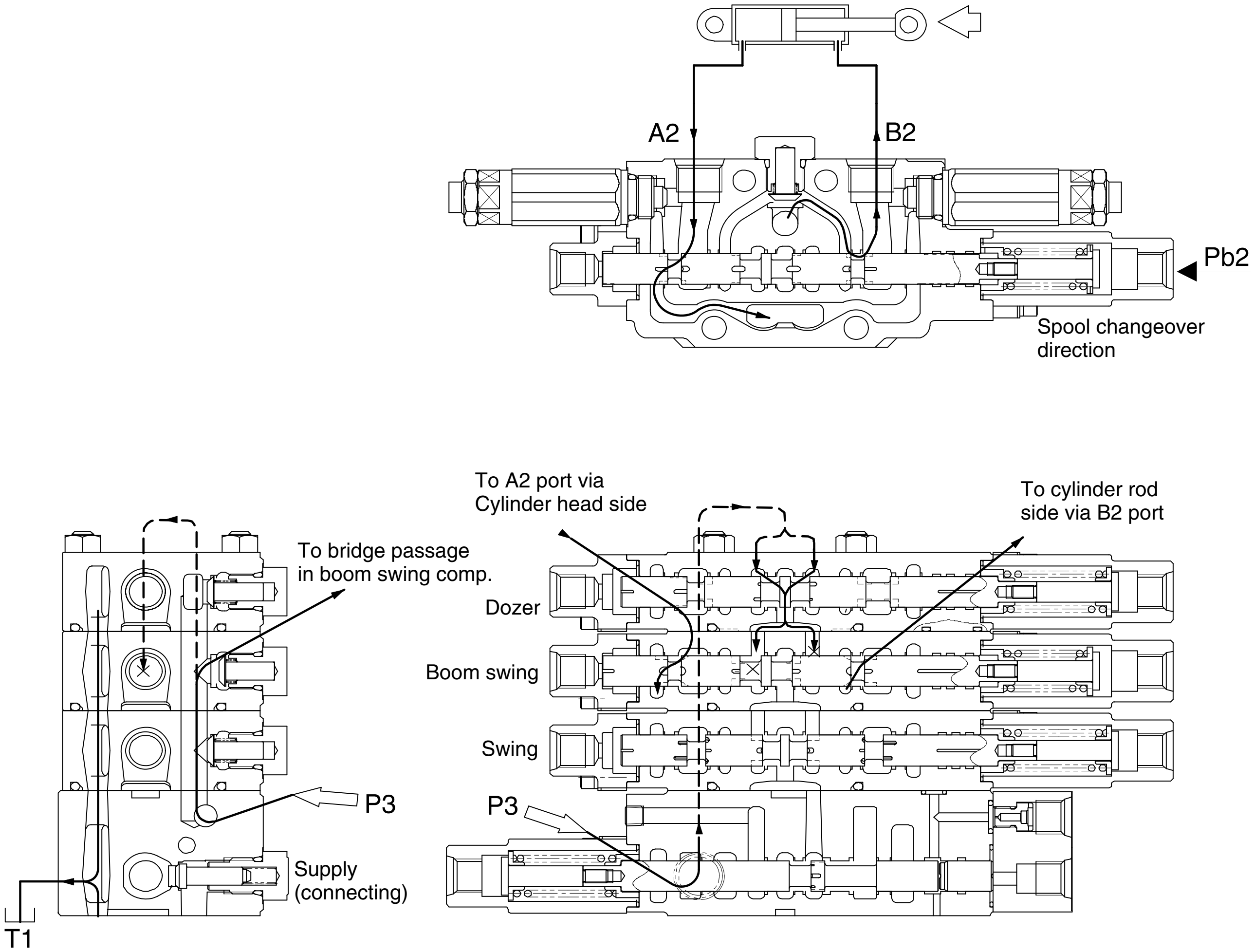
Boom right swing operation

When the boom right swing operation is carried out, the secondary pressure from the remote control valve is applied to Pb2 port to change over the boom swing spool.

Since the P3 side bypass passage is shut off at the boom swing section after the boom swing spool changeover, the oil flowed from P3 port through the P3 side parallel passage flows into B2 port through the load check valve in the boom swing section and the bridge passage since B2 port and the bridge passage have been opened after the spool changeover and then into the rod side of the boom swing cylinder.

On the other hand, the oil returned from the head side of the boom swing cylinder flows into A2 port to the tank passage that has opened with the spool's notch after the spool changeover.

Then, the boom swing cylinder retracts to swing the attachment right.



Boom right swing operation

27AZ72MCV24

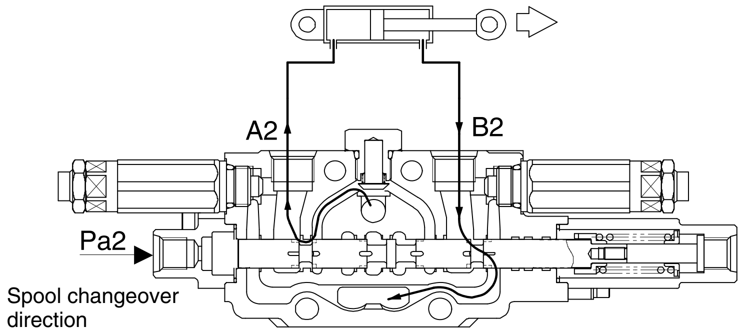
Boom left swing operation

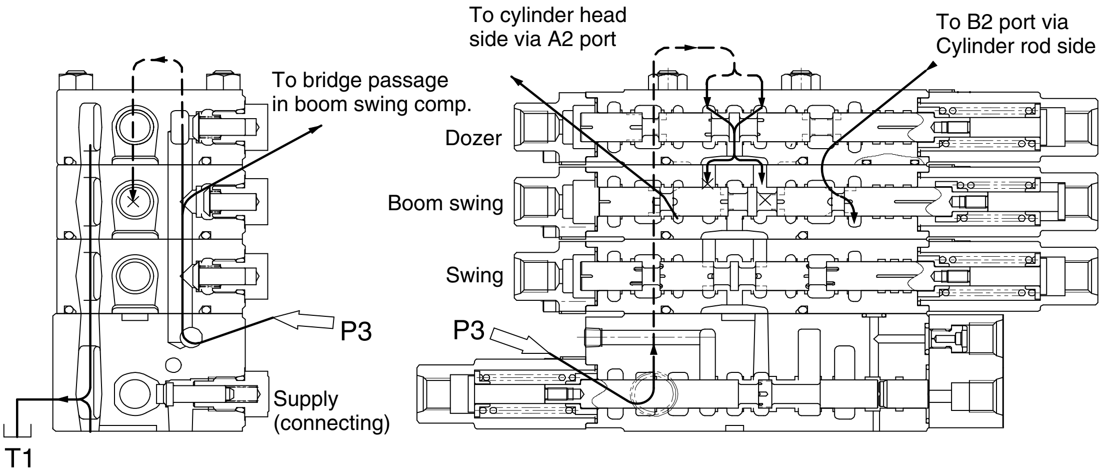
When the boom left swing operation is carried out, the secondary pressure from the remote control valve is applied to Pa2 port to change over the boom swing spool.

Since the P3 side bypass passage is shut off at the boom swing section after the boom swing spool changeover, the oil flowed from P3 port through the P3 side parallel passage flows into A2 port through the load check valve in the boom swing section and the bridge passage since A2 port and the bridge passage have been opened after the spool changeover and then into the head side of the boom swing cylinder.

On the other hand, the oil returned from the rod side of the boom swing cylinder flows into B2 port to the tank passage that has opened with the spool's notch after the spool changeover.

Then, the boom swing cylinder extends to swing the attachment left.





Boom left swing operation

27AZ72MCV25

(10) SWING OPERATION

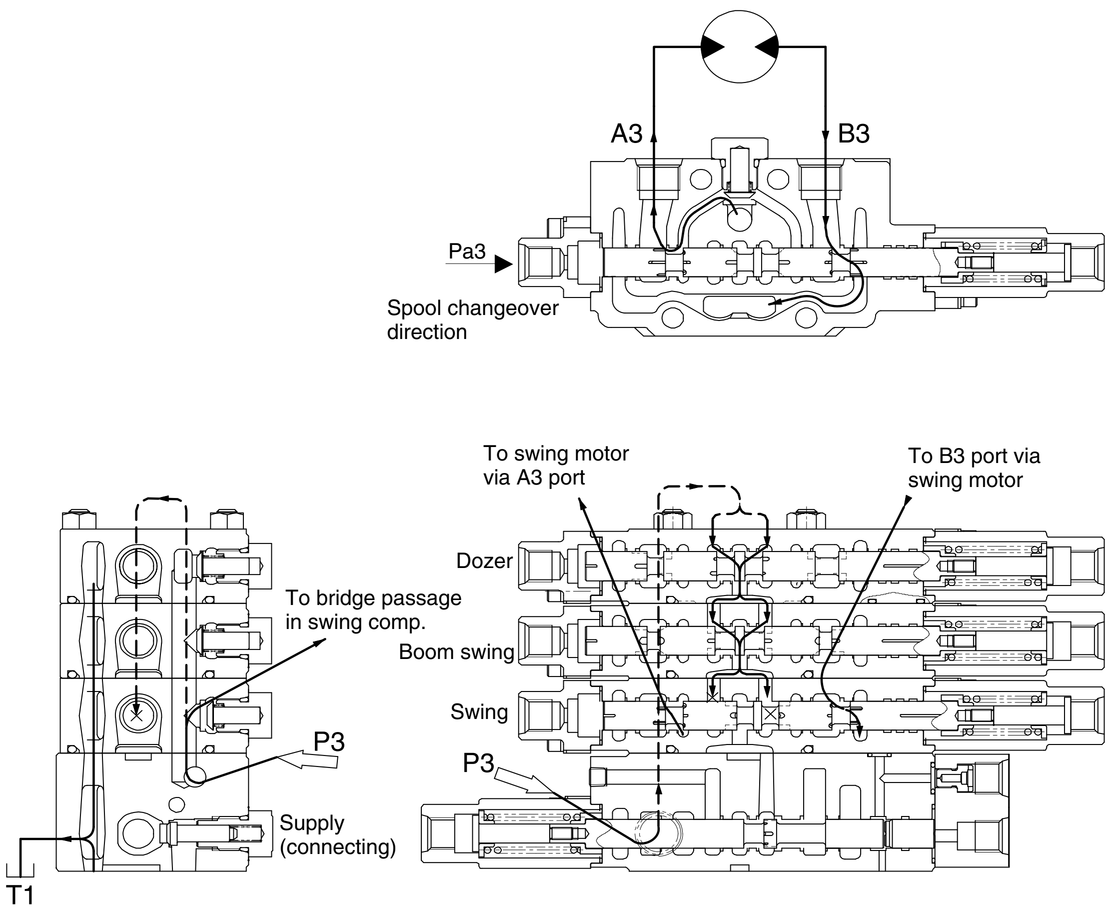
For the swing operation, both Pa pressurization and Pb pressurization are the same on operation so that only Pa pressurization is explained as follows.

When the right swing operation is carried out, the secondary pressure from the remote control valve is applied to Pa3 port to change over the swing spool.

Since the P3 side bypass passage is shut off at the swing section after the swing spool changeover, the oil flowed from P3 port through the P3 side parallel passage flows into A3 port through the load check valve in the swing section and the bridge passage since A3 port and the bridge passage have been opened after the spool changeover and then into the swing motor.

On the other hand, the oil returned from the swing motor flows into B3 port to the tank passage that has opened with the spool's notch after the spool changeover.

Then, the upper swing body swings right.



Right swing operation

R35Z72MCV26

(11) COMBINED CONTROL OPERATION ①

Boom up + Arm in + bucket

When the above combined control is carried out, the secondary pressure from the remote control valve is applied to each spool to change over them. Since the secondary pressure for arm in operation is also applied to the pilot chamber on the connecting section spring chamber side according to the piping, the connecting spool operates against the secondary pressure developed from boom up operation and arm in operation.

(Boom up operation secondary pressure - Arm in operation secondary pressure =
connecting spool changeover pressure)

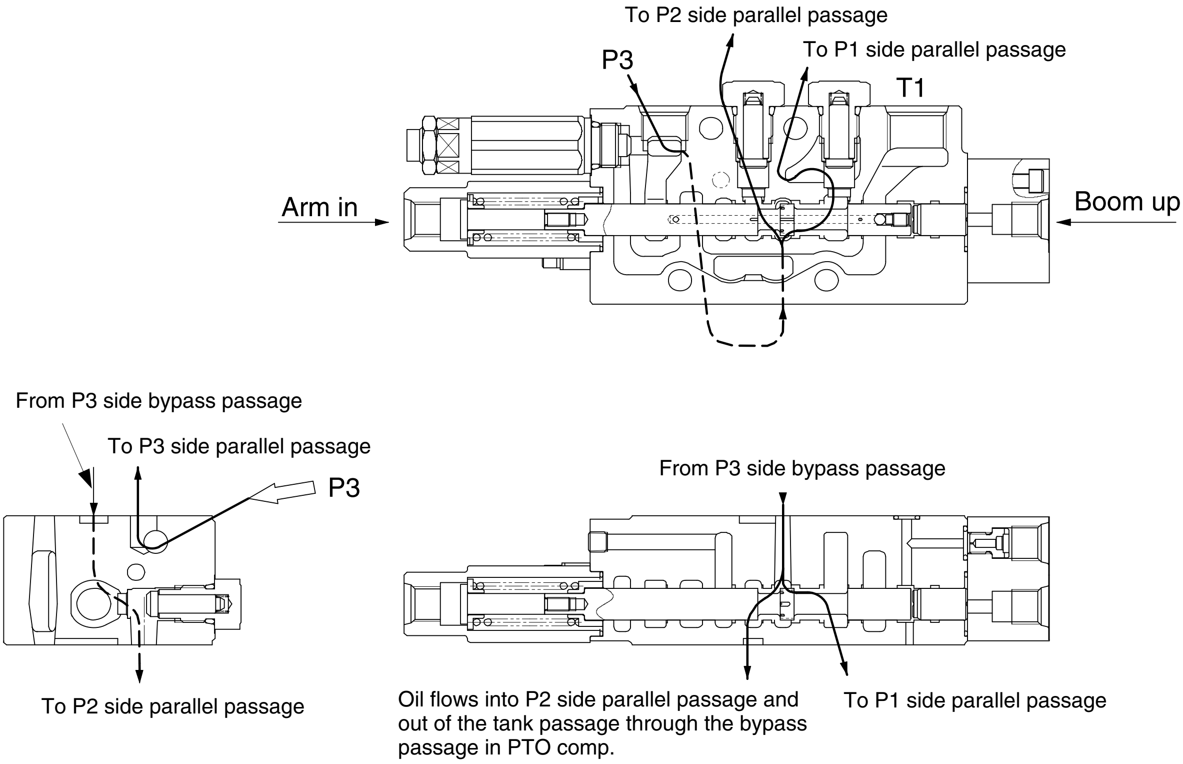
When all the above combined operations are carried out in full lever operation (full changeover), the oil supplied from P1 pump is supplied to the boom and bucket and the oil from P2 pump to the arm. Since the connecting spool changeover pressure becomes "0" as mentioned above, the connecting spool cannot change over and the oil from P3 pump flows to the P1 and P2 side parallel passages through the connecting section. Accordingly, much oil flows to the arm side normally because of its low working load.

In this condition, since gradually restricting the arm in operation (returning the lever) causes the secondary pressure for arm in operation to decrease, the connecting spool changeover pressure to increase, the connecting spool to start changing over, and the passage to the arm side to be narrowed, the oil supplied from P3 pump flows abundantly into the P1 side (Boom, bucket).

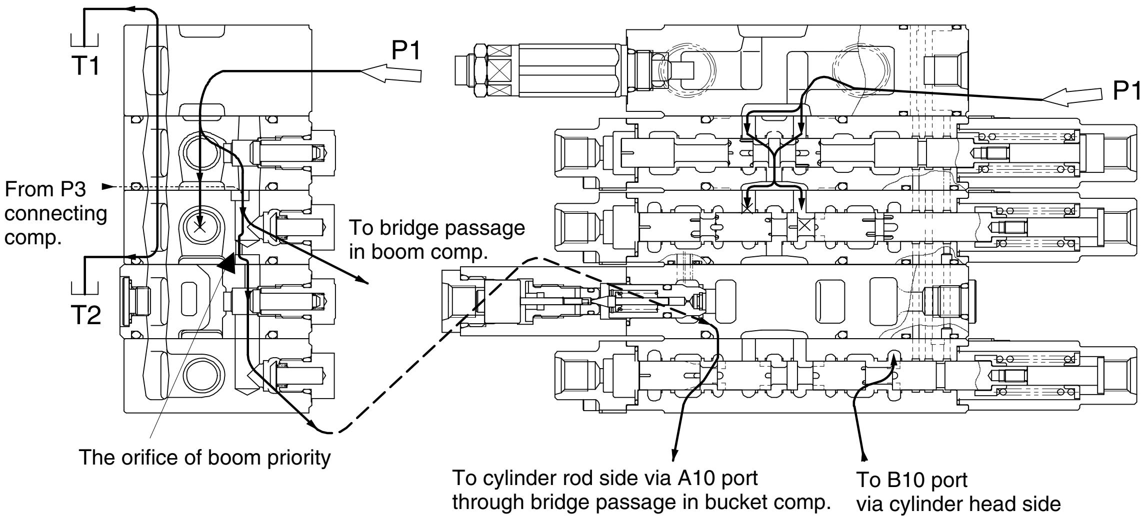
As mentioned above, the oil supplied from P3 pump flows suitably into each attachment according to the control input during the above combined control, resulting in a well-balanced and efficient working speed.

Besides, since the oil flow to the bucket whose working load is less than the boom is restricted with an orifice (the orifice of boom priority) provided before the bucket section in the P1 side parallel passage, much oil flows into the boom section. As a result, the working speed balance between both attachments is maintained during the combined operation of boom and bucket.

P3 side (connecting side) circuit



P1 side circuit (the orifice of boom priority)



Oil flow during combined operation

R35Z72MCV27

(12) COMBINED CONTROL OPERATION ②

Both travels + bucket

When the both travels operation is carried out together with the bucket operation at the same time, the oil flowed from Pp1 port flows through the orifice passage and into the travel independent signal passage; both travels and the bucket spool changeover make a passage to the drain port shut off.

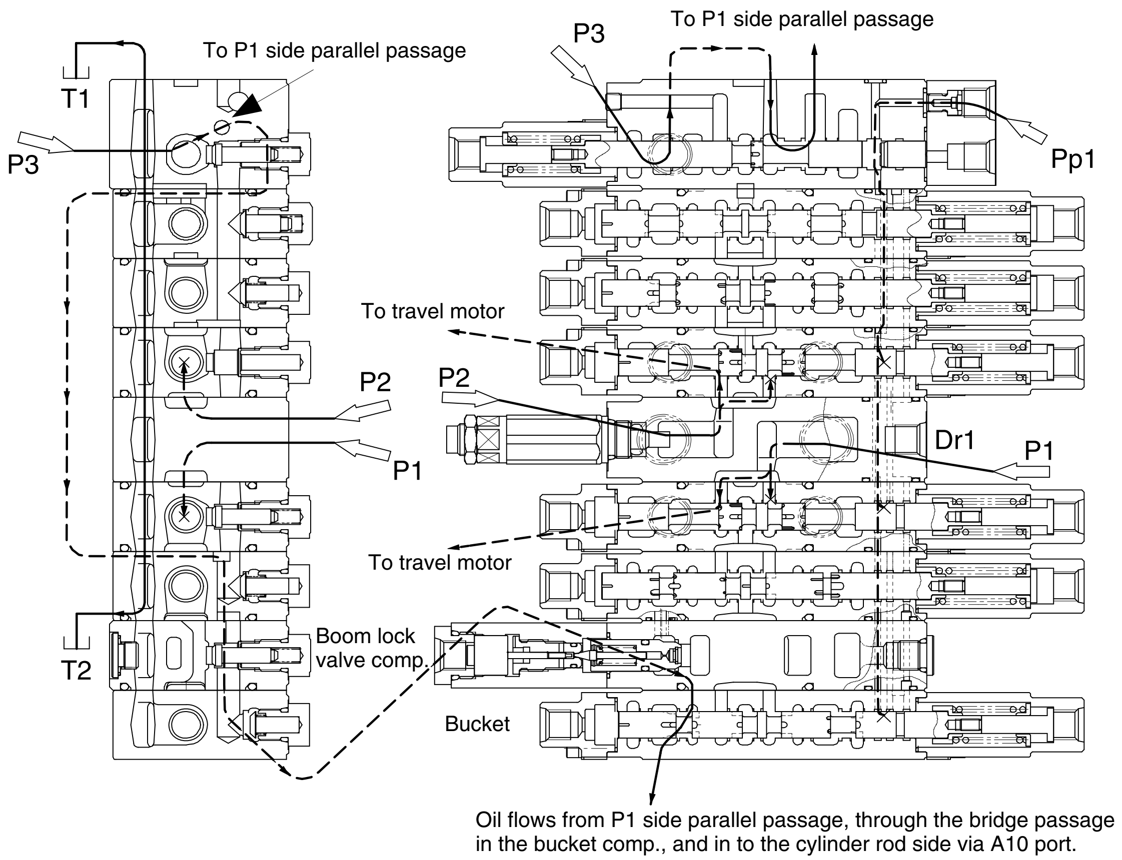
Then, the travel independent passage becomes the same pressure as Pp1 port pressure (pilot primary pressure).

When the travel independent passage becomes Pp1 pressure, the Pp1 pressure is applied to the connecting spool to change over the connecting spool.

Since the bypass passage from P3 to P2 side, which is a passage to the tank, in restricted, the oil from P3 side flows into the P1 side parallel passage that is connected through a check valve.

With his circuit arrangement, the bucket section is supplied with pressure oil from P3 during both travels operation, the simultaneous operation becomes possible.

Besides, since each of P1 and P2 is used independently during both travels and only P3 is used for bucket operation, stable travel is possible to continue even if there is change in the bucket load.



Travel independence operation

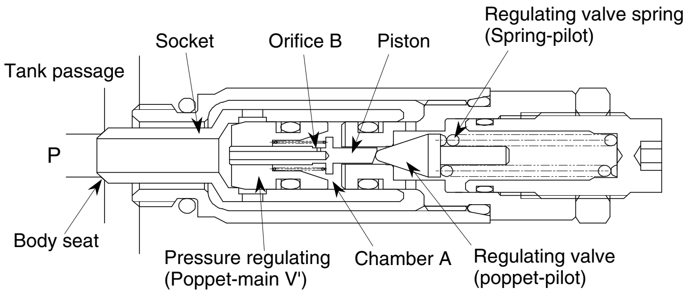
R35Z72MCV28

(13) MAIN AND PORT RELIEF VALVE OPERATION

Main relief valve operation

Main relief valves (MRV) are different in the uses for P1/P2 and P3; however, their structures and operation are the same.

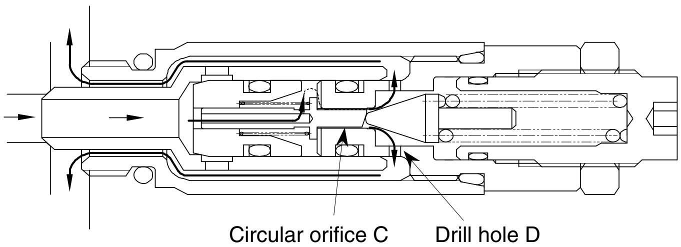
① Pressure oil flows through the inside of the piston built in the pressure regulating valve (poppet-main V') and the orifice B and then into the internal chamber A until it is filled up. The filled up pressure causes both of the pressure regulating valve and the socket and body seat to be seated securely.



MRV operation (1)

R35Z72MCV29

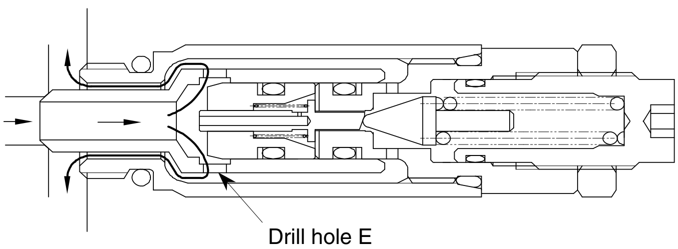
② When the oil pressure at port P increases up to the setting pressure of regulating valve spring, the pressure oil is applied to the regulating valve via the piston to open the regulating valve. Then, the pressure oil flows through a passage in the direction of piston inside → orifice B → chamber A → circular orifice C → Drill hole D and the external of socket and then into the tank passage.



MRV operation (2)

R35Z72MCV30

③ Since the pressure inside the chamber A decreases when the regulating valve is opened, which causes the pressure regulating valve to open to let the pressure oil port P flows into the tank passage through drill hole E.



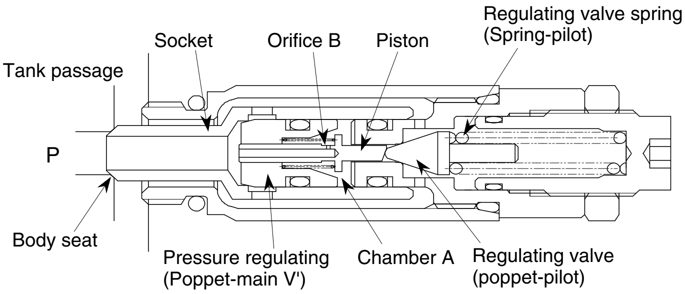
R35Z72MCV31

MRV operation (3)

④ Also, since the regulating valve is pressed to the seat by regulating valve spring when the pressure at port P decreases below the setting pressure of regulating valve spring, the pressure inside chamber A becomes the same as the pressure at port P to cause the pressure regulating valve to be pressed to the seat, resulting in the original condition (①).

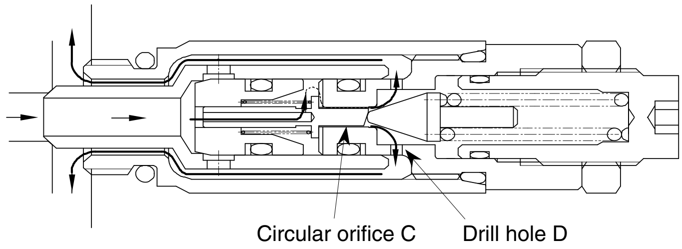
Overload relief valve (ORV) operation ①

① Pressure oil flows through the inside of the piston built in the pressure regulating valve (poppet-main V') and the orifice B and then into the internal chamber A until it is filled up. The filled up pressure causes both of the pressure regulating valve and socket and body seat to be seated securely.



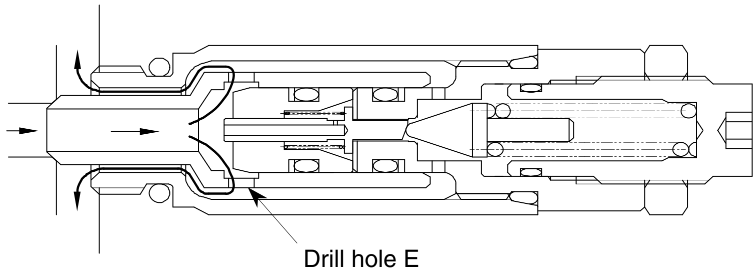
ORV operation (1) R35Z72MCV32

② When the oil pressure at port P increases up to the setting pressure of regulating valve spring, the pressure oil is applied to the regulating valve via the piston to open the regulating valve. Then, the pressure oil flows through a passage in the direction of piston inside → orifice B → chamber A → circular orifice C → Drill hole D and the external of socket and then into the tank passage.



ORV operation (2) R35Z72MCV33

③ Since the pressure inside the chamber A decreases when the regulating valve is opened, which causes the pressure regulating valve to open to let the pressure oil port P flows into the tank passage through drill hole E.

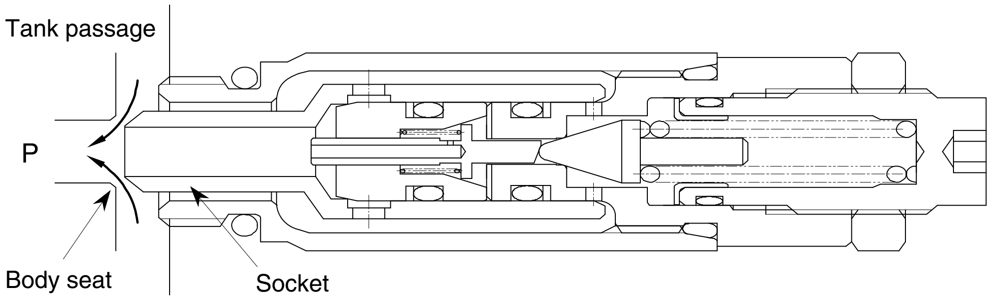


ORV operation (3) R35Z72MCV34

④ Also, since the regulating valve is pressed to the seat by regulating valve spring when the pressure at port P decreases below the setting pressure of regulating valve spring, the pressure inside chamber A becomes the same as the pressure at port P to cause the pressure regulating valve to be pressed to the seat, resulting in the original condition (①).

Overload relief valve (ORV) operation ② 【Operation during suction】

If there is negative pressure at port P (or the tank passage pressure is higher than P pressure), the socket is applied with press and open force. Then, the opening between body seat and socket increases to cause the oil to flow into port P from the tank passage, filling up the space.



ORV operation (during suction)   R35Z72MCV35

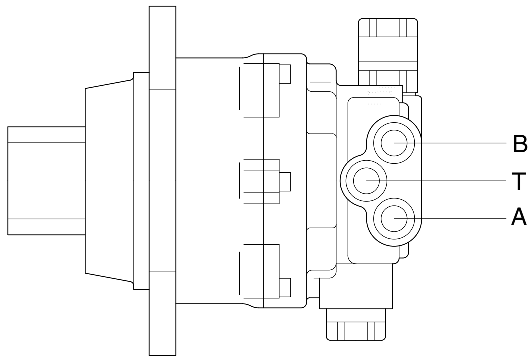
GROUP 3 SWING DEVICE

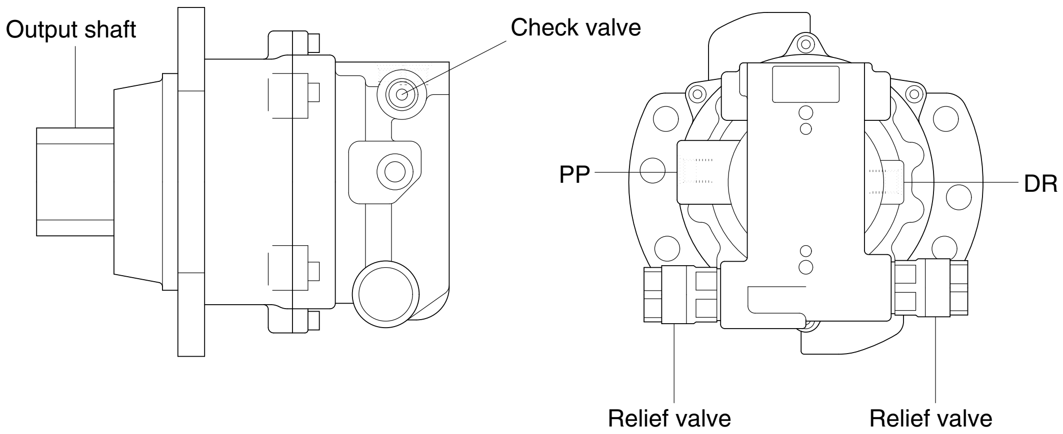
1. STRUCTURE

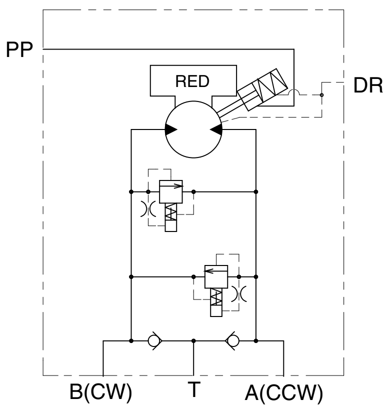
Swing device consists swing motor and swing reduction gear.

1) SWING MOTOR

Swing motor include mechanical parking valve, relief valve and make up valve.





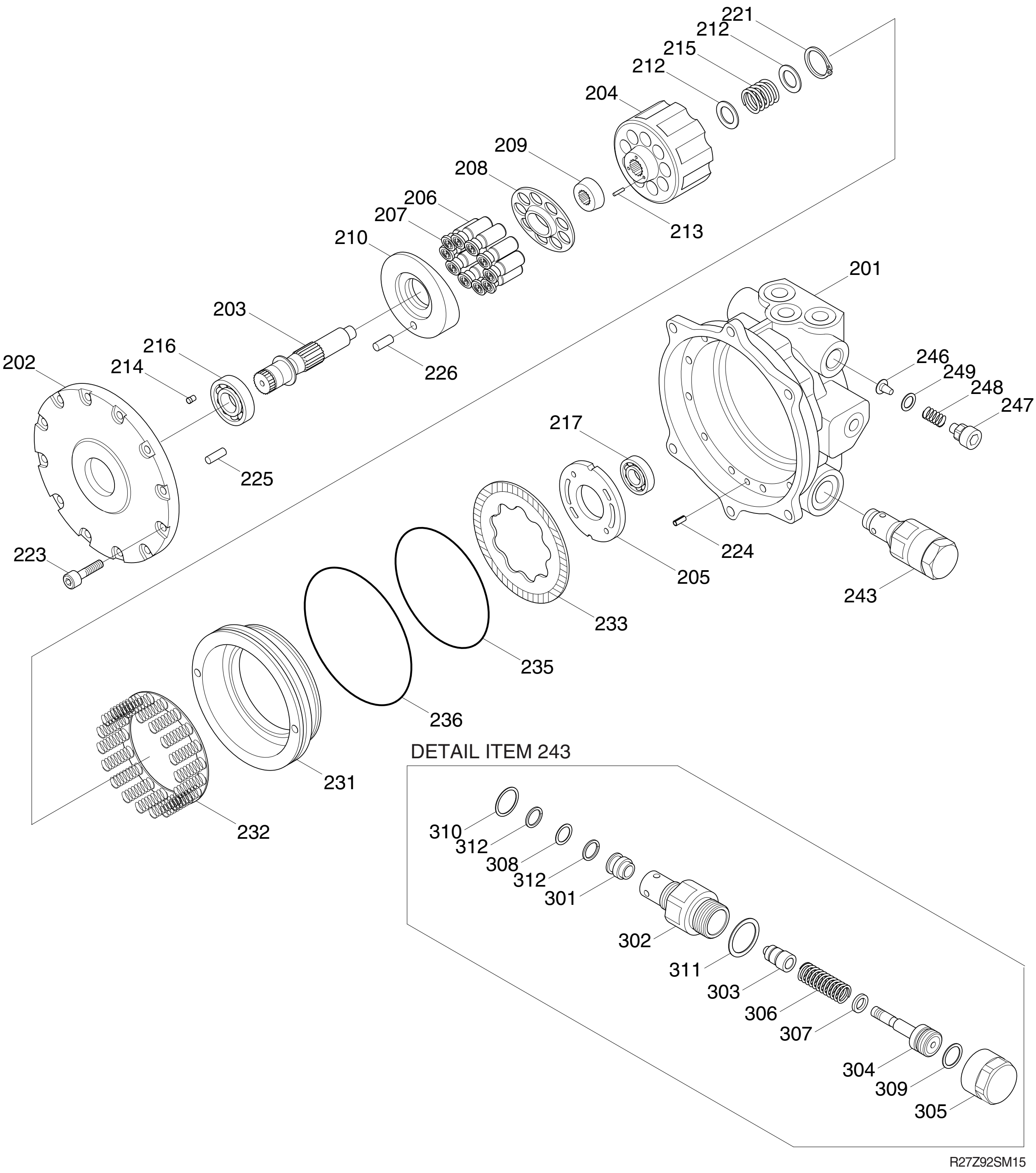


HYDRAULIC CIRCUIT

25AZ2SM01

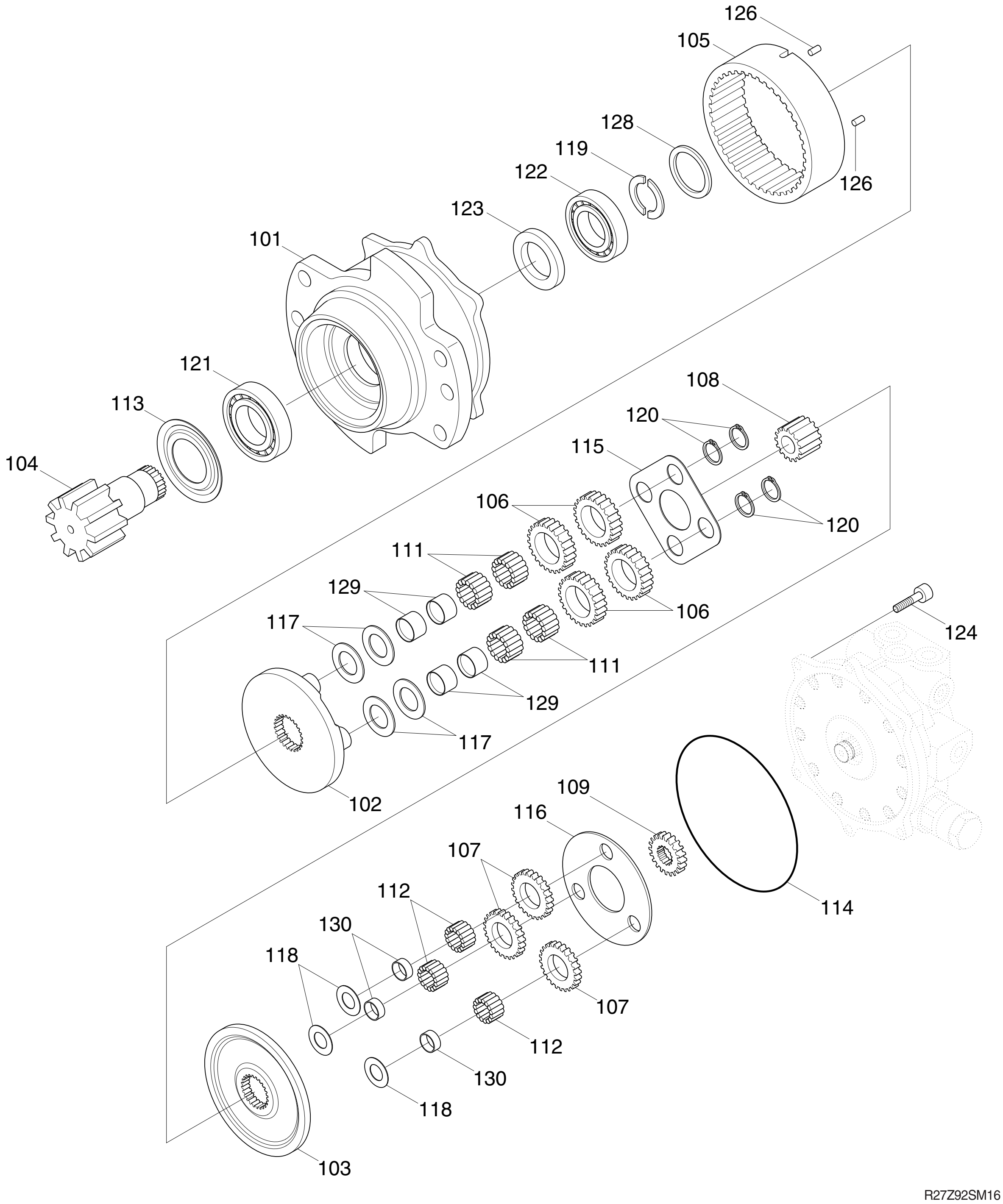
Port	Port name	Port size
A	Main port	PF 3/8
B	Main port	PF 3/8
DR	Drain port	PF 3/8
T	Make up port	PF 3/8
PP	Brake release port	PF 1/4

2) COMPONENTS (1/2)



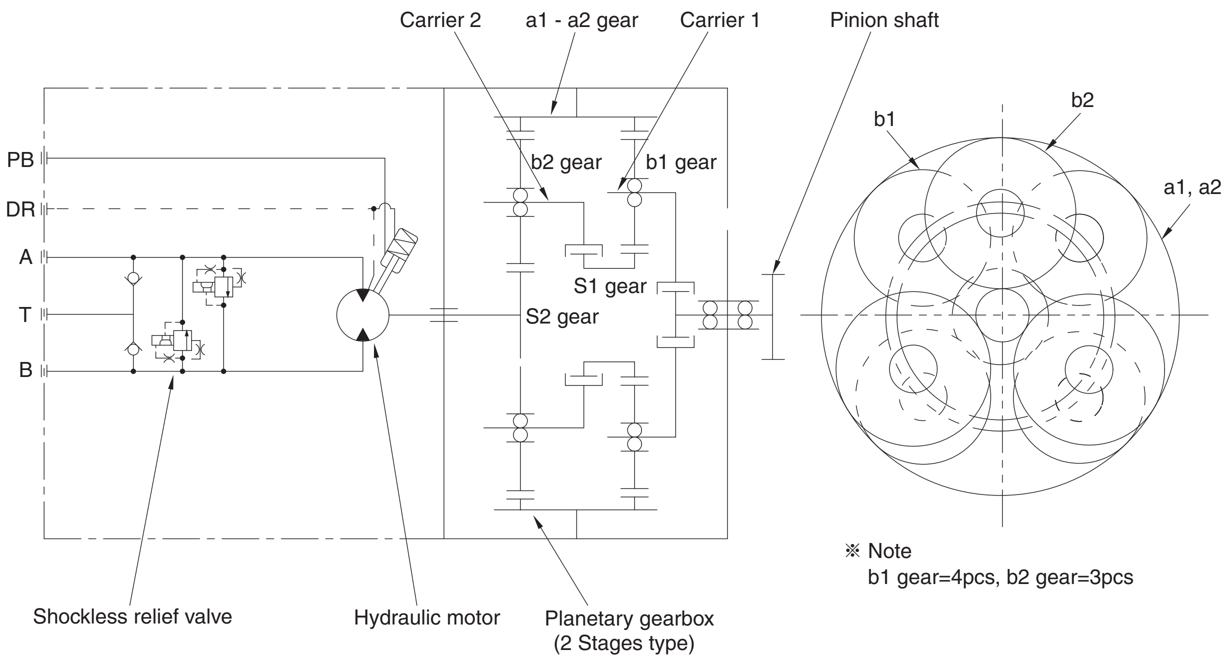
201	Body	213	Pin	232	Spring assy	303	Poppet
202	Plate	214	Filter	233	Disk plate	304	Piston
203	Shaft	215	Spring C	235	O-ring	305	Cap
204	Cylinder barrel	216	Bearing	236	O-ring	306	Spring
205	Valve plate	217	Bearing	243	Relief valve	307	Spacer
206	Piston	221	Snap ring	246	Check valve	308	O-ring
207	Shoe	223	Screw	247	Plug	309	O-ring
208	Shoe holder	224	Spring pin	248	Spring	310	O-ring
209	Barrel holder	225	Pin	249	O-ring	311	O-ring
210	Swash plate	226	Pin	301	Seat	312	Back up-ring
212	Retainer	231	Brake piston	302	Retainer		

COMPONENTS (2/2)



101	Body	111	Needle	120	Snap ring
102	Carrier 1	112	Needle	121	Bearing
103	Carrier 2	113	Seal ring	122	Bearing
104	Pinion shaft	114	O-ring	123	Oil seal
105	Internal gear	115	Thrust plate 1	124	Screw
106	Gear B1	116	Thrust plate 2	126	Pin
107	Gear B2	117	Thrust washer 1	128	Ring
108	Gear S1	118	Thrust washer 2	129	Ring 1
109	Gear S2	119	Preload collar	130	Ring 2

2. OPERATION PRINCIPLE



R27Z92SM02

3. OPERATION

The swing motor consists of a planetary gear speed reducer, a hydraulic motor and the hydraulic valves.

1) REDUCTION GEAR SECTION

(1) Function

The speed reducer of swing motor is a simple planetary gear type with two stages. The high output speed of the hydraulic motor is reduced to low speed with high torque and obtaining the pinion shaft rotation.

(2) Operation

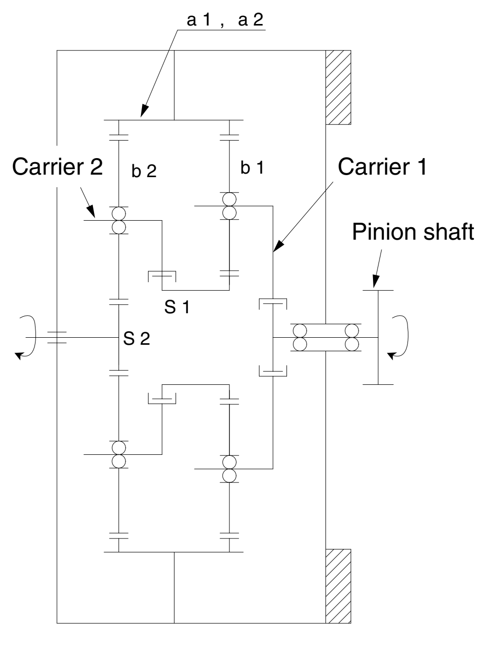
The s2 gear is attached to the hydraulic motor shaft, and the s2 output speed is reduced between the gears (s2, b2, a2).

This reduced output speed is transmitted to the s1 gear and the speed is reduced again between the gears (s1, b1, a1), and it is transmitted to the pinion shaft, and drives the machine.

The gear ratio of two stages simple planetary speed reducer is calculated using the following formula.

$$R = \frac{Zs1}{Zs1+Za1} \times \frac{Zs2}{Zs2+Za2}$$

※ Z ** : Number of gear teeth.



R27Z92SM03

2) HYDRAULIC MOTOR SECTION

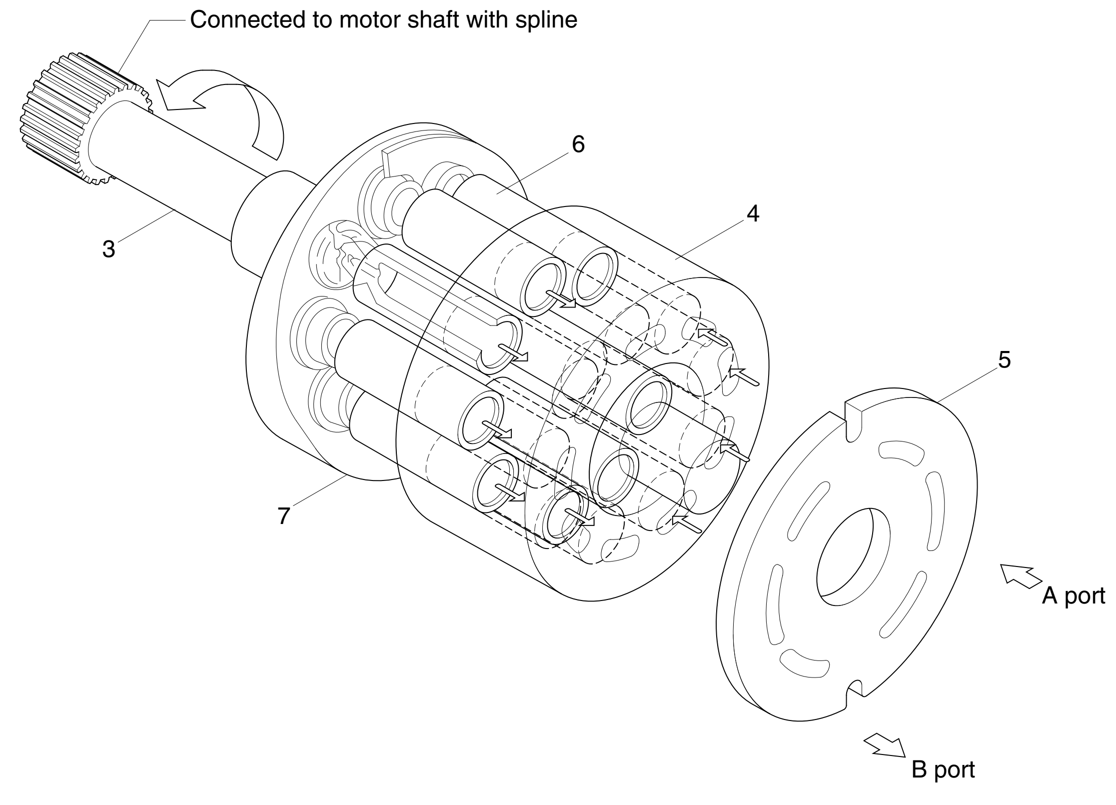
(1) Function

This hydraulic motor is an axial piston type, and changes the hydraulic energy supplied from the pump to the rotary motion.

(2) Structure

Through a hydraulic valve, the pressurized oil is supplied to the valve plate (5). When the pressurized oil is supplied to the A port, this pressurized oil pushes the piston (6) in the cylinder barrel (4). This pushing force is changed to the rotational power by the swash plate (7) and transmitted to the shaft (3) which is connected to the cylinder barrel (4) with the spline. The return flow from the cylinder port is going out through the B port of the valve plate (5).

To reverse rotation, pressurized oil is supplied to the B port and returning oil exits through the A port.



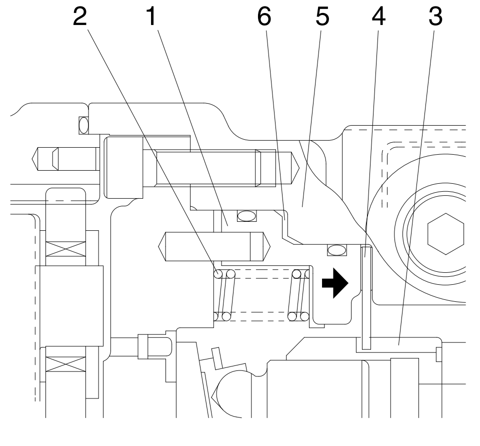
R27Z92SM04

(3) Parking brake

The parking brake fixes the output shaft of hydraulic motor mechanically while the wheel motor is stopped.

① At the brake releasing pressure OFF

When brake releasing pressure is not supplied, the brake piston (1) is pressed in the direction (shown as arrow) by the spring (2). Then the disk plate (4) which is fixed to the cylinder barrel (3) is held between the body H (5) and the brake piston (1). As a result, with the friction of these parts, the cylinder barrel (3) and the hydraulic motor are unable to rotate.

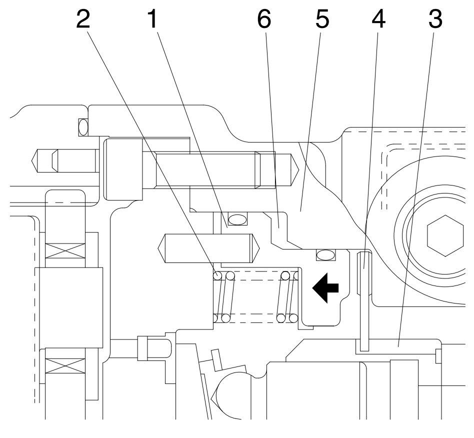


R27Z92SM05

② At the brake releasing pressure ON

When brake releasing pressure is supplied, the oil is lead to chamber (6).

Then the brake piston (1) is moved to the direction (shown as arrow in) against the force of spring (2). As a result, the disk plate (4) is released from the friction, and the cylinder barrel (3) can be rotated.



R27Z92SM06

3) HYDRAULIC VALVE SECTION

(1) Shockless relief valve

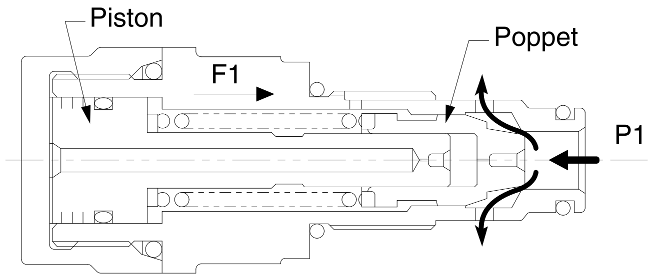
The shockless relief valve consists of the direct relief valve (poppet) and the piston for changing the spring force with two stages.

When the hydraulic motor is stopped, even after closing IN and OUT port of the hydraulic motor, the motor tries to run with inertia. Motor works as like a pump, and the pressure (brake pressure) is made on the OUT port side. The shockless relief valve releases this brake pressure with two stages of operation. This makes the shock smooth, and prevents the motor being damaged.

It also makes the start of the motor smooth.

① First stage

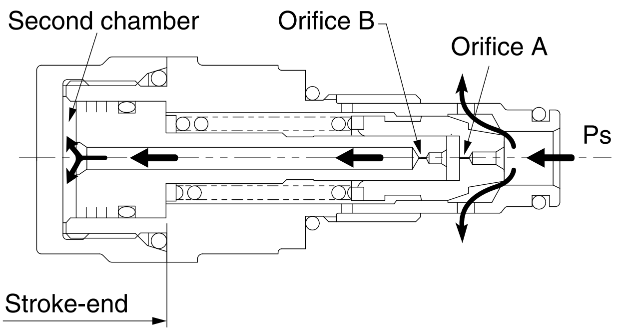
When the P1 pressure is going up, the poppet opens due to the pressure of the spring force F1.



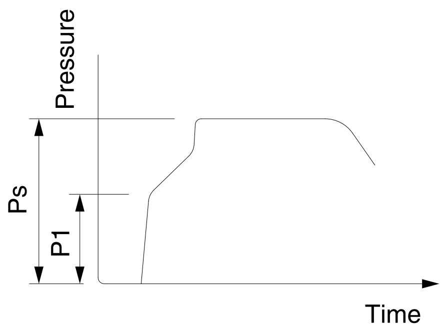
R27Z92SM07

② Second stage

When P1 pressure enters the second chamber through the orifice A and B, the piston moves to its stroke-end. With this action, the spring is compressed, the spring force becomes stronger, and the P1 pressure is increased to the setting pressure Ps.



R27Z92SM08



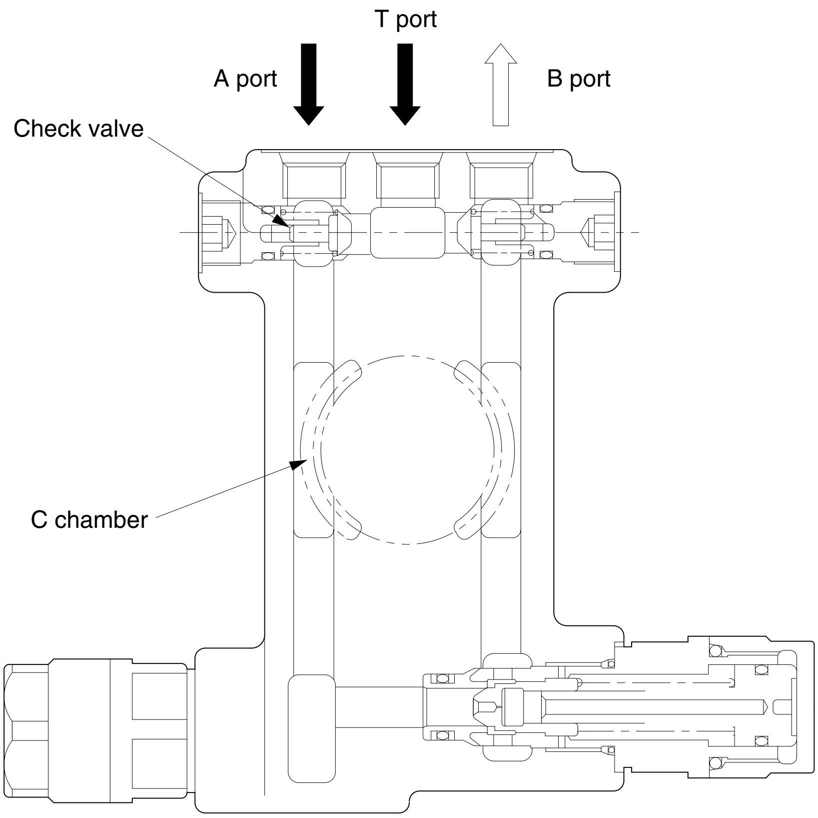
R27Z92SM09

With the above two stages of operation, the motor starts and stops smoothly.

(2) Check valve

When the swing motor is decelerated by operating the control valve, it continues to be moved by the inertia of the machine. Then, it works as pump, and the pressure of C chamber tends to become negative. However, when B port pressure is below cracking pressure of the relief valve, all flow in A port goes out from B port through the motor.

Therefore, if C chamber can get flow only from the control valve, the flow will not be enough to prevent the negative pressure; as a result, cavitation could occur. The check valve works to supply the flow from T port to C chamber; and prevents cavitation.



R27Z92SM10

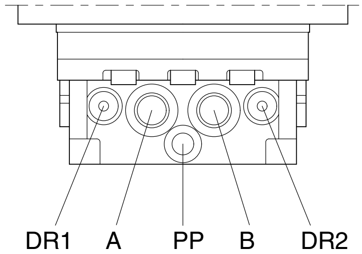
GROUP 4 TRAVEL DEVICE

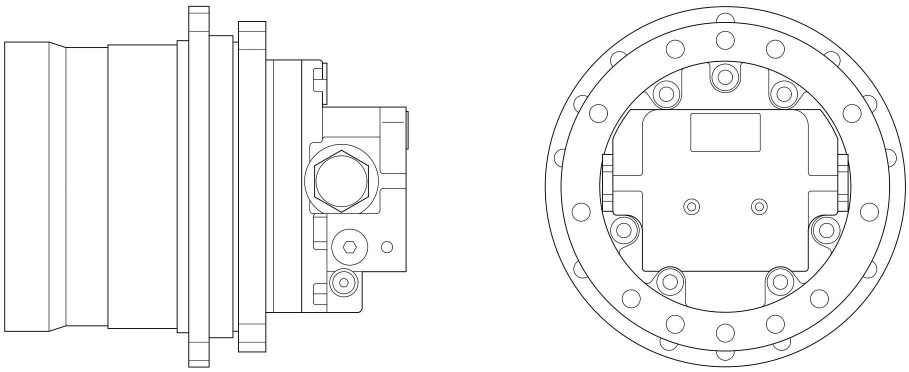
1. CONSTRUCTION

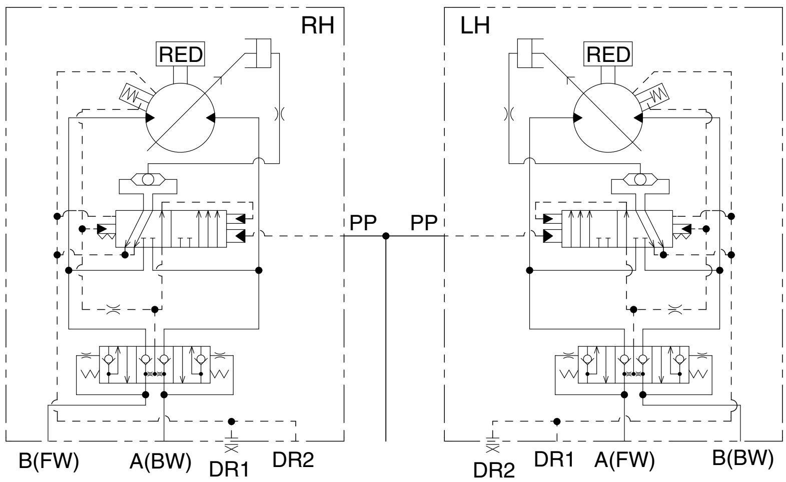
Travel device consists travel motor and gear box.

Travel motor includes counterbalance valve, parking brake and high/low speed changeover mechanism.

Port	Port name	Port size
A	Main port	PF 1/2
B	Main port	PF 1/2
DR1, DR2	Drain port	PF 1/4
PP	2 speed control port	PF 1/4



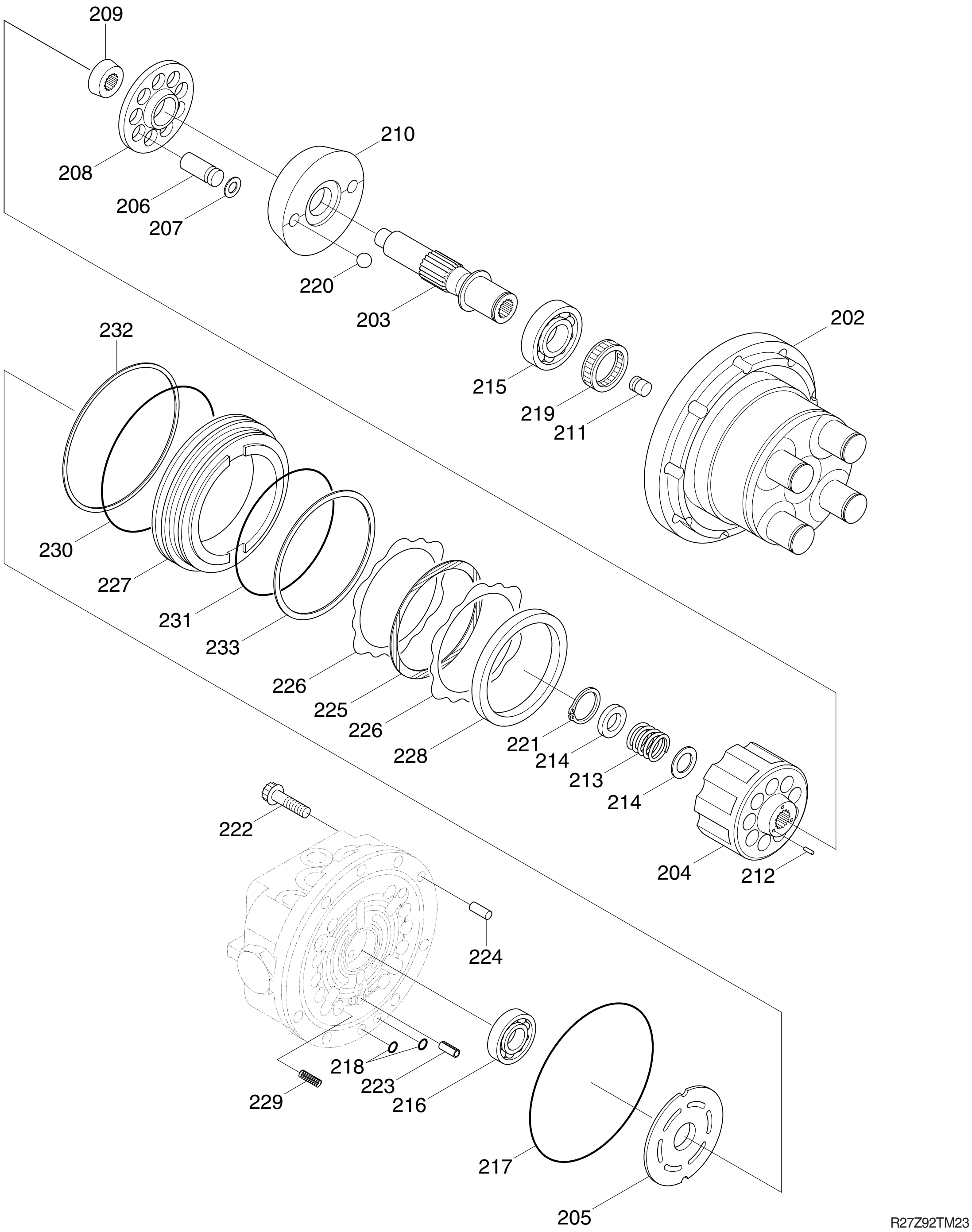




HYDRAULIC CIRCUIT

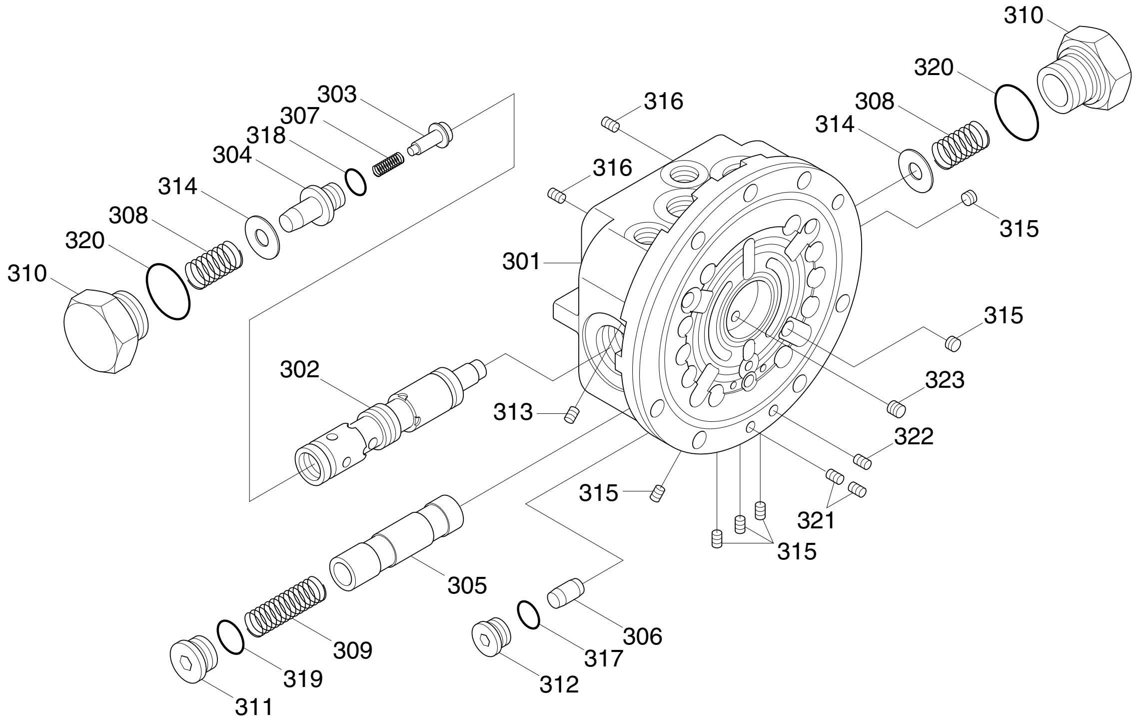
R27Z9AK2TM20

2) STRUCTURE (1/3)



202	Body 2	213	Spring C	224	Pin
203	Shaft	214	Retainer	225	Disk plate
204	Cylinder barrel	215	Bearing	226	Steel plate
205	Valve plate	216	Bearing	227	Brake piston
206	Piston	217	O-ring	228	Brake spacer
207	Shoe	218	O-ring	229	Spring B
208	Shoe holder	219	Oil seal	230	O-ring
209	Barrel holder	220	Ball	231	O-ring
210	Swash plate	221	Snap ring	232	Back up-ring
211	Control piston	222	Screw	233	Back up-ring
212	Pin	223	Spring pin		

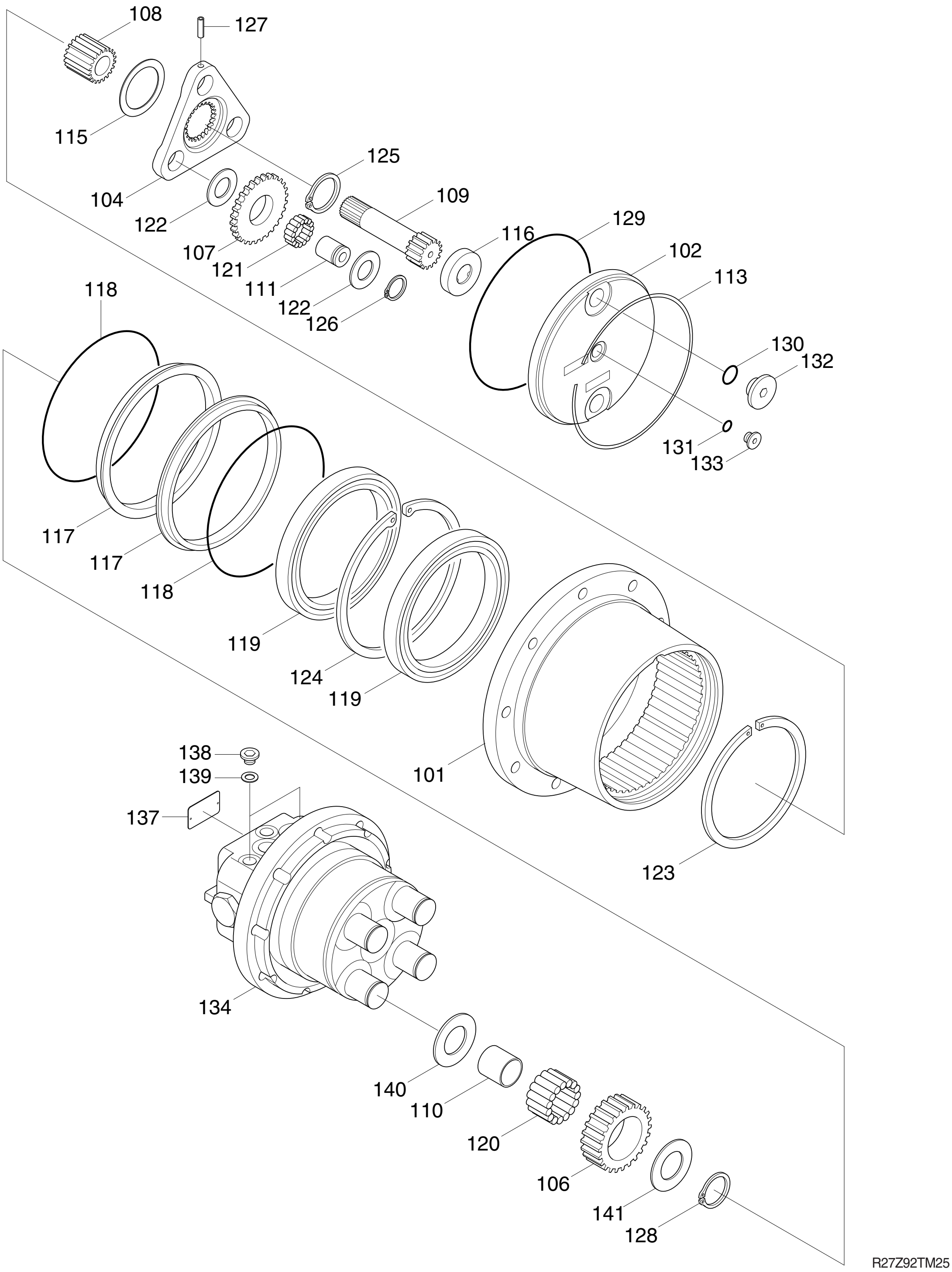
STRUCTURE (2/3)



R27Z92TM24

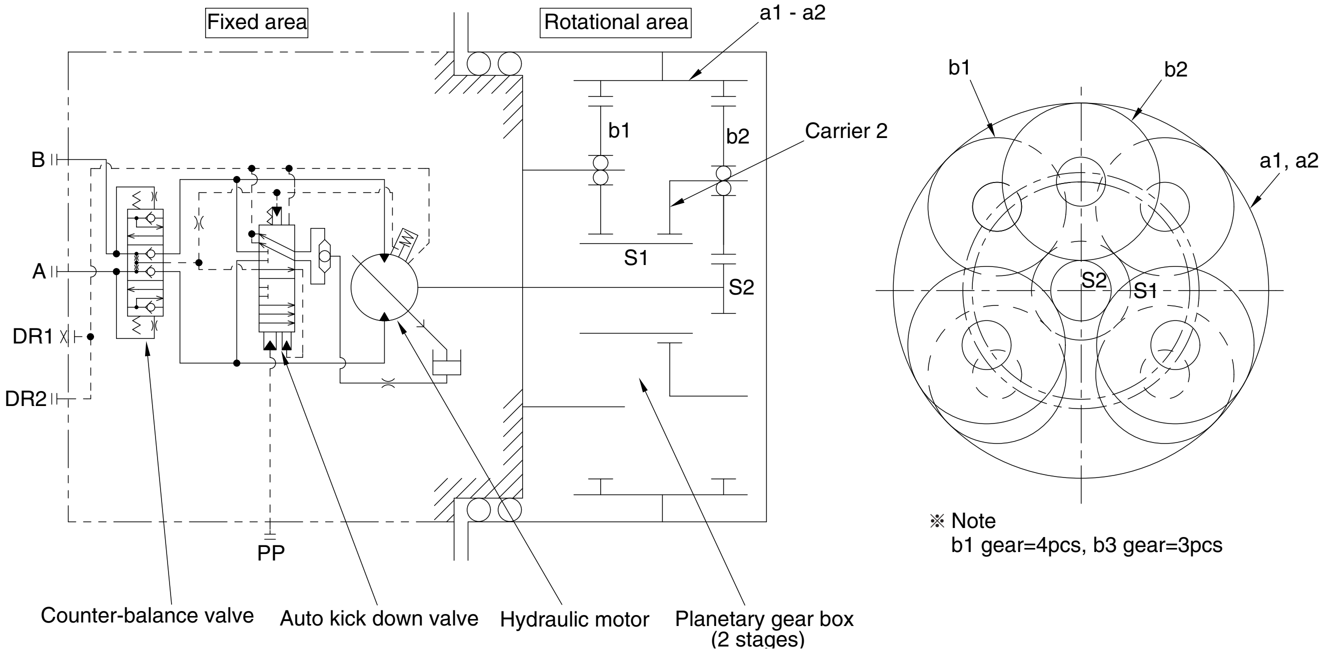
301	Body 1	309	Spring V3	317	O-ring
302	Spool	310	Plug	318	O-ring
303	Check valve	311	Plug	319	O-ring
304	Spring guide	312	Plug	320	O-ring
305	Spool	313	Choke	321	Choke
306	spool	314	Ring	322	Choke
307	Spring V1	315	Plug	323	Plug
308	Spring V2	316	Plug		

STRUCTURE (3/3)



101	Body	113	Snap ring	122	Thrust washer	131	O-ring
102	Cover	115	Thrust collar	123	Snap ring	132	Plug
104	Carrier 2	116	Slide ring	124	Snap ring	133	Plug
106	Gear B1	117	Floating seat	125	Snap ring	134	Hydraulic motor
107	Gear B2		(Incl 118)	126	Snap ring	137	Name plate
108	Gear S1	118	O-ring	127	Spring pin	138	Plug
109	Gear S2	119	Bearing	128	Snap ring	139	O-ring
110	Ring	120	Needle	129	O-ring	140	Thrust washer
111	Pin B2	121	Needle	130	O-ring	141	Thrust washer

2. DRAWING OF OPERATIONAL PRINCIPLE



R27Z9AK2TM03

3. OPERATION

Travel motor consists of a hydraulic motor "Fixed parts" and a planetary gear speed reducer "Rotating parts".

1) REDUCTION GEAR SECTION

(1) Function

The speed reducer of travel motor is a simple planetary gear type with two stages. The high output speed of the hydraulic motor is reduced to low speed with high torque.

(2) Operation

The S2 gear is attached to the hydraulic motor shaft and the S2 output speed is reduced between the gears (s2, b2, a2) as a first stage speed reducer.

The reduced output speed of this first stage is reduced again between the gears (s1, b1, a1) which are connected to the carrier 2 with the spline.

This reduced output speed of the second stage is transmitted to the body case "rotating parts" through the inner gears (a1, a2) and drives the machine.

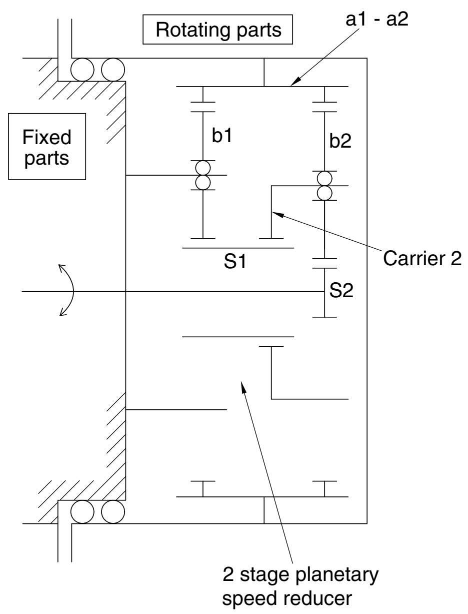
The gear ratio of 2 stage simple planetary speed reducer is calculated using the following formula.

$$R = \frac{Zs1}{Zs1+Za1} \times \frac{Zs2}{Zs2+Za2}$$

※ Z** : Number of teeth

With the travel motor, the body case rotating, so the gear ratio is ;

$$R' = \frac{1}{1-1/R}$$



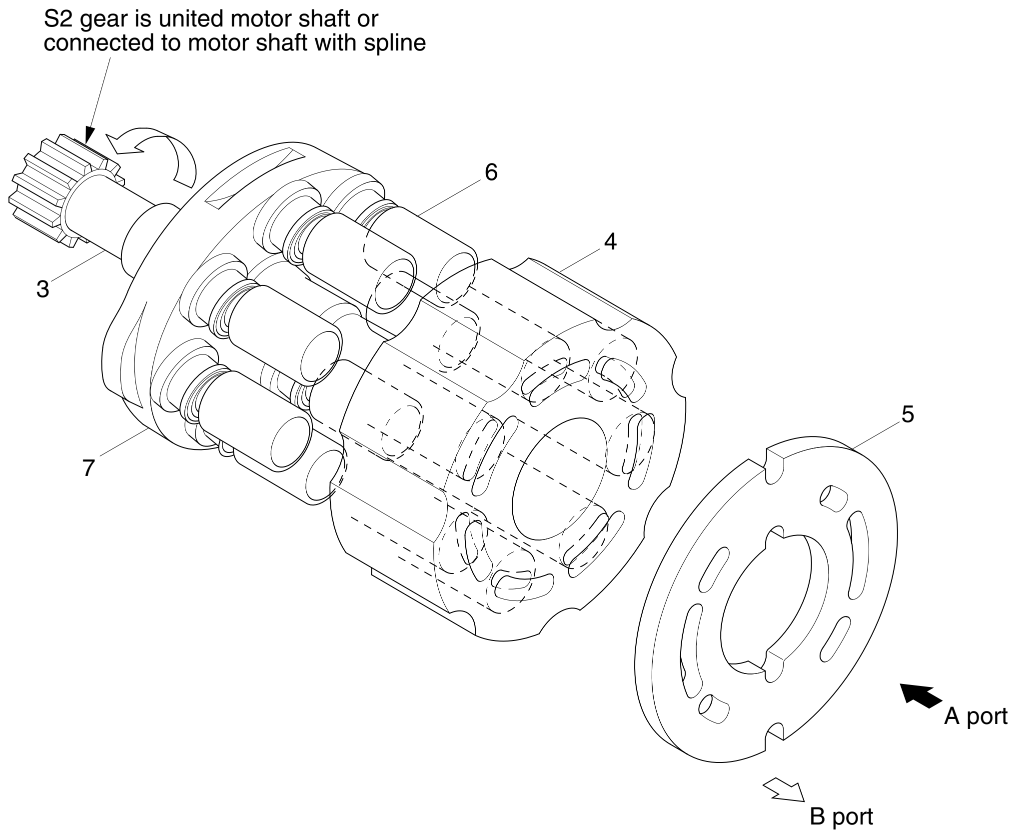
R27Z92TM05

2) HYDRAULIC MOTOR SECTION

(1) Function

This hydraulic motor is an axial piston type, and changes the hydraulic energy supplied from the pump to the rotary motion.

(2) Structure



R27Z92TM06

Through a hydraulic valve, the pressurized oil is supplied to the valve plate (5).
When the pressurized oil is supplied to the A port, this pressurized oil pushes the piston (6) in the clylinder barrel (4). This pushing force is changed to the rotational power by the swash plate (7) and transmitted to the shaft (3) which is connected to the cylinder barrel (4) with the spline. The return flow from the cylinder port is going out through the B port of the valve plate (5). To reverse rotation, pressurized oil is supplied to the B port and returning oil exits through the A port.

(3) 2 Speed motor operation

The swash plate, which has surface Ⅰ and Ⅱ in the opposite side to the shoe sliding surface, is supported by the 2 balls which are fixed to the body 2.

Since the balls are located in the eccentric position, in the low speed range, the surface Ⅰ is faced to the body 2 by the oil pressure in the piston and the spring force in the cylinder barrel.

The swash plate angle is α (Max. capacity).

When the pressurized oil is supplied to the (PP) port, the two-speed spool moves to the high position.

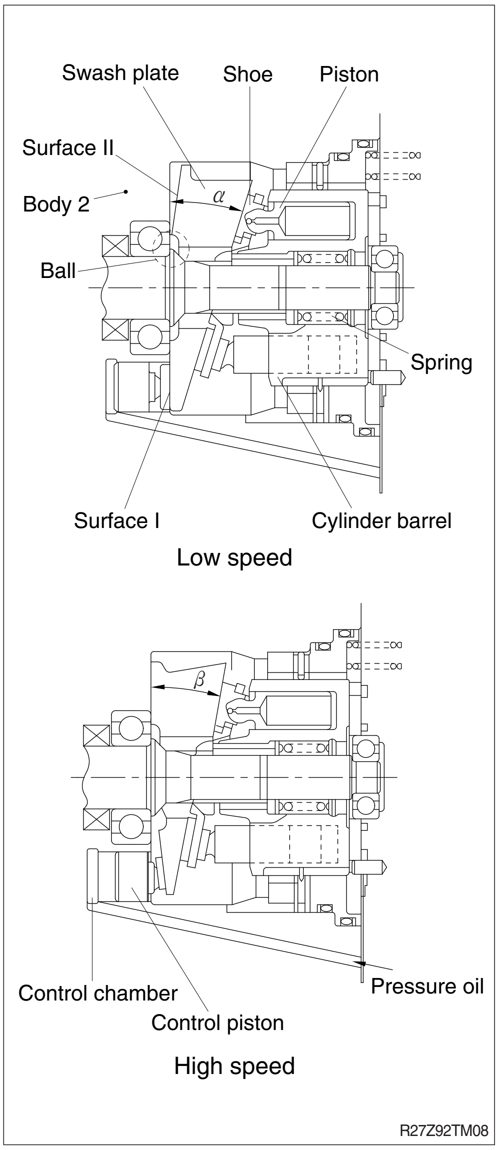
And the pressurized oil of inlet is led to the control chamber through the two-speed spool.

The control piston moves forward until the surface Ⅱ of the swash plate is in contact with the body 2, and the swash plate angle becomes β.

The capacity of the hydraulic motor is made small.

The pressurized oil of the (PP) port is shut off (or the engine is stopped), the two-speed spool moves to the low position.

And the control chamber is led to the tank port through the two-speed spool and the swash plate position comes to the low speed by the spring force.



(4) Auto kick down valve

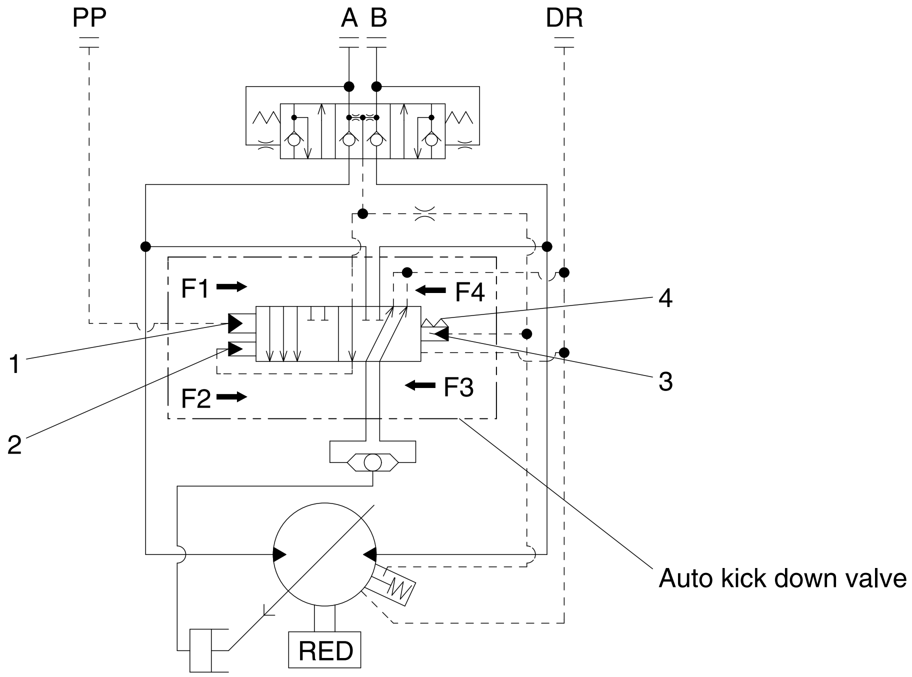
When the pilot switch for Hi speed mode is turned on, the pilot pressure for Hi speed mode comes from PP port to the hydraulic pilot (1), then the force F1 occurs, The auto kick down valve moves to the right direction because the F1 is larger than F4, which is by spring (4). Then the speed of track motor is changed to the Hi speed mode.

On the other hand, the operating pressure comes from A or B port to the hydraulic pilot (2) and (3), then the force F2 and F3 occur. The F3 larger than F2 because the area of (3) is wider than the area of (2). Therefore, if the operating pressure increased, the difference between F2 and F3 also increases.

When the operating pressure is larger than the setting pressure of Hi speed to Lo speed, the right direction resultant of F1 and F2 is smaller than the left direction resultant of F3 and F4.

Therefore the auto kick down valve moves to the left direction, then the speed of track motor is changed to the Lo speed mode. When the operating pressure is smaller than the larger than the left direction resultant of F3 and F4.

Therefore the auto kick down valve moves to the right direction, then the speed of track motor is changed to the Hi speed mode.



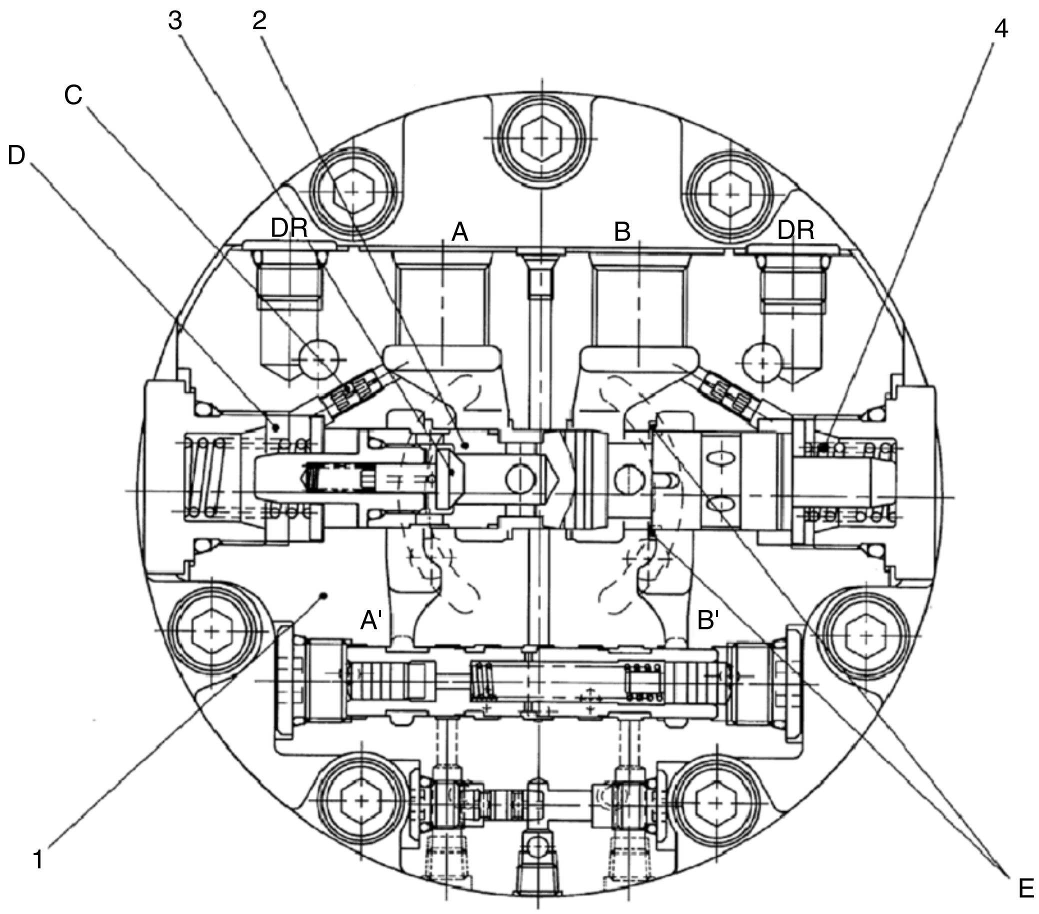
R27Z9AK2TM09

3) HYDRAULIC VALVE SECTION

(1) Counter-balance valve

When the pressurized oil is supplied from the A port, the pressurized oil opens the check valve (3) and flows into the hydraulic motor inlet A' port. At the same time, the pressurized oil goes through the orifice C into the chamber D, pushes the spring (4) and moves the spool (2) to right. Then the returned oil from the hydraulic motor flows into the B port, goes through area E and drives the hydraulic motor. When the pressurized oil is supplied from the B port, the hydraulic motor rotates in reverse.

Even the pressurized oil of the A port is shut off, the hydraulic motor tries to rotate by inertia force. When the pressurized oil from the A port is shut off, the spool (2) tries to return to left by the spring (4) force. At this time, the oil in the chamber D tries to go out to the A port through the orifice C, but due to the throttle effect of orifice C, the spool (2) speed is reduced. With the orifice and notches on the spool, the returned oil is controlled gradually and the hydraulic motor stops smoothly.



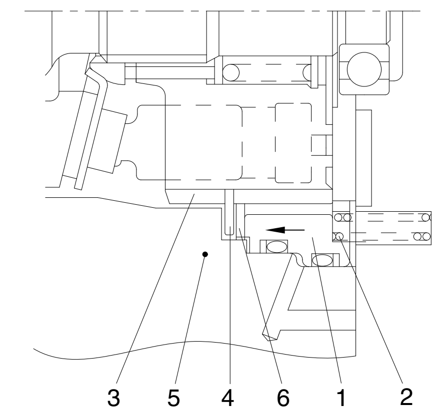
R25Z9AK2TM19

4) PARKING BRAKE SECTION

(1) Structure

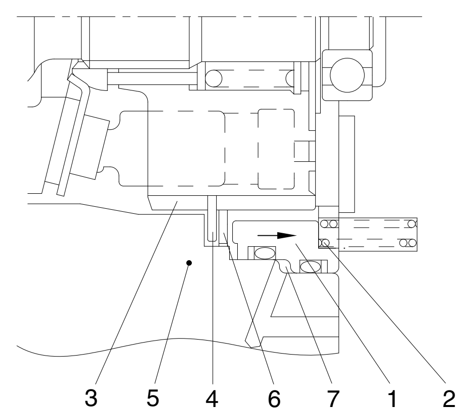
The parking brake fixes the output shaft of hydraulic motor mechanically while the travel motor is stopped. And it is applied automatically in the following fashion.

When A and B ports are not pressurized, the brake piston (1) is pressed in the direction (shown as arrow) by the spring (2). Then the disk plate (4) which is fixed to the cylinder barrel (3) is held between the steel plate (6) which are fixed to the body 2 (5) and the body 2 (5). As a result, with the friction of these plates, the cylinder barrel (3) and the hydraulic motor are unable to rotate.



R27Z92TM10

When A or B ports are pressurized, the oil is lead to chamber (7). Then the brake piston (1) is moved to the direction (shown as arrow) against the force of spring (2). As a result, the disk plate (4) is released from the steel plate (6) and the body 2 (5), and the cylinder barrel (3) can be rotated.



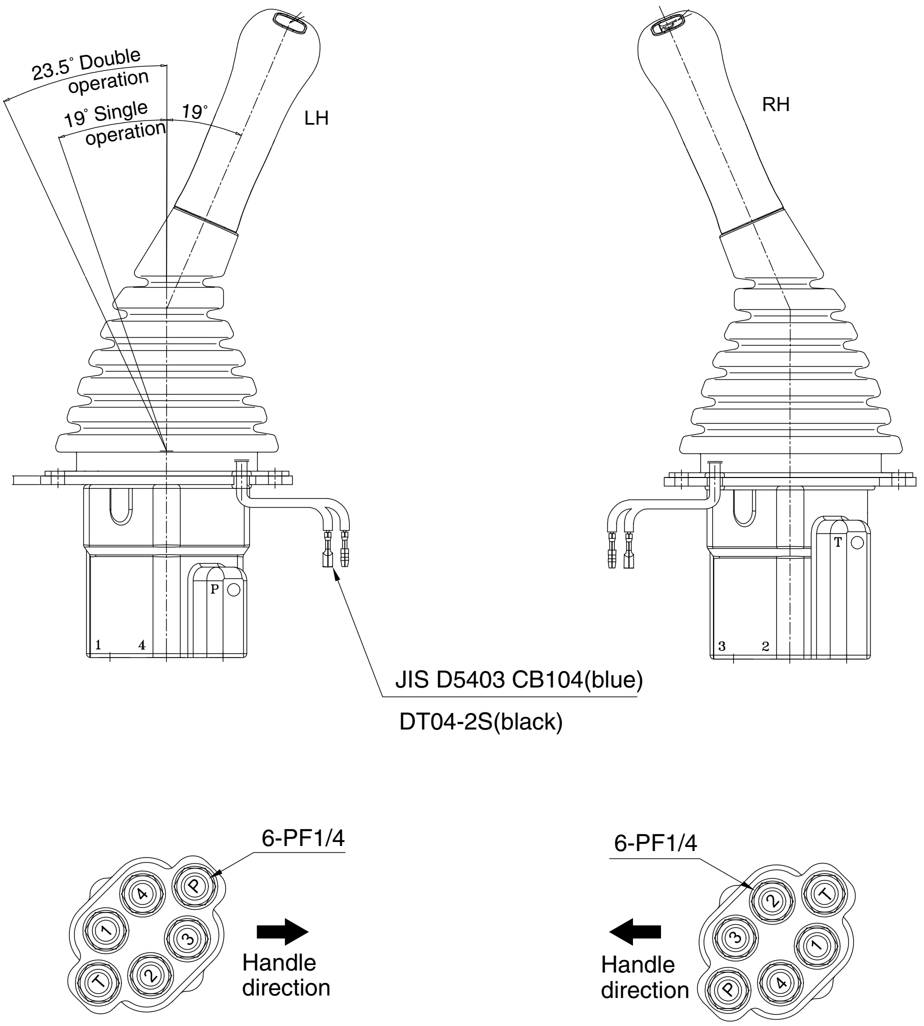
R27Z92TM11

GROUP 5 RCV LEVER

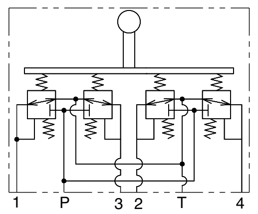
■ TYPE 1 (STD)

1. STRUCTURE

The casing has the oil inlet port P (primary pressure) and the oil outlet port T (tank). In addition the secondary pressure is taken out through ports 1,2,3 and 4 provided at the bottom face.



19A2RL01



Hydraulic circuit

Port	LH	RH	Port size
P	Pilot oil inlet port	Pilot oil inlet port	PF 1/4
T	Pilot oil return port	Pilot oil return port	
1	Left swing port	Bucket out port	
2	Arm out port	Boom up port	
3	Right swing port	Bucket in port	
4	Arm in port	Boom down port	

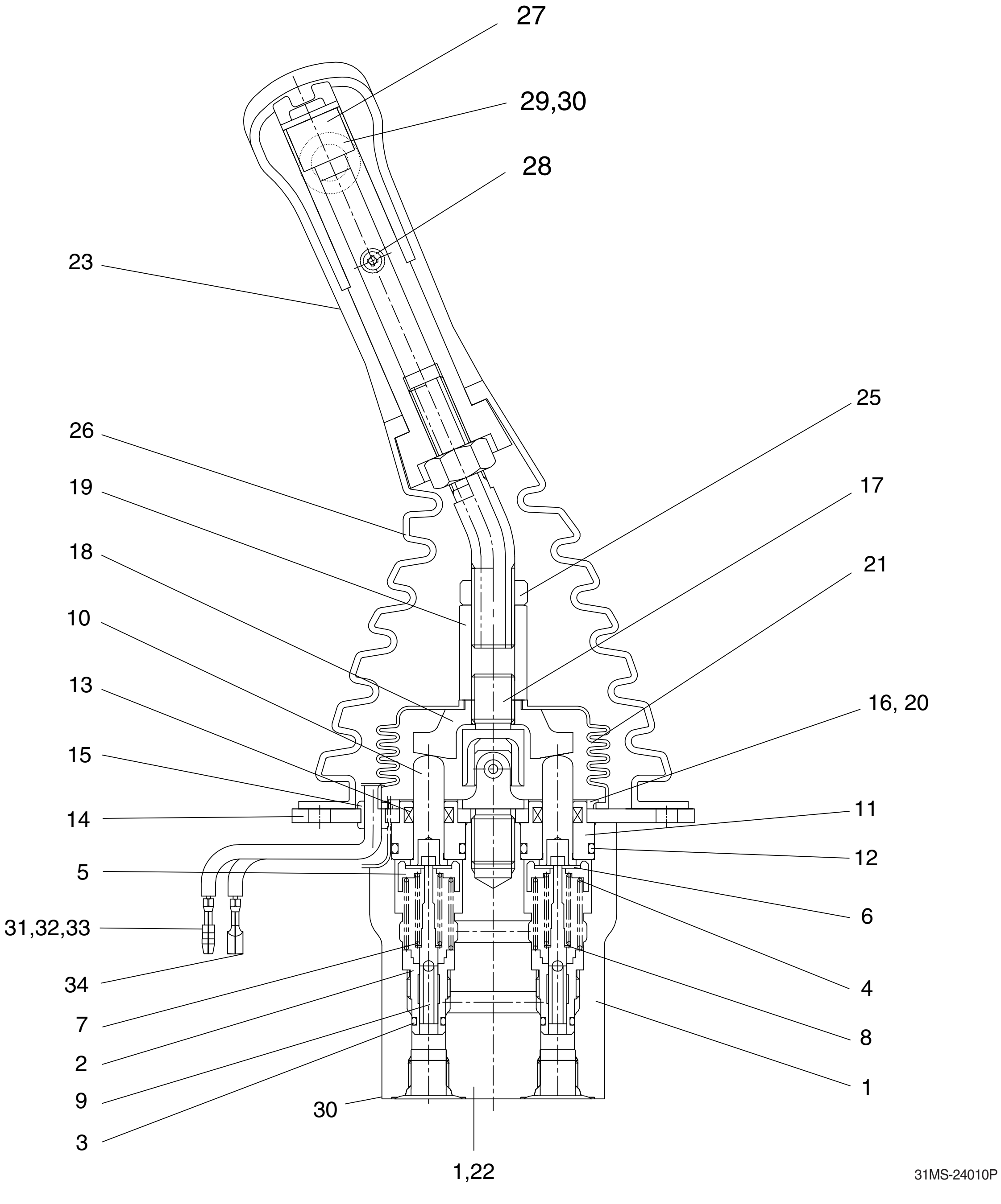
CROSS SECTION

The construction of the pilot valve is shown in the attached cross section drawing. The casing has vertical holes in which reducing valves are assembled.

The pressure reducing section is composed of the spool (9), spring (7) for setting secondary pressure, return spring (4), stopper (6), spring seat (5) and shim (8). The spring for setting the secondary pressure has been generally so preset that the secondary pressure is 5.5 to 20.5 kgf/cm^2 (depending on the type). The spool is pushed against the push rod (10) by the return spring.

When the push rod is pushed down by tilting the handle, the spring seat comes down simultaneously and changes setting of the secondary pressure spring.

CROSS SECTION

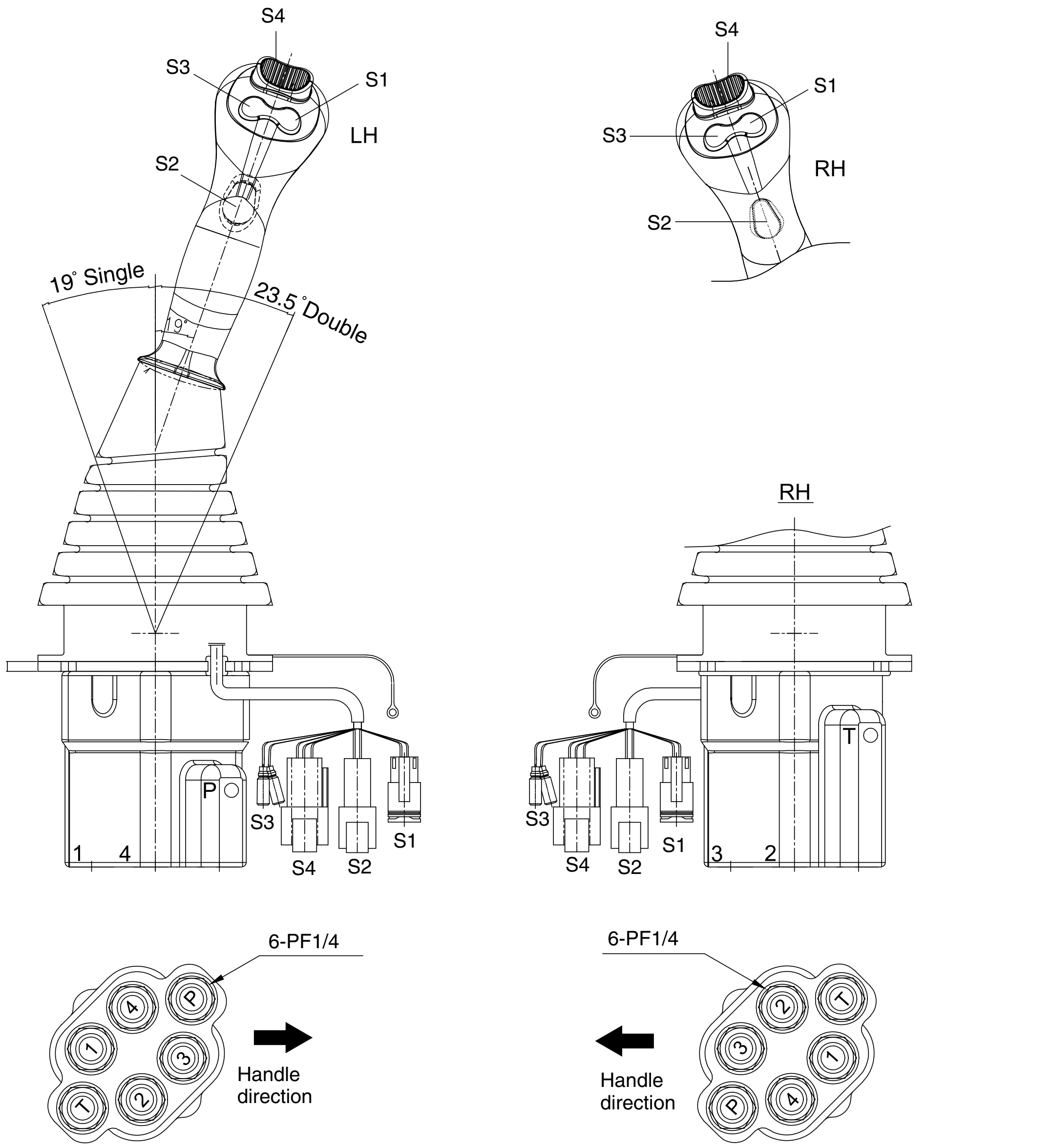


1	Body	13	Rod seal	25	Nut
2	Plug	14	Plate (A)	26	Boots
3	O-ring	15	Bushing	27	Switch 1
4	Spring	16	Machine screw	28	Screw
5	Spring seat	17	Joint assy	29	Switch 2
6	Stopper	18	Swash plate	30	Switch cover
7	Spring	19	Hex nut	31	Connector assy
8	Shim	20	Plate (B)	32	Terminal
9	Spool	21	Inner boots	33	Guide
10	Push rod	22	Plug	34	Connector
11	Plug	23	Handle assy (LH, RH)		
12	O-ring	24	Handle bar		

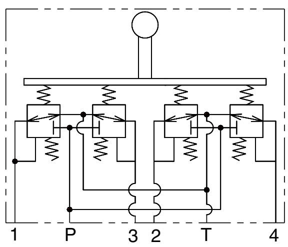
■ TYPE 2 (PROPORTIONAL, OPT)

2. STRUCTURE

The casing has the oil inlet port P (primary pressure) and the oil outlet port T (tank). In addition the secondary pressure is taken out through ports 1,2,3 and 4 provided at the bottom face.



19A2RL03



Hydraulic circuit

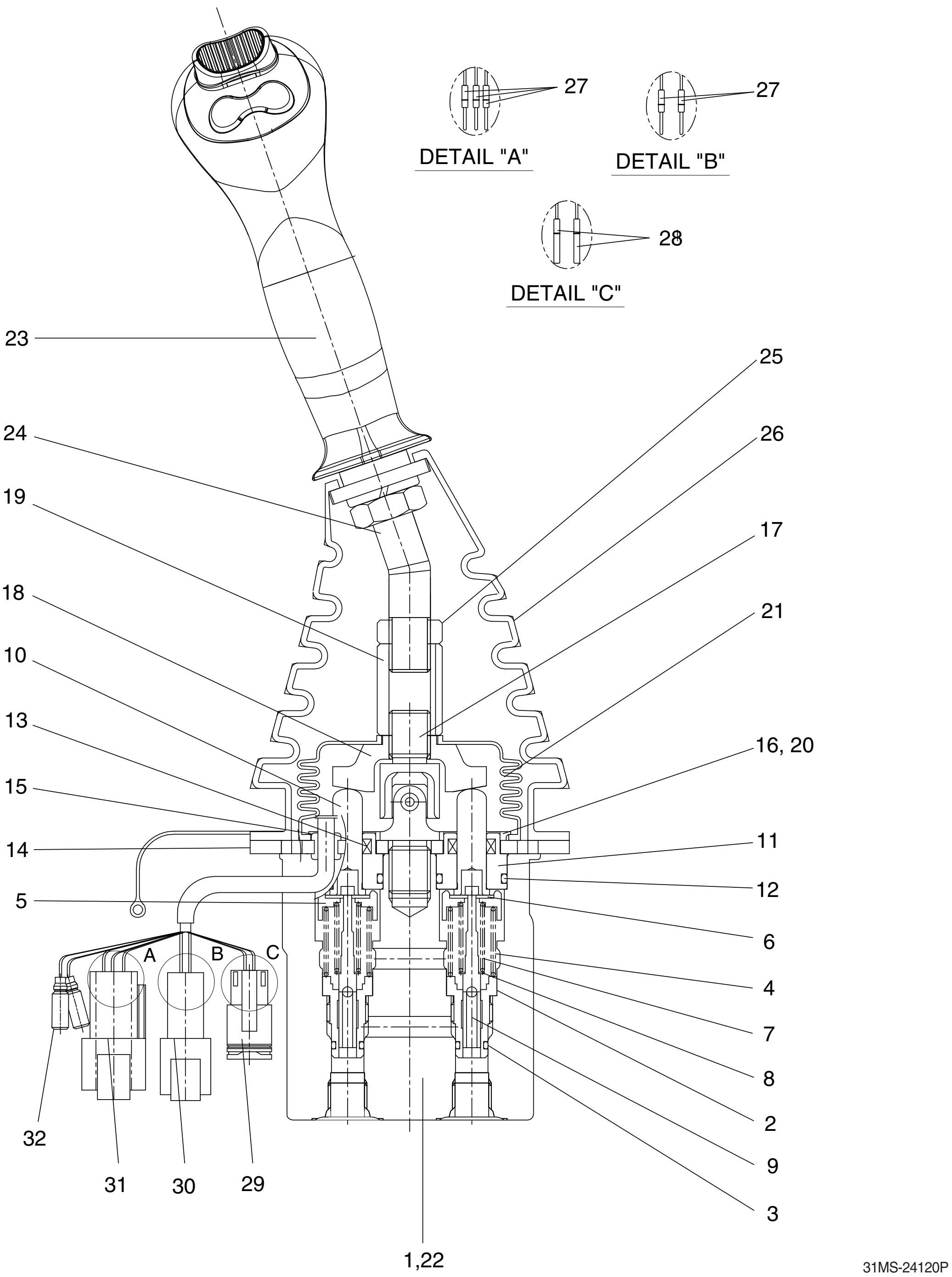
Port	LH	RH (with proportional)	Port size
P	Pilot oil inlet port	Pilot oil inlet port	PF 1/4
T	Pilot oil return port	Pilot oil return port	
1	Left swing port	Bucket in port	
2	Arm out port	Boom down port	
3	Right swing port	Bucket out port	
4	Arm in port	Boom up port	

CROSS SECTION

The structure of the remote control valve is as shown in the assembly. There is a vertical axial hole in the casing and the reduction valves are inserted into this.

The secondary pressure setting spring is set such that the secondary pressure is calculated as 5-5~20.5 kgf/cm^2. Spool (9) is pushed onto the push rod (10) by return spring (4).
Tilting the control handle pushes down push rod (10), the spring seat (5) also moves down and the setting of the secondary pressure setting spring is changed.
Port P, oil inlet (primary pressure) and port T outlet (tank) are in the casing.

CROSS SECTION

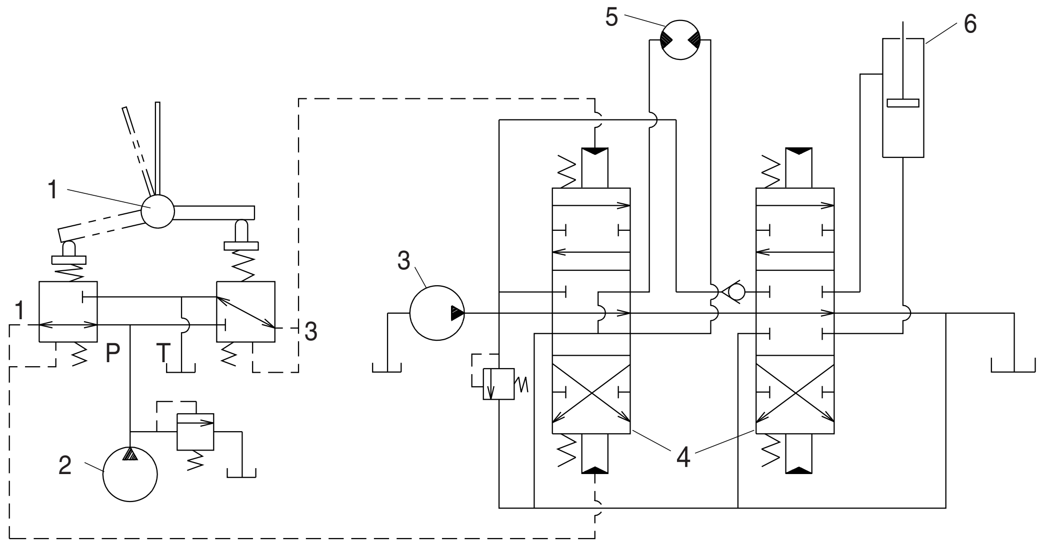


1	Body	12	O-ring	23	Handle assy (LH, RH)
2	Plug	13	Rod seal	24	Handle bar
3	O-ring	14	Plate (A)	25	Nut
4	Spring	15	Bushing	26	Boots
5	Spring seat	16	Machine screw	27	Connector pin male
6	Stopper	17	Joint assy	28	Connector pin female
7	Spring	18	Swash plate	29	Connector assy
8	Shim	19	Hex nut	30	Connector assy
9	Spool	20	Plate (B)	31	Connector assy
10	Push rod	21	Inner boots	32	Connector
11	Plug	22	Plug		

3. OPERATION

The operation of the remote control valve will be described on the basis of the hydraulic circuit diagram shown below and the attached operation explanation drawing.

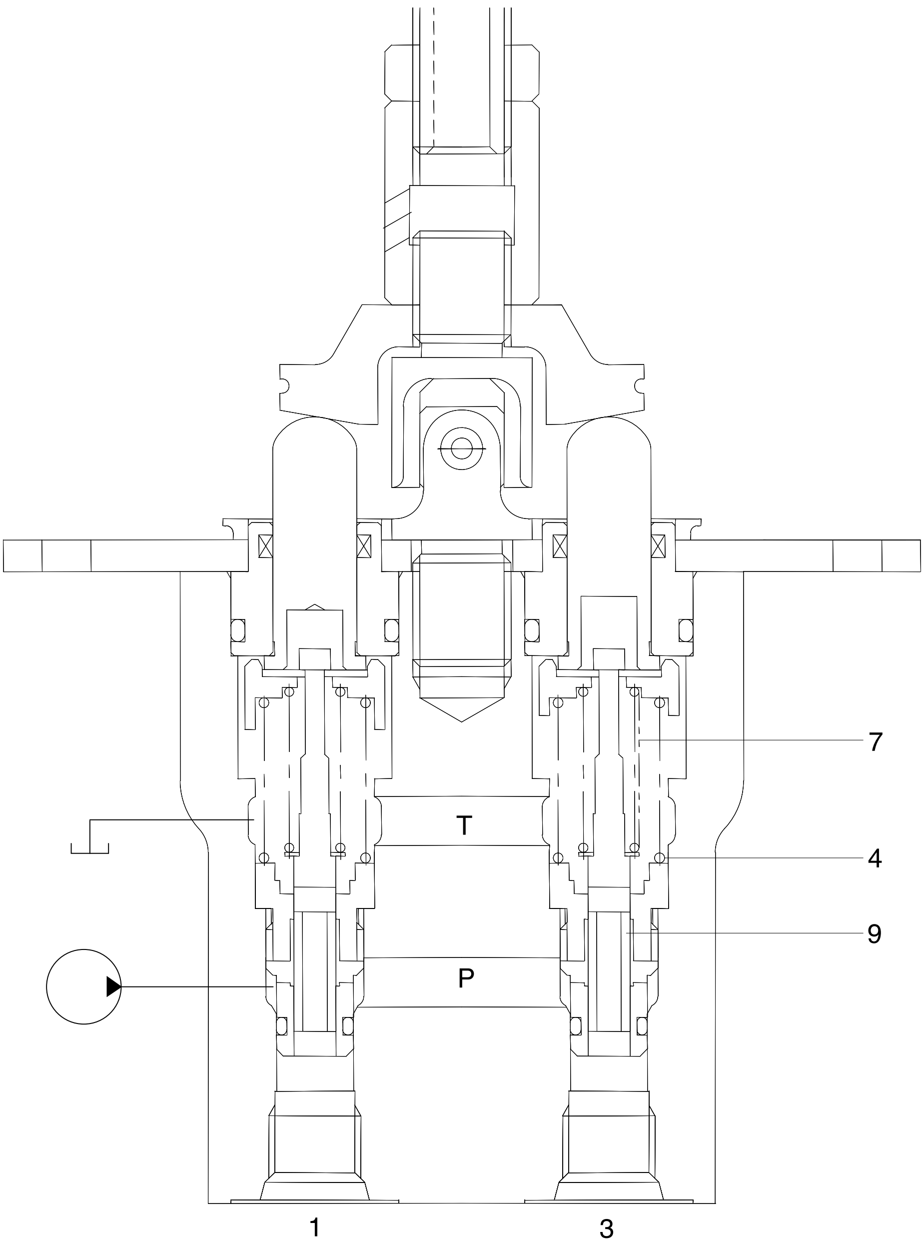
The diagram shown below is the typical application example of the remote control valve.



2-70 (140-7TIER)

1	Remote control valve	3	Main pump	5	Hydraulic motor
2	Pilot pump	4	Main control valve	6	Hydraulic cylinder

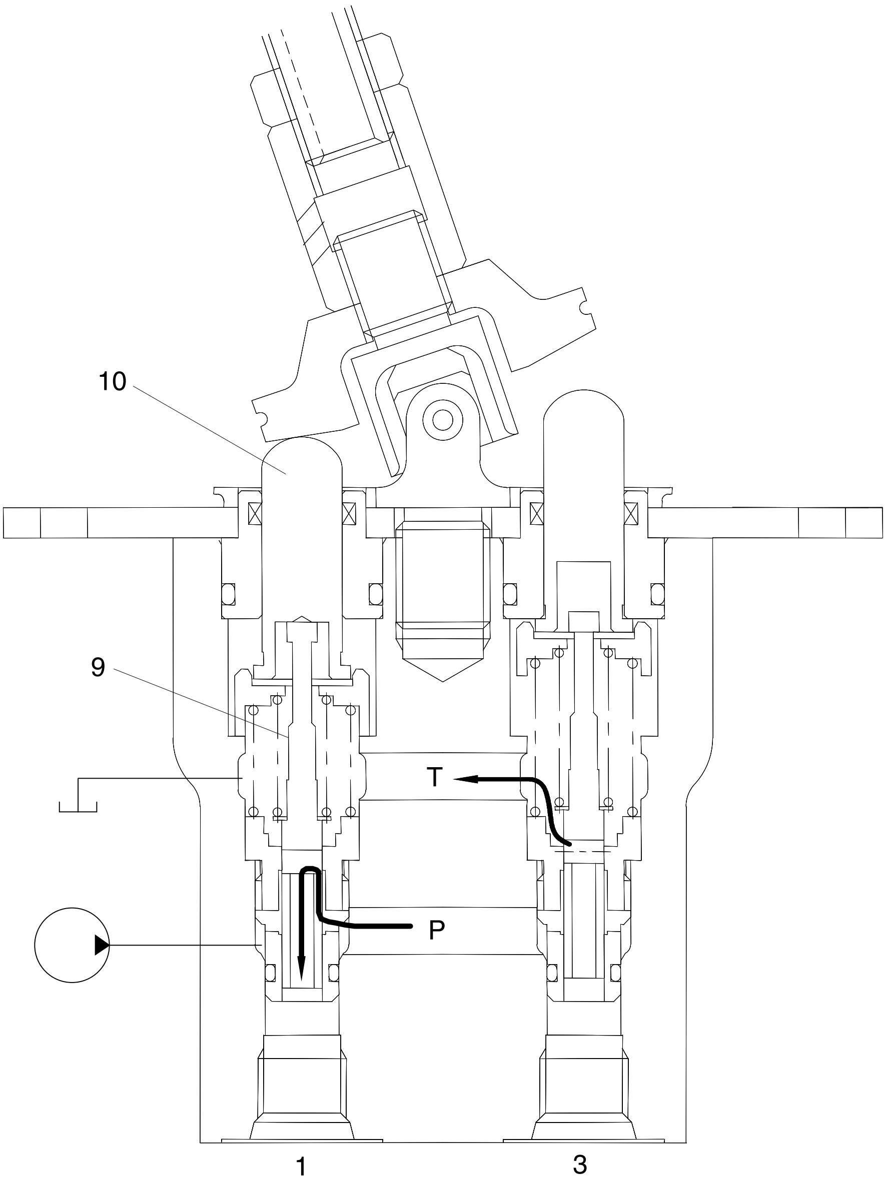
(1) Case where handle is in neutral position



R30Z9AK2RL03

The force of the spring (7) that determines the output pressure of the pilot valve is not applied to the spool (9). Therefore, the spool is pushed up by the spring (4) to the position of port (1, 3) in the operation explanation drawing. Then, since the output port is connected to tank port T only, the output port pressure becomes equal to tank pressure.

(2) Case where handle is tilted

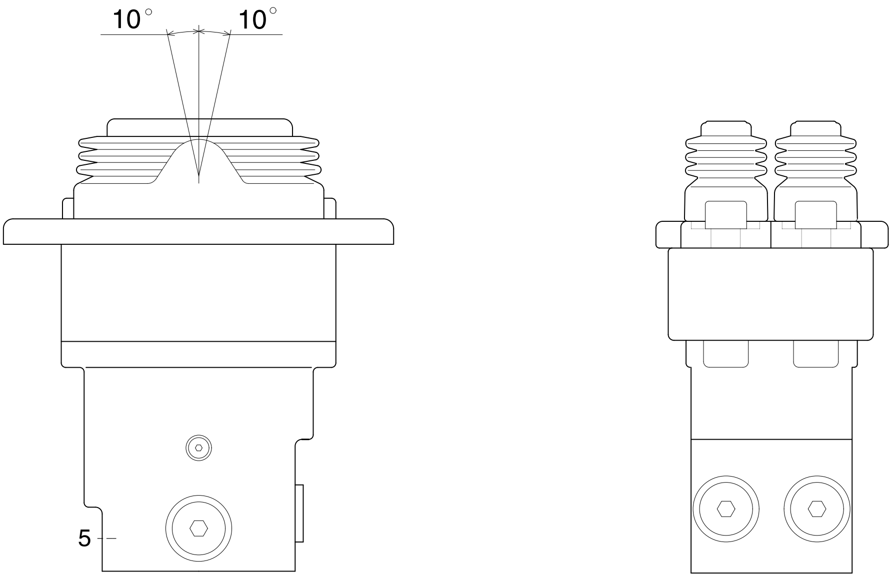


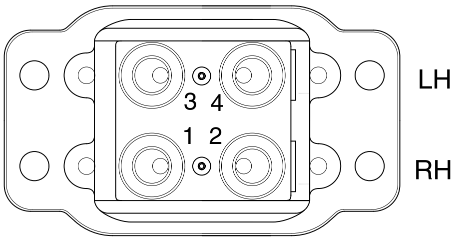
When the push rod (10) is stroked, the spool (9) moves downwards.
Then port P is connected with port (1) and the oil supplied from the pilot pump flows through port (1) to generate the pressure.
When the pressure at port (1) increases to the value corresponding to the spring force set by tilting the handle, the hydraulic pressure force balances with the spring force. If the pressure at port (1) increases higher than the set pressure, port P is disconnected from port (1) and port T is connected with port (1). If it decreases lower than the set pressure, port P is connected with port (1) and port T is disconnected from port 1.
In this manner the secondary pressure is kept at the constant value.

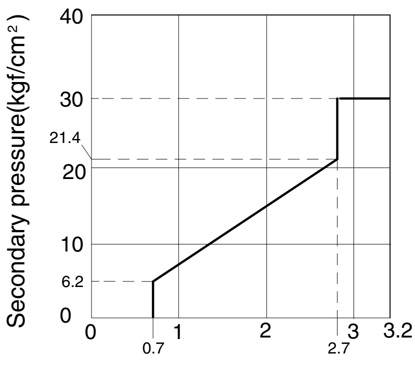
GROUP 6 RCV PEDAL

1. STRUCTURE

The casing has the oil inlet port P (primary pressure), and the oil outlet port T (tank). In addition the secondary pressure is taken out through ports 1, 2, 3 and 4 provided at the bottom face.







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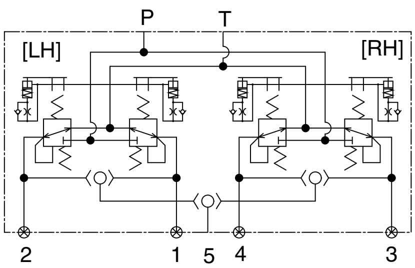


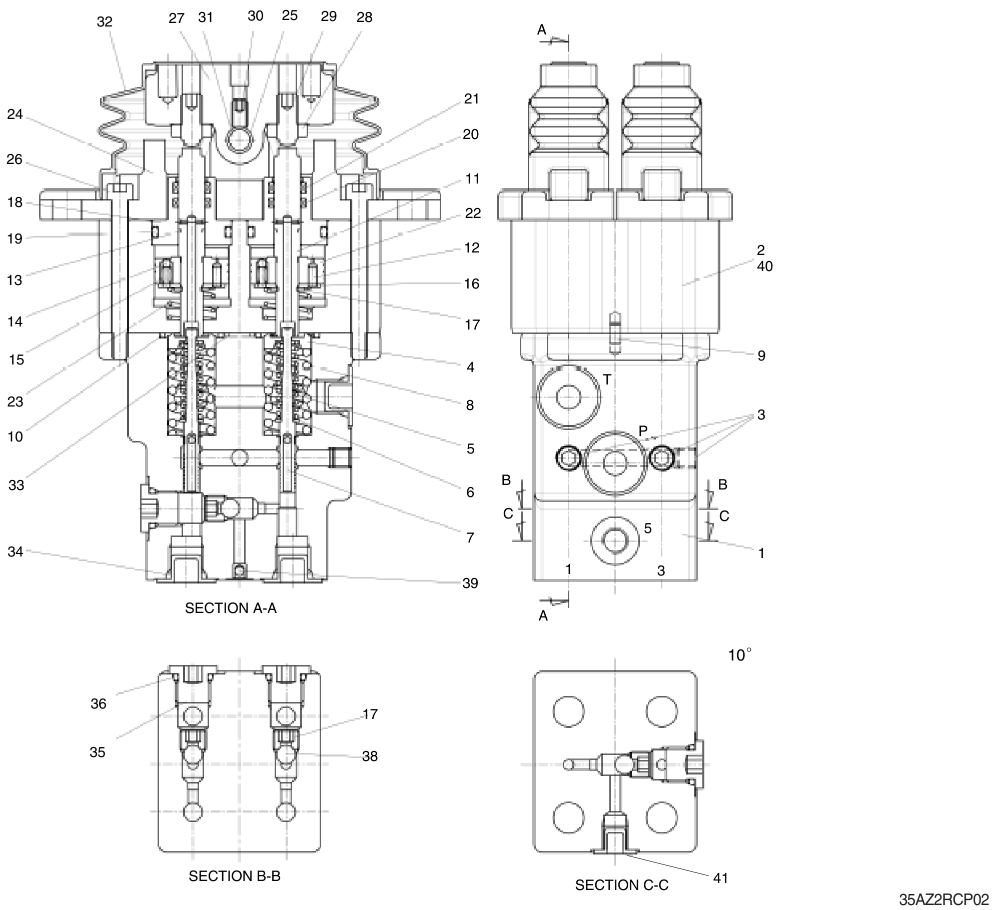
Port	Port name	Port size
P	Pilot oil inlet port	PF 1/4
T	Pilot oil return port	
1	Travel (LH, backward)	
2	Travel (LH, forward)	
3	Travel (RH, backward)	
4	Travel (RH, forward)	
5	Travel alarm	PT 1/8

CROSS SECTION

The construction of the RCV pedal is shown in the below drawing. The casing has vertical holes in which reducing valves are assembled.

The pressure reducing section is composed of the spool (7), spring (5) for setting secondary pressure, return spring (8), spring seat (4) and washer (6). The spring for setting the secondary pressure has been generally so preset that the secondary pressure is 6.2 to 21.4 kgf/cm^2 (depending on the type). The spool is pushed against the push rod (11) by the return spring.

When the push rod is pushed down by tilting pedal, the spring seat comes down simultaneously and changes setting of the secondary pressure spring.



1	Body 1	15	Spring	29	Set screw
2	Body 2	16	Plate	30	Set screw
3	Plug	17	Snap ring	31	Hex nut
4	Spring seat	18	Plug	32	Bellows
5	Spring	19	O-ring	33	O-ring
6	Washer	20	Rod seal	34	Cap
7	Spool	21	Dust seal	35	Plug
8	Spring	22	Piston	36	O-ring
9	Spring pin	23	Spring	37	Check seat
10	O-ring	24	Cover	38	Steel ball
11	Push rod	25	Bushing	39	Expander
12	Spring pin	26	Wrench bolt	40	Name plate
13	Seal	27	Cam assy	41	Cap
14	Steel ball	28	Cam shaft		

2. FUNCTION

1) FUNDAMENTAL FUNCTIONS

The pilot valve is a valve controls the spool stroke, direction, etc of a main control valve. This function is carried out by providing the spring at one end of the main control valve spool and applying the output pressure (secondary pressure) of the pilot valve to the other end.

For this function to be carried out satisfactorily, the pilot valve is composed of the following elements.

(1) Inlet port (P) where oil is supplied from hydraulic pump.

(2) Output port (1, 2, 3 & 4) to apply pressure supplied from inlet port to ends of control valve spools.

(3) Tank port (T) necessary to control the above output pressure.

(4) Spool to connect output port to inlet port tank port.

(5) Mechanical means to control output pressure, including springs that work on the above spools.

2) FUNCTIONS OF MAJOR SECTIONS

The functions of the spool (7) are to receive the supply oil pressure from the hydraulic pump at its port P, and to change over oil paths to determine whether the pressure oil of port P is led to output ports 1, 2, 3 & 4 or the output spool to determine the output pressure.

The spring (5) works on this spool to determine the output pressure.

The change the deflection of this spring, the push rod (11) is inserted and can slide in the plug (18).

For the purpose of changing th displacement of the push rod through the cam (27) and cam shaft (28) are provided the pedal that can be tilted in any direction around the fulcrum of the cam (27) center.

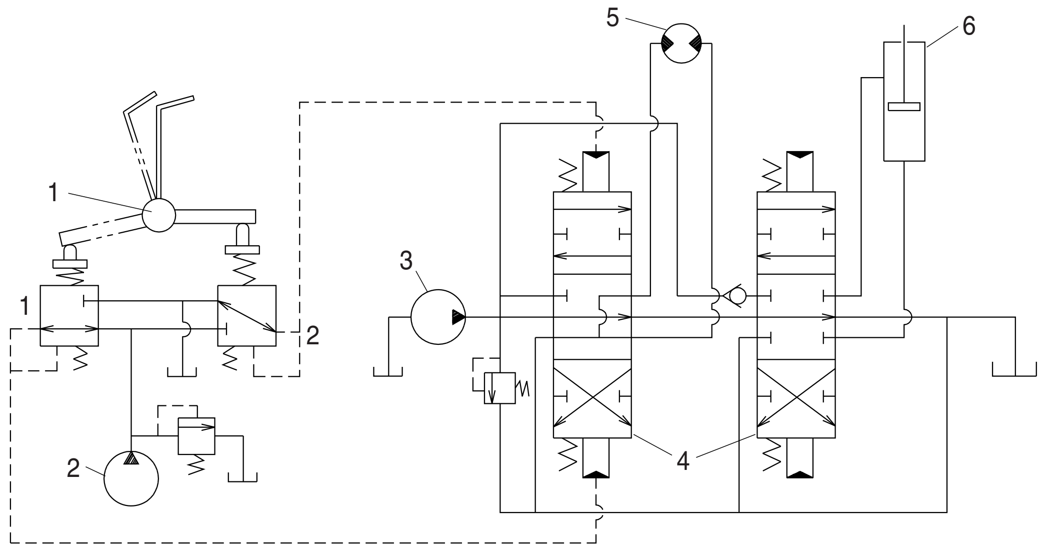
The spring (8) works on the casing (1) and washer (6) and tries to return the push rod (11) to the zero-displacement position irrespective of the output pressure, securing its resetting to the center position.

This also has the effect of a reaction spring to give appropriate control feeling to the operator.

3) OPERATION

The operation of the pilot valve will be described on the basis of the hydraulic circuit diagram shown below ant the attached operation explanation drawing.

The diagram shown below is the typical application example of the pilot valve.



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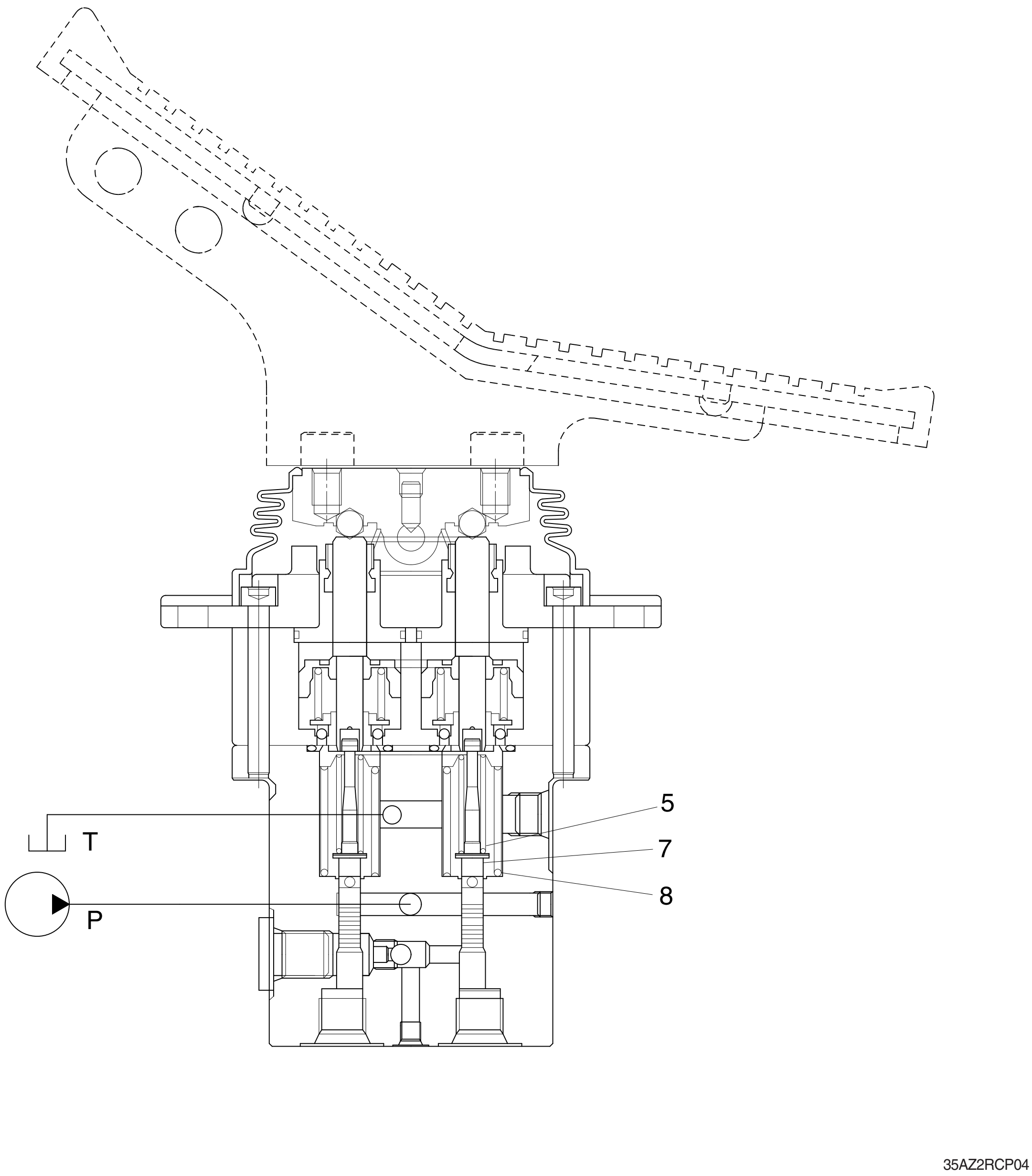
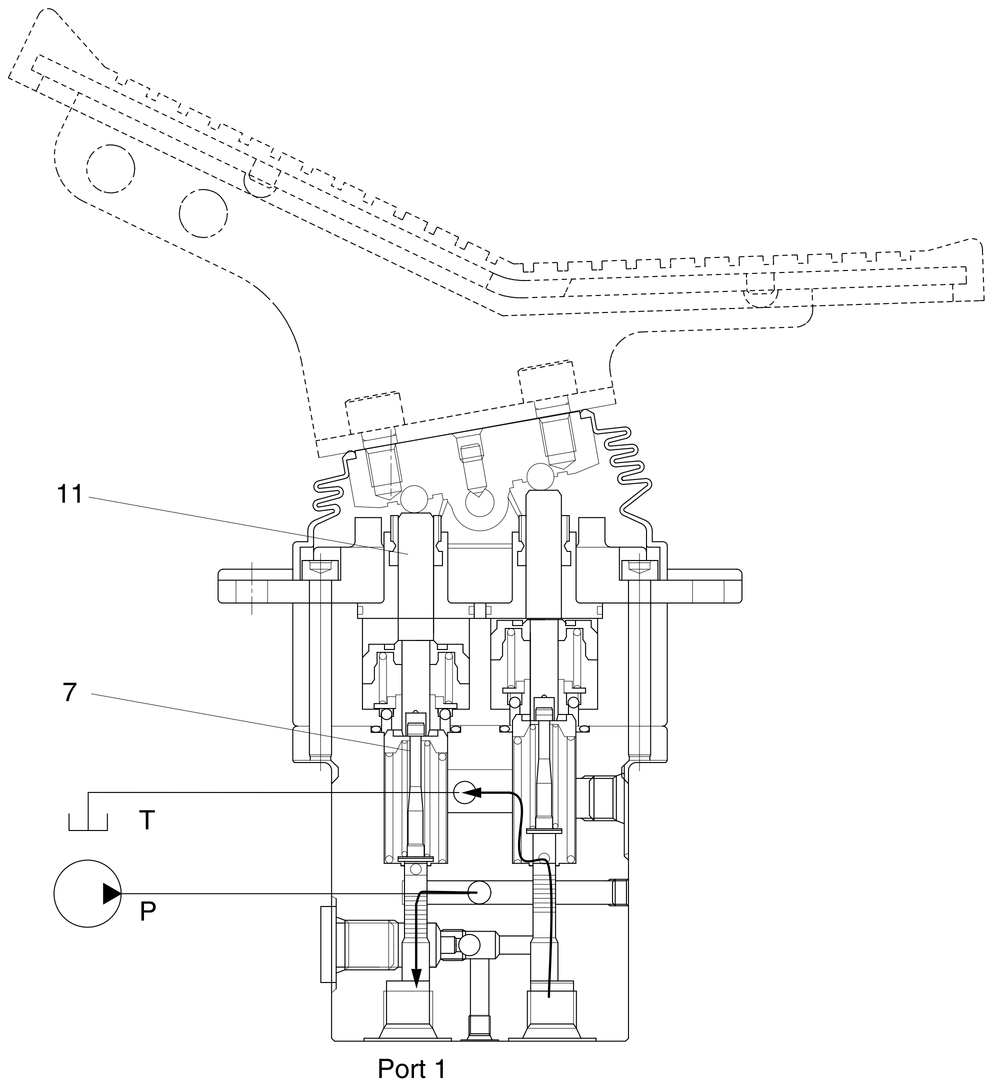
1	Pilot valve	3	Main pump	5	Hydraulic motor
2	Pilot pump	4	Main control valve	6	Hydraulic cylinder

(1) Case where pedal is in neutral position



The force of the spring (5) that determines the output pressure of the pilot valve is not applied to the spool (7). Therefore, the spool is pushed up by the spring (8) to the position of port 2 in the operation explanation drawing. Then, since the output port is connected to tank port T only, the output port pressure becomes equal to tank pressure.

(2) Case where pedal is tilted



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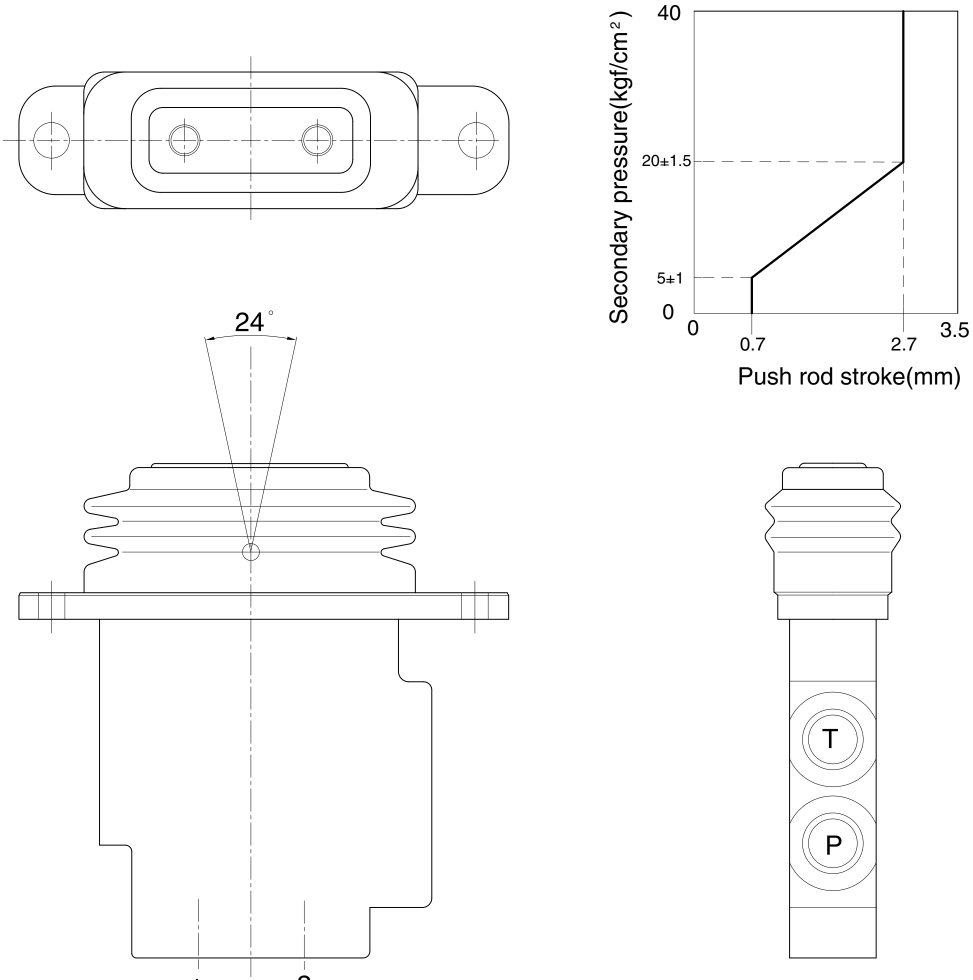
When the push rod (11) is stroked, the spool (7) moves downwards.
Then port P is connected with port 1, and the oil supplied from the pilot pump flows through port 1 to generate the pressure.
When the pressure at port 1 increases to the value corresponding to the spring force set by tilting the handle, the hydraulic pressure force balances with the spring force. If the pressure at port 1 increases higher than the set pressure, port P is disconnected from port 1 and port T is connected with port 1. If it decreases lower than the set pressure, port P is connected with port 1 and port T is disconnected from port 1.
In this manner the secondary pressure is kept at the constant value.

3. BOOM SWING PEDAL

1) STRUCTURE

The casing has the oil inlet P (primary pressure) and the oil return port (tank).
In addition the secondary pressure is taken out through port 1 and port 2 provided at the housing bottom face.



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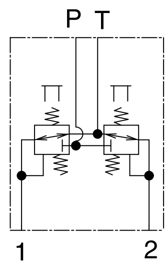
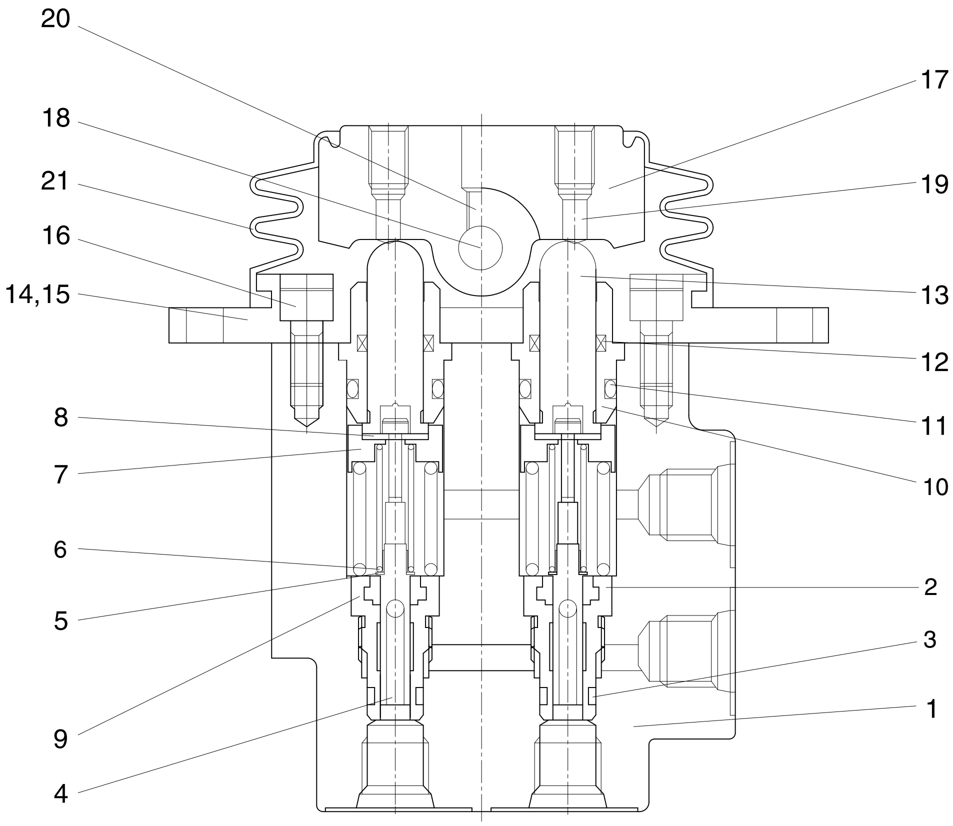


Hydraulic circuit

Port	Port name	Port size
P	Pilot oil inlet port	PF 1/4
T	Pilot oil return port	
1	Boom swing (LH)	
2	Boom swing (RH)	

2) COMPONENT



31MH-20050

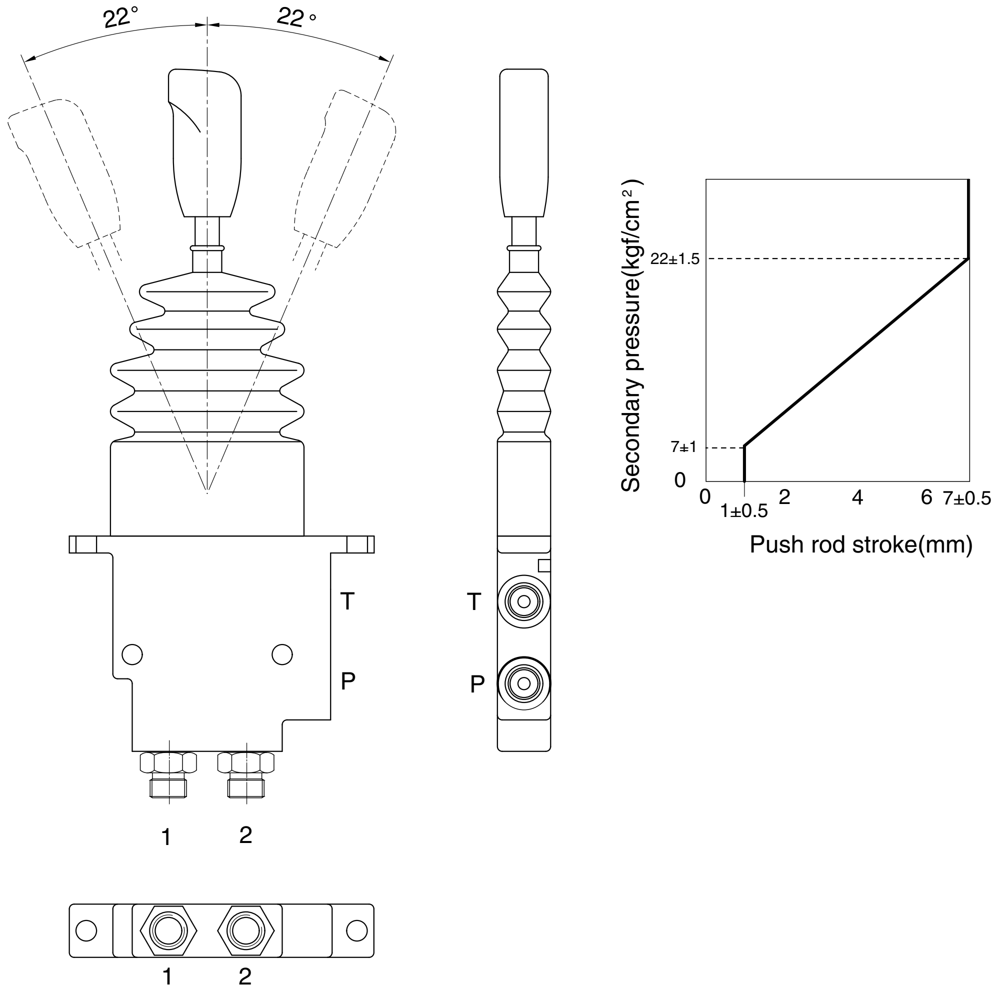
1	Body	8	Stopper	15	DU bush
2	Plug	9	Spring	16	Wrench bolt
3	O-ring	10	Plug	17	Cam
4	Spool	11	O-ring	18	Pin
5	Spring seat	12	Rod seal	19	Adjust screw
6	Spring	13	Push rod	20	Socket bolt
7	Spring seat	14	Cover	21	Bellows

4. DOZER LEVER

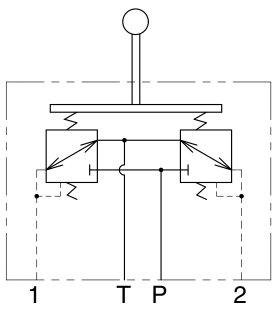
1) STRUCTURE

The casing has the oil inlet P (primary pressure) and the oil return port (tank).

In addition the secondary pressure is taken out through port 1 and port 2 provided at the housing bottom face.



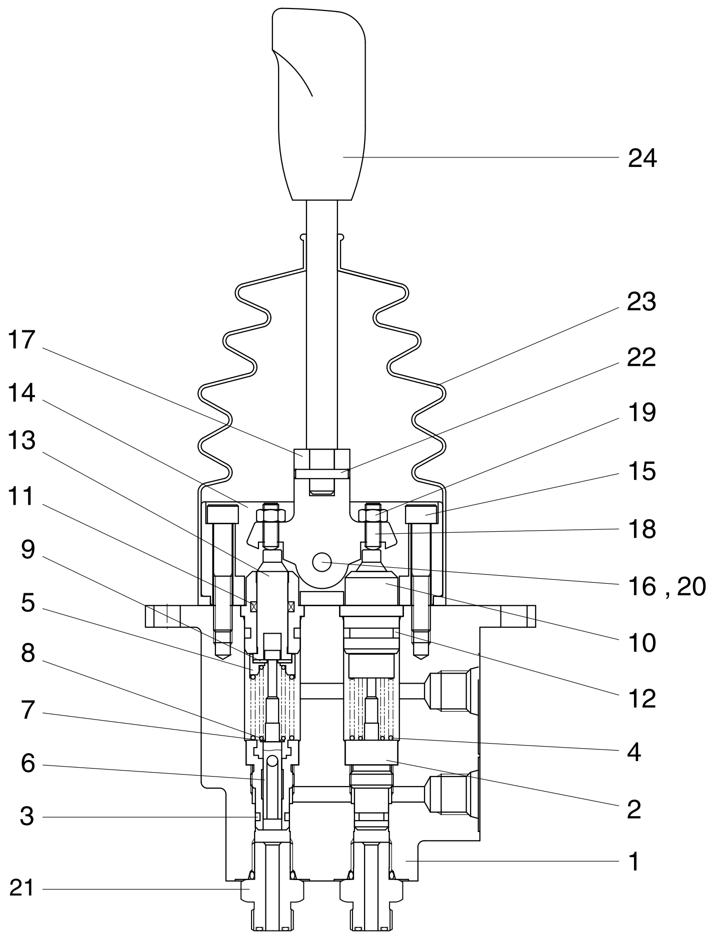
17AZ2DL01



Hydraulic circuit

Port	Port	Port size
P	Pilot oil inlet port	PF 1/4
T	Pilot oil return port	PF 1/4
1	Dozer blade up port	9/16 UNF
2	Dozer blade down port	9/16 UNF

2) COMPONENT



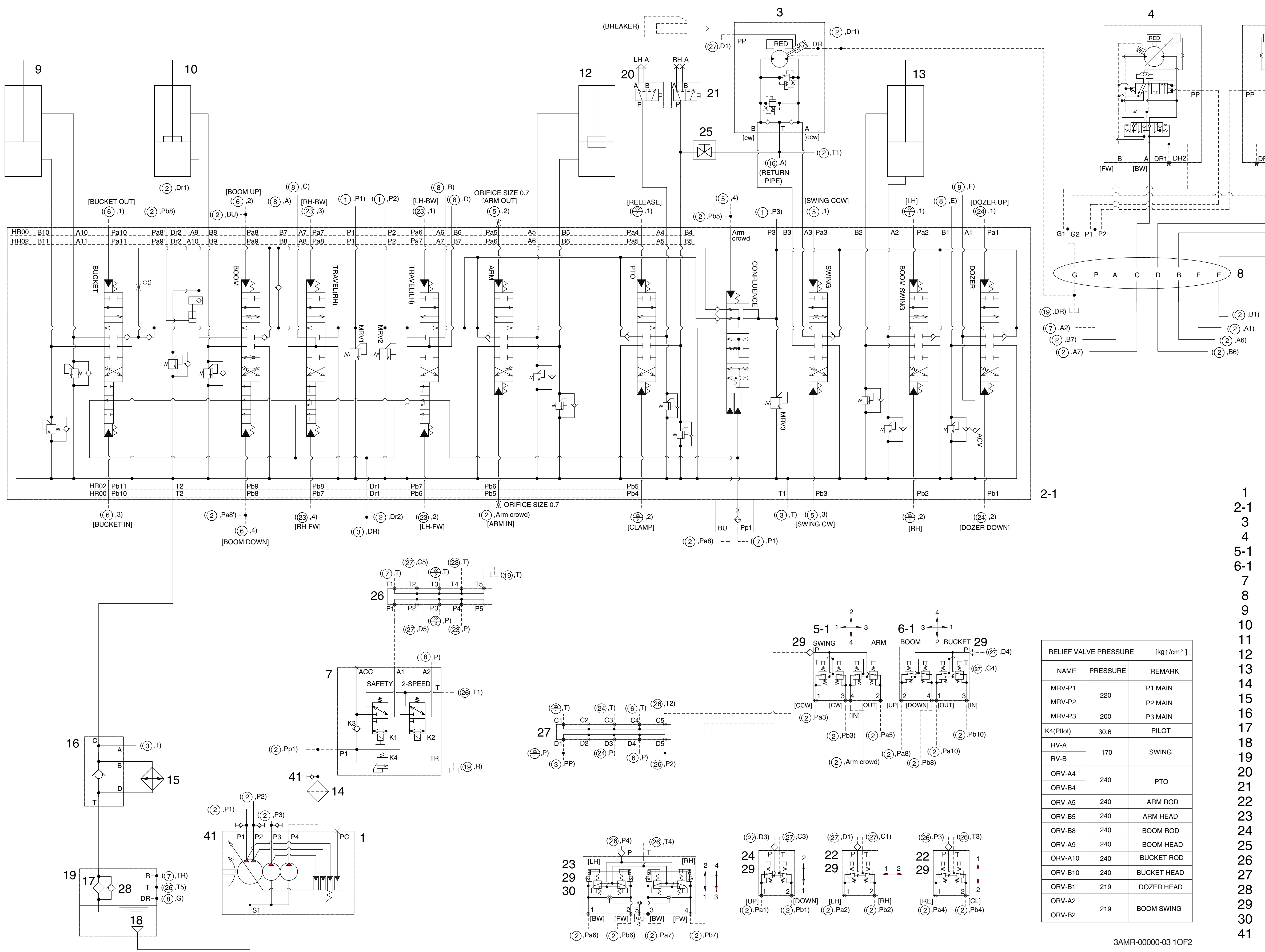
17AZ2DL02

1	Body	9	Stopper	17	Guide
2	Plug	10	Plug	18	Socket bolt
3	O-ring	11	Rod seal	19	Nut
4	Spring	12	O-ring	20	Snap ring
5	Spring seat	13	Push rod	21	Connector
6	Spool	14	Cover	22	Spring pin
7	Spring seat	15	Wrench bolt	23	Bellows
8	Spring	16	Pin	24	Lever

SECTION 3 HYDRAULIC SYSTEM

GROUP 1 HYDRAULIC CIRCUIT

1. HYDRAULIC CIRCUIT 1



RELIEF VALVE PRESSURE [kgf/cm²]		
NAME	PRESSURE	REMARK
MRV-P1	220	P1 MAIN
MRV-P2		P2 MAIN
MRV-P3	200	P3 MAIN
K4(PIlot)	30.6	PILOT
RV-A	170	SWING
RV-B		
ORV-A4	240	PTO
ORV-B4		
ORV-A5	240	ARM ROD
ORV-B5	240	ARM HEAD
ORV-B8	240	BOOM ROD
ORV-A9	240	BOOM HEAD
ORV-A10	240	BUCKET ROD
ORV-B10	240	BUCKET HEAD
ORV-B1	219	DOZER HEAD
ORV-A2	219	BOOM SWING
ORV-B2		

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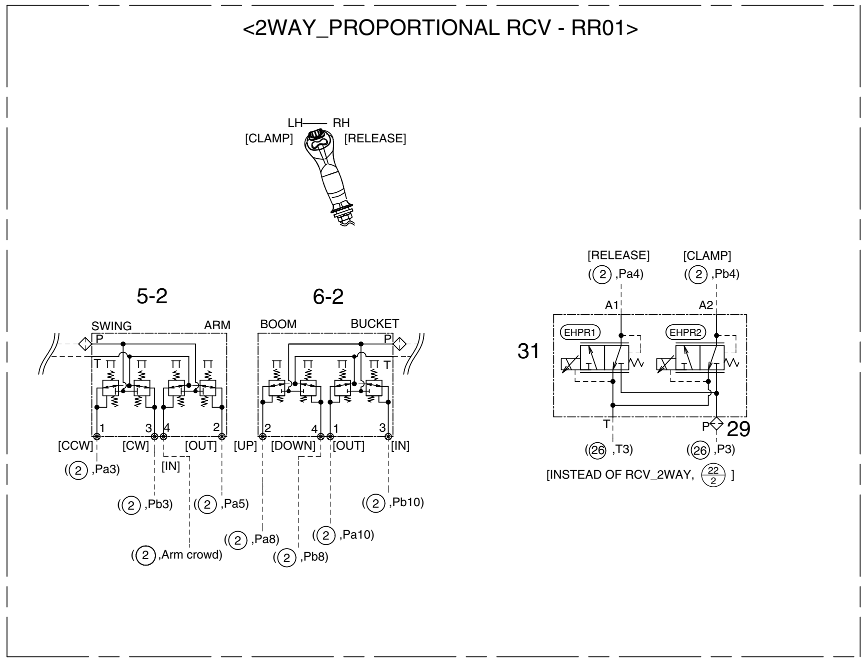
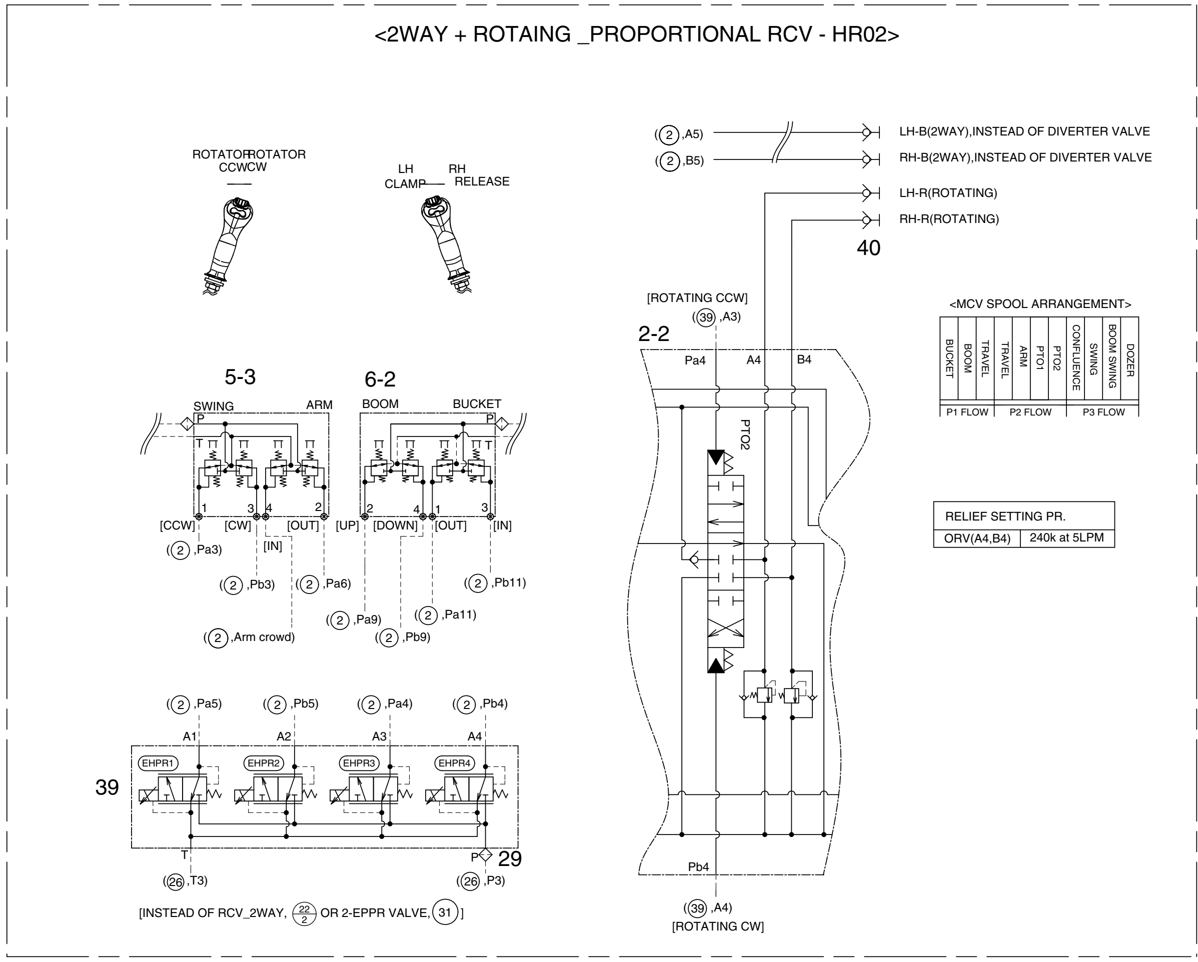
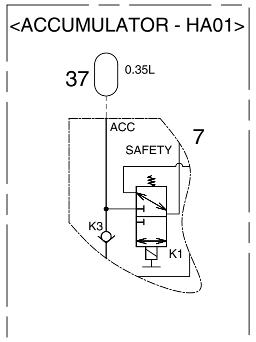
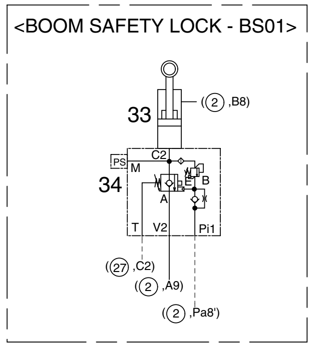
1 Main pump
2-1 Main control valve
3 Swing motor
4 Travel motor
5-1 RCV lever (LH)
6-1 RCV lever (RH)
7 2-solenoid valve
8 Turning joint
9 Bucket cylinder
10 Boom cylinder
11 Dozer cylinder
12 Arm cylinder
13 Boom swing cylinder
14 Line filter
15 Oil cooler
16 Return check valve
17 Return filter
18 Suction strainer
19 Hydraulic tank
20 Deverter valve (LH)
21 Deverter valve (RH)
22 RCV pedal (2-way, BS)
23 RCV pedal (travel)
24 RCV dozer
25 Selector valve
26 Block (P)
27 Block
28 Bypass valve
29 Last guard filter
30 Pressure switch
41 Screw coupling

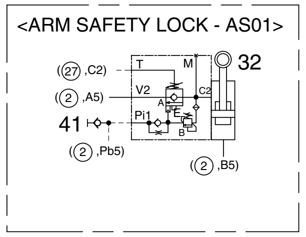
2. HYDRAULIC CIRCUIT 2

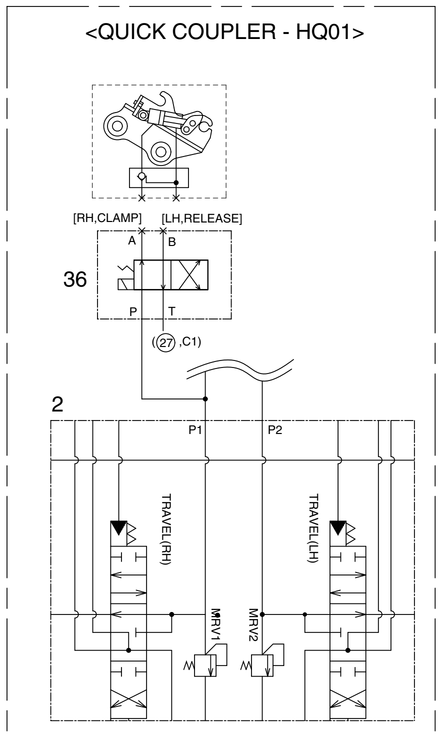


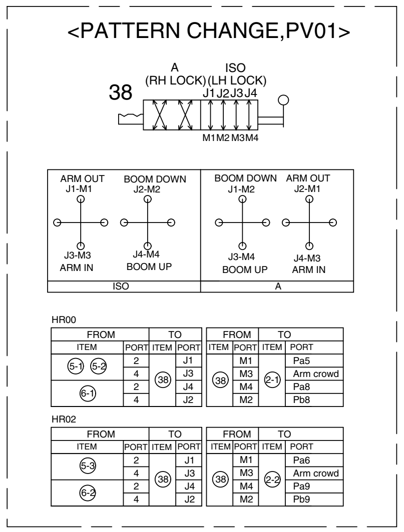


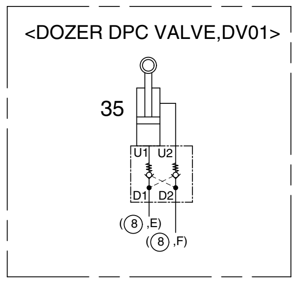












2-2 Main control valve
5-2 RCV (button, LH)
5-3 RCV (proportional, LH)
6-2 RCV (proportional, RH)
31 2-EPPR vavle
32 Arm cylinder
33 Boom cylinder
34 Pressure sensor
35 Dozer cylinder
36 Solenoid valve
37 Accumulator
38 Selector valve
39 4-EPPR valve
40 Quick coupling (male)

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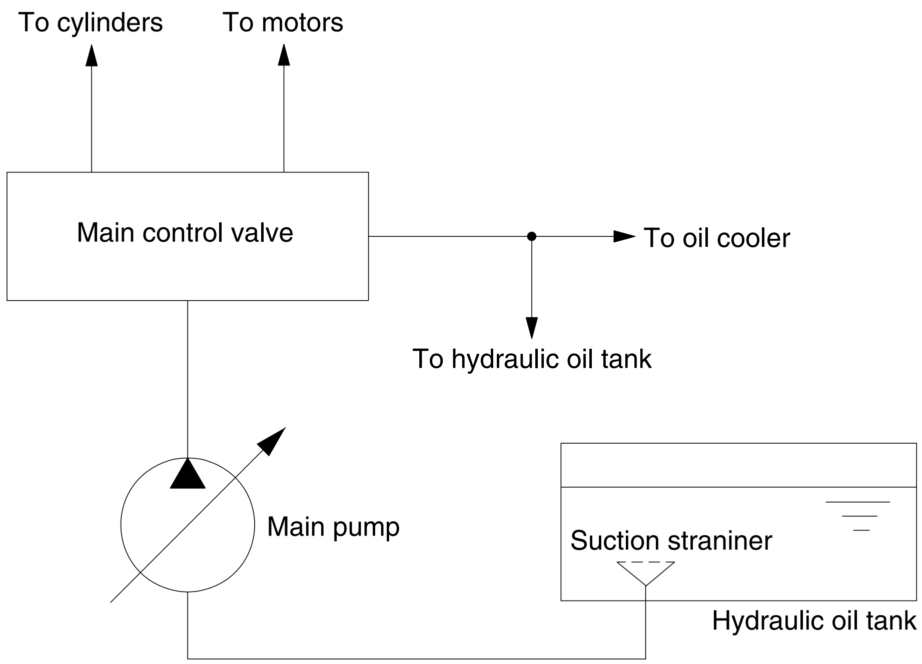
GROUP 2 MAIN CIRCUIT

The main hydraulic circuit consists of suction circuit, delivery circuit, return circuit and drain circuit.
The hydraulic system consists of one main pump, one control valve, one swing motor, four cylinders and two travel motors.
The swash plate type variable displacement axial piston pump is used as the main pump and is driven by the engine at ratio 1.0 of engine speed.

1. SUCTION AND DELIVERY CIRCUIT

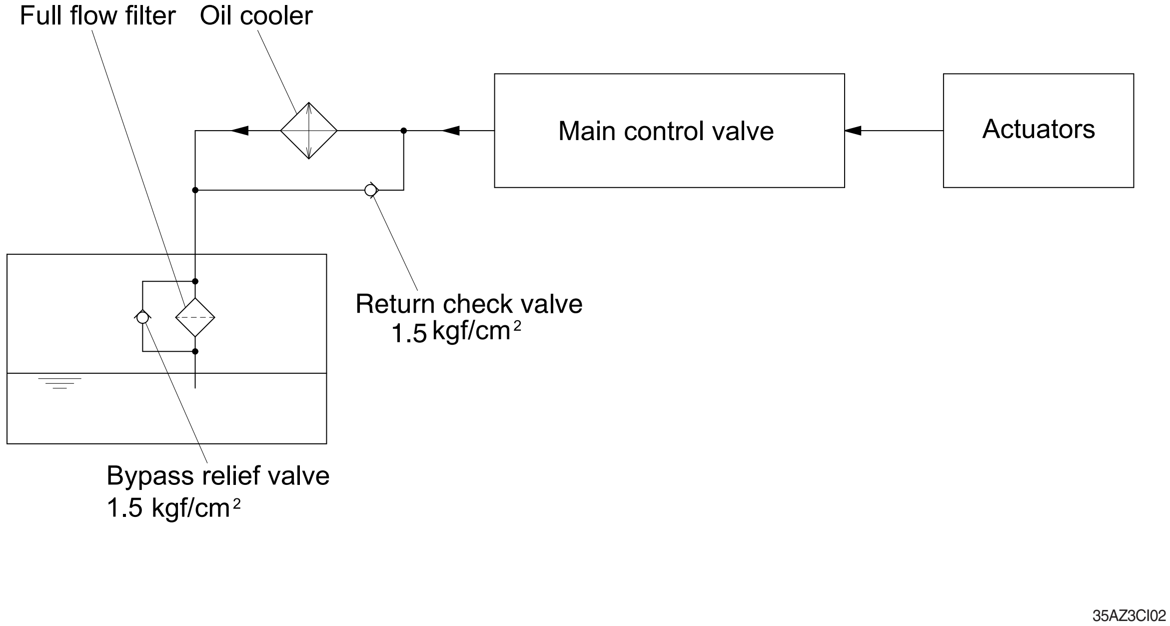


140L3CI01

The pumps receive oil from the hydraulic tank through a suction strainer. The discharged oil from the pump flows into the control valve and goes out the tank ports.
The oil discharged from the main pump flows to the actuators through the main control valve.
The main control valve controls the hydraulic functions.
The return oil from the actuators flows to the hydraulic tank through the main control valve and the oil cooler.

※ The circuit diagram may differ from the equipment, so please check before a repair.

2. RETURN CIRCUIT



All oil returned from each actuator returns to the hydraulic tank through the control valve.

The return check valve is provided in the return circuit.

The setting pressure of return check valve is 1.5 kgf/cm^2 (21 psi). Usually, oil returns to the hydraulic tank from the left side of control valve through oil cooler.

When oil temperature is low, viscosity becomes higher and flow resistance increases when passing through the oil cooler. When the oil pressure exceeds 1.5 kgf/cm^2 (21 psi), the oil returns directly to the hydraulic tank, resulting in the oil temperature being raised quickly at an appropriate level.

When the oil cooler is clogged, the oil returns directly to the hydraulic tank through return check valve.

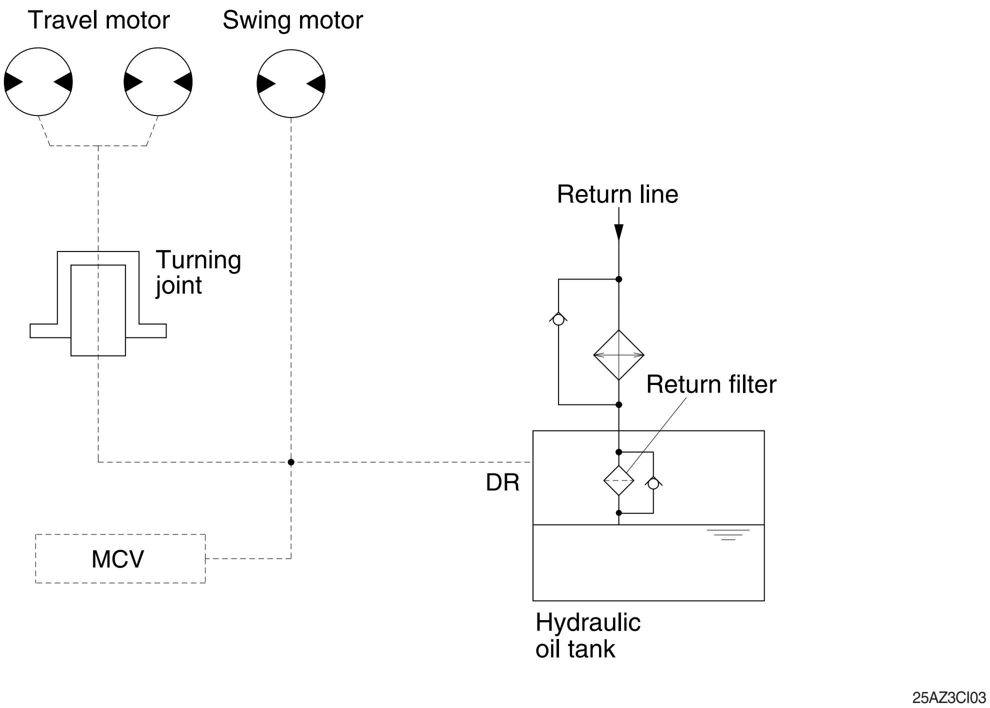
The full-flow filter and bypass relief valve are provided in the hydraulic tank.

The oil returned from the main control valve is filtered by the full-flow filter. A bypass relief valve is provided in the full-flow filter.

When the filter element is clogged, the bypass relief valve opens at 1.5 kgf/cm^2 (21 psi) differential pressure.

※ The circuit diagram may differ from the equipment, so please check before a repair.

3. DRAIN CIRCUIT



Besides internal leaks from the motors and main pump, the oil for lubrication circulates.

1) TRAVEL MOTOR DRAIN CIRCUIT

Oil leaked from the right and left travel motors comes out of the drain ports provided in the respective motor casing and join with each other. These oils pass through the turning joint and return to the hydraulic tank.

2) SWING MOTOR DRAIN CIRCUIT

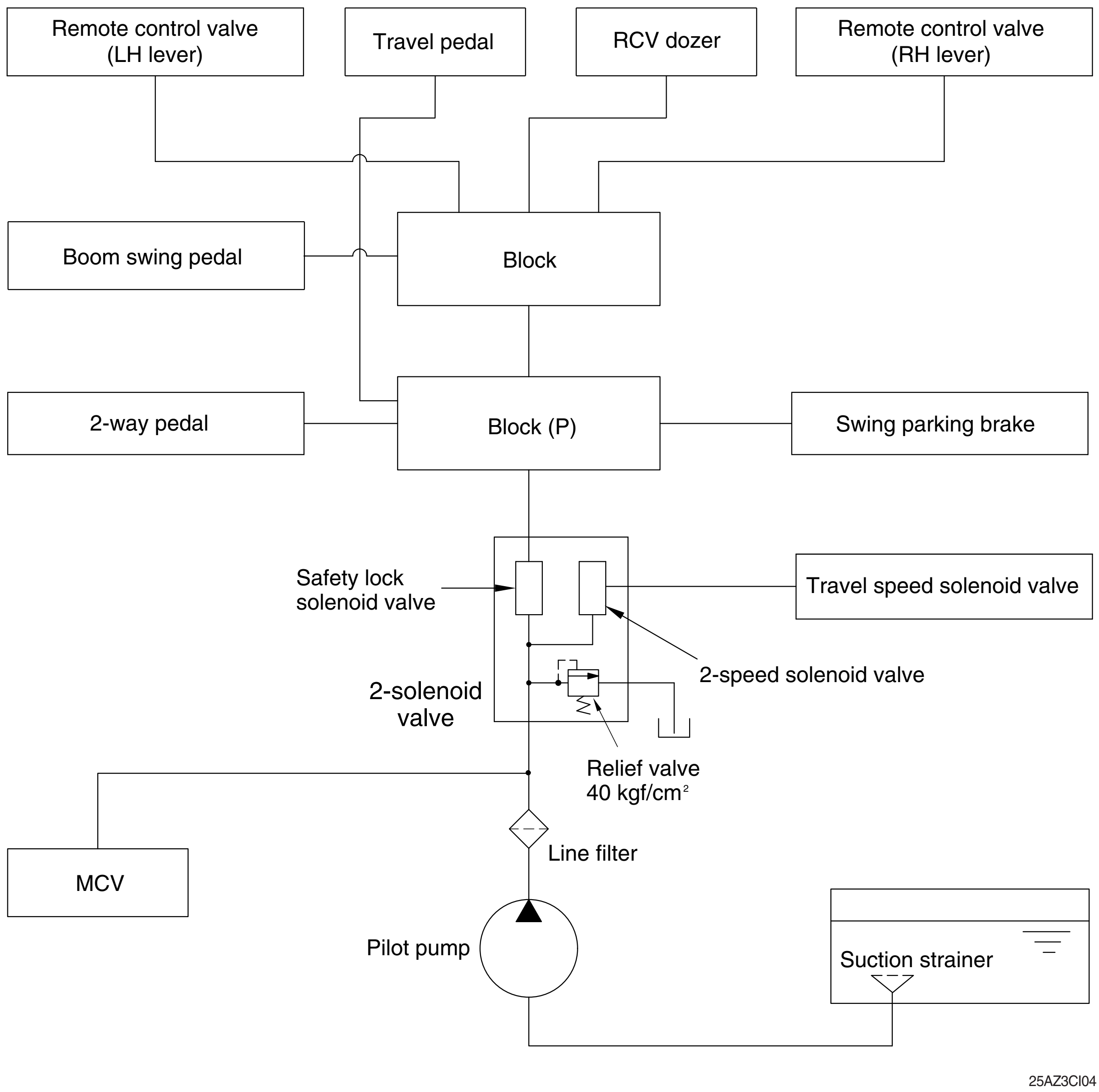
Oil leaked from the swing motor returns to the hydraulic tank with oil drained from the travel circuit .

3) MAIN CONTROL VALVE

Oil leaked from the main control valve returns to the hydraulic tank with oil drained from the travel circuit.

※ The circuit diagram may differ from the equipment, so please check before a repair.

GROUP 3 PILOT CIRCUIT



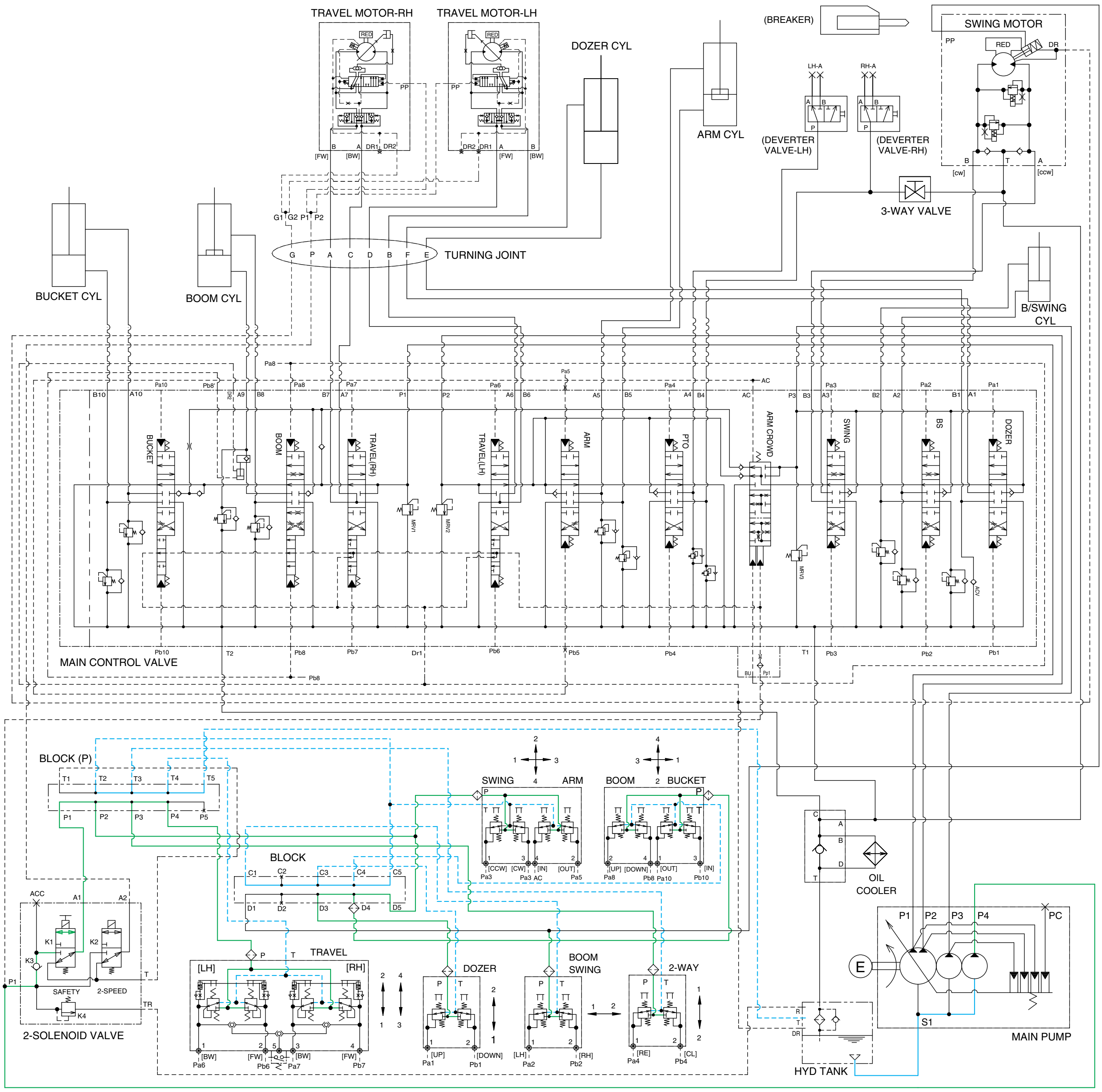
The pilot circuit consists of suction circuit, delivery circuit and return circuit.
The pilot pump receives the oil from the hydraulic tank through the suction strainer.
The discharged oil from the pilot pump flows to the 2-solenoid valve and provides oil to each control valve as below.

- RCV lever (LH & RH), RCV dozer, and boom swing pedal through the safety lock solenoid valve, block (P) and block.
- Swing parking brake, travel pedal and 2-way pedal through the safety lock solenoid valve and block (P).
- Travel speed solenoid valve through the 2-speed solenoid valve and turning joint.

Also, the oil from the pilot pump flows to the pilot pressure port of the main control valve and functions as auto idle signal pressure.

※ The circuit diagram may differ from the equipment, so please check before a repair.

1. SUCTION, DELIVERY AND RETURN CIRCUIT



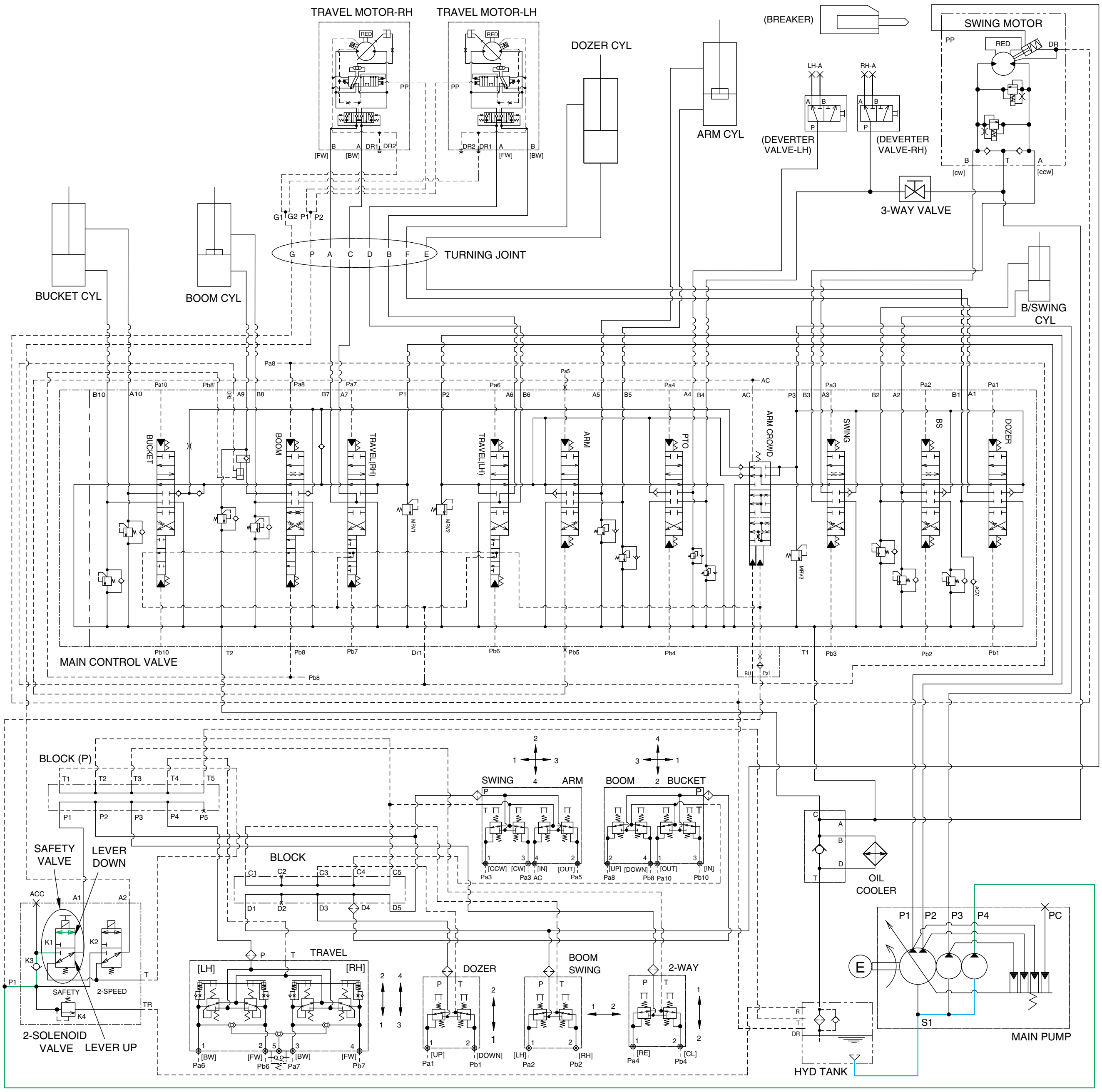
25AZ3HC03

The pilot pump receives oil from the hydraulic tank. The discharged oil from the pilot pump flows to the safety solenoid valve through the line filter. The oil is filtered by the line filter. The pilot relief valve is provided in the pilot pump for limiting the pilot circuit pressure.

The oil filtered by line filter flows remote control valve, MCV and swing motor through safety solenoid valve. The return oil flow into the hydraulic tank.

※ The circuit diagram may differ from the equipment, so please check before a repair.

2. SAFETY VALVE (SAFETY LEVER)



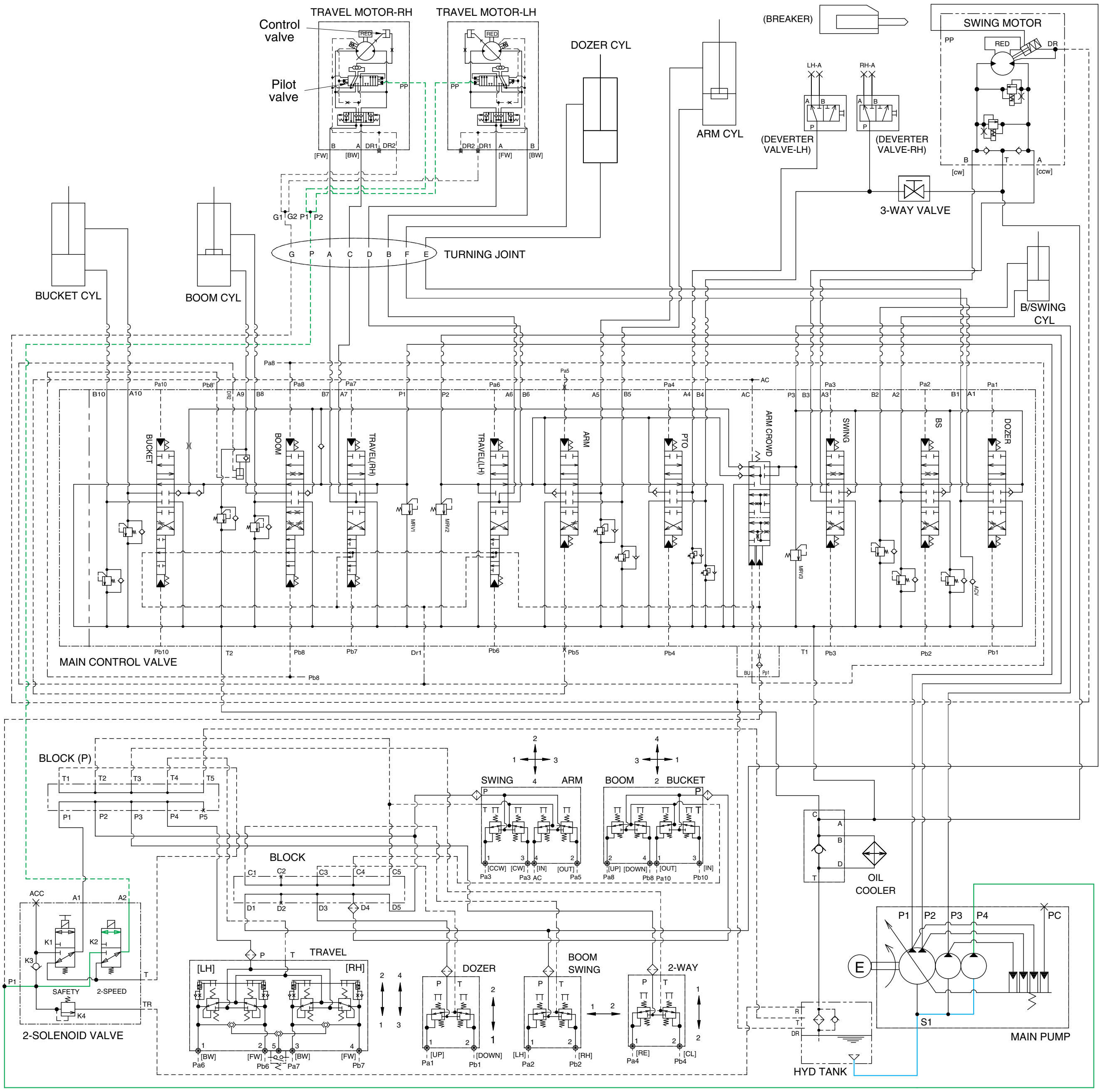
25AZ3HC04

When the lever of the safety solenoid valve is moved downward, oil flows into the remote control valve through safety solenoid valve and line filter.

When the lever of the safety solenoid valve is moved upward, oil does not flow into the remote control valve, because of the blocked port.

※ The circuit diagram may differ from the equipment, so please check before a repair.

3. TRAVEL SPEED CONTROL SYSTEM



25AZ3HC05

When the travel speed switch is pushed, the travel speed solenoid valve is actuated and the discharged oil from the pilot pump flows to the PP port of pilot valve in the travel motors.

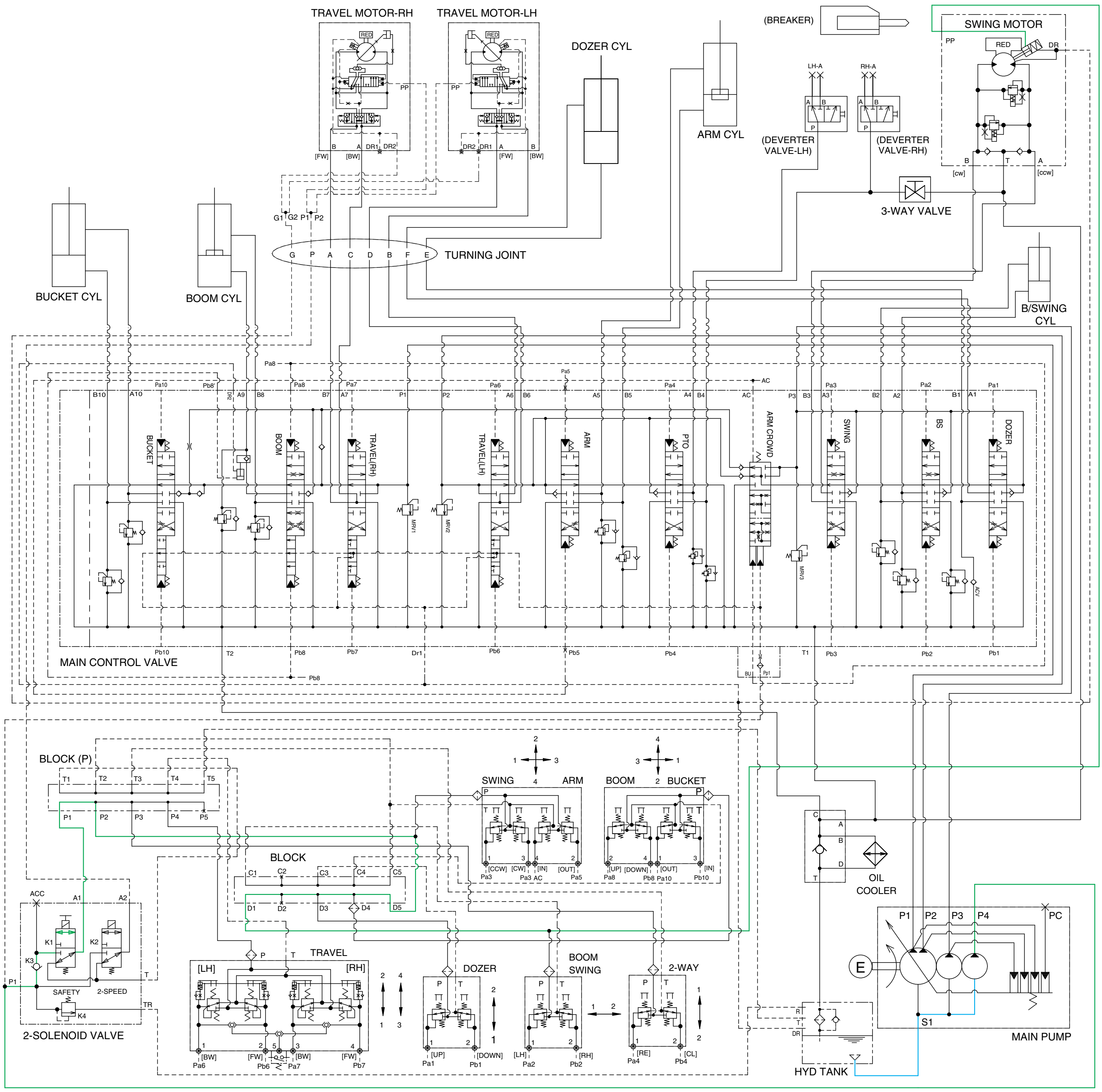
As a result, the control piston is pushed by the main oil flow, thus the displacement is minimized.

When the travel speed switch is pushed once more, the travel speed solenoid valve is return to original position by the force of spring, the hydraulic oil of PP port returns to the hydraulic tank.

As a result, the control piston is returned by the main oil flow, thus the displacement is maximized.

※ The circuit diagram may differ from the equipment, so please check before a repair.

4. SWING PARKING BRAKE RELEASE



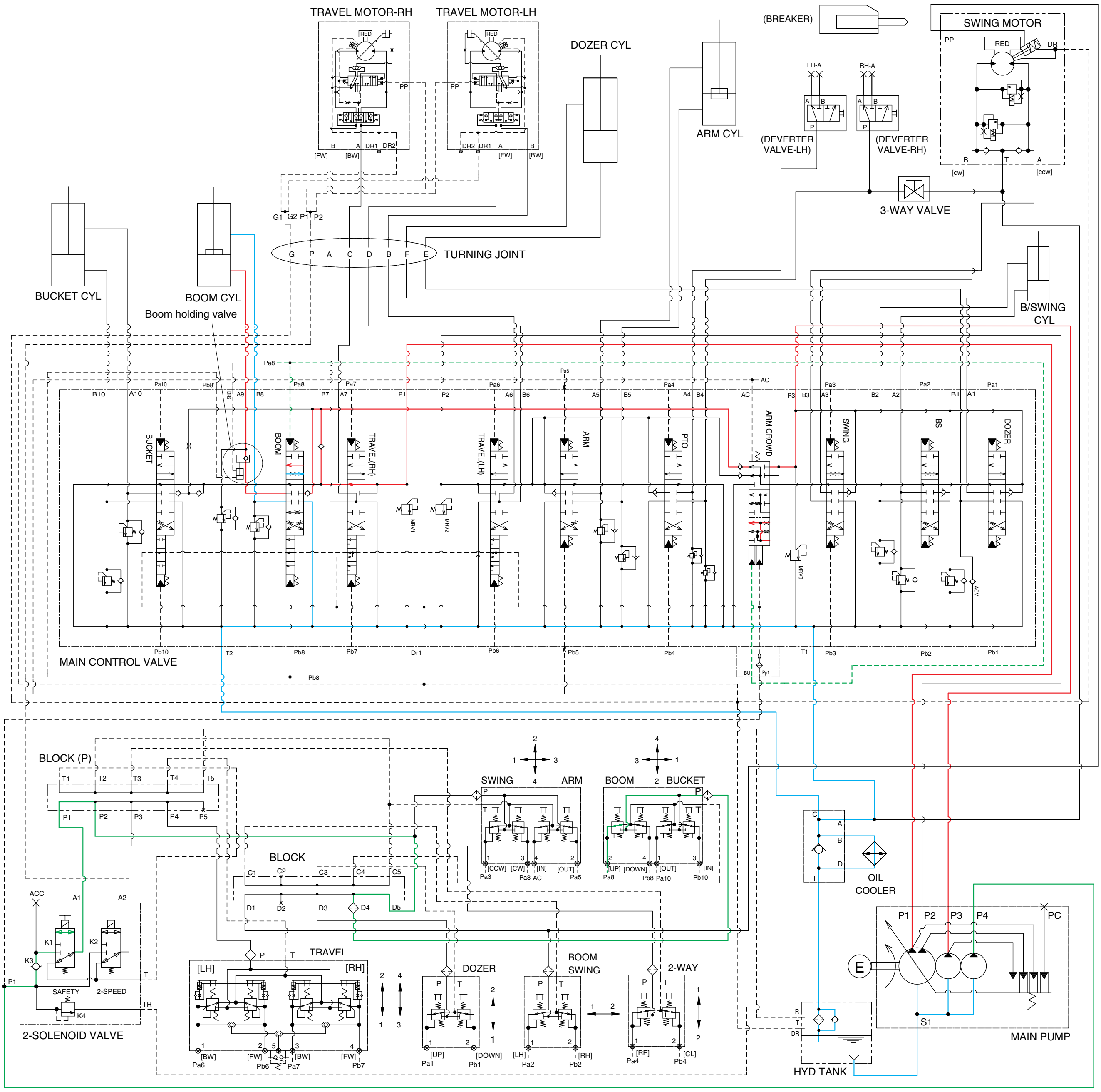
25AZ3HC06

When the Safety solenoid lever is moved downward, the pilot oil flow into PP port of the swing motor through solenoid valve. This pressure is applied to swing motor disc, thus the brake is released.

When the safety solenoid lever is moved to upward, oil in the swing motor disc cylinder is drained, thus the brake is applied.

※ The circuit diagram may differ from the equipment, so please check before a repair.

1. BOOM UP OPERATION



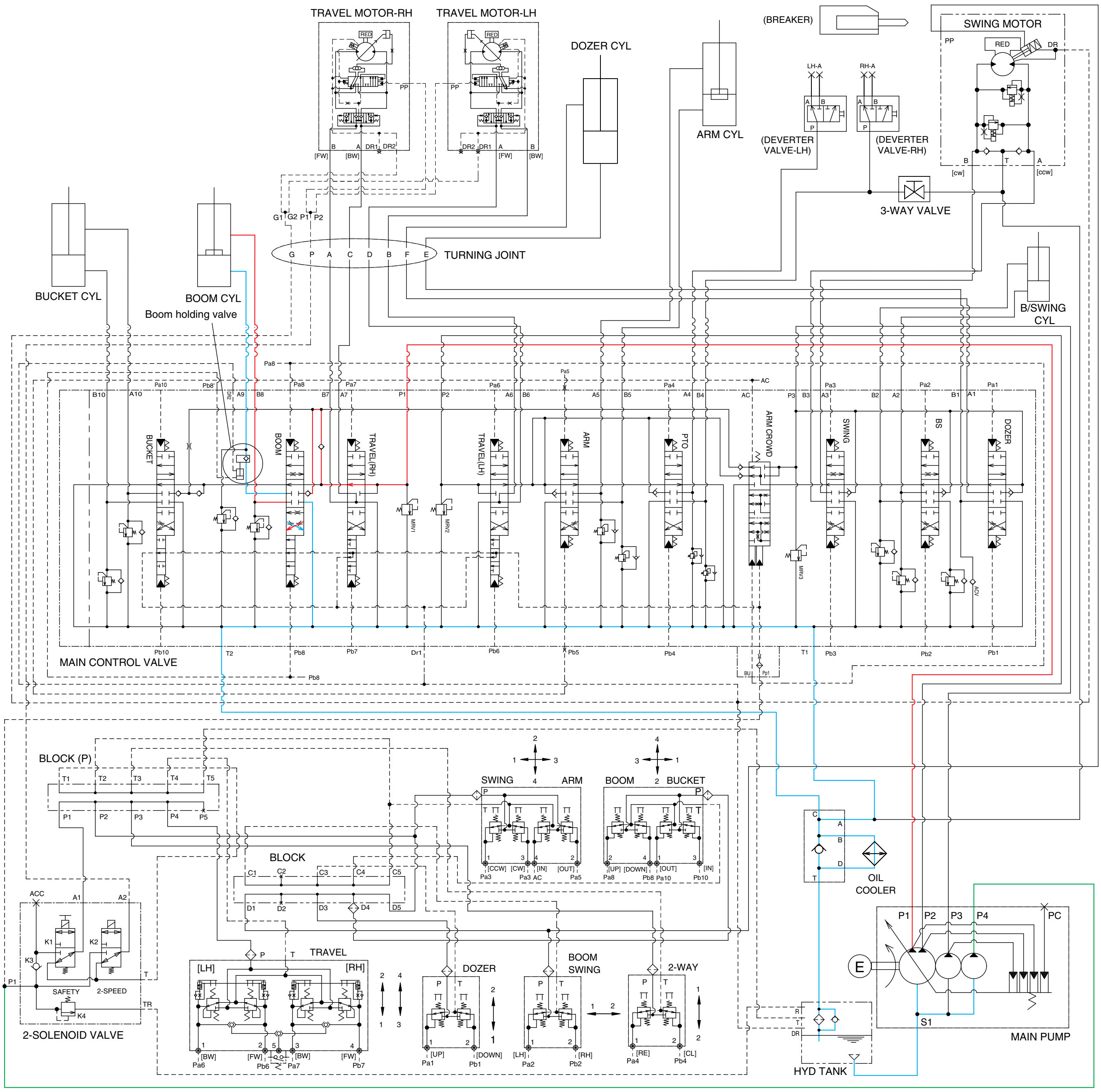
25AZ3HC10

When the right control lever is pulled back, the boom spool in the main control valve is moved to the up position by the pilot oil pressure (Pa8) from the remote control valve.

The oil from the P1 and P3 pump flows into the main control valve and then goes to the large chamber of boom cylinders. At the same time, the oil from the small chamber of boom cylinders returns to the hydraulic oil tank through the boom spool in the main control valve. When this happens, the boom goes up. The excessive pressure in the boom cylinder bottom end circuit is prevented by relief valve. When the boom is up and the control lever is returned to neutral position, the circuit for the holding pressure at the bottom end of the boom cylinder is closed by the boom holding valve. This prevents the hydraulic drift of boom cylinder.

※ The circuit diagram may differ from the equipment, so please check before a repair.

2. BOOM DOWN OPERATION



25AZ3HC11

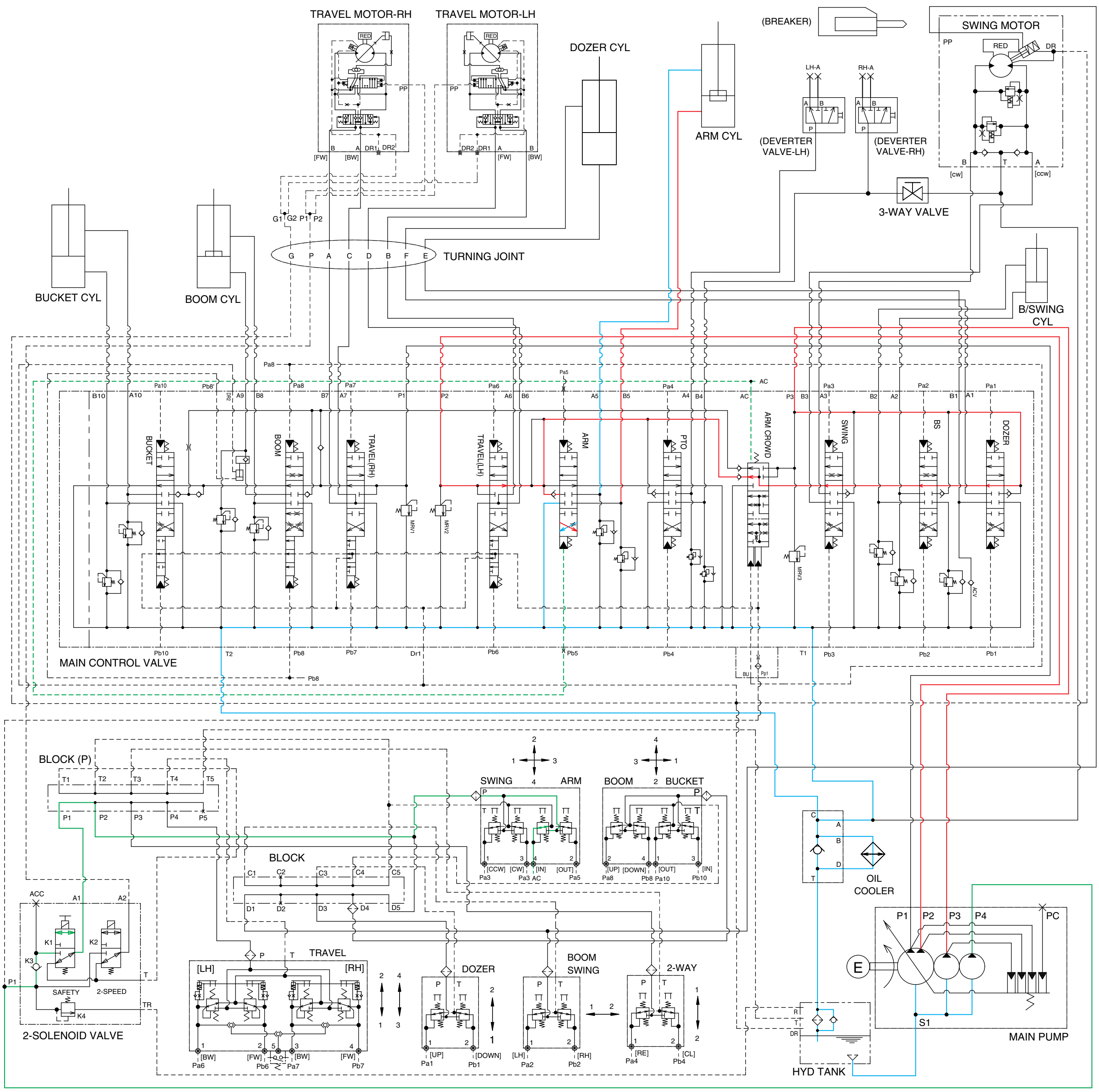
When the right control lever is pushed forward, the boom spool in the main control valve is moved to the down position by the pilot oil pressure (Pb8) from the remote control valve. Since Pb8 port is connected Pb8' port through the piping, boom holding valve is also released.

The oil from the P1 pump flows into the main control valve and then goes to the small chamber of boom cylinders. At the same time, the oil from the large chamber of boom cylinders returns to the hydraulic tank through the boom spool in the main control valve.

The excessive pressure in the boom cylinder rod end circuit is prevented by the relief valve.

※ The circuit diagram may differ from the equipment, so please check before a repair.

3. ARM ROLL IN OPERATION



25AZ3HC12

When the left control lever is pulled back, the arm spool in the main control valve is moved the to roll in position by the pilot oil pressure (AC, Pb5) from the remote control valve.

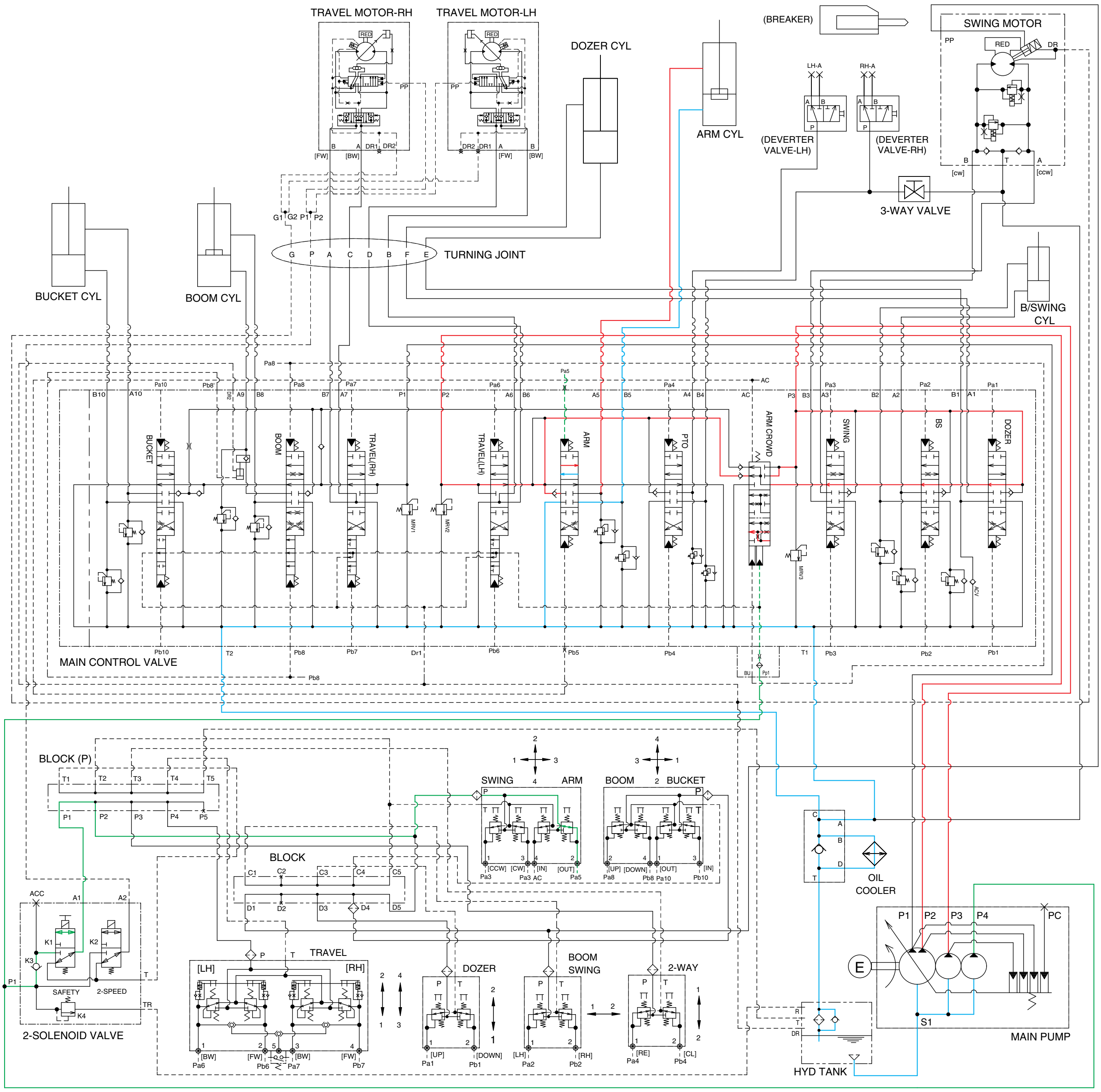
The oil from the P2 and P3 pump flows into the main control valve and then goes to the large chamber of arm cylinder.

At the same time, the oil from small chamber of arm cylinder returns to the hydraulic oil tank through the arm spool in the main control valve. When this happens, the arm rolls in.

The cavitation which will happen to the bottom of the arm cylinder is also prevented by the make-up valve in the main control valve.

※ The circuit diagram may differ from the equipment, so please check before a repair.

4. ARM ROLL OUT OPERATION



25AZ3HC13

When the left control lever is pushed forward, the arm spool in the main control valve is moved to the roll out position by the pilot oil pressure (Pa5) from the remote control valve.

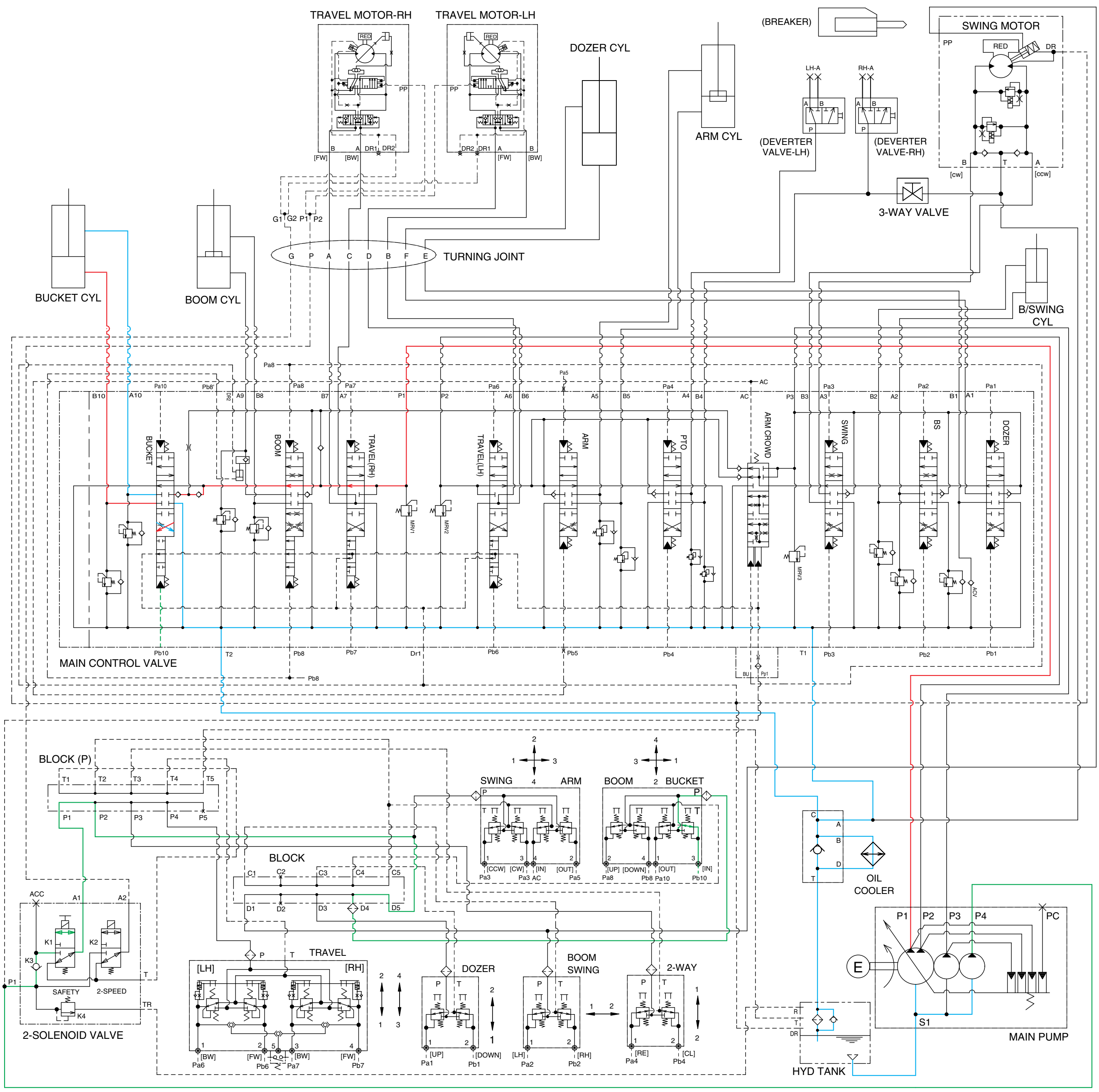
The oil from the P2 and P3 pump flows into the main control valve and then goes to the small chamber of arm cylinder.

At the same time, the oil from the large chamber of arm cylinder returns to the hydraulic oil tank through the arm spool in the main control valve. When this happens, the arm rolls out.

The cavitation which will happen to the rod of the arm cylinder is also prevented by the make-up valve in the main control valve.

※ The circuit diagram may differ from the equipment, so please check before a repair.

5. BUCKET ROLL IN OPERATION



25AZ3HC14

When the right control lever is pulled left, the bucket spool in the main control valve is moved to the roll in position by the pilot oil pressure (Pb10) from the remote control valve.

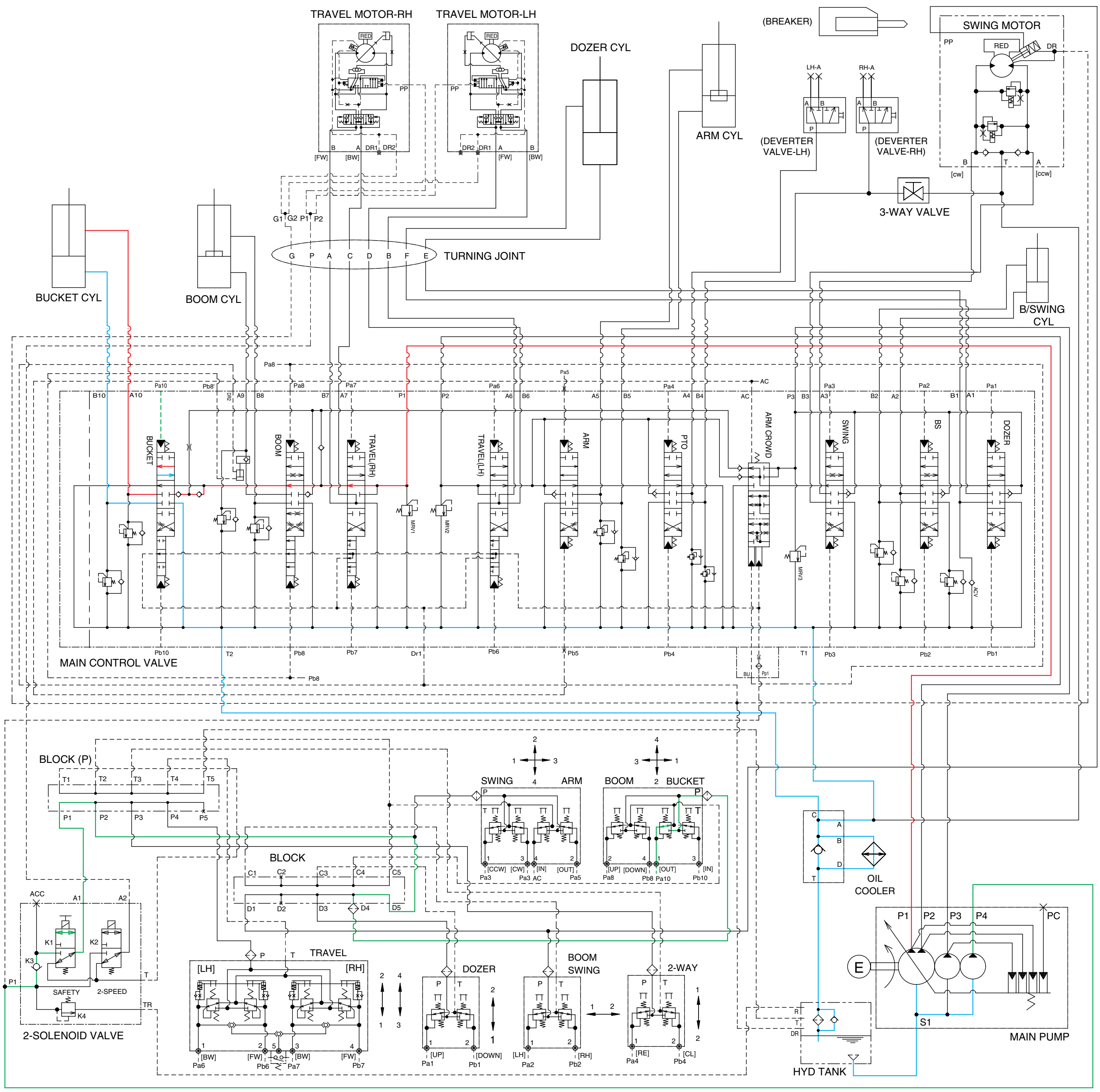
The oil from the P1 pump flows into the main control valve and then goes to the large chamber of bucket cylinder.

At the same time, the oil from the small chamber of bucket cylinder returns to the hydraulic oil tank through the boom spool in the main control valve. When this happens, the bucket rolls in.

The cavitation which will happen to the bottom of the bucket cylinder is also prevented by the make-up valve in the main control valve.

※ The circuit diagram may differ from the equipment, so please check before a repair.

6. BUCKET ROLL OUT OPERATION

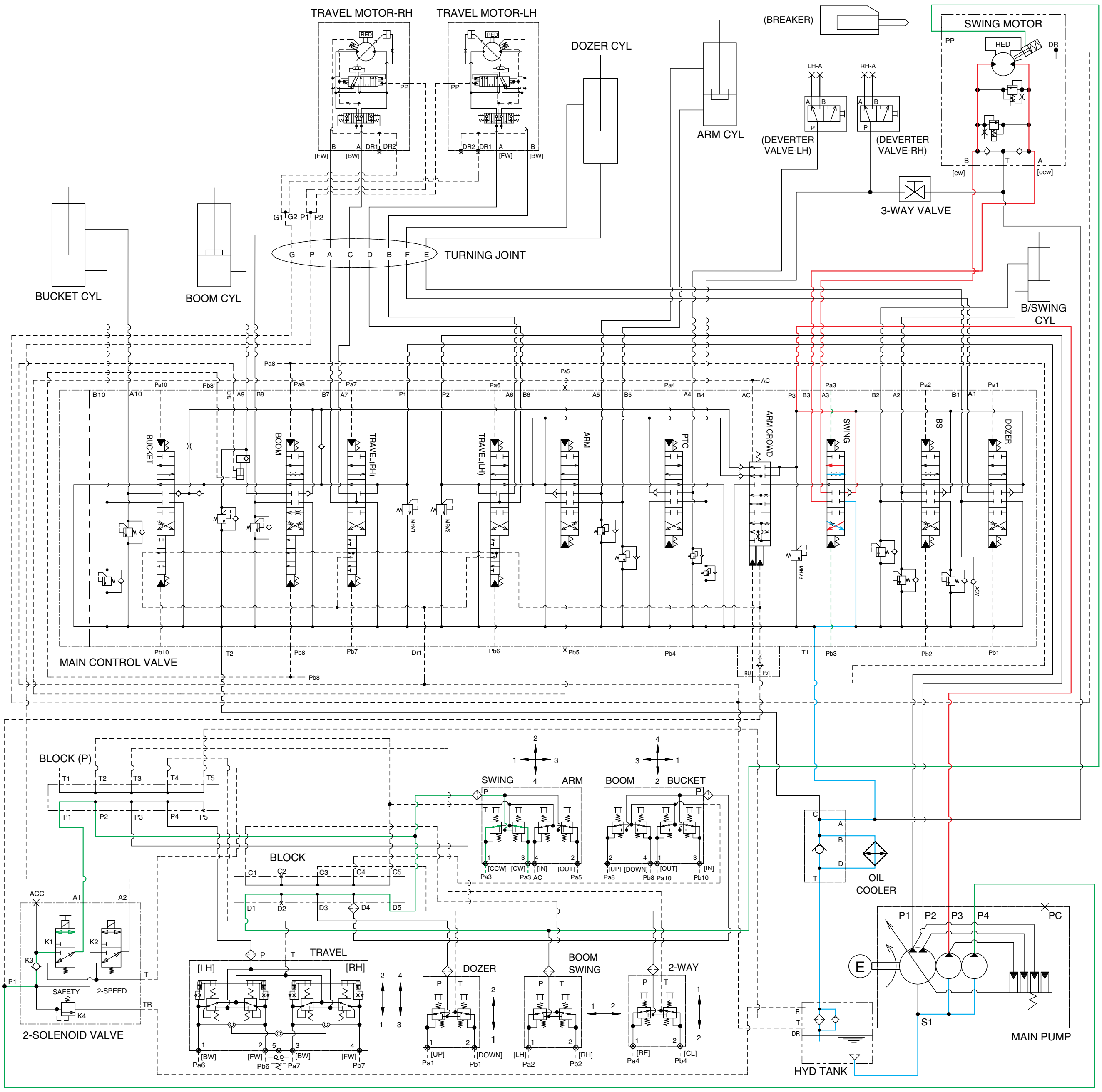


25AZ3HC15

When the right control lever is pushed right, the bucket spool in the main control valve is moved to the roll out position by the pilot oil pressure (Pa10) from the remote control valve.
The oil from the P1 pump flows into the main control valve and then goes to the small chamber of bucket cylinder.
At the same time, the oil from the large chamber of bucket cylinder returns to the hydraulic oil tank through the bucket spool in the main control valve. When this happens, the bucket rolls out.
The cavitation which will happen to the rod of the bucket cylinder is also prevented by the make-up valve in the main control valve.

※ The circuit diagram may differ from the equipment, so please check before a repair.

7. SWING OPERATION

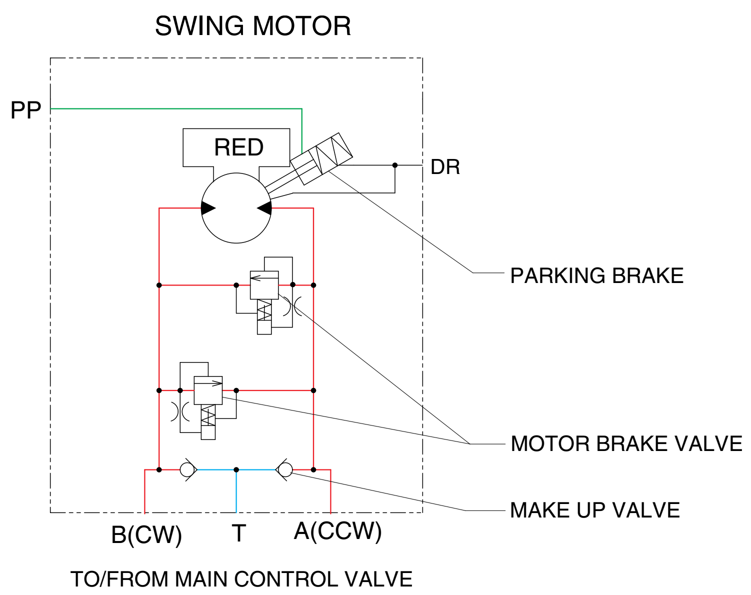


25AZ3HC16

When the left control lever is pushed left or right, the swing spool in the main control valve is moved to the left or right swing position by the pilot oil pressure (Pa3, Pb3) from the remote control valve.
The oil from the P3 pump flows into the main control valve and then goes to the swing motor.
At the same time, the return oil from the swing motor returns to the hydraulic oil tank through the swing spool in the main control valve. When this happens, the superstructure swings to the left or right. The swing parking brake, make up valve and the overload relief valve are provided in the swing motor. The cavitation which will happen to the swing motor is also prevented by the make up valve in the swing motor itself.

※ The circuit diagram may differ from the equipment, so please check before a repair.

SWING CIRCUIT OPERATION



25AZ3HC20

1) MOTOR BRAKE VALVE

Motor brake valve for the swing motor limits to cushion the starting and stopping pressure of swing operation.

2) MAKE UP VALVE

The make up valves prevent cavitation by supplying return oil to the vacuum side of the motor.

3) PARKING BRAKE

PARKING BRAKE "ON" OPERATION

When the safety solenoid lever is moved to upward, the oil in the parking brake is drained to the tank. So, parking brake is applied.

PARKING BRAKE "OFF" OPERATION

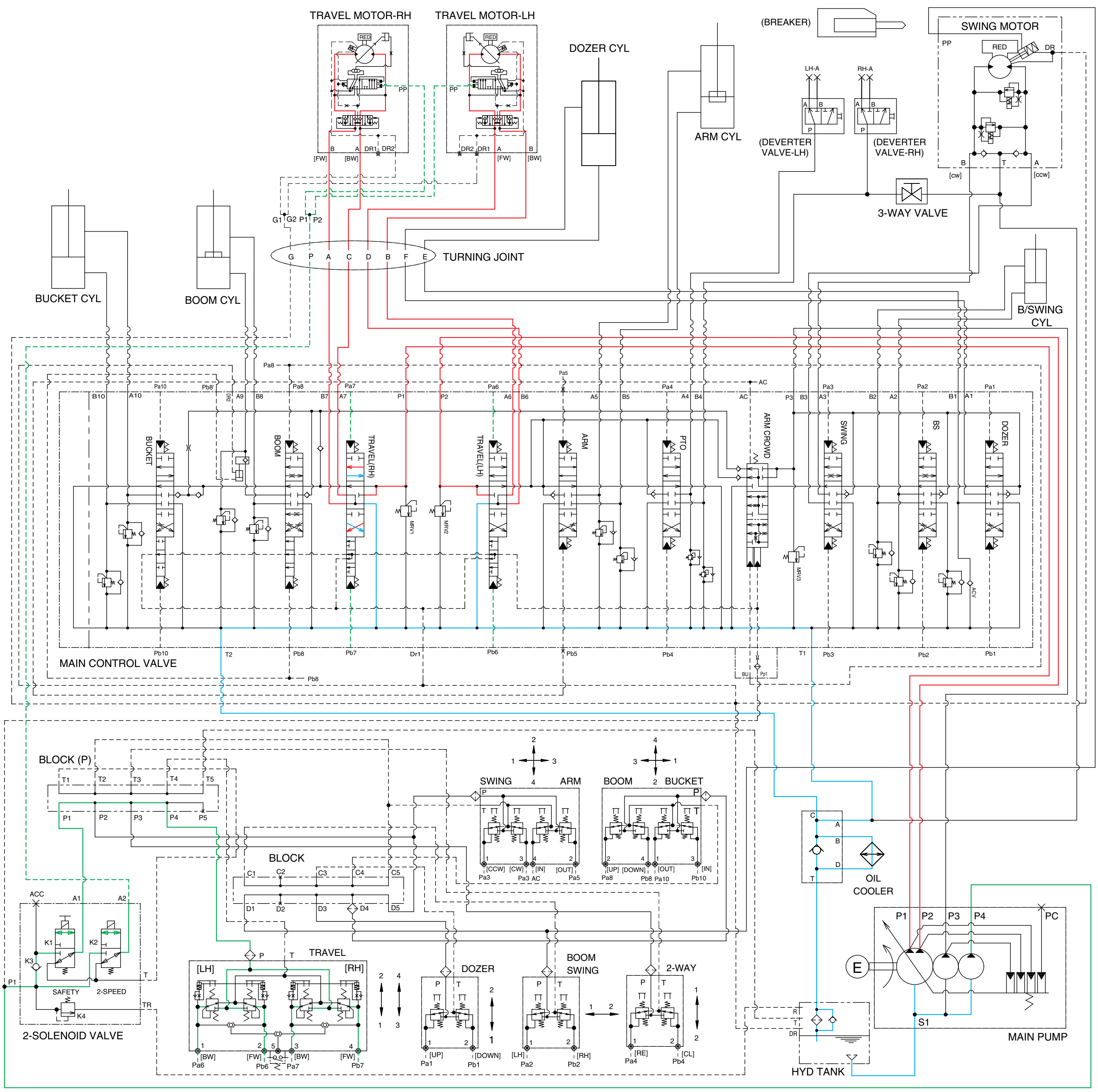
The parking brake is released by the pilot oil pressure (PP) from pilot pump.

When the safety solenoid lever is moved to downward, the pilot oil from the pilot pump (P4) is flow into parking brake through safety solenoid valve.

Then the pilot pressure lift the brake piston and release the parking brake.

※ The circuit diagram may differ from the equipment, so please check before a repair.

8. TRAVEL FORWARD AND REVERSE OPERATION

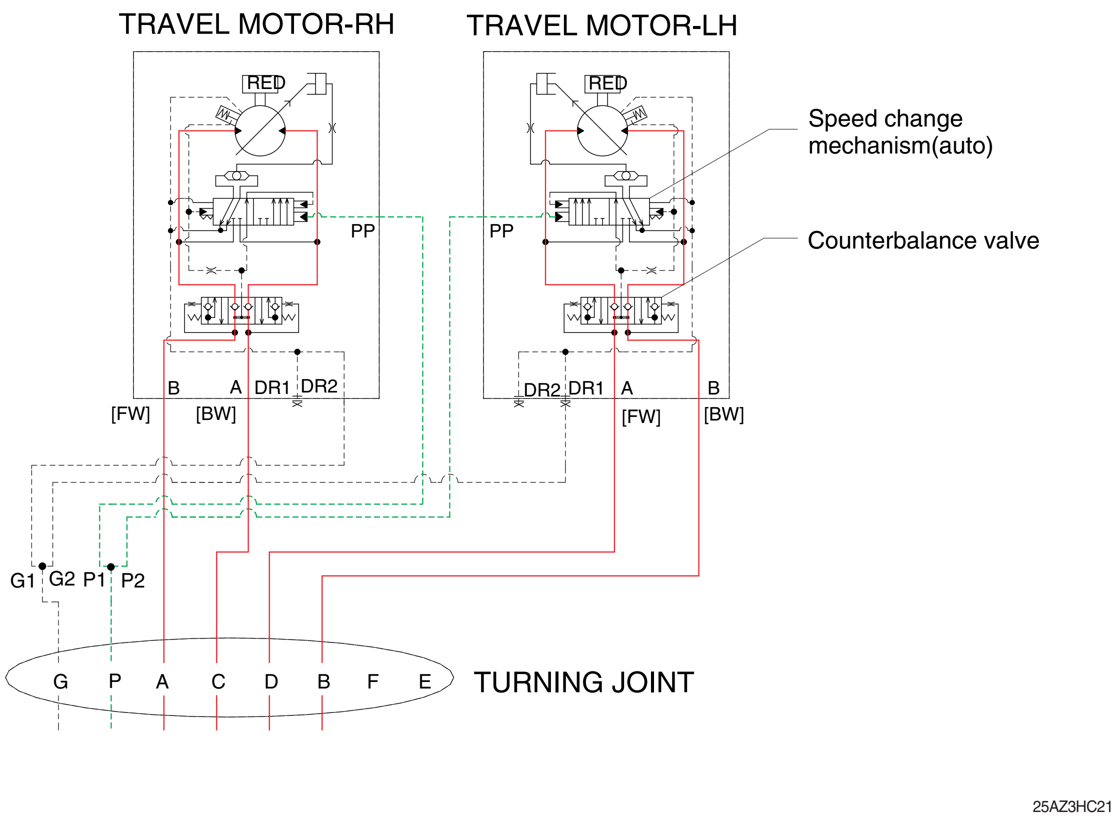


25AZ3HC17

When the travel levers are pushed forward or reverse position, the travel spools in the main control valve are moved to the forward or reverse travel position by pilot pressure oil (Pa6, Pb6, Pa7, Pb7). The oil from the P1 and P2 pumps flows into the main control valve and then goes to the both travel motors through the turning joint. The return oil from both travel motors returns to the hydraulic oil tank through the turning joint and the travel spools in the main control valve. When this happens, the machine moves to the forward or reverse.

※ The circuit diagram may differ from the equipment, so please check before a repair.

TRAVEL CIRCUIT OPERATION



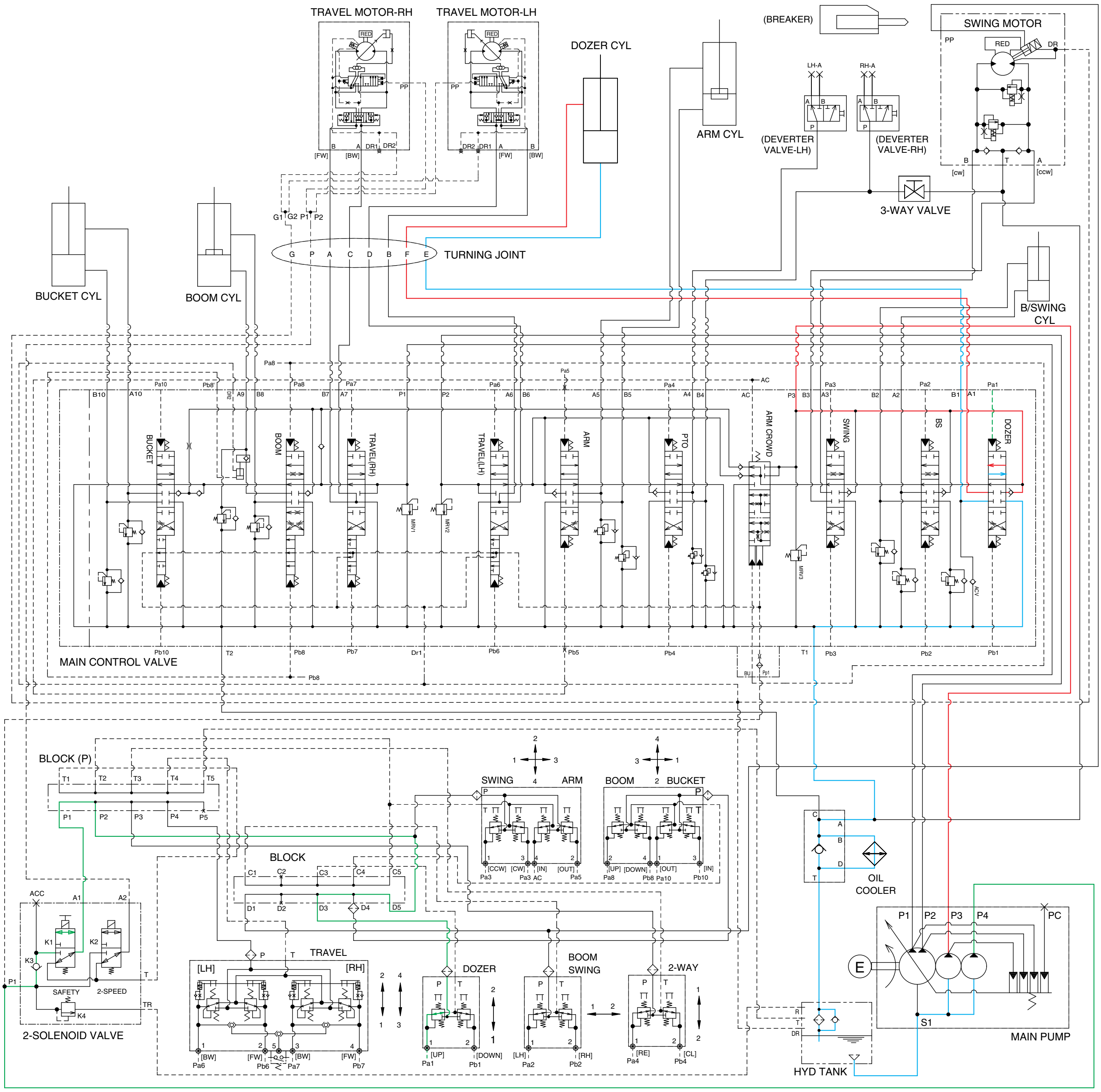
Valves are provided on travel motors to offer the following functions.

1) COUNTERBALANCE VALVE
When stopping the motor of slope descending, this valve to prevent the motor over run.

2) SPEED CHANGE MECHANISM (auto)
Auto two speed control mechanism consists of two spools and spring. This valve automatically changes motor displacement in portion to motor pressure.

※ The circuit diagram may differ from the equipment, so please check before a repair.

9. DOZER UP OPERATION

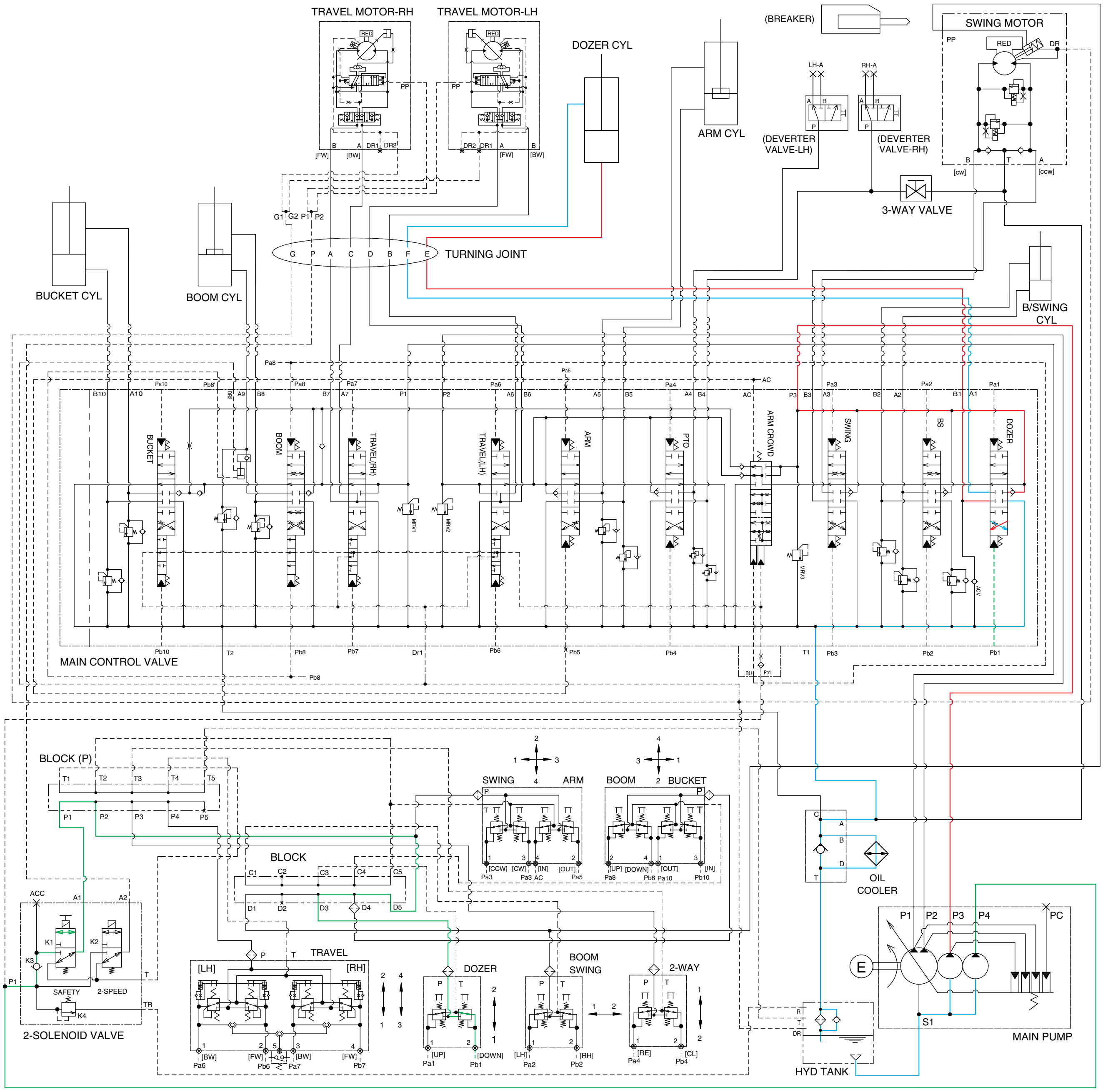


25AZ3HC18

When the dozer control lever is pulled back, the dozer spool in the main control valve is moved to the dozer up position by the pilot oil pressure (Pa1) from the remote control valve.
The oil from the P3 pump flows into the main control valve and then goes to the small chamber of dozer cylinder.
At the same time, the oil from the large chamber of dozer cylinders returns to the hydraulic oil tank through the dozer spool in the main control valve. When this happens, the dozer goes up.

※ The circuit diagram may differ from the equipment, so please check before a repair.

10. DOZER DOWN OPERATION



25AZ3HC19

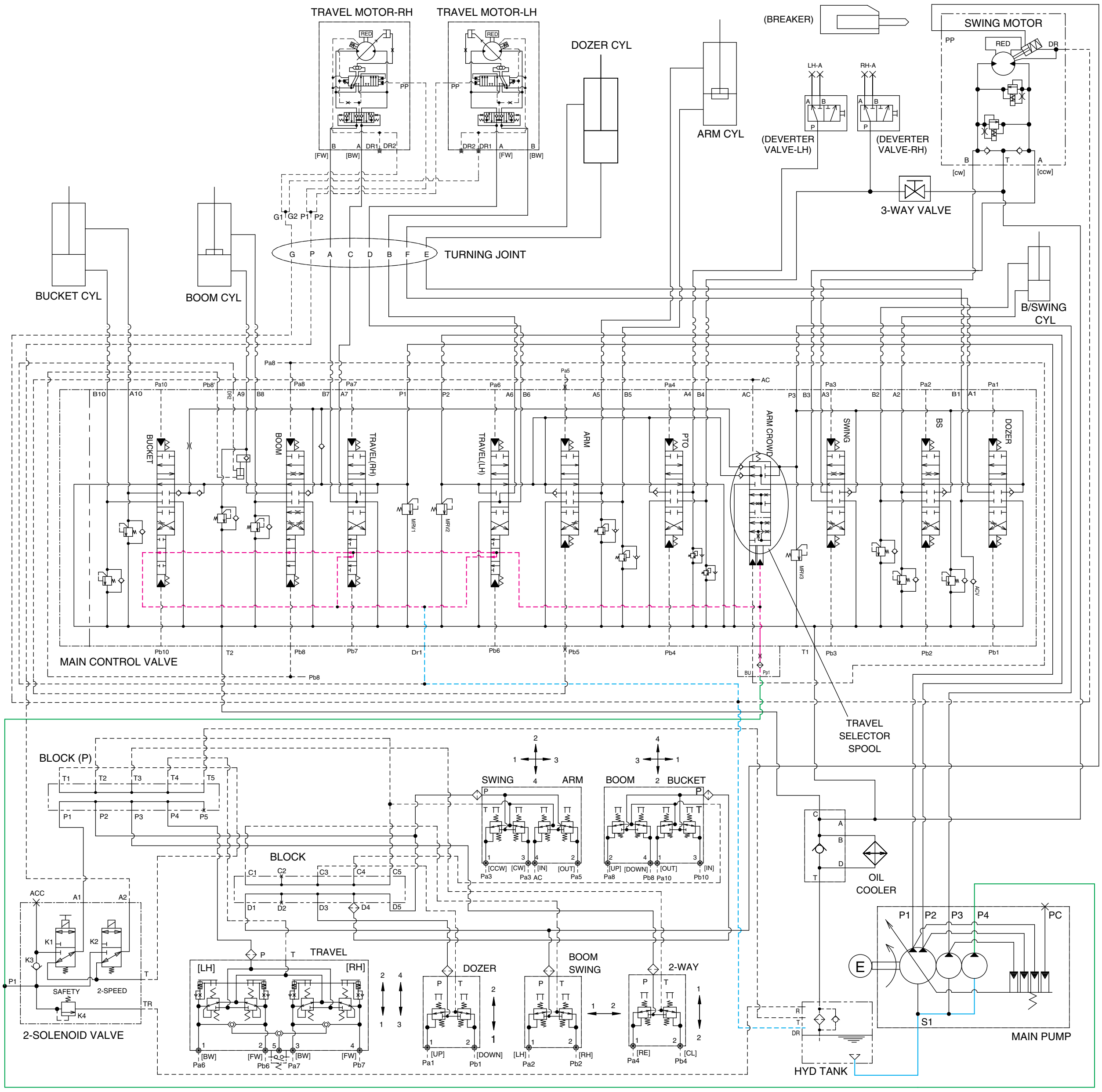
When the dozer control lever is pushed forward, the dozer spool in the main control valve is moved to the dozer down position by the pilot oil pressure (Pb1) from the remote control valve.

The oil from the P3 pump flows into the main control valve and then goes to the large chamber of dozer cylinder.

At the same time, the oil from the small chamber of dozer cylinder returns to the hydraulic oil tank through the dozer spool in the main control valve. When this happens, the dozer blade is down.

※ The circuit diagram may differ from the equipment, so please check before a repair.

1. OUTLINE



25AZ3HC30

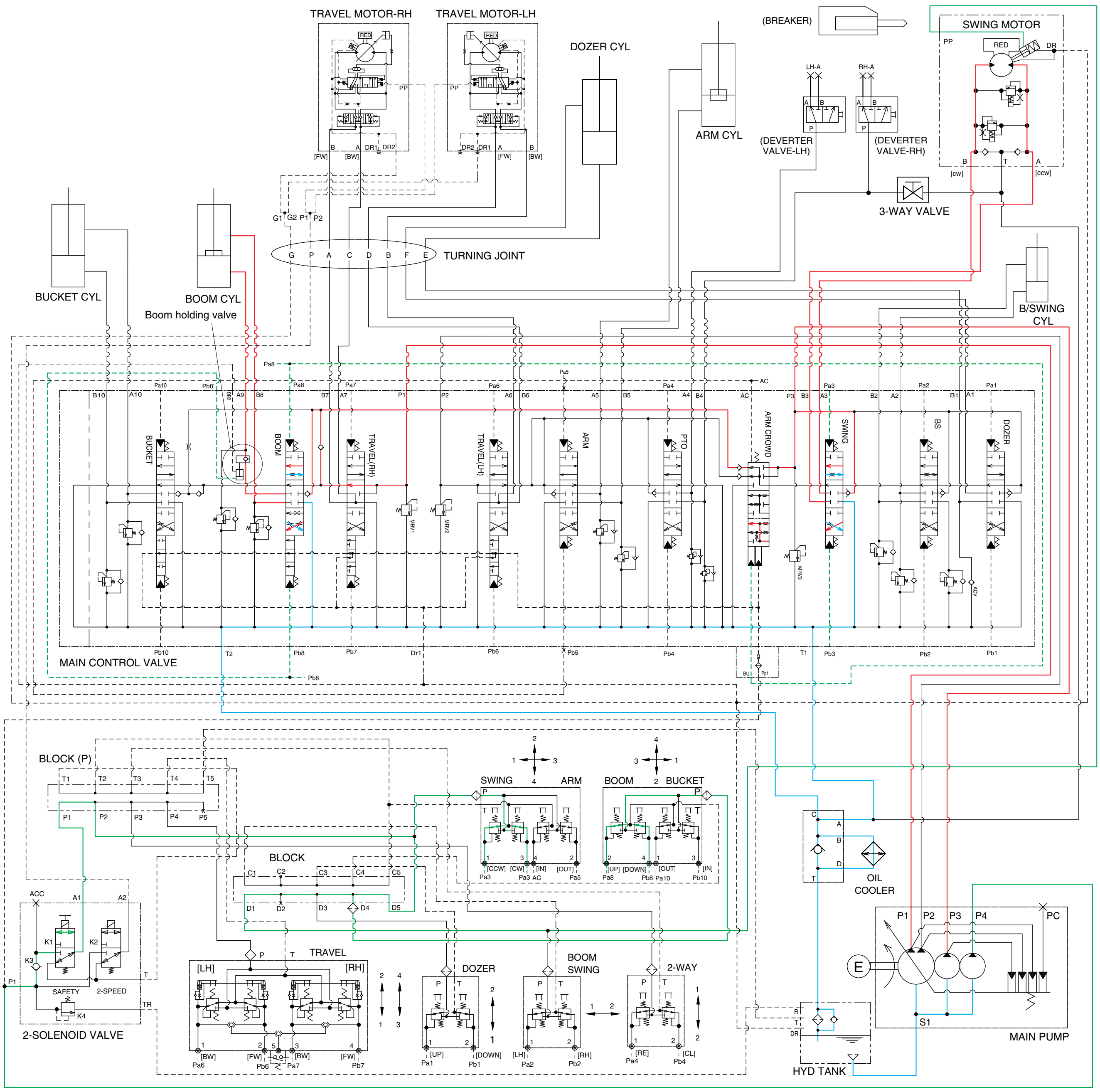
The oil from the P1, P2 and P3 pumps flows through the neutral oil passage, bypass oil passage and confluence oil passage in the main control valve. Then the oil goes to each actuator and operates them. Check valves and orifices are located on these oil passage in the main control valve. These control the oil from the main pumps so as to correspond to the operation of each actuator and smooth the combined operation.

INDEPENDENT TRAVEL SYSTEM

This independent travel system for straight travel is provided in the main control valve.
If any actuator(s) on P1 and P2 pump side is operated when traveling, the connecting spool is moved to the selected side by the pilot oil pressure (Pp1).
Consequently, the pressure oil from P1 and P2 pump are supplied to the right and left travel motor and oil from P3 pump flows into the other operated actuator.
This keeps the straight travel.

※ The circuit diagram may differ from the equipment, so please check before a repair.

2. COMBINED SWING AND BOOM OPERATION



25AZ3HC31

When the swing and boom functions are operated, simultaneously the selector spool, swing spool and boom spool in the main control valve are moved to the functional position by the pilot oil pressure (Pa3, Pb3, Pa8, Pb8) from the remote control valve.

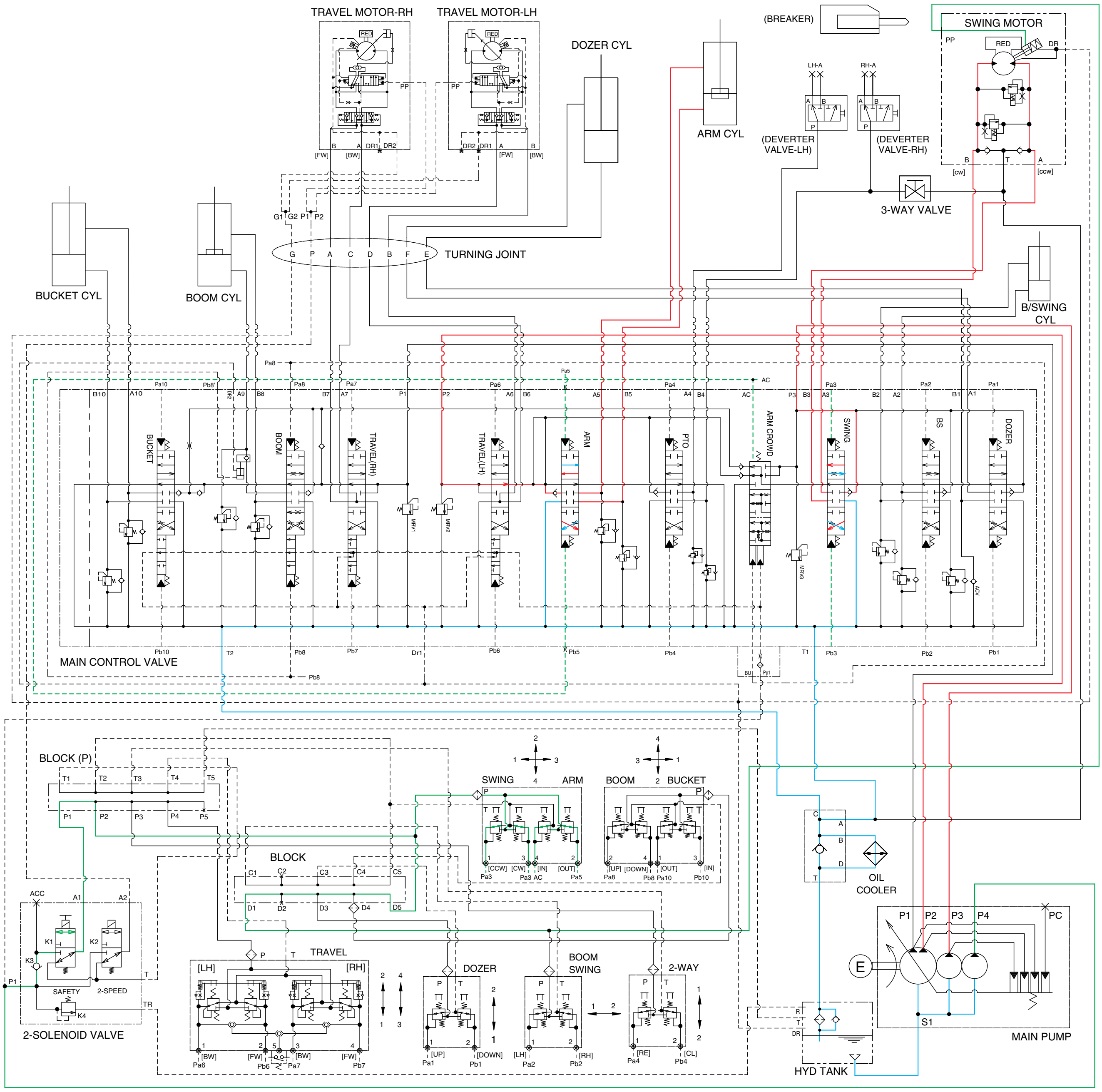
The oil from the P1 pump and some oil from the P3 pump through connecting spool (boom up only) flow. Into the boom cylinder.

The oil from the P3 pump flows into the swing motor through the swing spool.

The superstructure swings and the boom is operated.

※ The circuit diagram may differ from the equipment, so please check before a repair.

3. COMBINED SWING AND ARM OPERATION

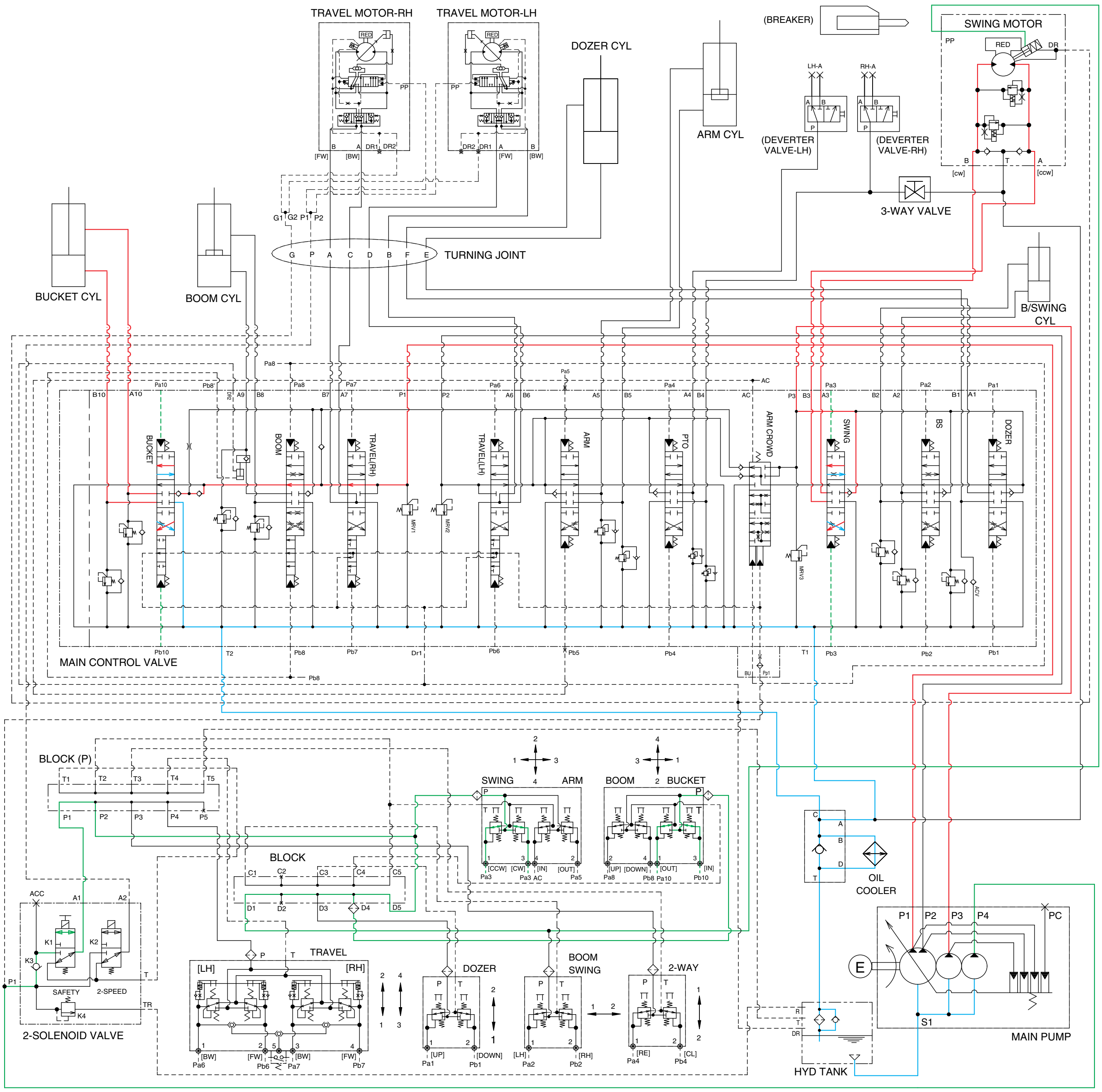


25AZ3HC32

When the swing and arm functions are operated, simultaneously the swing spool and arm spool in the main control valve are moved to the functional position by the pilot oil pressure (Pa3, Pb3, Pa5, Pb5) from the remote control valve.
The oil from the P3 pump flows into the swing motor through swing spool.
The oil from the P2 pump flows into the arm cylinder through the arm.
The superstructure swings and the arm is operated.

※ The circuit diagram may differ from the equipment, so please check before a repair.

4. COMBINED SWING AND BUCKET OPERATION



25AZ3HC33

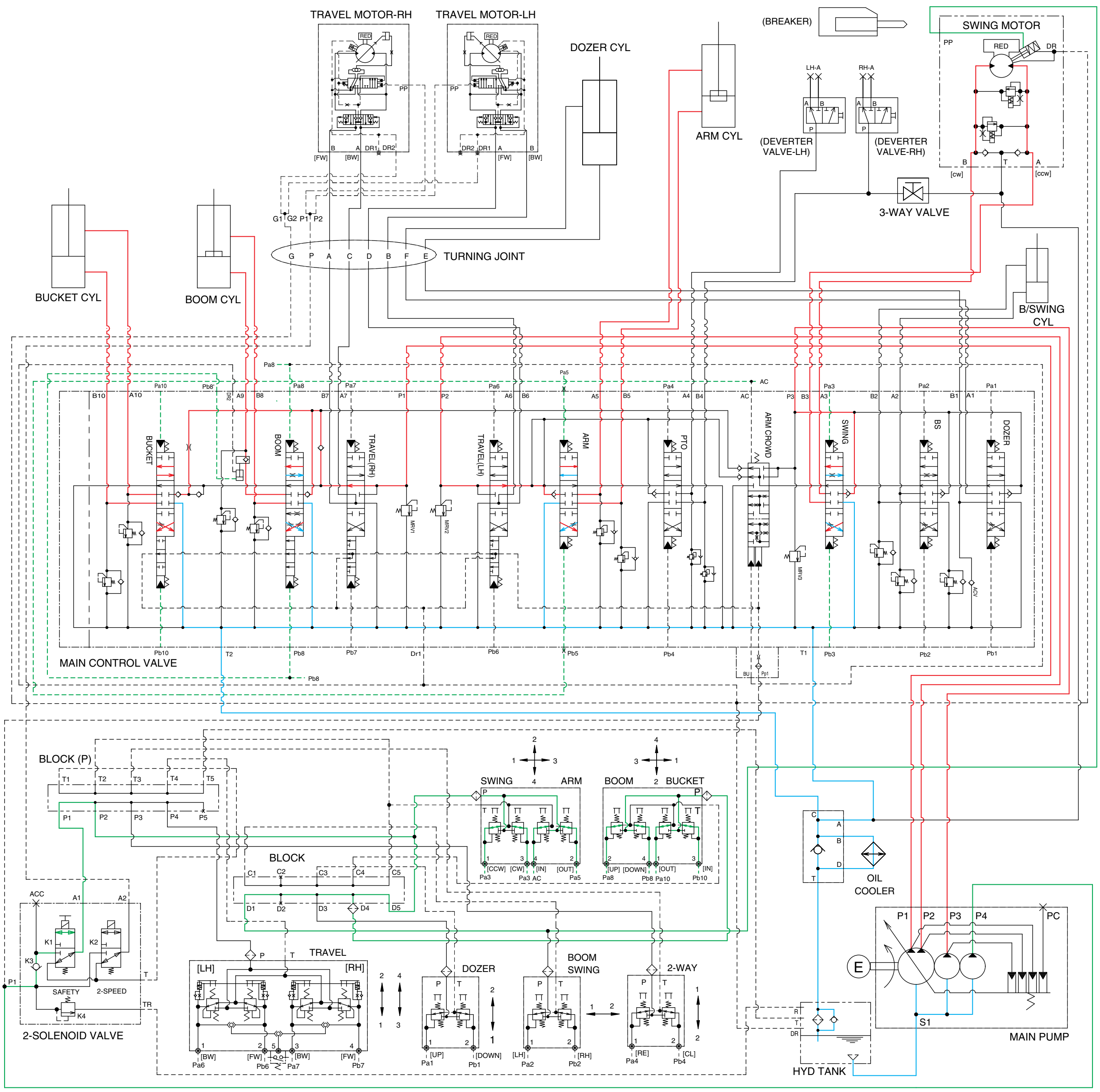
When the swing and bucket functions are operated, simultaneously the swing spool and bucket spool in the main control valve are moved to the functional position by the pilot oil pressure (Pa3, Pb3, Pa10, Pb10) from the remote control valve.

The oil from the P3 pump flows into the swing motor through the swing spool.

The oil from the P1 pump flows into the bucket cylinder through the bucket spool.

※ The circuit diagram may differ from the equipment, so please check before a repair.

5. COMBINED SWING, BOOM, ARM AND BUCKET OPERATION



25AZ3HC34

When the swing, boom, arm and bucket functions are operated, simultaneously each spool in the main control valve is moved to the functional position by the pilot oil pressure (Pa3, Pb3, Pa8, Pb8, Pa5, Pb5, Pa10, Pb10) from the remote control valve.

The oil from the P2 pump flows into the arm cylinder through, arm spool.

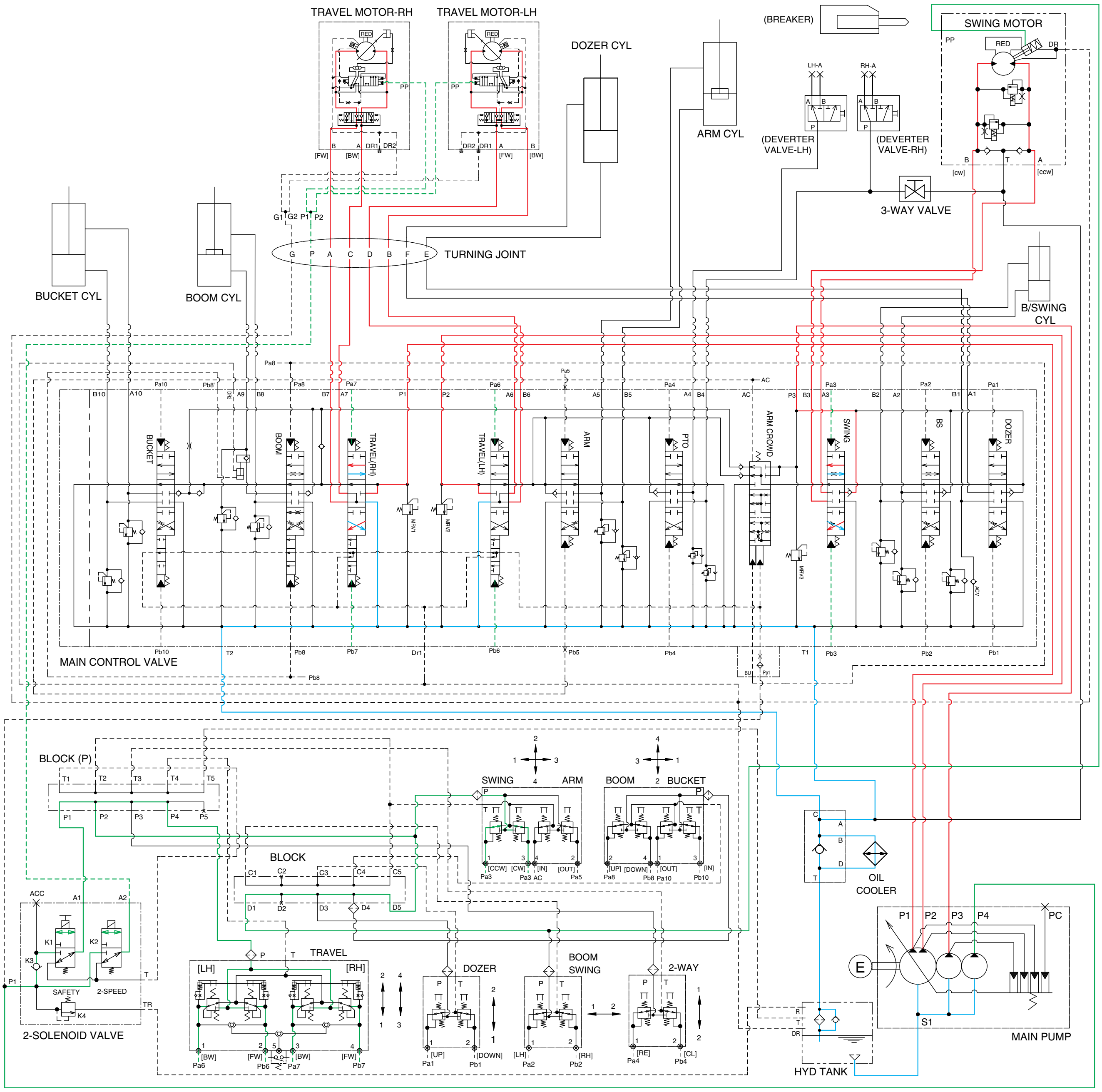
The oil from the P1 pump flows into the boom cylinder and bucket cylinder through the boom spool, bucket spool.

The oil from the P3 pump flows into the swing motor through the swing spool.

The superstructure swings and the boom, arm and bucket are operated.

※ The circuit diagram may differ from the equipment, so please check before a repair.

6. COMBINED SWING AND TRAVEL OPERATION



25AZ3HC35

When the swing and travel functions are operated, simultaneously the swing spool and travel spools in the main control valve are moved to the functional position by the pilot oil pressure (Pa3, Pb3, Pa6, Pb6, Pa7, Pb7) from the remote control valve and the travel levers.

The oil from the P3 pump flows into the swing motor through the swing spool.

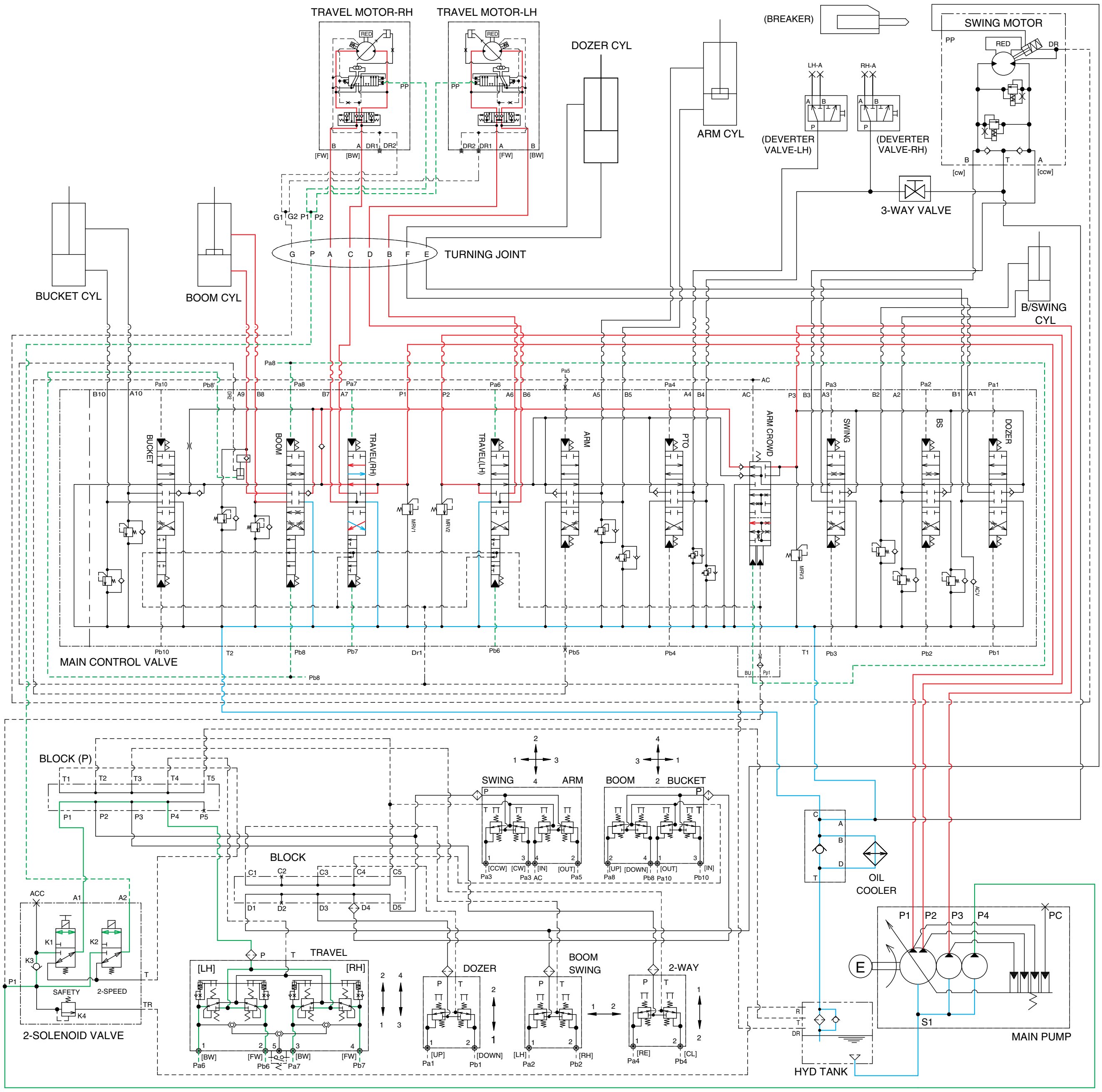
The oil from the P1 pump flows into the travel motor through the RH travel spool.

The oil from the P2 pump flows into the travel motor through the LH travel spool.

The superstructure swings and the machine travels straight.

※ The circuit diagram may differ from the equipment, so please check before a repair.

7. COMBINED BOOM AND TRAVEL OPERATION

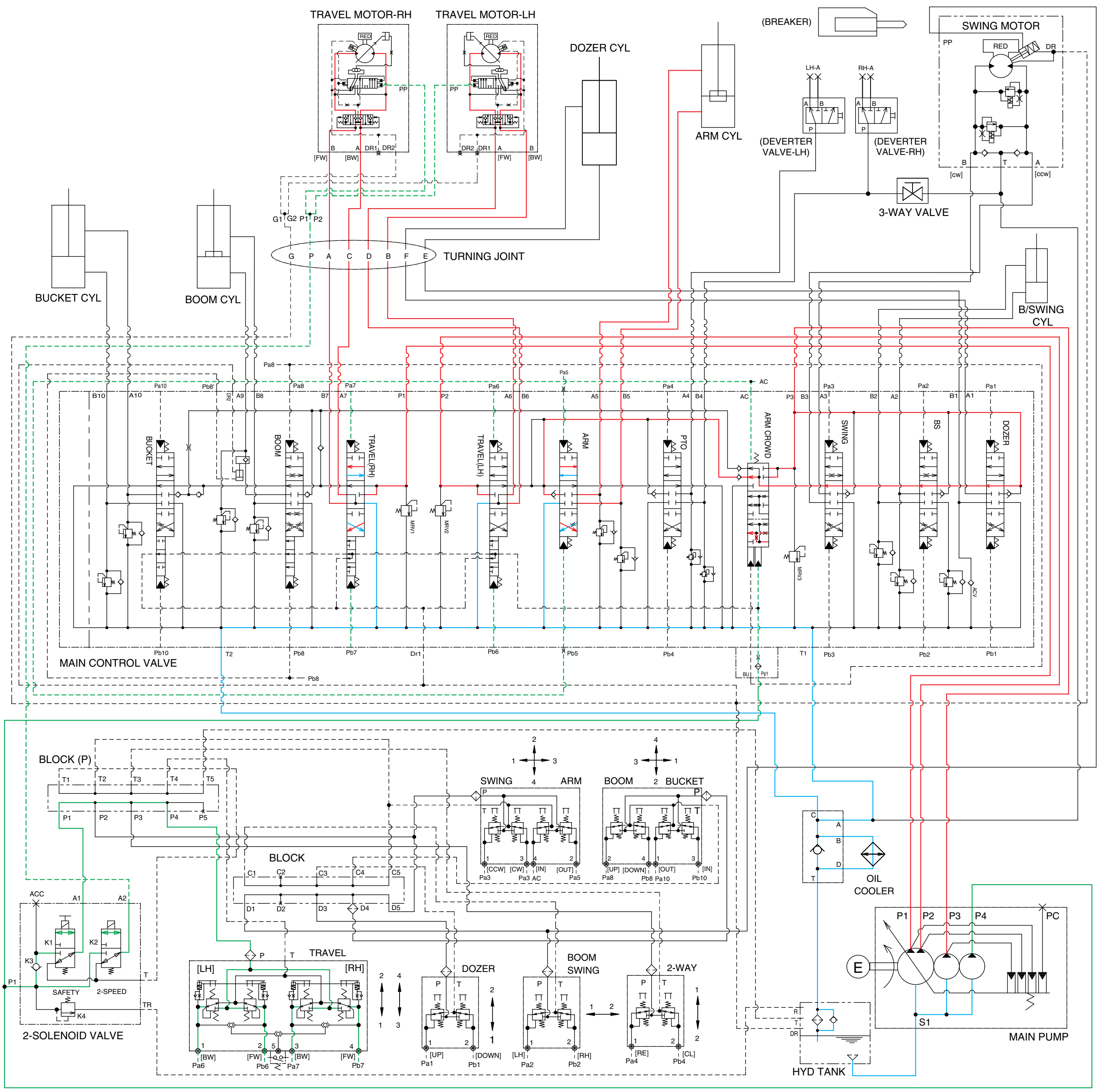


25AZ3HC36

When the boom and travel functions are operated, simultaneously the boom spool and travel spools in the main control valve are moved to the functional position by the pilot oil pressure (Pa8, Pb8, Pa6, Pb6, Pa7, Pb7) from the remote control valve.
The oil from the P1 and P2 pumps flows into the travel motors through travel RH and travel LH spools.
The oil from the P3 pump flows into the boom cylinder through boom spool via the travel selector spool. The boom is operated and the machine travels straight.

※ The circuit diagram may differ from the equipment, so please check before a repair.

8. COMBINED ARM AND TRAVEL OPERATION



25AZ3HC37

When the arm and travel functions are operated, simultaneously the arm spool and travel spools in the main control valve are moved to the functional position by the pilot oil pressure (Pa8, Pb8, Pa6, Pb6, Pa7, Pb7) from the remote control valve.

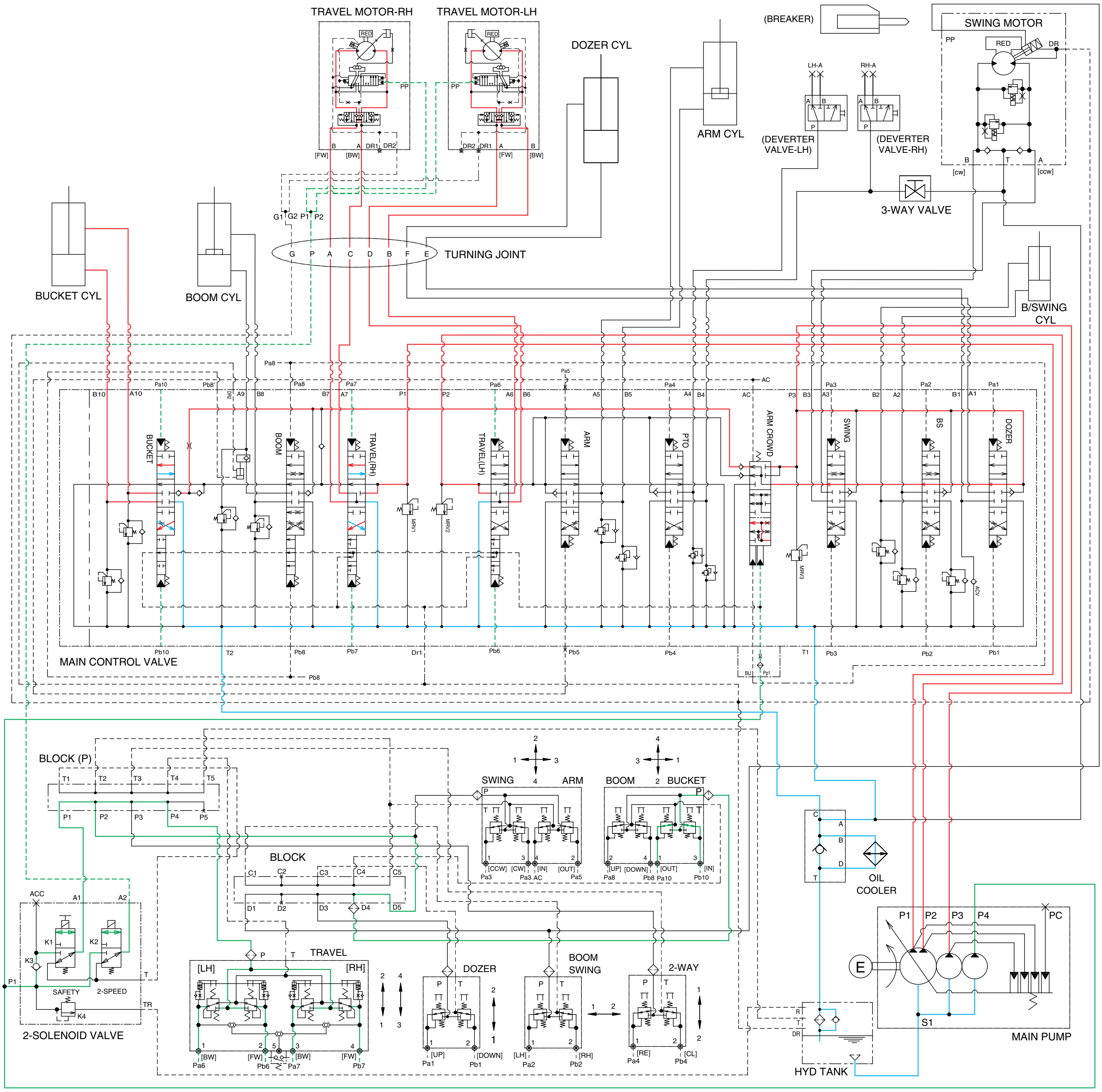
The oil from the P1 and P2 pumps flows into the travel motors through travel spools.

The oil from the P3 pump flows into the arm cylinder through arm spool via the connecting spool.

The arm is operated and the machine travels straight.

※ The circuit diagram may differ from the equipment, so please check before a repair.

9. COMBINED BUCKET AND TRAVEL OPERATION



25AZ3HC38

When the bucket and travel functions are operated, simultaneously the bucket spool and travel spools in the main control valve are moved to the functional position by the pilot oil pressure (Pa8, Pb8, Pa6, Pb6, Pa10, Pb10) from the remote control valve, and the connecting spool is pushed to the up by the oil pressure from pilot pump. The oil from the P1 and P2 pumps flows into the travel motors.

The oil from the P3 pump flows into the bucket cylinder through bucket spool via the connecting spool.

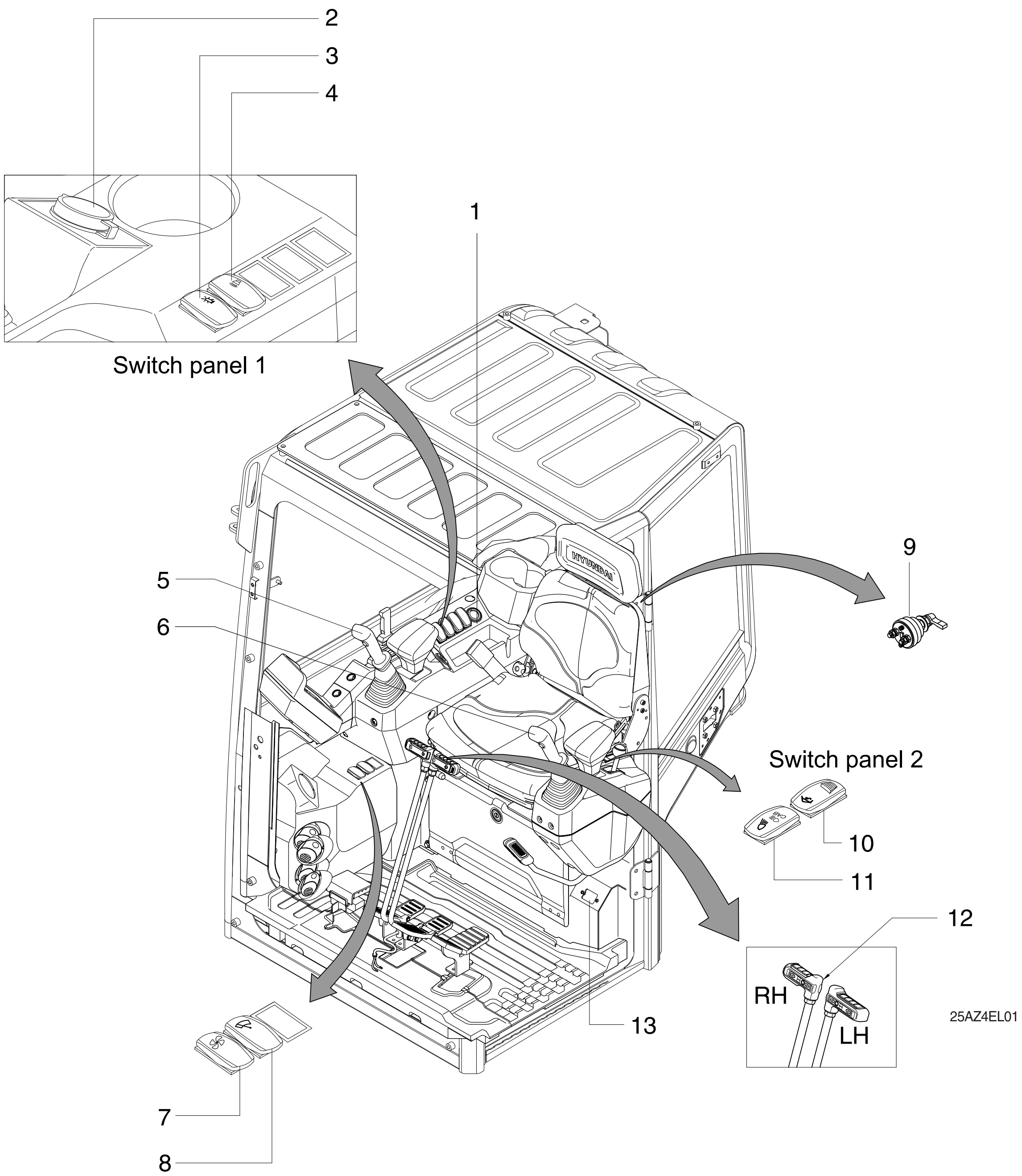
The bucket is operated and the machine travels straight.

※ The circuit diagram may differ from the equipment, so please check before a repair.

SECTION 4 ELECTRICAL SYSTEM

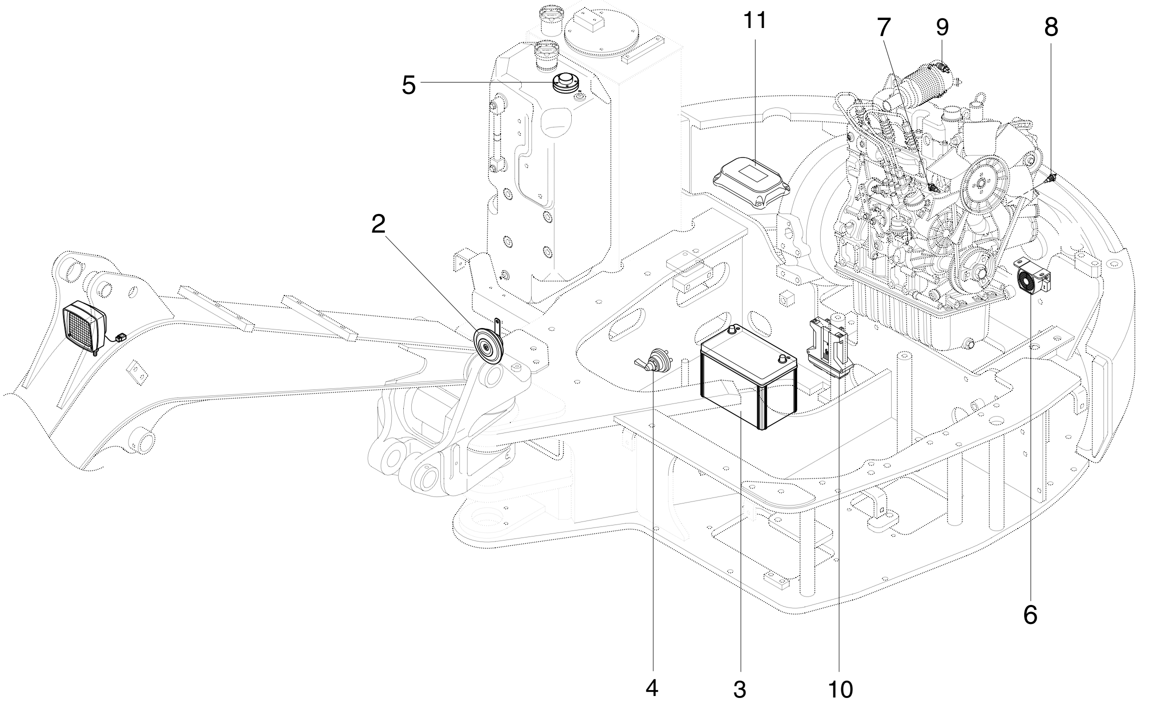
GROUP 1 COMPONENT LOCATION

1. LOCATION 1



1	12V socket	6	Switch on RH RCV	8	Washer/wiper switch
2	Start switch		- Breaker switch	9	Master switch
3	Beacon switch		- Horn switch	10	Quick coupler switch
4	Travel alarm switch		- Quick coupler switch	11	Work light switch
5	Switch on LH RCV		- 2-way switch	12	Travel speed control switch
	- Rotating switch	7	Heater switch	13	Emergency stop switch

2. LOCATION 2



1	Work lamp	5	Fuel sender	9	Air cleaner pressure switch
2	Horn	6	Travel alarm buzzer	10	HCU assy
3	Battery	7	Water temperature sender	11	RMCU assy
4	Master switch	8	Engine oil pressure switch		

GROUP 2 MONITORING SYSTEM

1. OUTLINE

The cluster consists of LCD and switches as shown below. The LCD is to warn the operator in case of abnormal machine operation or conditions for the appropriate operation and inspection.
The LCD is to display for monitoring, manage and display set with the switches.

※ **The cluster installed on this machine does not entirely guarantee the condition of the machine. Daily inspection should be performed according to chapter 6, Maintenance.**

※ **When the cluster provides a warning, immediately check the problem and perform the required action.**

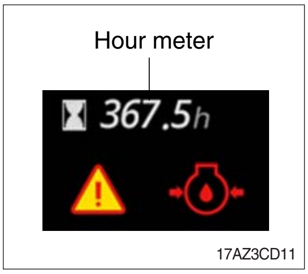
2. CLUSTER

1) MONITOR PANEL

25AZ4CD01

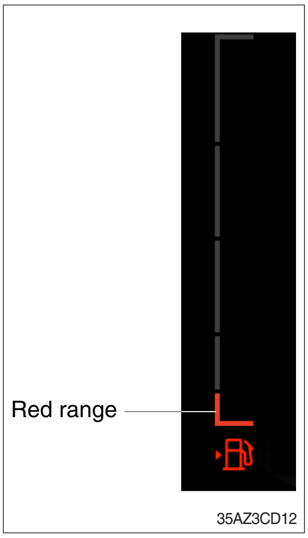
2) GAUGES AND DISPLAYS

(1) Hour meter



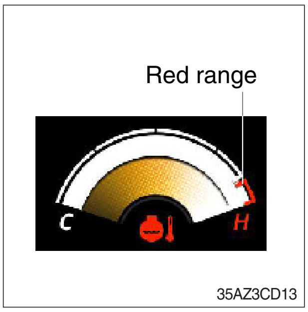
① This meter shows the total operation hours of the machine.
② Always ensure the operating condition of the meter during the machine operation.
Inspect and service the machine based on hours as indicated the operator's manual in chapter 6, maintenance.

(2) Fuel gauge



① This gauge indicates the amount of fuel in the fuel tank.
② Fill the fuel when in the red range or warning lamp ON.
※ If the gauge illuminates the red range or warning lamp ON even though the machine is in the normal condition range, check the electric device as this can be caused by poor connection of sensor.

(3) Engine coolant temperature gauge



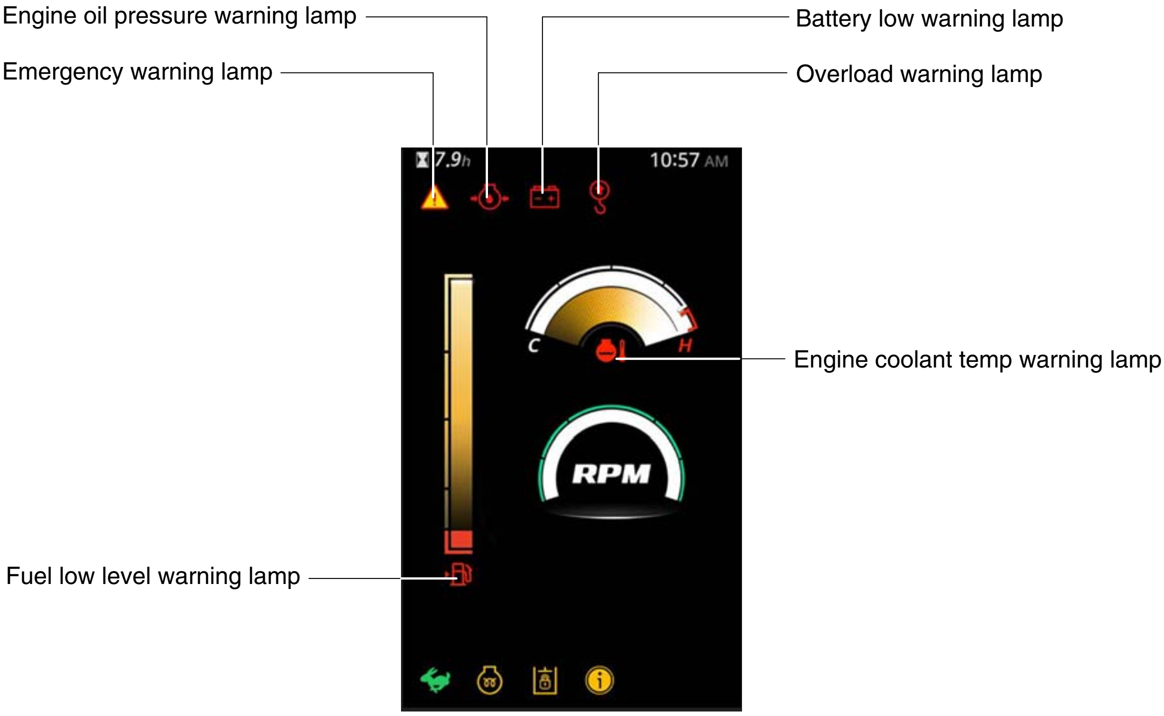
① This indicates the temperature of coolant.
· Red range : Above 105°C (221°F)
② When the red range pointed or warning lamp ON, engine do not abruptly stop but run it at medium speed to allow it to cool gradually, then stop it.
Check the radiator and engine.
※ If the engine is stopped without cooled down running, the temperature of engine parts will rise suddenly, this could cause severe engine trouble.
※ If the gauge indicates the red range or warning lamp ON in red even though the machine is in the normal condition range, check the electric device as this can be caused by poor connection of sensor.

(4) Engine rpm gauge

17AZ3CD15

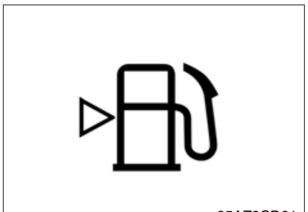
① This gauge indicates the engine speed.

3) WARNING LAMPS



25AZ3CD20

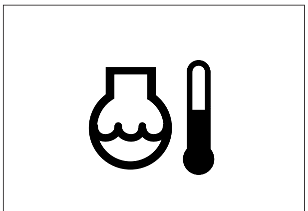
(1) Fuel low level warning lamp



35AZ3CD21

① This lamp lights up and buzzer sounds when the level of fuel is below 9 ℓ (2.4 U.S. gal).
② Fill the fuel immediately when the lamp ON.

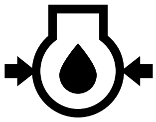
(2) Engine coolant temperature warning lamp



35AZ3CD22

① This lamp lights up and buzzer sounds when the temperature of coolant is over the normal temperature 105°C (221°F).
② Check the cooling system when the lamp ON.

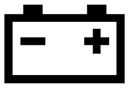
(3) Engine oil pressure low warning lamp



R5573CD13

① This lamp lights up and buzzer sounds after starting the engine because of the low oil pressure.
② If the lamp ON during engine operation, shut OFF engine immediately. Check oil level.

(4) Battery low warning lamp



R5573CD16

① This lamp lights up and buzzer sounds when the starting switch is ON, it is turned OFF after starting the engine.
② Check the battery charging circuit when this lamp does not turn off, or turns on or blinks during engine operation.

(5) Emergency warning lamp

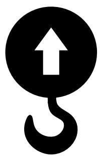
290F3CD64

① This lamp pops up and the buzzer sounds when each of the below warnings occurs.
- Engine coolant temperature high warning lamp ON

※ **The pop-up warning lamp moves to the original position and lights up when the buzzer stop switch is pushed or pop-up is touched. The buzzer will stop.**
This is same as following warning lamps.

② When this warning lamp lights up, machine must be checked and serviced immediately.

(6) Overload warning lamp



R25Z9AK3CD24

① When the machine is overloaded, this lamp blinks and buzzer sounds.
② Reduce the machine load.

4) PILOT LAMP

25AZ3CD30

(1) Travel mode pilot lamp

No	Mode	Pilot lamp	Selected mode
1	Travel mode	 	Low speed traveling High speed traveling

(2) Preheat pilot lamp


290F3CD79

① Turning the start key switch to the ON position starts preheating in cold weather.
② Start the engine after this lamp goes OFF.
※ Refer to the operator's manual page 4-4 for details.

(3) Maintenance pilot lamp


85A3CD110

① This lamp lights up when consumable parts are in need of replacement. It means that the change or replacement interval of parts is 30 hours from the required change interval.
② Check the message in maintenance information of main menu. Also, this lamp lights up for 3 minutes when the start switch is switched to the ON position.

(4) Manual safety lock pilot lamp

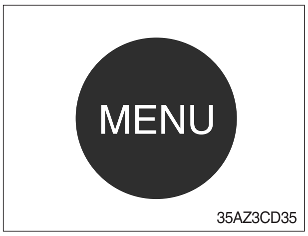

140WA3CD37

① This lamp lights up when the safety lever is set to the LOCK position.
※ Refer to the operator's manual page 3-29 for the safety lever.

5) SWITCHES

Sound short beep when each button is pressed.

(1) Menu button



① Go into the menu screen.

※ Please refer to page 4-11.

(2) Left/up/(+)

① Move left in sub menu.

② Move up in menu list

③ Increase input value in menu

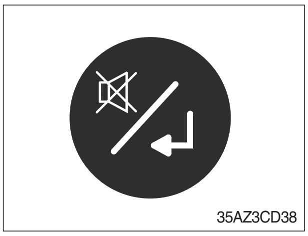
(3) Right/down/(-) button

① Move right in sub menu.

② Move down in menu list

③ Decrease input value in menu

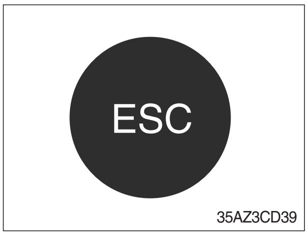
(4) Enter and buzzer stop button



① Select menu (enter).

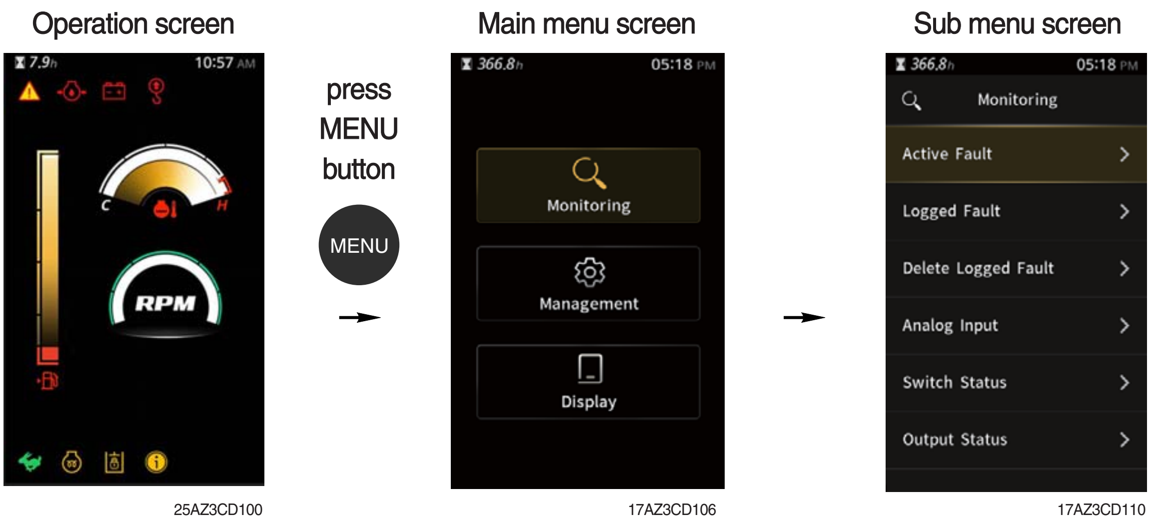
② Stop buzzer sound when press this button immediately.

(5) ESC



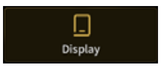
① Escape in the menu.

6) MAIN MENU



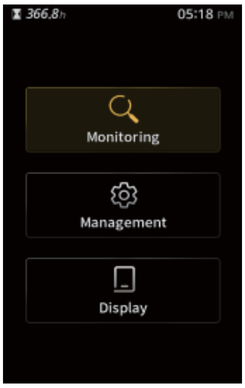
※ Please refer to the switches, page 4-10 for selection and change of menus and input values.
※ In the operation screen, press the menu button to access the sub-menu screen.

(1) Structure

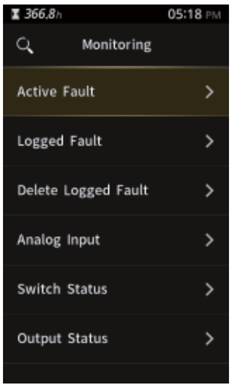
No	Main menu	Sub menu	Description
1	 Monitoring 17AZ3CD103	Active fault Logged fault Delete logged fault Analog input Switch status Output status	Active fault Logged fault Delete logged fault Coolant temp., Battery volt, Engine speed, Overload pressure Safety lever, Quick coupler 1, Quick coupler 2, Travel speed Quick coupler solenoid, Start limit relay, Buzzer
2	 Manage 35AZ3CD104	Operating hours Maintenance ESL mode Change password Warning setting Machine information A/S phone number	A day's operating hours Elapse, Interval, Replacement etc. Disabled, Enable (Always), Enable (Interval) Change password Overload on/off Machine, Engine, Cluster A/S phone number, A/S phone number change
3	 Display set 17AZ3CD105	Clock adjust Brightness Unit Language	12 hours, 24 hours Manual, Auto Temperature Korean, English, Turkish, etc (total 12 languages)

(2) Monitoring

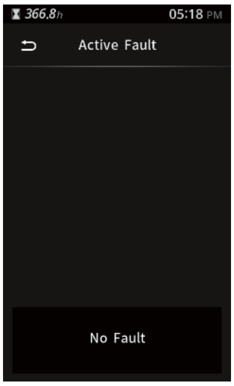
① Active fault



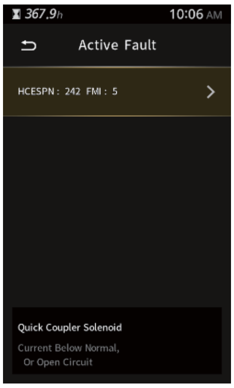
17AZ3CD106



17AZ3CD110



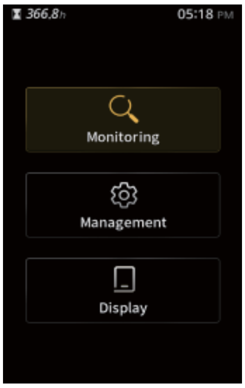
17AZ3CD111



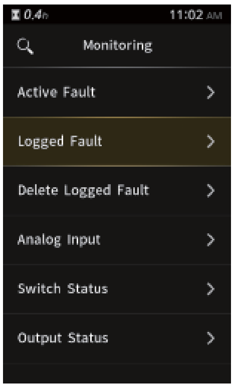
17AZ3CD112

- The active fault of the machine and engine can be checked by this menu.

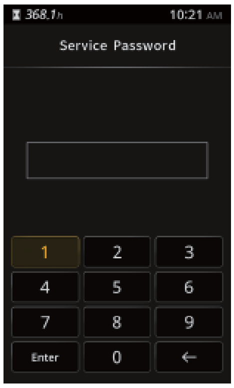
② Logged fault



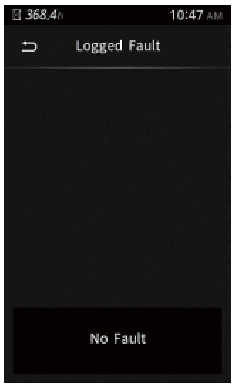
17AZ3CD106



17AZ3CD113

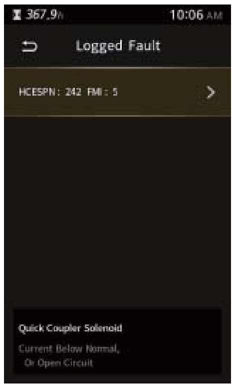


17AZ3CD114



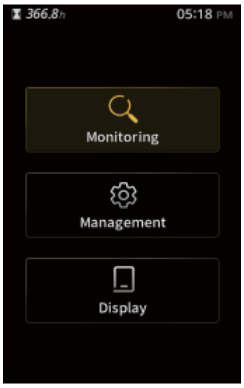
17AZ3CD115

- The logged fault of the machine and engine can be checked by this menu.
- · This menu can be used only HCE service man.

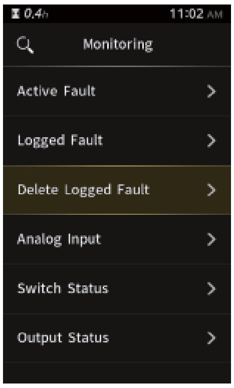


17AZ3CD116

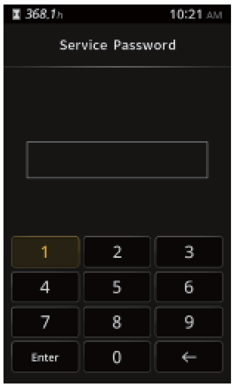
③ Delete logged fault



17AZ3CD106

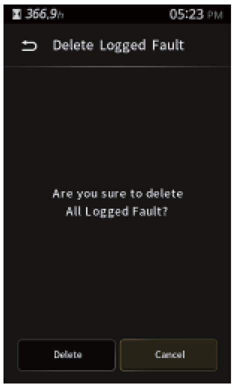


17AZ3CD117

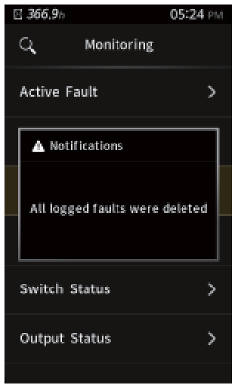


17AZ3CD118

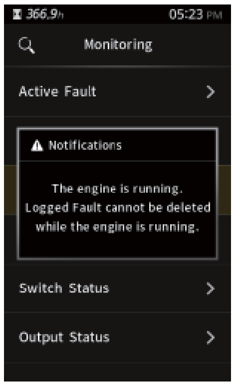
- The logged fault of the machine and engine can be deleted by this menu.
  (It is possible under the engine stop conditions)



17AZ3CD119

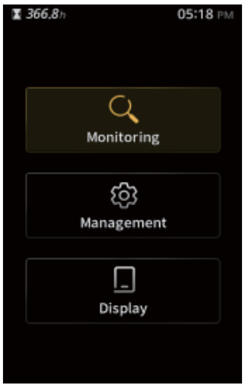


17AZ3CD120

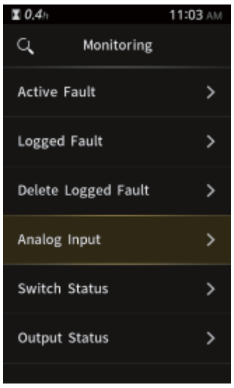


17AZ3CD121

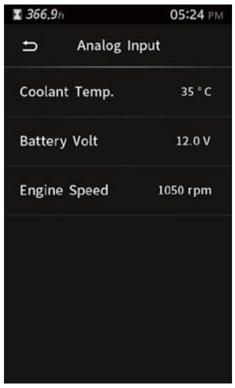
④ Analog input



17AZ3CD106



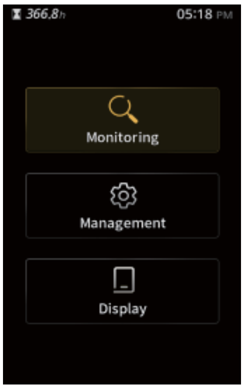
17AZ3CD122



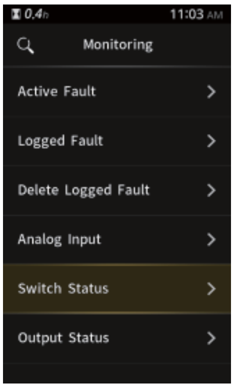
17AZ3CD123

- The machine status such as the engine speed, coolant temperature, battery voltage can be checked by this menu.

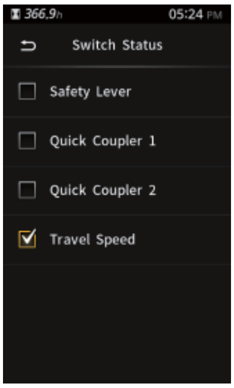
⑤ Switch status



17AZ3CD106



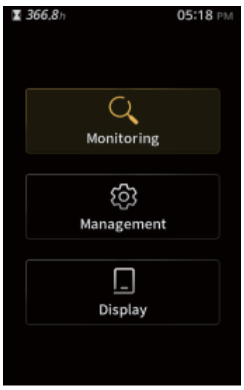
17AZ3CD124



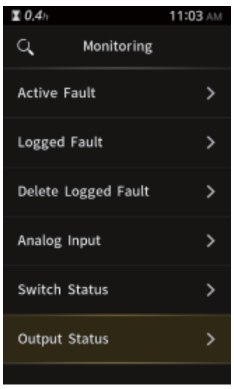
17AZ3CD125

- The switch input status can be checked by this menu.

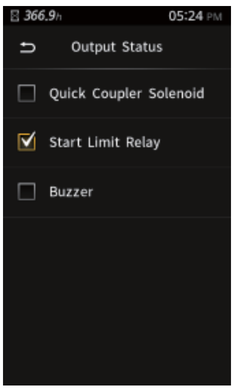
⑥ Output status



17AZ3CD106



17AZ3CD126



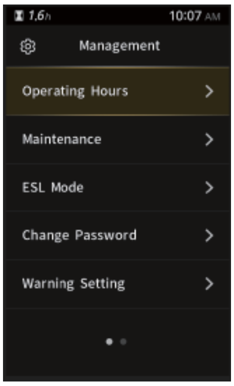
17AZ3CD127

- The output status can be confirmed by this menu.

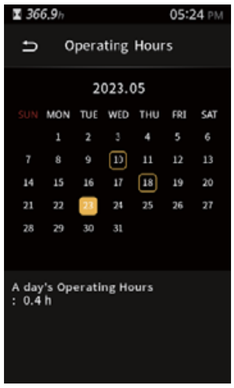
(3) Manage

① Operating hours

17AZ3CD107



17AZ3CD130A

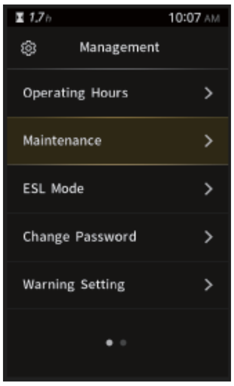


17AZ3CD131

- You can check the operating hours by this menu.

② Maintenance

17AZ3CD107



17AZ3CD132A

17AZ3CD133

- Elapse : Maintenance elapsed time.
- Interval : The change intervals can be changed in hour increments of 50.
- History-Hourmeter : Display elapsed time.
- Replacement : The elapsed time will be reset to zero (0).

※ Refer to section, Maintenance chart for further information of maintenance interval.

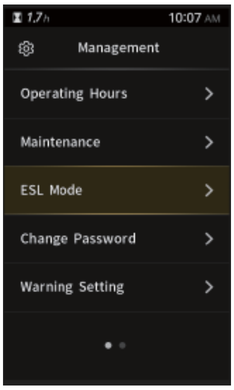
17AZ3CD134

17AZ3CD135

17AZ3CD136

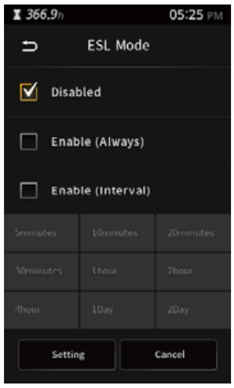
③ ESL mode

17AZ3CD107



17AZ3CD137A

17AZ3CD138

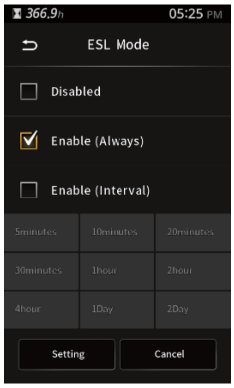


17AZ3CD139

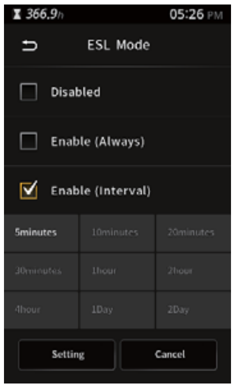
ESL mode setting

- ESL mode is designed to be a theft deterrent or will prevent the unauthorized operation of the machine.
- When you Enable the ESL mode, the password will be required when the starting switch is turned to the on position.
- Machine security
  - · Disable : ESL function is disabled and password is not required to start engine.
  - · Enable (Always) : The password is required whenever the operator starts engine.
  - · Enable (Interval) : The password is required when the operator starts engine first. But the operator can restart the engine within the interval time without inputting the password. The interval time can be set to a maximum 2 days.

※ ESL : Engine Starting Limit



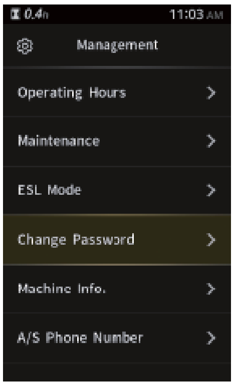
17AZ3CD140



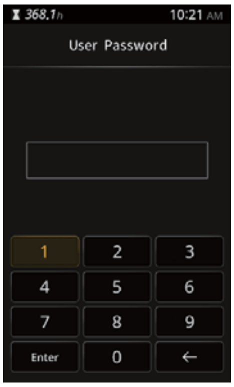
17AZ3CD141

④ Change password

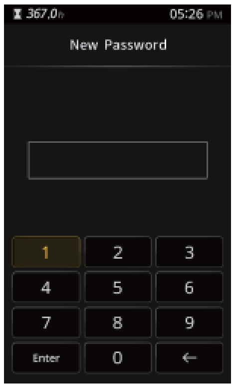
17AZ3CD107



17AZ3CD142A



17AZ3CD143

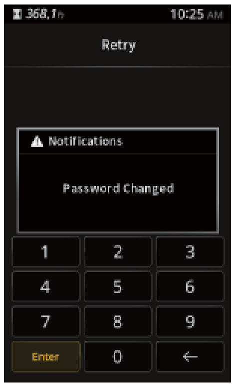


17AZ3CD144

- The password is 5~10 digits.

※ Before first use, please set user password and owner password in advance for machine security.

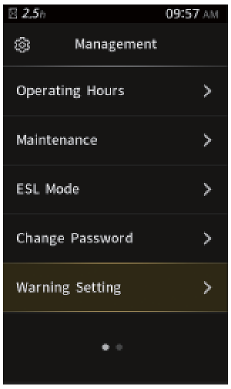
17AZ3CD145



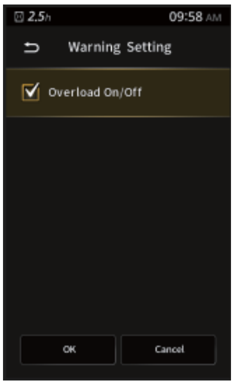
17AZ3CD146

⑤ Warning setting

17AZ3CD107



25AZ3CD100

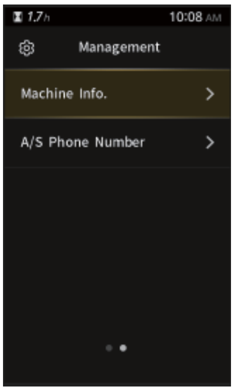


25AZ3CD101

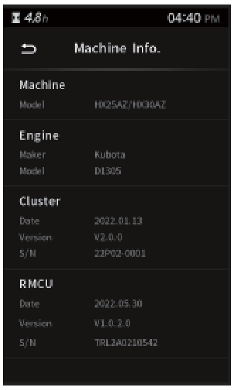
- You can set the warning items by this menu (optional menu).

⑥ Machine information

17AZ3CD107



17AZ3CD147A

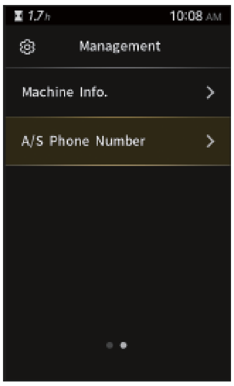


17AZ3CD148A

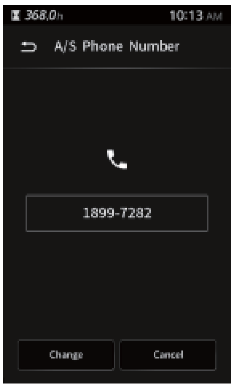
- This can confirm the identification of the machine, engine and cluster.

⑦ A/S phone number

17AZ3CD107



17AZ3CD149A



17AZ3CD150

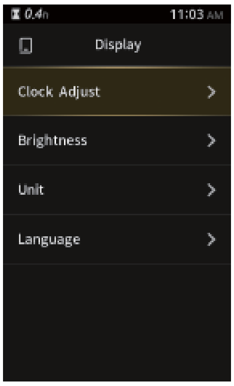
17AZ3CD151

- The A/S phone number can be checked and changed.

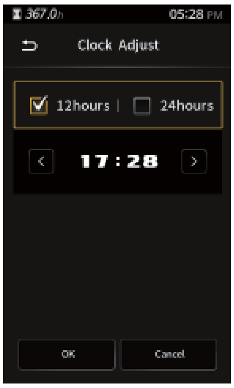
(4) Display set

① Clock adjust

17AZ3CD108



17AZ3CD160

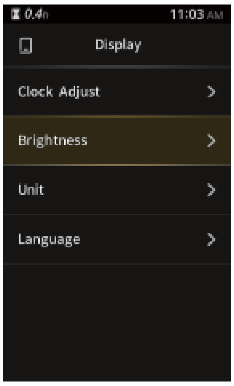


17AZ3CD161

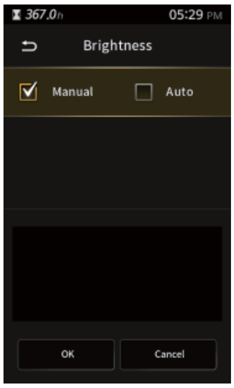
- Set the time (12 hours or 24 hours)

② Brightness

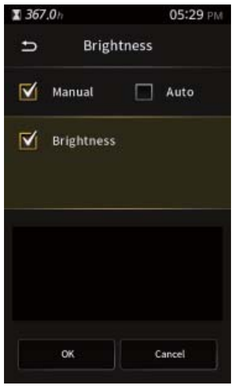
17AZ3CD108



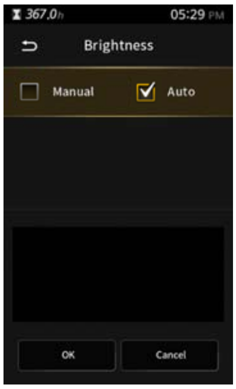
17AZ3CD162



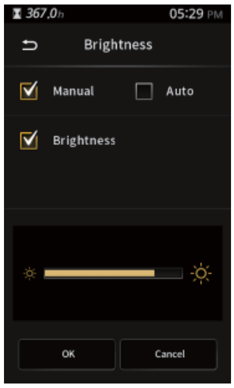
17AZ3CD163



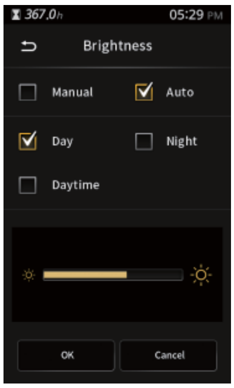
17AZ3CD164



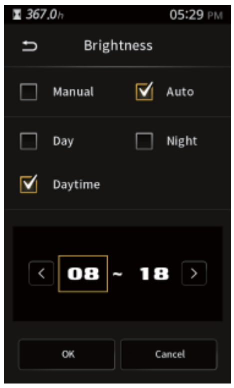
17AZ3CD166



17AZ3CD165



17AZ3CD167

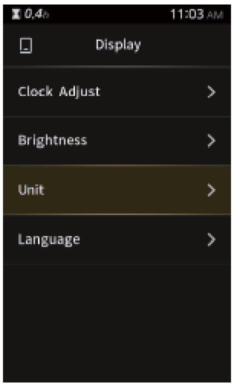


17AZ3CD168

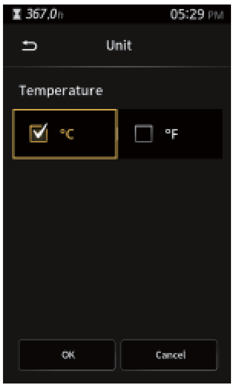
- Manual : Manual setting for LCD brightness.
- Automatic : Automatic control of LCD brightness as set level of Day/Night.
- Setting day time : Set the time for daylight.
(in figure, black area represents night time while orange shows day time)

③ Unit

17AZ3CD108



17AZ3CD169

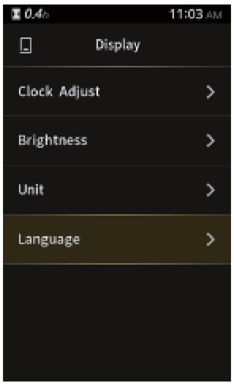


17AZ3CD170

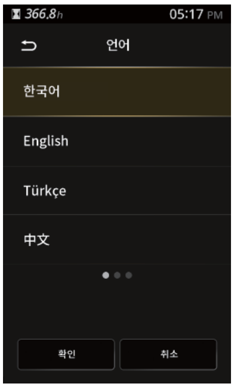
- Temperature : °C ↔ °F

④ Language

17AZ3CD108

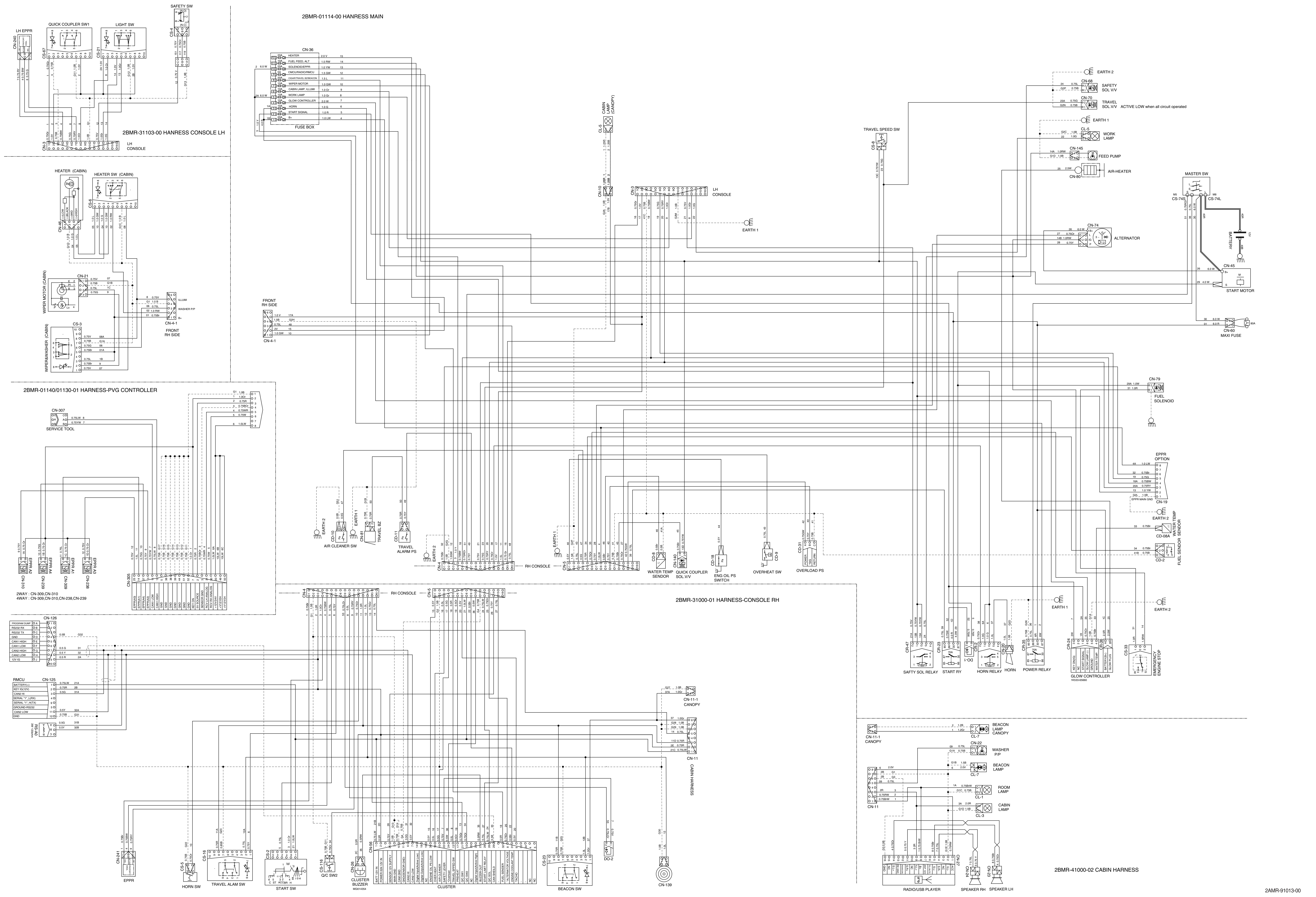


17AZ3CD171



17AZ3CD172

- User can select preferable language and all displays are changed to the selected language (한국어, English, Turkish, etc ; total 12 languages).


2BMR-01114-00 HANRESS MAIN
2BMR-31103-00 HANRESS CONSOLE LH
2BMR-01140/01130-01 HARNESS-PVG CONTROLLER
2BMR-31000-01 HARNESS-CONSOLE RH
2BMR-41000-02 CABIN HARNESS
FUSE BOX
LH EPPR
QUICK COUPLER SW1
LIGHT SW
SAFETY SW
HEATER (CABIN)
HEATER SW (CABIN)
WIPER MOTOR (CABIN)
WIPER&WASHER (CABIN)
SERVICE TOOL
2WAY : CN-309,CN-310
4WAY : CN-309,CN-310,CN-238,CN-239
RMCU
EARTH 1
EARTH 2
SAFETY SOL V/V
TRAVEL SOL V/V
ACTIVE LOW when all circuit operated
WORK LAMP
FEED PUMP
AIR-HEATER
TRAVEL SPEED SW
MASTER SW
ALTERNATOR
BATTERY
START MOTOR
MAXI FUSE
FUEL SOLENOID
EPPR OPTION
WATER TEMP SENSOR
FUEL SENSOR
AIR CLEANER SW
TRAVEL BZ
TRAVEL ALARM PS
RH CONSOLE
WATER TEMP SENDOR
QUICK COUPLER SOL V/V
ENG OIL PS SWITCH
OVERHEAT SW
OVERLOAD PS
SAFTY SOL RELAY
START RY
HORN RELAY
HORN
POWER RELAY
GLOW CONTROLLER
EMERGENCY ENGINE STOP
CANOPY
CABIN HARNESS
BEACON LAMP CANOPY
WASHER P/P
BEACON LAMP
ROOM LAMP
CABIN LAMP
EPPR
HORN SW
TRAVEL ALAM SW
START SW
Q/C SW2
CLUSTER BUZZER
CLUSTER
BEACON SW
RADIO/USB PLAYER
SPEAKER RH
SPEAKER LH
2AMR-91013-00

MEMORANDUM

1. POWER CIRCUIT

The negative terminal of battery is grounded to the machine chassis directly.

When the start switch is in the OFF position, the current flows from the positive battery terminal as shown below.

1) OPERATING FLOW

Battery [B+] → Master sw [CS-74 (L)] → Maxi fuse [CN-60]

- → Start motor [CN-45 (B+)] → Alternator [CN-74 (B+)]
- → Power relay [CR-35 (30)]
- → Start relay [CR-23 (30)]
- → Glow controller [CR-36 (A)]
- → Fuse box [No. 1]
  - → I/conn [CN-5 (1)]
    - → RMCU [CN-125 (1)]
    - → Cluster [CN-56 (1)]
    - → I/conn [CN-11 (1)]
      - → Room lamp [CL-1 (1)]
      - → Radio and USB player [CN-27 (8)]
    - → Start switch [CS-2 (1)]
  - → To option EPPR [CN-19 (8)]
- → Fuse box [No. 3] → Horn relay [CR-2 (1, 3)]

※ I/conn : Intermediate connector

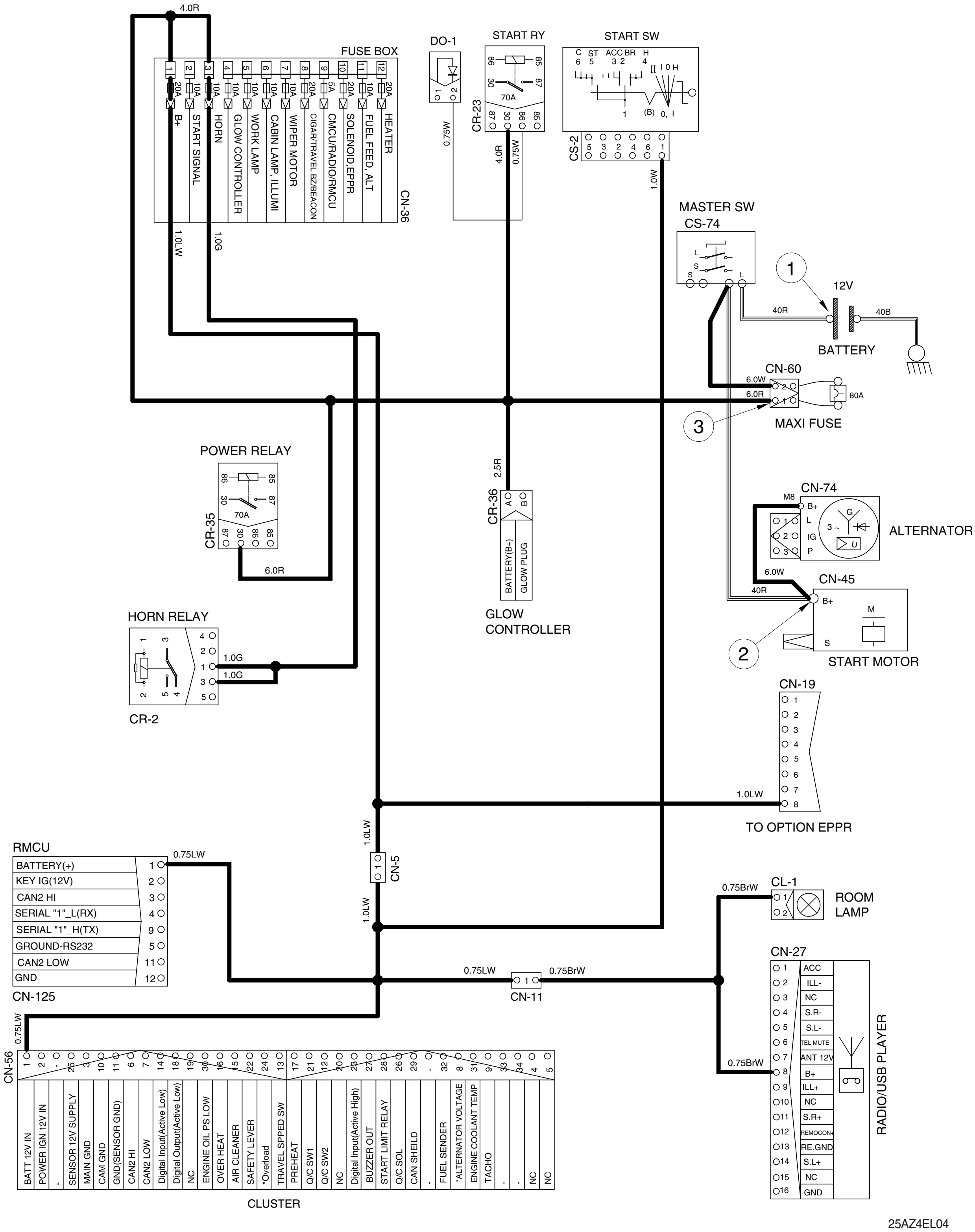
2) CHECK POINT

Engine	Start switch	Check point	Voltage
STOP	OFF	① - GND (Battery) ② - GND (Start motor B+) ③ - GND (Maxi fuse)	10~12.5 V

※ GND : Ground

※ The circuit diagram may differ from the equipment, so please check before a repair.

POWER CIRCUIT



※ The circuit diagram may differ from the equipment, so please check before a repair.

2. STARTING CIRCUIT

1) OPERATING FLOW

Battery [+] terminal → Master switch [CS-74L] → Maxi fuse [CN-60]
- → Fuse box [No. 1] → I/conn [CN-5 (1)] → Start switch [CS-2 (1)]
- → Power relay [CR-35 (30)]
- → Start relay [CR-23 (30)]
- → Glow controller [CR-36 (A)]

(1) Start switch : ON

Start switch [CS-2 (2)] → I/conn [CN-4 (6)] → Master switch [CS-74S]
→ Power relay [CR-35 (30) → (87)]
→ Fuse box [all power is supplied with electric component)

(2) Start switch : START

Start switch [CS-2 (6)] → I/conn [CN-4 (4)] → Fuse box [No.2]
- → Start relay [CR-23 (30) → (87)] → Start motor [CN-45 (S)]
  → Start motor operating
- → Glow controller [CR-24 (3)]

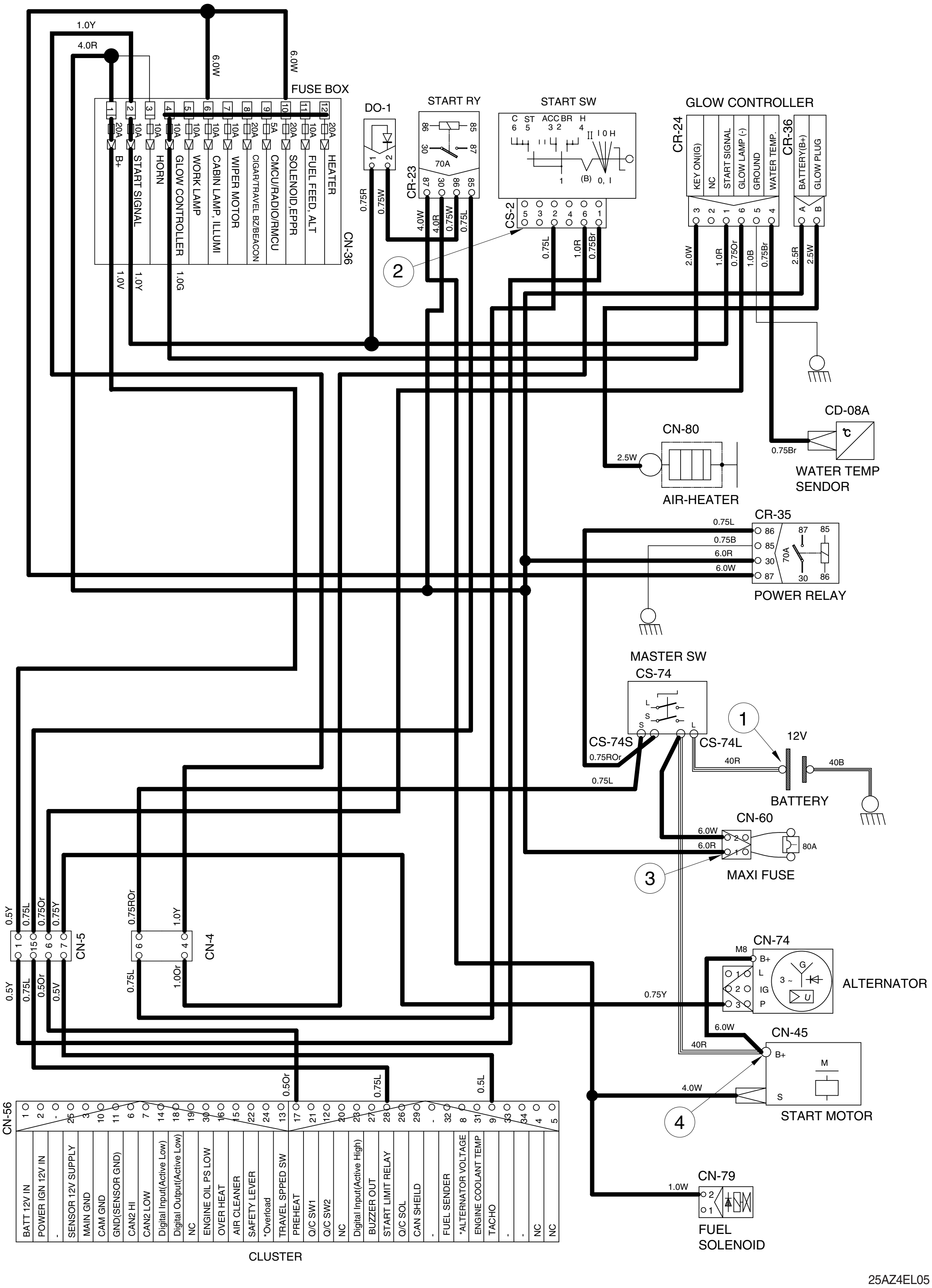
2) CHECK POINT

Engine	Start switch	Check point	Voltage
Operating	START	① - GND (Battery) ② - GND (Start switch) ③ - GND (Start motor B^+) ④ - GND (Start motor S)	10~12.5 V

※ GND : Ground

※ The circuit diagram may differ from the equipment, so please check before a repair.

STARTING CIRCUIT



※ The circuit diagram may differ from the equipment, so please check before a repair.

3. CHARGING CIRCUIT

When the start motor is activated and the engine is started, the operator releases the start switch to the ON position.

Charging current generated by operating the alternator flows into the battery.

The current also flows from alternator to each electrical component and controller through the fuse box.

1) OPERATING FLOW

(1) Warning flow

Alternator terminal [CN-74 (1)] → I/conn [CN-5 (13)] → Cluster [CN-56 (8)]
→ Cluster warning lamp ON

(2) Charging flow

Alternator terminal [CN-74 (B^+)] → Start motor [CN-45 (B^+)] → Master switch [CS-74L]
→ Battery [+] terminal
→ Maxi fuse [CN-60] → Fuse box [No. 1, 3]
→ Power relay [CR-35 (30) → (87)] → Fuse box [No. 4~12]

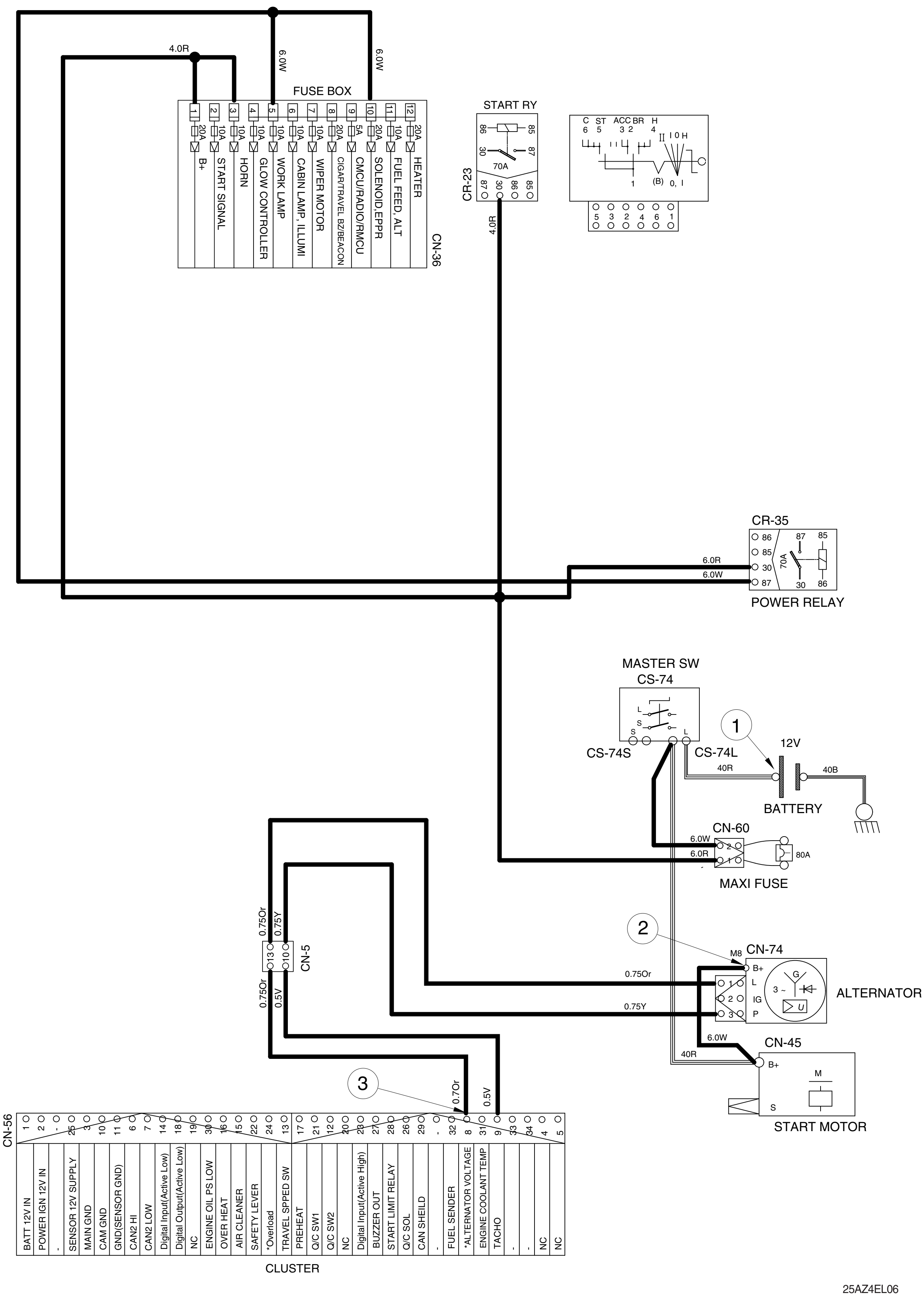
2) CHECK POINT

Engine	Start switch	Check point	Voltage
Operating	ON	① - GND (Battery voltage) ② - GND (Alternator B^+ terminal) ③ - GND (Cluster)	10~12.5 V

※ GND : Ground

※ The circuit diagram may differ from the equipment, so please check before a repair.

CHARGING CIRCUIT



※ The circuit diagram may differ from the equipment, so please check before a repair.

4. WORK LIGHT CIRCUIT

1) OPERATING FLOW

Fuse box [No.6] → I/conn [CN-3 (8)] → Light switch [CS-21 (2)]
Fuse box [No.5] → I/conn [CN-3 (13)] → Light switch [CS-21 (5)]

(1) Main light switch ON : 1st step

Main light switch ON [CS-21 (2)]
- → Light switch illumination ON [CS-21 (8)]
- → I/conn [CN-3 (2)] → I/conn [CN-4 (13)]
  - → I/conn [CN-11 (3)]
    - → Cabin lamp [CL-3 (2)]
    - → Radio/USB player [CN-27 (9)]
  - → I/conn [CN-4-1 (5)]
    - → Heater switch illumination ON [CS-6 (8)]
    - → Wiper & washer illumination ON [CS-3 (8)]
  - → Beacon switch illumination ON [CS-23 (8)]
  - → Travel alarm switch illumination ON [CS-16 (8)]

(2) Main light switch ON : 2nd step

Main light switch ON [CS-21 (4)] → I/conn [CN-3 (14)] → Work light ON [CL-5 (2)]

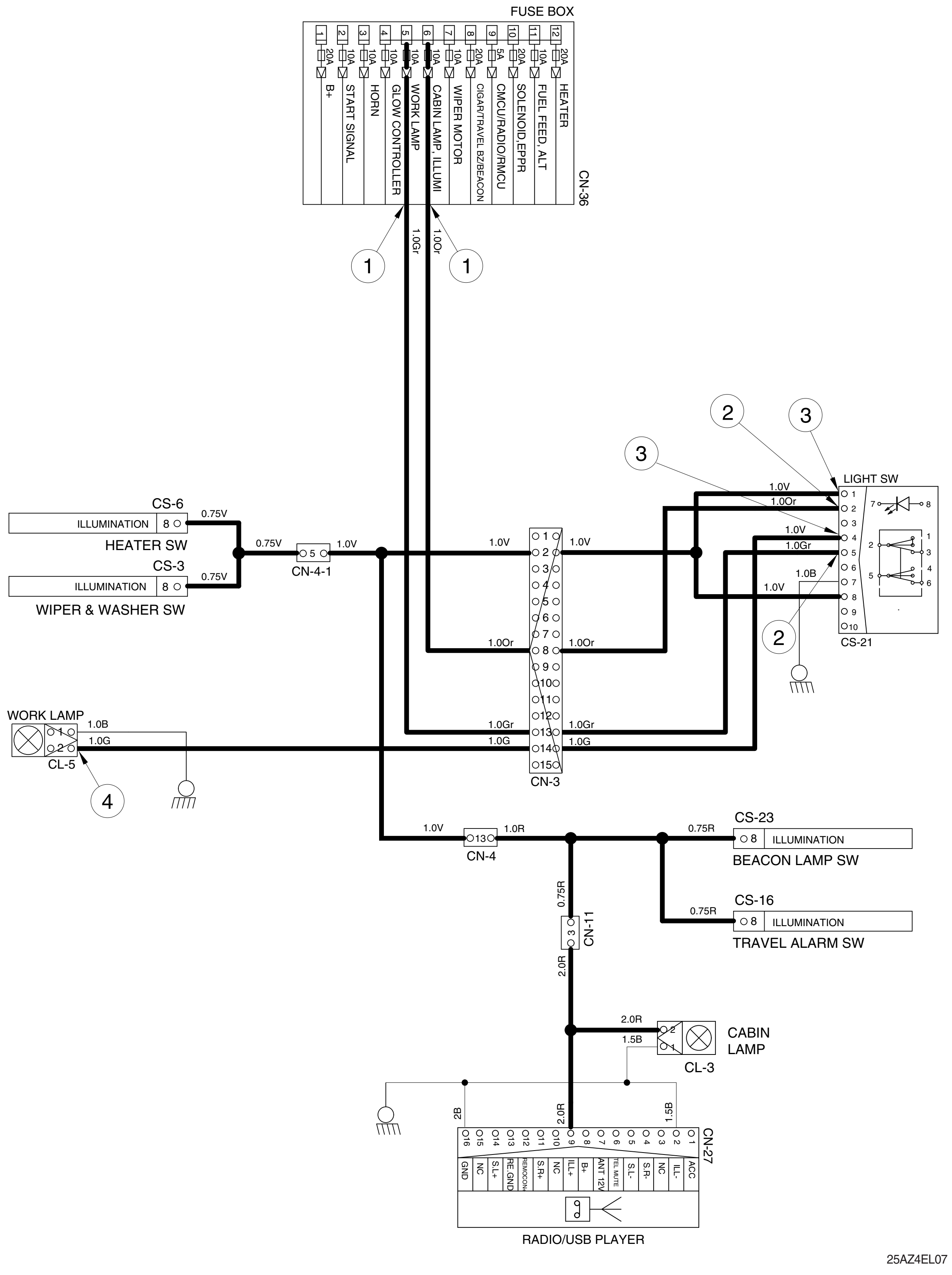
2) CHECK POINT

Engine	Start switch	Check point	Voltage
STOP	ON	① − GND (Fuse box) ② − GND (Switch power input) ③ − GND (Switch power output) ④ − GND (Work light)	10~12.5 V

※ GND : Ground

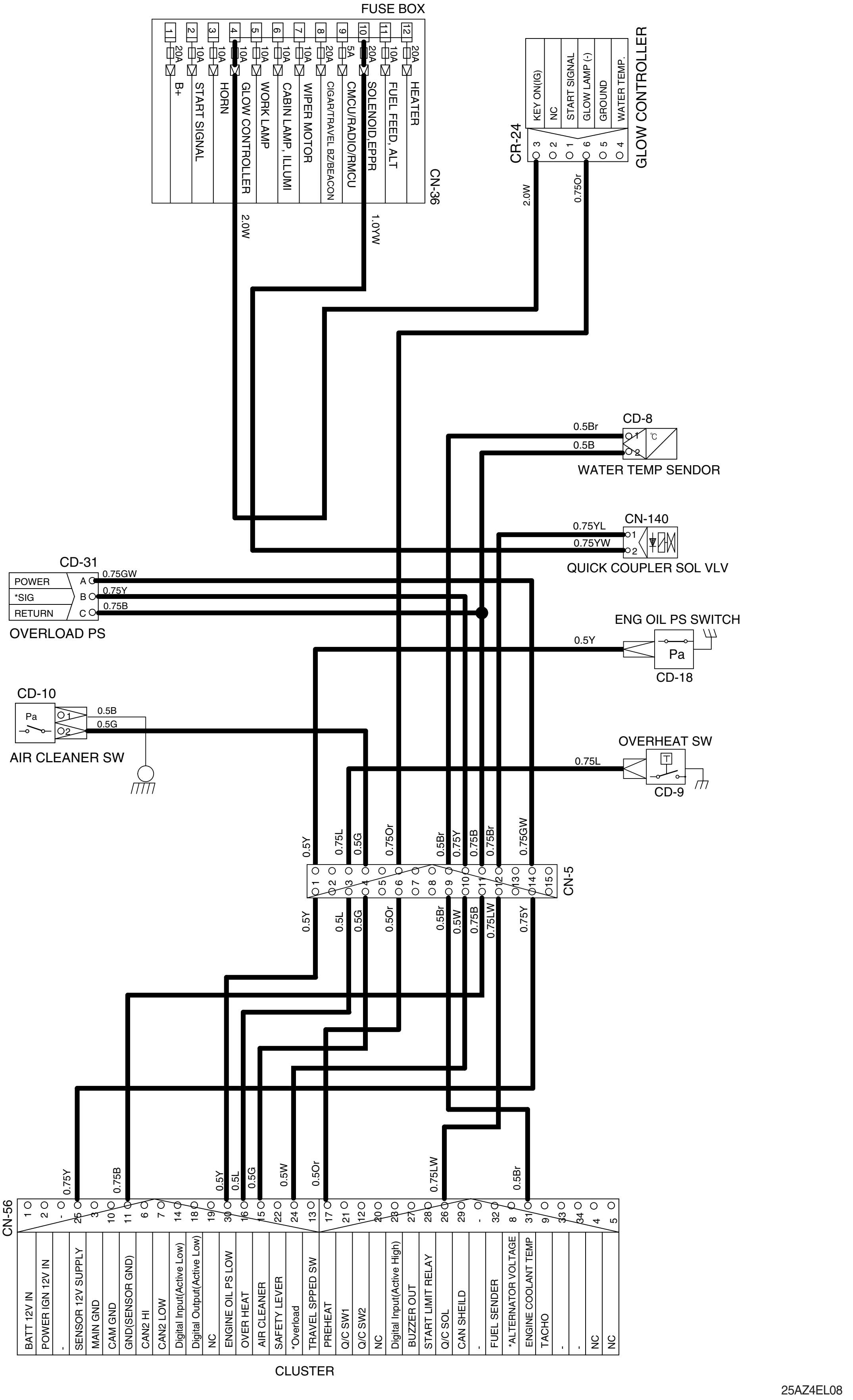
※ The circuit diagram may differ from the equipment, so please check before a repair.

WORK LAMP CIRCUIT



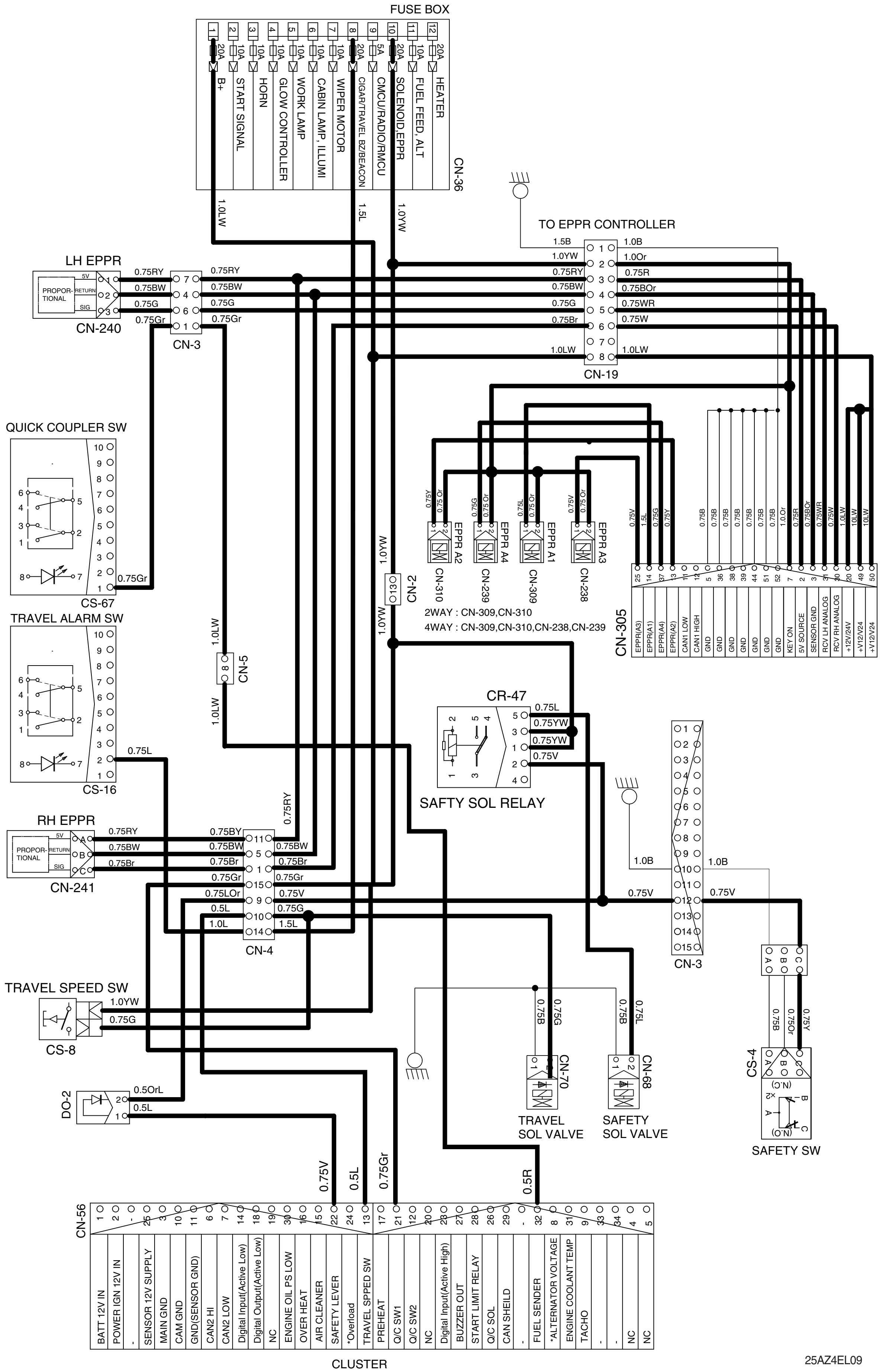
※ The circuit diagram may differ from the equipment, so please check before a repair.

MONITORING CIRCUIT



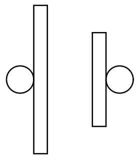
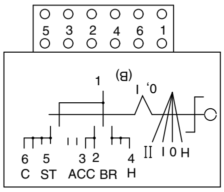
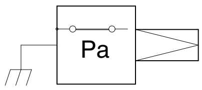
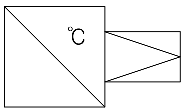
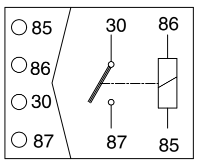
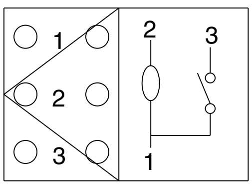
※ The circuit diagram may differ from the equipment, so please check before a repair.

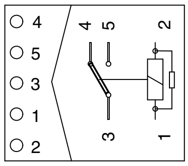
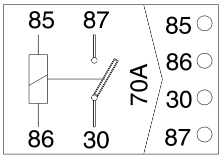
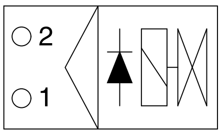
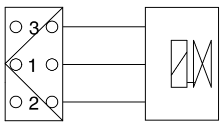
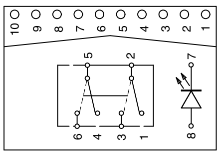
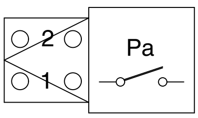
ELECTRIC CIRCUIT FOR HYDRAULIC

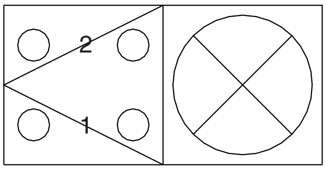
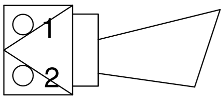
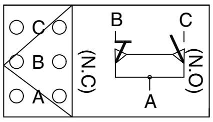
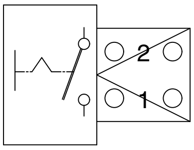
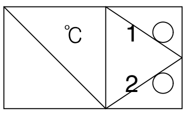
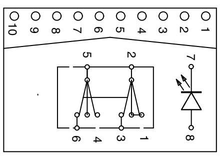


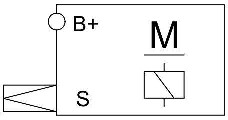
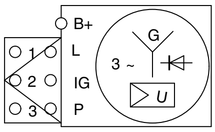
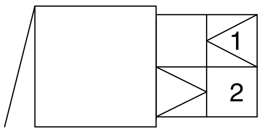
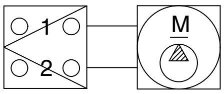
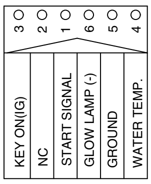
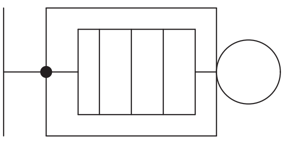
※ The circuit diagram may differ from the equipment, so please check before a repair.

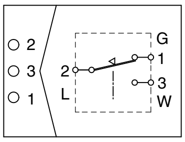
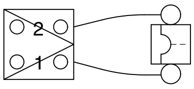
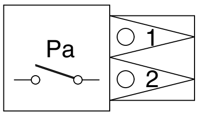
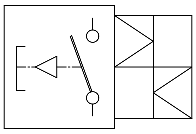
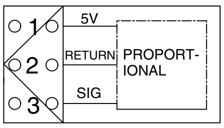
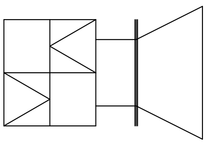
GROUP 4 ELECTRICAL COMPONENT SPECIFICATION

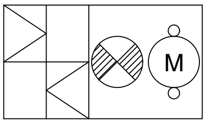
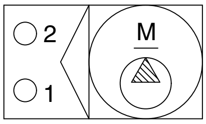
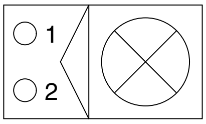
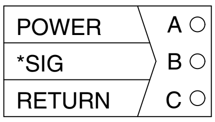
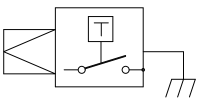
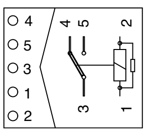
Part name	Symbol	Specification	Check
Battery		12V × 72Ah	※ Check specific gravity 1.280 over : Over charged 1.280 ~ 1.250 : Normal 1.250 below : Recharging
Start switch	 CS-2	12V	※Check contact OFF : ∞Ω (for each terminal) ON : 0Ω (for terminal 1-2) START : 0Ω (for terminal 1-6)
Pressure switch (for engine oil)	 CD-18	0.5 kgf/cm^2 (N.C TYPE)	※ Check resistance Normal : 0Ω (CLOSE)
Water temp sendor	 CD-08A	Pressure: 635 mmH_2O	-
Start relay	 CR-23	12V 60A	※ Rated coil current 1.2±0.3A
Fuel sender	 CD-2	-	※ Check resistance Full : 30Ω Low : 100Ω Empty warning : 200Ω

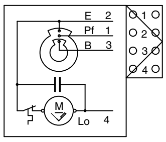
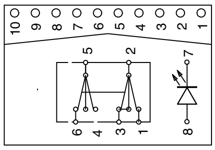
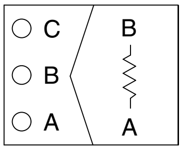
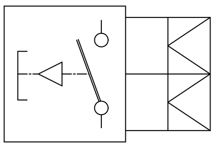
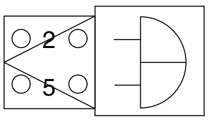
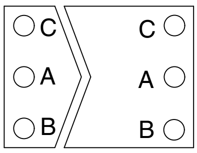
Part name	Symbol	Specification	Check
Horn relay	 CR-2	12V 20A	※ Check resistance Normal : About 200Ω (for terminal 1-3) : 0Ω (for terminal 2-4)
Power relay	 CR-35	12V 70A	※ Rated coil current 1.2±0.3 A
Solenoid valve	 CN-68 CN-70 CN-140 CN-238 CN-239 CN-309 CN-310	12V 1A	※ Check resistance Normal : 15~25Ω (for terminal 1-2)
Solenoid valve (engine stop)	 CN-79	12V	※Coil resistance : 1.8Ω
Switch (looking type)	 CS-16 CS-23 CS-67	12V 16A	※ Check contact Normal OFF - ∞Ω (for terminal 2-1) - 0Ω (for terminal 2-3)
Pressure switch	 CD-11	10bar (N.O type)	※ Check contact Normal : 0.1Ω

Part name	Symbol	Specification	Check
Work lamp	 CL-5	12V 55W (H3 TYPE) 12V LED (opt)	※ Check disconnection Normal : 1.2Ω
Horn	 CN-20	12V 6A	132±5 dB
Safety switch	 CS-4	Micro 12V 15A	※ Check contact Normal : 0Ω Operating : ∞Ω
Horn switch	 CS-5	12V 10A	※ Check contact Normal : 0Ω
Water temp sender	 CD-8	-	※ Check contact 50°C : 0.748~0.904Ω 67°C : 0.538~0.650Ω 102°C : 0.185~0.167Ω 110°C : 0.143~0.130Ω 135°C : 0.076~0.100Ω
Light switch	 CS-21	12V 16A	※Check contact Normal : ∞Ω

Part name	Symbol	Specification	Check
Start motor	 CN-45	12V 1.4kW	※ Check contact Normal : 0.1Ω
Alternator	 CN-74	12V 40A	※ Check contact Normal : 0Ω (For terminal B^+-1) Normal : 10 ~ 12.5V
Travel alarm	 CN-81	12V	-
Fuel feed pump	 CN-145	12V	-
Glow controller	 CR-24	12V	-
Air-heater	 CN-80	12V 42A 500W	-

Part name	Symbol	Specification	Check
Emergency engine stop	 CS-33	12V	-
Maxi fuse	 CN-60	80A	-
Air cleaner switch	 CD-10	12V (N.O type)	-
Travel speed switch	 CS-8	12V	-
EPPR valve	 CN-240 CN-241	12V	-
Speaker	 CN-23 (LH) CN-24 (RH)	4Ω 20W	※Check resistance Normal : 4Ω

Part name	Symbol	Specification	Check
Beacon lamp	 CL-7	12V LED	※ Check disconnection Normal : a few Ω
Washer pump	 CN-22	12V 3.8A	※ Check contact Normal : 3Ω (for terminal 1-2)
Room lamp	 CL-1	12V 10W	※ Check disconnection Normal : a few Ω
Pressure sensor	 CD-31	12V	-
Overheat switch	 CD-9	12V	-
Relay	 CR-47	12V 20A	※ Check resistance Normal : 0Ω (for terminal 1-5) ∞Ω (for terminal 1-3)

Part name	Symbol	Specification	Check
Wiper motor	 CN-21	12V 3A	※ Check contact Normal : 6Ω (for terminal 2-4)
Wiper and washer switch	 CS-3	12V 16A	※ Check disconnection Normal : ∞Ω (for terminal 2-3, 5-6)
Resistor	 RS-A0	3W 120Ω	-
Quick coupler switch 2	 CS-116	12V	-
Cluster buzzer	 CN-26	12V	-
Service tool	 CN-307	-	-

GROUP 5 CONNECTORS

1. CONNECTOR DESTINATION

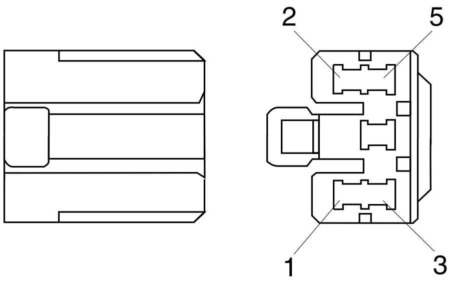
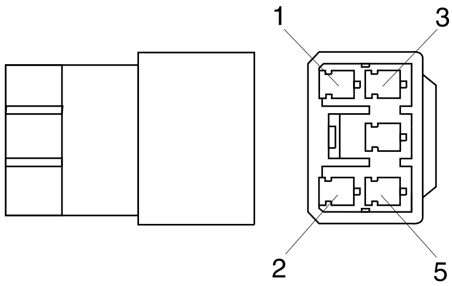
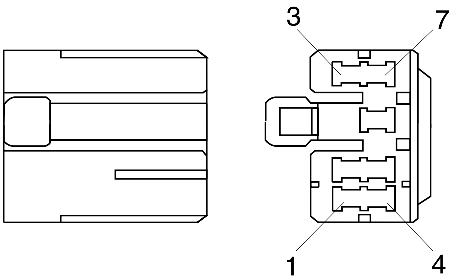
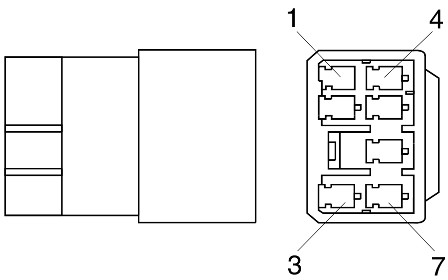
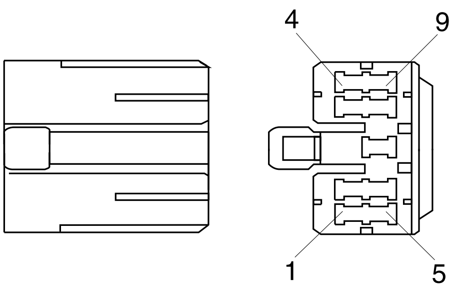
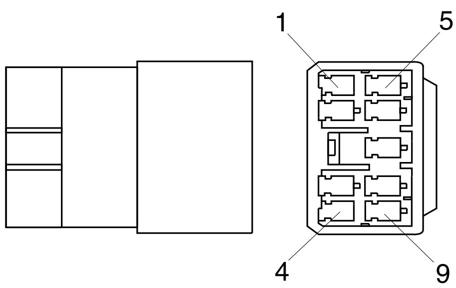
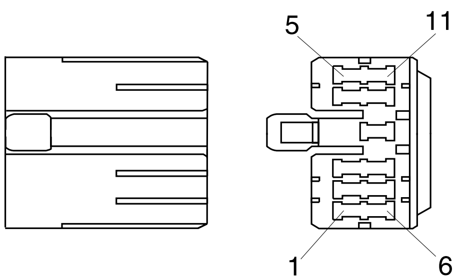
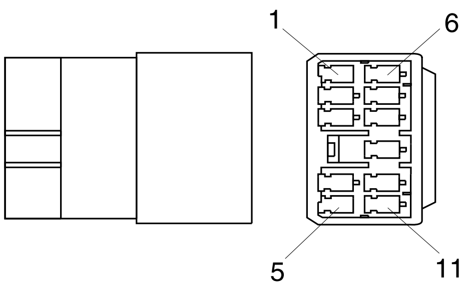
Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
CN-3	AMP	16	I/conn (LH console harness-main harness)	368047-1	368050-1
CN-4	AMP	16	I/conn (RH console harness-main harness)	368047-1	368050-1
CN-4-1	AMP	6	I/conn (Upper harness-washer harness)	174262-2	174264-2
CN-5	AMP	16	I/conn (Main harness-RH console harness)	368047-1	368050-1
CN-10	DEUTSCH	2	Canopy lamp	DT06-2S-EP06	DT04-2P-E005
CN-11	AMP	8	I/conn (RH console harness-cab harness)	174982-2	174984-2
CN-11-1	AMP	2	I/conn (RH console harness-canopy harness)	174352-2	174354-2
CN-19	AMP	8	I/conn (Main harness-PVG controller harness)	174982-2	174984-2
CN-20	DEUTSCH	2	Horn	DT06-2S-EP06	-
CN-21	AMP	4	Wiper moter	180900-0	-
CN-22	KET	2	Washer tank	MG640605	-
CN-23	KET	2	Speaker-LH	MG610070	-
CN-24	KET	2	Speaker-RH	MG610070	-
CN-26	KET	5	Buzzer	MG614354	-
CN-27	-	16	Radio & USB player	PK145-16017	-
CN-36	-	-	Fuse box	F12 890 010	-
CN-45	YAZAKI	1	Start motor	7123-2115	-
CN-45	RINGTERM	1	Start motor B+	ST710285-2	-
CN-46	AMP	4	Heater	180900-0	-
CN-56	AMP	34	CMCU	4-1437290-0	-
CN-60	-	-	Maxi fuse	03.21000	03.01080
CN-68	DEUTSCH	2	Safety solenoid valve	DT06-2S-EP06	-
CN-70	DEUTSCH	2	Travel speed solenoid valve	DT06-2S-EP06	-
CN-74	SUMITOMO	3	Alternator	6189-0443	-
CN-74	KET	1	Alternator B+	S820-306000	-
CN-79	SUMITOMO	2	Engine stop solenoid	6195-0003	-
CN-80	KET	1	Air heater	S820-104000	-
CN-81	KET	2	Travel buzzer	MG610320	-
CN-112	DEUTSCH	2	I/conn (Upper harness-boom harness)	-	DT04-2P
CN-112	DEUTSCH	2	To work lamp	DT06-2S-EP06	-
CN-125	DEUTSCH	12	GPS telematics	DT06-12S	DT06-12P
CN-126	AMP	10	Service tool	174655-2	174657-2
CN-139	AMP	2	12V socket	172434-2	-
CN-140	DEUTSCH	2	Quick coupler solenoid valve	DT06-2S-EP06	DT04-2P-E005
CN-145	TE	2	Fuel feed pump	174198-1	-

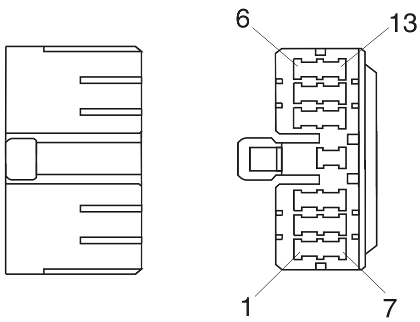
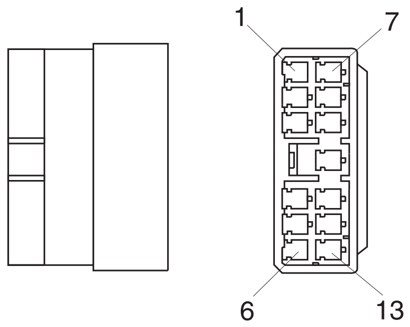
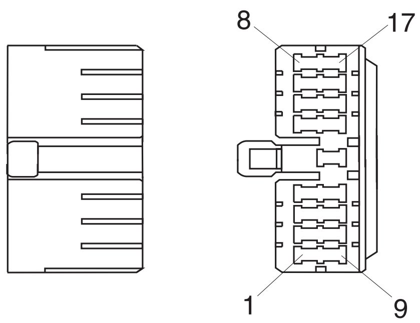
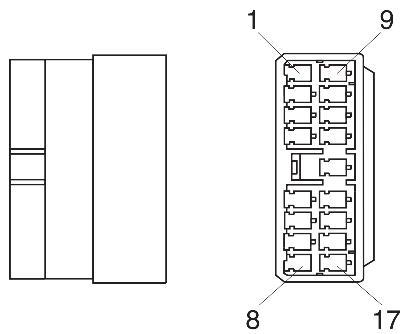
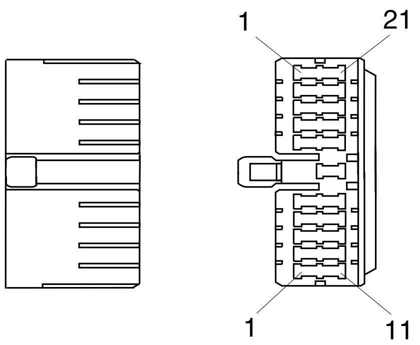
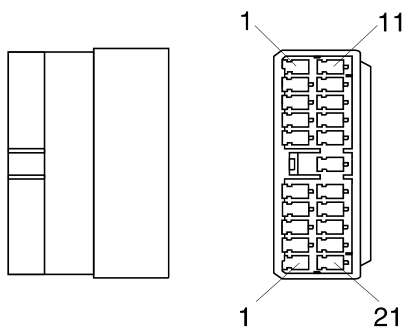
Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
CN-238	DEUTSCH	2	EPPR A3	DT06-2S	DT04-2P
CN-239	DEUTSCH	2	EPPR A1	DT06-2S	DT04-2P
CN-240	DEUTSCH	3	EPPR-LH	DT06-3S	DT04-3P
CN-241	DEUTSCH	3	EPPR-RH	DT06-3S	DT04-3P
CN-264	DEUTSCH	2	Extention valve	DT06-2S	DT06-2P
CN-305	REXROTH	56	EPPR controller	1-928-405-161	-
CN-307	DEUTSCH	3	Service tool	DT06-3S	DT04-3P
CN-309	DEUTSCH	2	EPPR A1	DT06-2S	-
CN-310	DEUTSCH	2	EPPR A2	DT06-2S	-
LAMP					
CL-1	KET	2	Room lamp	MG610392	-
CL-3	DEUTSCH	2	Cab lamp	DT06-2S	-
CL-5	KET	2	Boom lamp	DT06-2S-EP06	-
CL-7	DEUTSCH	2	Beacon lamp	DT06-2S-EP06	-
RELAY					
CR-2	AMP	5	Horn relay	VCFM-1002	-
CR-23	KET	4	Start relay	MG612017-5	-
CR-24	SUMITOMO	6	Glow controller relay	6195-0021	-
CR-35	KET	4	Power relay	MG612017-5	-
CR-36	SUMITOMO	2	Glow controller	6195-0060	-
CR-47	AMP	5	Safety solenoid relay	VCFM-1002	-
SENSOR					
CD-2	AMP	2	Fuel sender	174357-2	-
CD-8	AMP	2	Water temp sender	174374-3	-
CD-08A	AMP	1	Water temp sender	171809-2	-
CD-9	AMP	1	Overheat switch	172320-2	-
CD-11	KET	2	Travel alarm pressure switch	MG640795	-
CD-18	KET	1	Engine oil pressure switch	S820-104000	-
CD-31	DEUTSCH	3	Overload pressure switch	DT06-3S-EP06	DT04-3P
DO-01	-	2	Diode	21EA-50550	-
DO-02	-	2	Diode	21EA-50550	-
SWITCH					
CS-2	KET	6	Start switch	MG610335	-
CS-3	CARLING	10	Wiper & washer switch	21HN-56300	-
CS-4	DEUTSCH	3	Safety switch	DT06-3S	-
CS-5	DEUTSCH	2	Horn switch	-	DT04-2P
CS-6	CARLING	10	Heater switch	21HN-56300	-
CS-8	KET	1	Travel speed switch	S822-014000	S822-114000

Connector number	Type	No. of pin	Destination	Connector part No.	
				Female	Male
CS-16	CARLING	10	Travel alarm switch	21HN-56300	-
CS-21	CARLING	10	Light switch	VC2-01	-
CS-23	CARLING	10	Beacon switch	21HN-56300	-
CS-33	TE	6	Emergency engine stop switch	174262-2	-
CS-67	CARLING	10	Quick coupler switch 1	VC2-01	-
CS-74S	KET	1	Master switch-S	S820-306000	-
CS-74L	KET	1	Master switch-L	ST710287-2	-
CS-116	-	1	Quick coupler sw 2	-	CA104

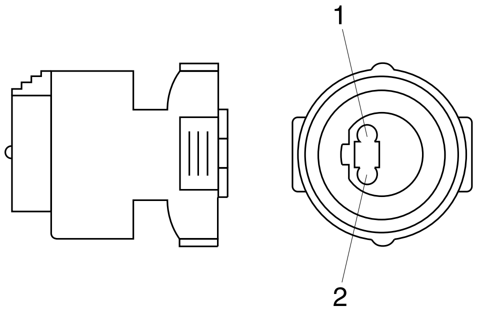
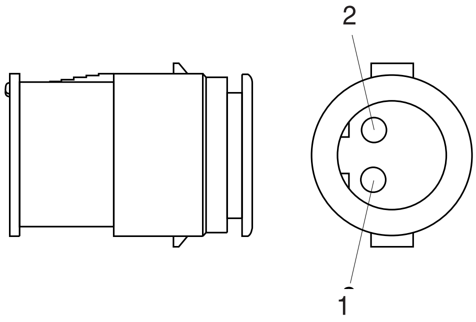
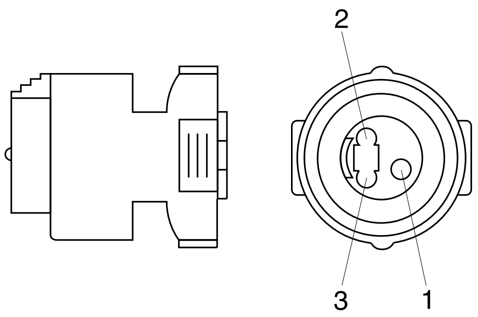
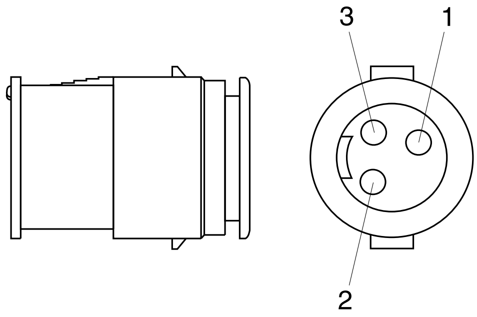
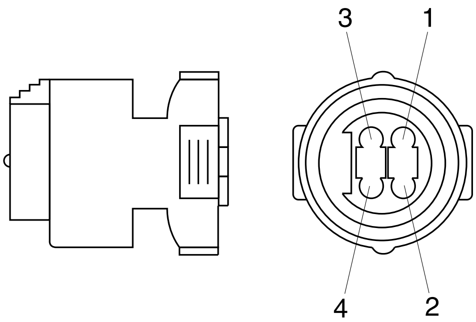
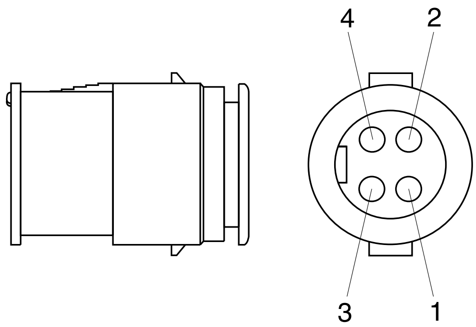
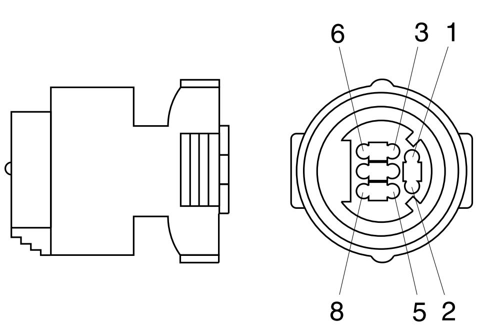
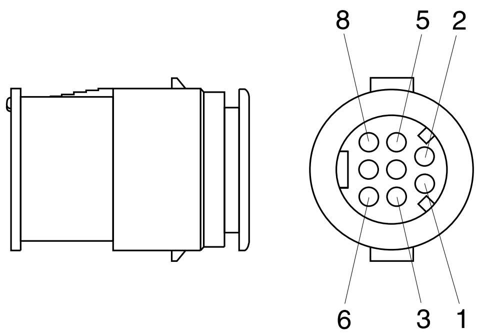
2. CONNECTION TABLE FOR CONNECTORS

1) PA TYPE CONNECTOR

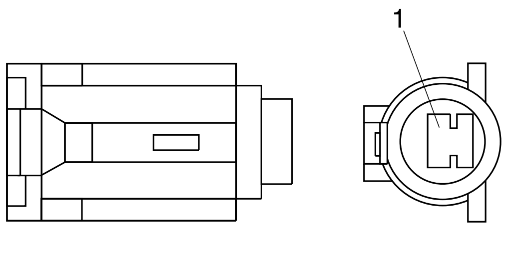
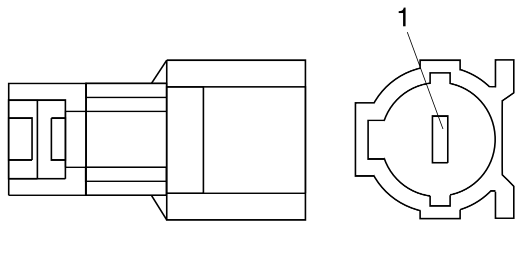
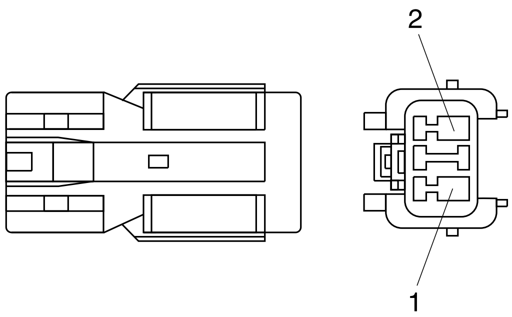
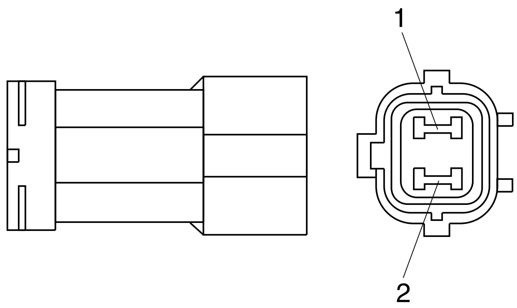
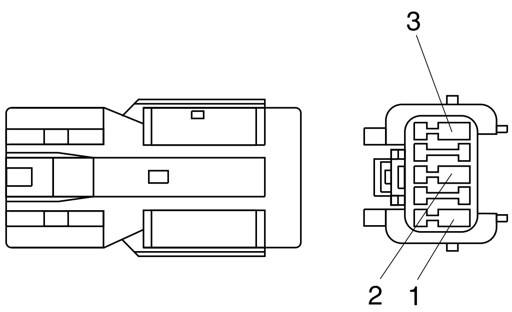
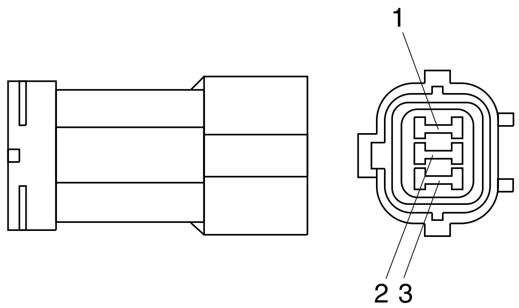
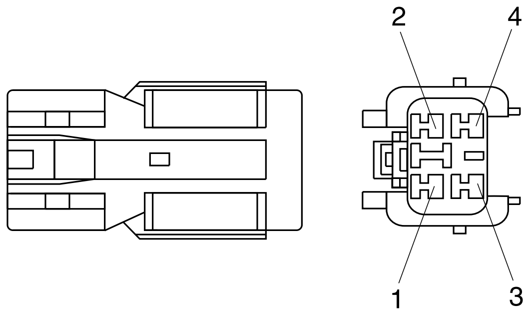
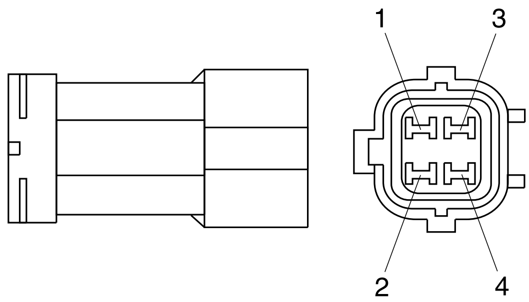
No. of pin	Receptacle connector (female)	Plug connector (male)
5	 S811-005002	 S811-105002
7	 S811-007002	 S811-107002
9	 S811-009002	 3S811-109002
11	 S811-011002	 S811-111002

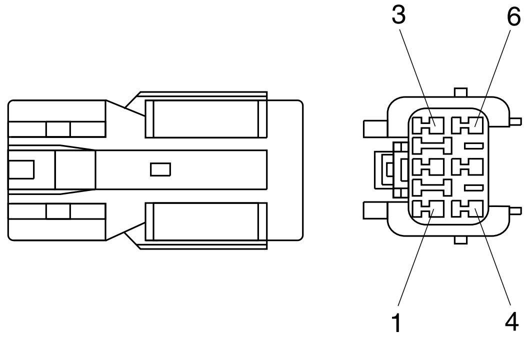
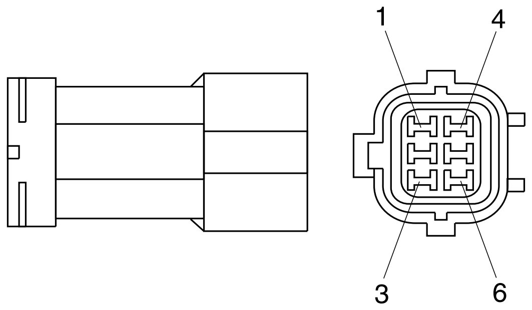
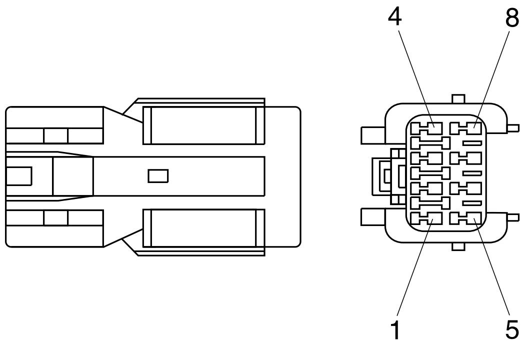
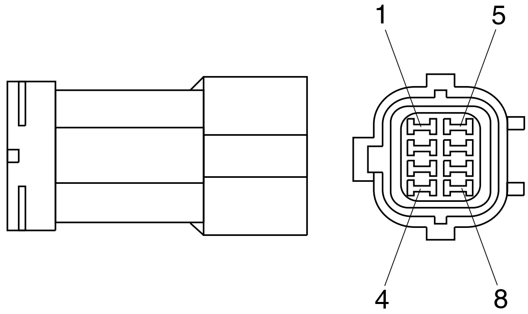
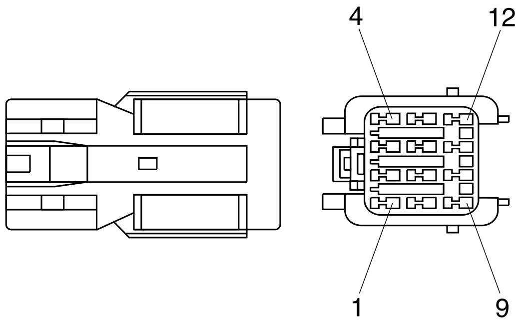
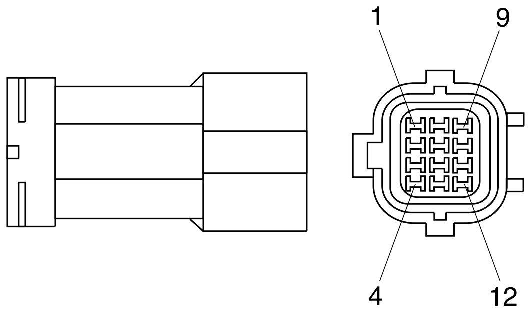
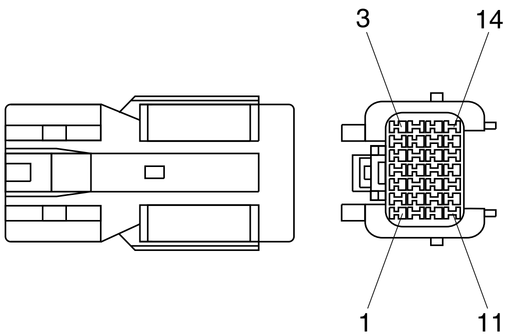
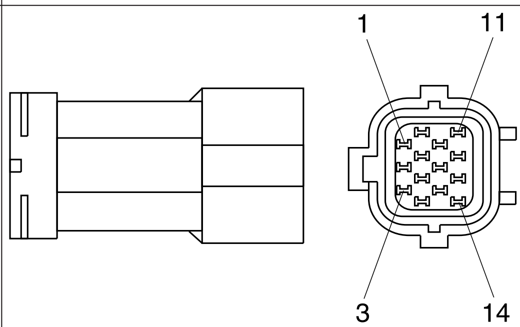
No. of pin	Receptacle connector (female)	Plug connector (male)
13	 S811-013002	 S811-113002
17	 S811-017002	 S811-117002
21	 S811-021002	 S811-121002

2) J TYPE CONNECTOR

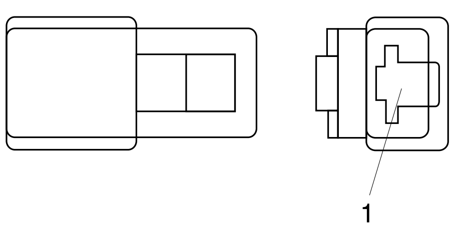
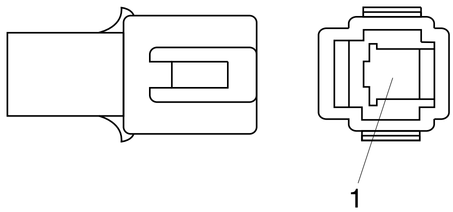
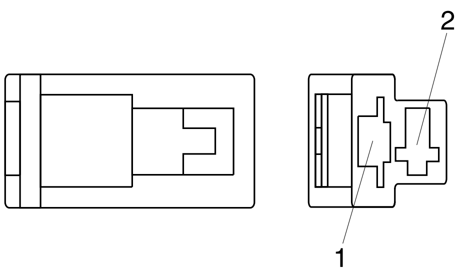
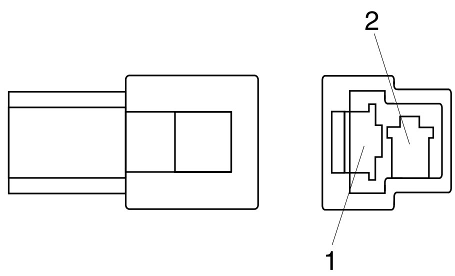
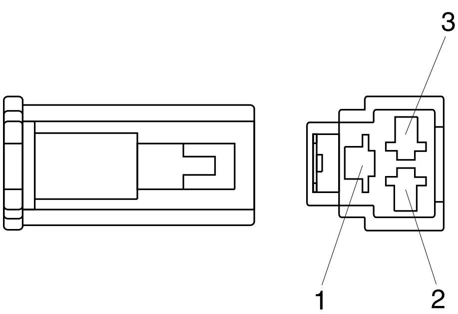
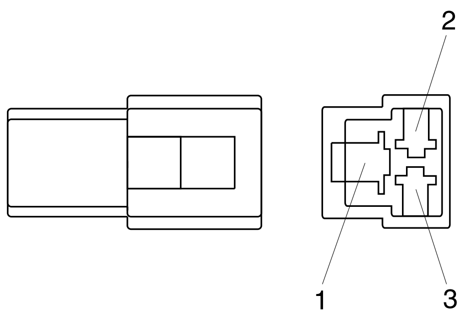
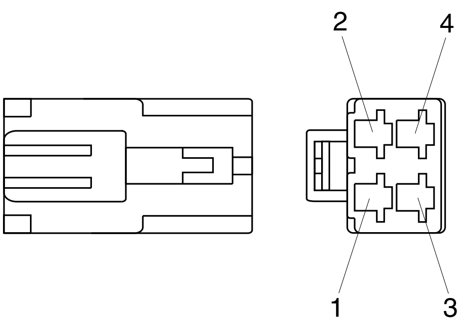
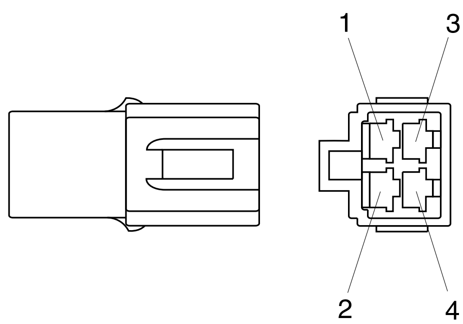
No. of pin	Receptacle connector (female)	Plug connector (male)
2	 S816-002001	 S816-102001
3	 S816-003001	 S816-103001
4	 S816-004001	 S816-104001
8	 S816-008001	 S816-108001

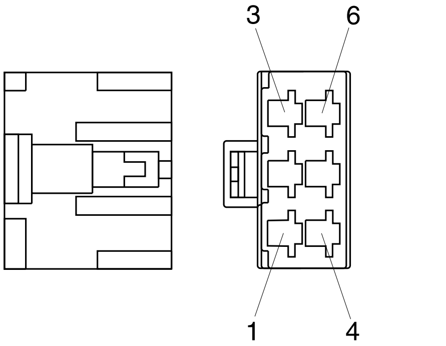
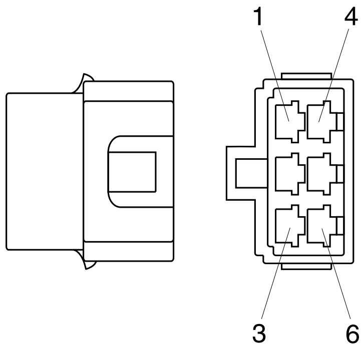
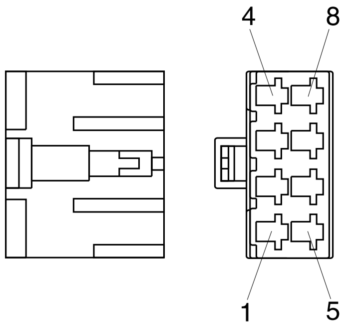
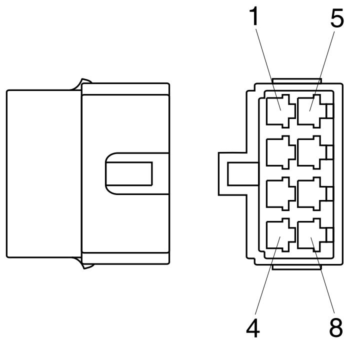
3) SWP TYPE CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
1	 S814-001000	 S814-101000
2	 S814-002000	 S814-102000
3	 S814-003000	 S814-103000
4	 S814-004000	 S814-104000

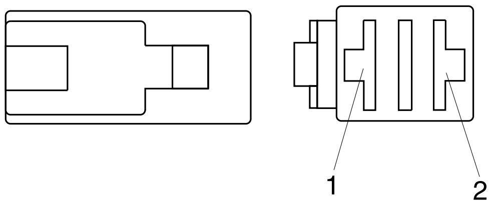
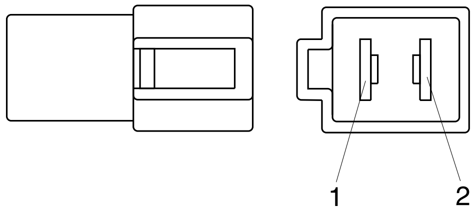
No. of pin	Receptacle connector (female)	Plug connector (male)
6	 S814-006000	 S814-106000
8	 S814-008000	 S814-108000
12	 S814-012000	 S814-112000
14	 S814-014000	 S814-114000

4) CN TYPE CONNECTOR

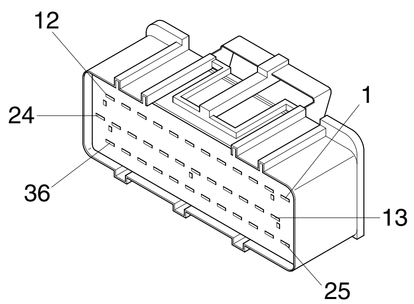
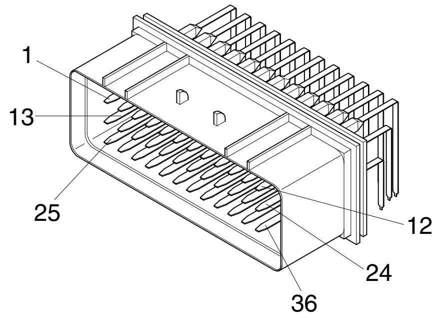
No. of pin	Receptacle connector (female)	Plug connector (male)
1	 S810-001202	 S810-101202
2	 S810-002202	 S810-102202
3	 S810-003202	 S810-103202
4	 S810-004202	 S810-104202

No. of pin	Receptacle connector (female)	Plug connector (male)
6	 S810-006202	 S810-106202
8	 S810-008202	 S810-108202

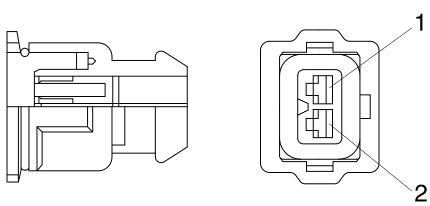
5) 375 FASTEN TYPE CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
2	 S810-002402	 S810-102402

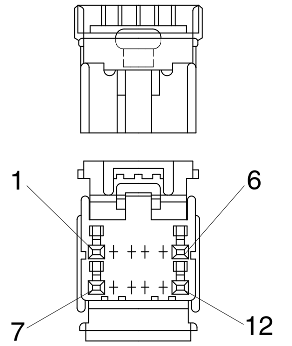
6) AMP ECONOSEAL CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
36	 344111-1	 344108-1

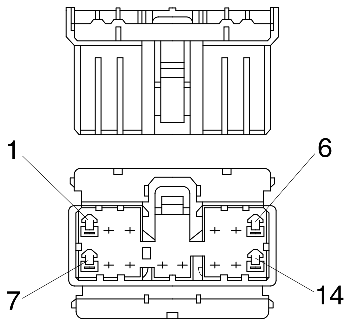
7) AMP TIMER CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
2	 85202-1	

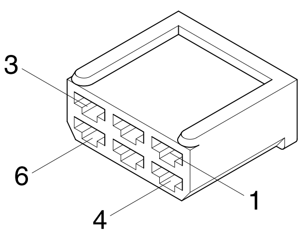
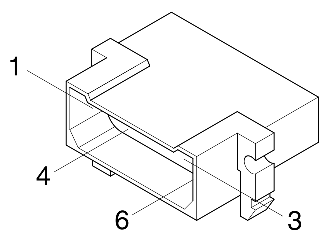
8) AMP 040 MULTILOCK CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
12	 174045-2	

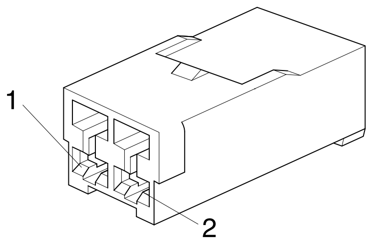
9) AMP 070 MULTILOCK CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
14	 173852	

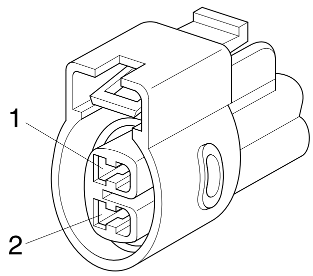
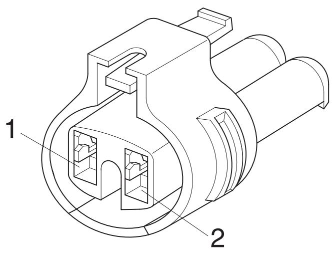
10) AMP FASTIN - FASTON CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
6	 925276-0	 480003-9

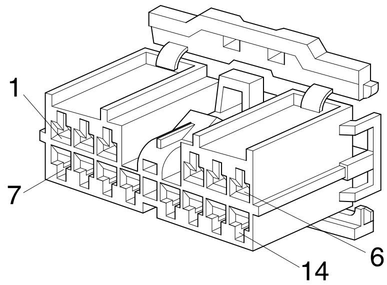
11) KET 090 CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
2	 MG610070	

12) KET 090 WP CONNECTORS

No. of pin	Receptacle connector (female)	Plug connector (male)
2	 MG640605	
2	 MG640795	

13) KET SDL CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
14	 MG610406	

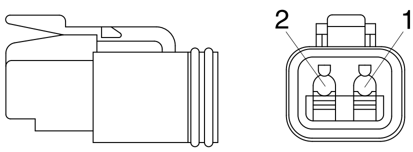
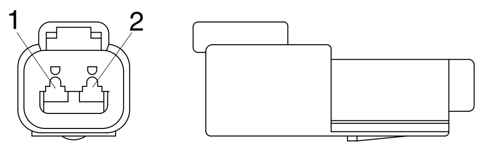
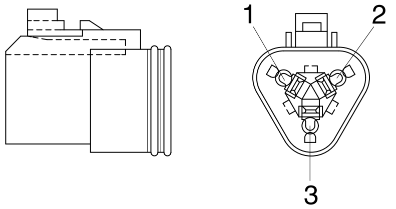
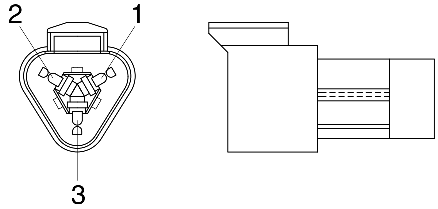
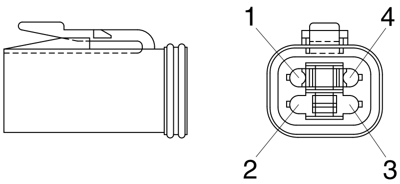
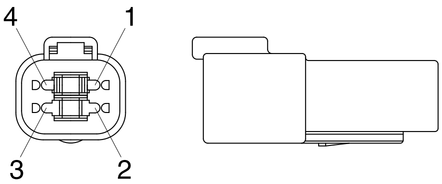
14) DEUTSCH DT CONNECTORS

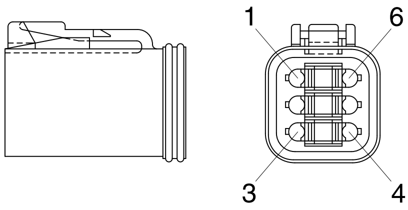
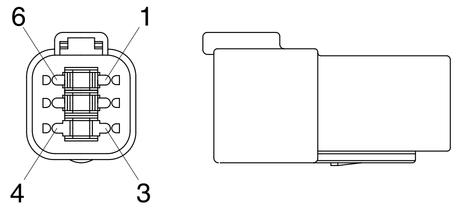
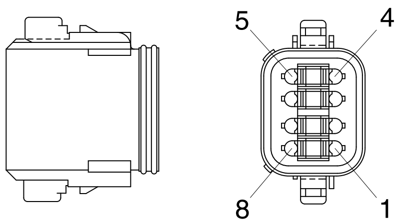
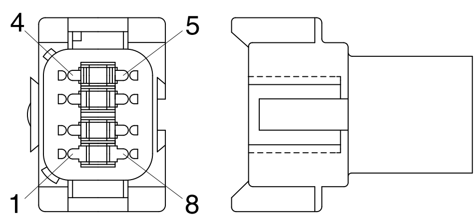
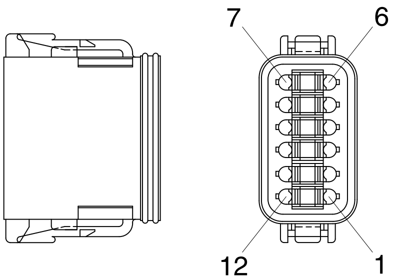
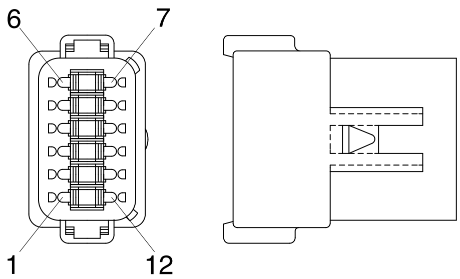
DT 06 - 3S - ★★★★

- ★★★★ — Modifications (See below)
- 3S — Number of contacts (P : Pin, S : Socket)
- 06 — 06 : Receptacle, 04 : Plug
- DT — Deutsch connectors

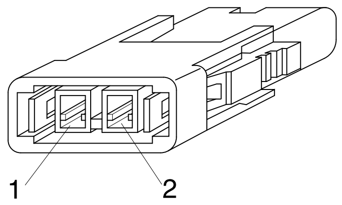
※ Modification

E003 : Standard end cap - gray
E004 : Color of connector to be black
E005 : Combination - E004 & E003
EP04 : End cap
EP06 : Combination P012 & EP04
P012 : Front seal enhancement - connectors color to black for 2, 3, 4 & 6pin

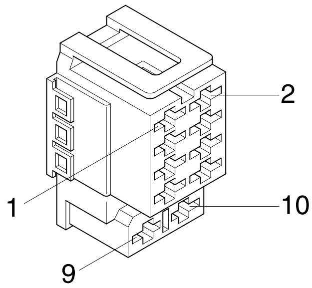
No. of pin	Receptacle connector (female)	Plug connector (male)
2	 DT06-2S	 DT04-2P
3	 DT06-3S	 DT04-3P
4	 DT06-4S	 DT04-4P

No. of pin	Receptacle connector (female)	Plug connector (male)
6	 DT06-6S	 DT04-6P
8	 DT06-8S	 DT04-8P
12	 DT06-12S	 DT04-12P

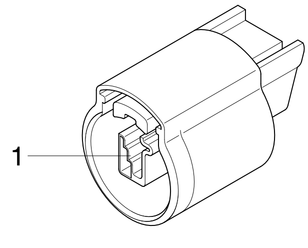
15) MOLEX 2CKTS CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
2	 35215-0200	

16) ITT SWF CONNECTOR

No. of pin	Receptacle connector (female)	Plug connector (male)
10	 SWF593757	

17) MWP NMWP CONNECTOR

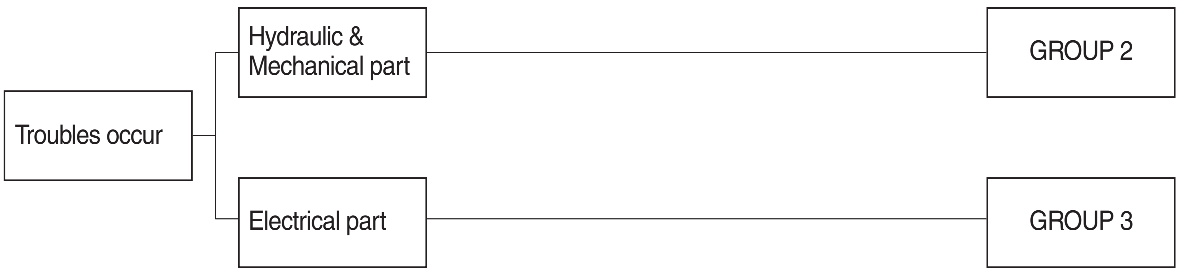
No. of pin	Receptacle connector (female)	Plug connector (male)
1	 NMWP01F-B	

SECTION 5 TROUBLESHOOTING

GROUP 1 BEFORE TROUBLESHOOTING

1. INTRODUCTION

When a trouble is occurred in the machine, this section will help an operator to maintain the machine with easy.
The trouble of machine is parted Hydraulic & Mechanical system and Electrical system.
At each system part, an operator can check the machine according to the troubleshooting process diagram.

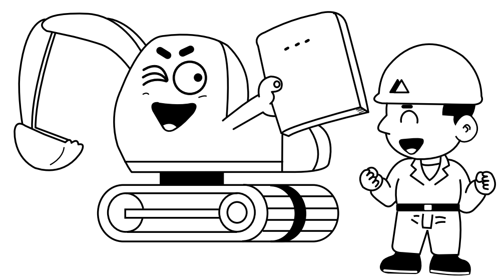


2. DIAGNOSING PROCEDURE

To carry out troubleshooting efficiently, the following steps must be observed.

STEP 1. Study the machine system

Study and know how the machine is operating, how the system is composing, what kinds of function are installed in the machine and what are specifications of the system components by the machine service manual.
Especially, deepen the knowledge for the related parts of the trouble.

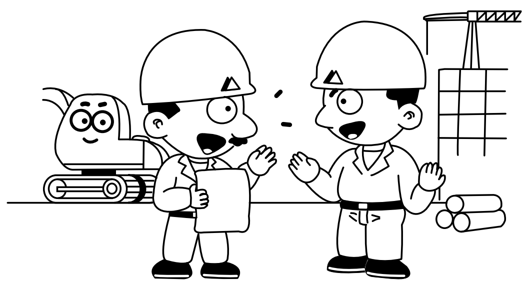


13031SH02

STEP 2. Ask the operator

Before inspecting, get the full story of malfunctions from a witness --- the operator.

1) How the machine is used and when it is serviced?
2) When the trouble was noticed and what work the machine was doing at that time?
3) What is the phenomenon of the trouble? Was the trouble getting worse, or did it come out suddenly for the first time?
4) Did the machine have any troubles previously? If so, which parts were repaired before.

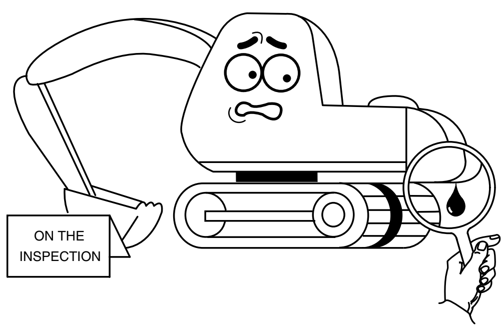


13031SH03

STEP 3. Inspect the machine

Before starting troubleshooting, check the machine for the daily maintenance points as shown in the operator's manual.

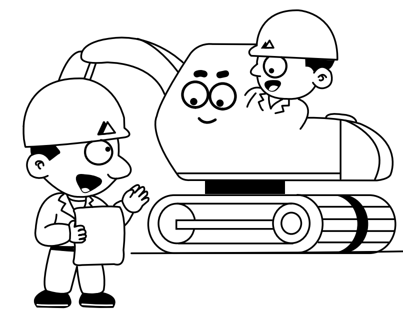
And also check the electrical system including batteries, as the troubles in the electrical system such as low battery voltage, loose connections and blown out fuses will result in malfunction of the controllers causing total operational failures of the machine.



6-2(3) 140-7

STEP 4. Inspect the trouble actually on the machine

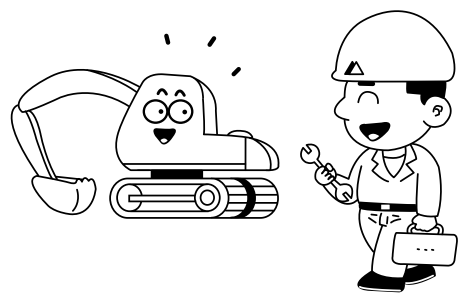
In case that some trouble cannot be confirmed, obtain the details of the malfunction from the operator.
Also, check if there are any in complete connections of the wire harnesses are or not.



6-3(1) 140-7

STEP 5. Perform troubleshooting

According to where the trouble parts are located, hydraulic & mechanical system part or electrical system part or mechatronics system part, perform troubleshooting the machine refer to the each system part's troubleshooting process diagram.

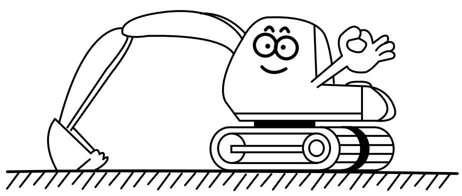


13031SH05

STEP 6. Trace a cause

Before reaching a conclusion, check the most suspectible causes again. Try to trace what the real cause of the trouble is.

Make a plan of the appropriate repairing procedure to avoid consequential malfunctions.



6-3(3) 140-7

GROUP 2 HYDRAULIC AND MECHANICAL SYSTEM

1. INTRODUCTION

1) MACHINE IN GENERAL

(1) If even a minor fault is left intact and operation is continued, a fatal failure may be caused, entailing a large sum of expenses and long hours of restoration.
Therefore when even a small trouble occurs, do not rely on your intuition and experience, but look for the cause based on the troubleshooting principle and perform maintenance and adjustment to prevent major failure from occurring. Keep in mind that a fault results from a combination of different causes.

(2) The following lists up commonly occurring faults and possible causes with this machine. For the troubleshooting of the engine, refer to the coming troubleshooting and repair.

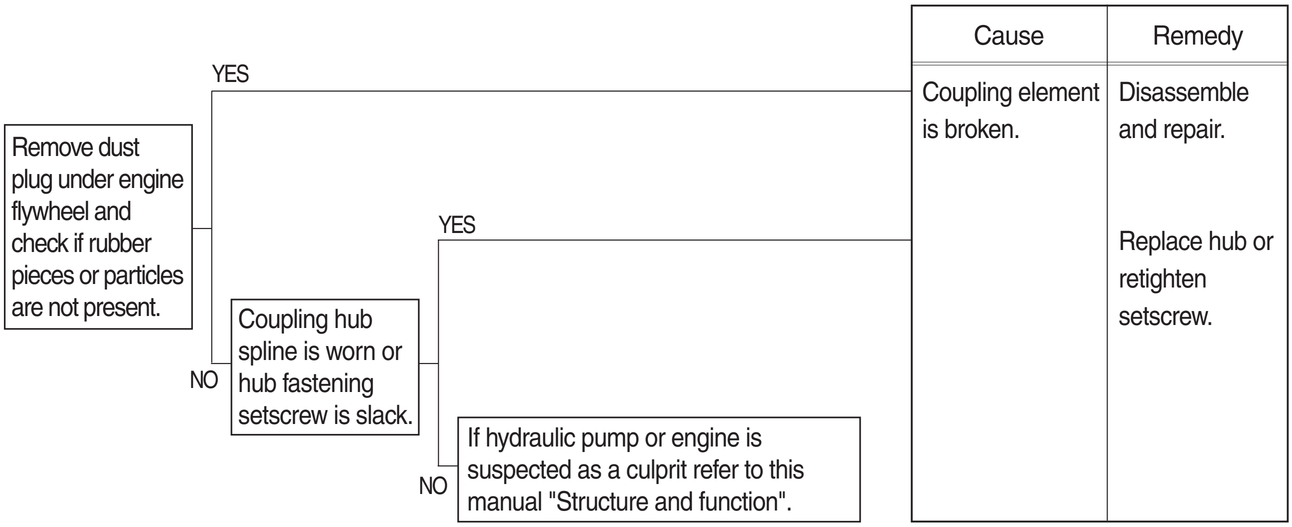
(3) When carrying out troubleshooting, do not hurry to disassemble the components.
It will become impossible to find the cause of the problem.

(4) Ask user or operator the following.
① Was there any strange thing about machine before failure occurred?
② Under what conditions did the failure occur?
③ Have any repairs been carried out before the failure?

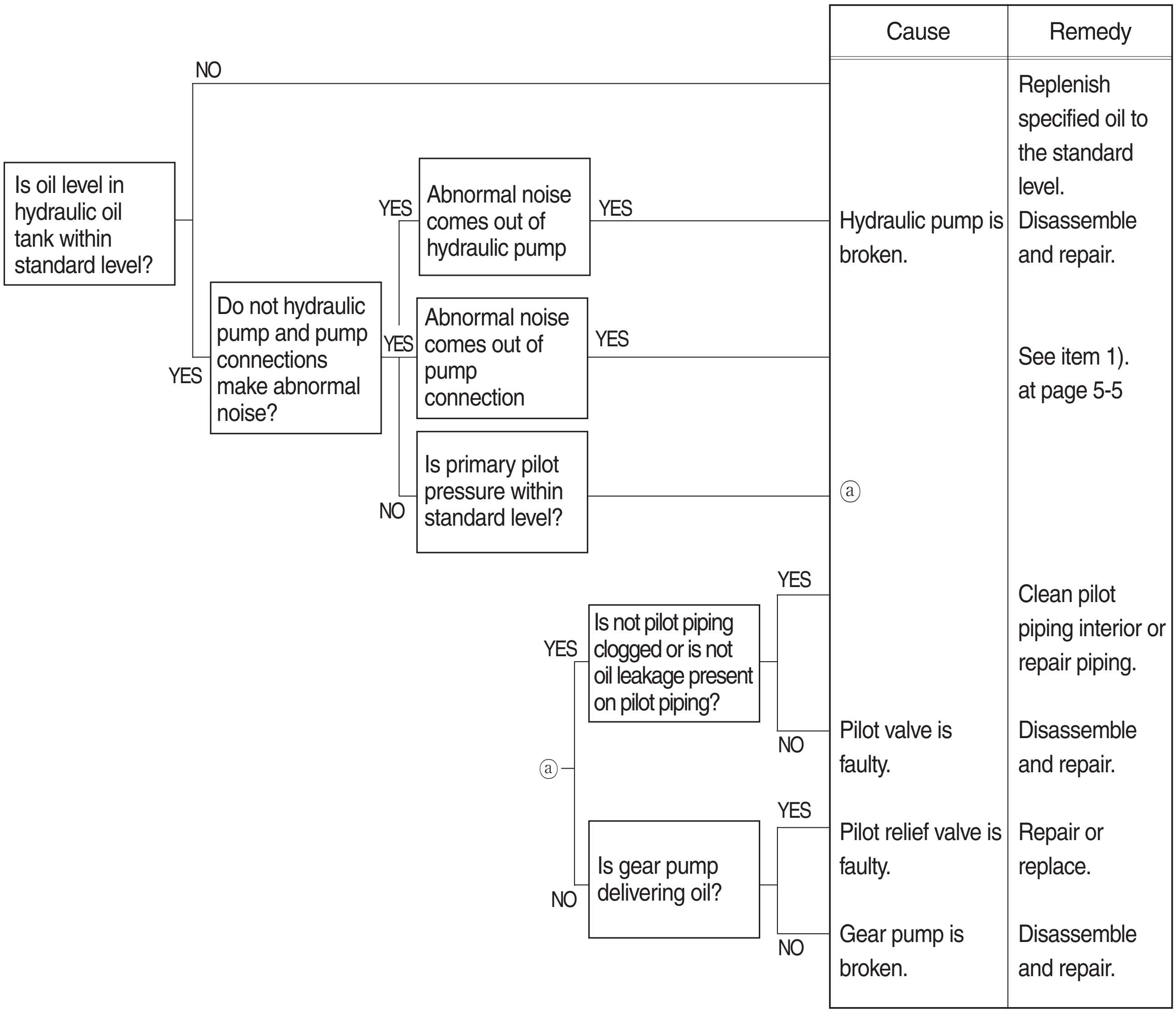
(5) Check before troubleshooting.
① Check oil and fuel level.
② Check for any external leakage of oil from components.
③ Check for loose or damage of wiring and connections.

2. DRIVE SYSTEM

1) UNUSUAL NOISE COMES OUT OF PUMP CONNECTION



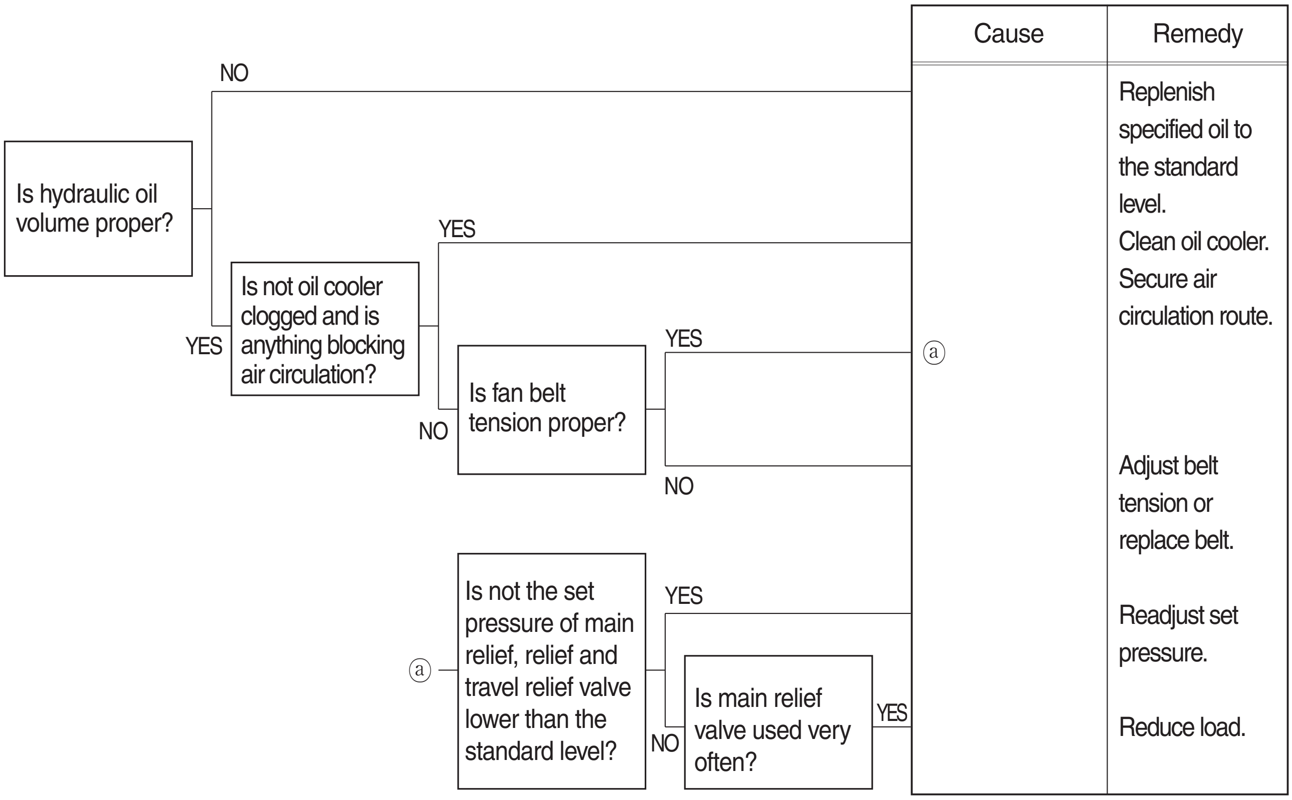
2) ENGINE STARTS BUT MACHINE DOES NOT OPERATE AT ALL



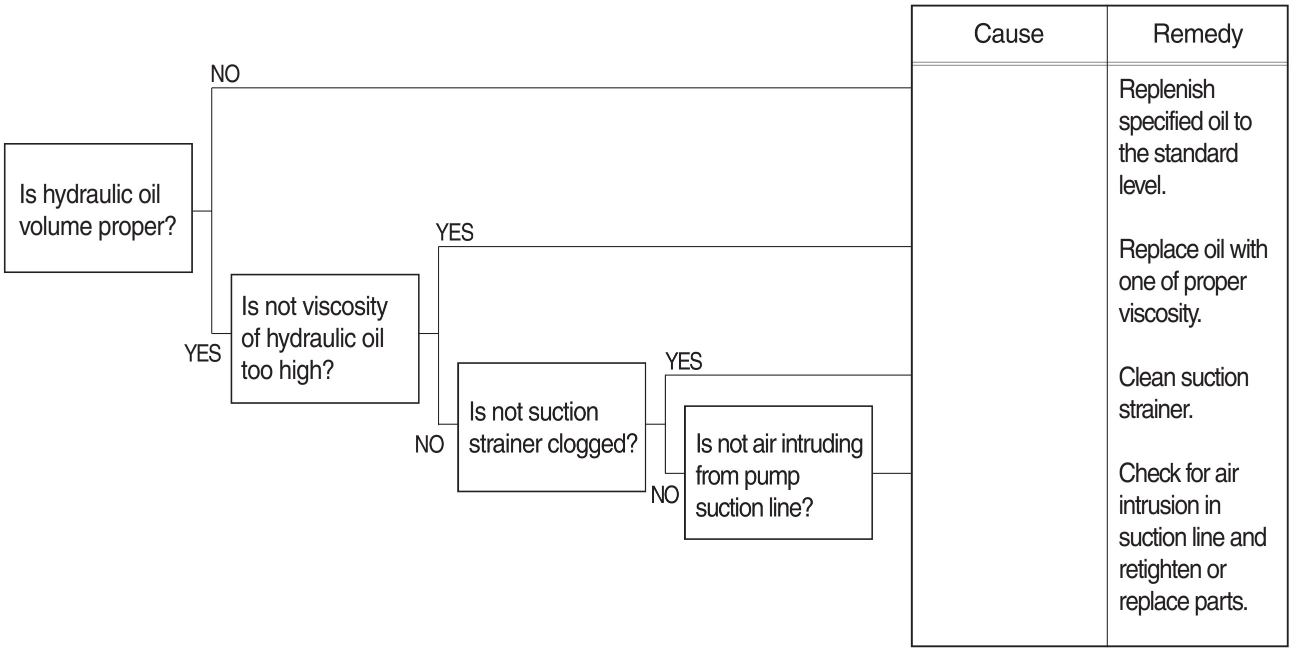
3. HYDRAULIC SYSTEM

1) HYDRAULIC OIL IS CLOUDY

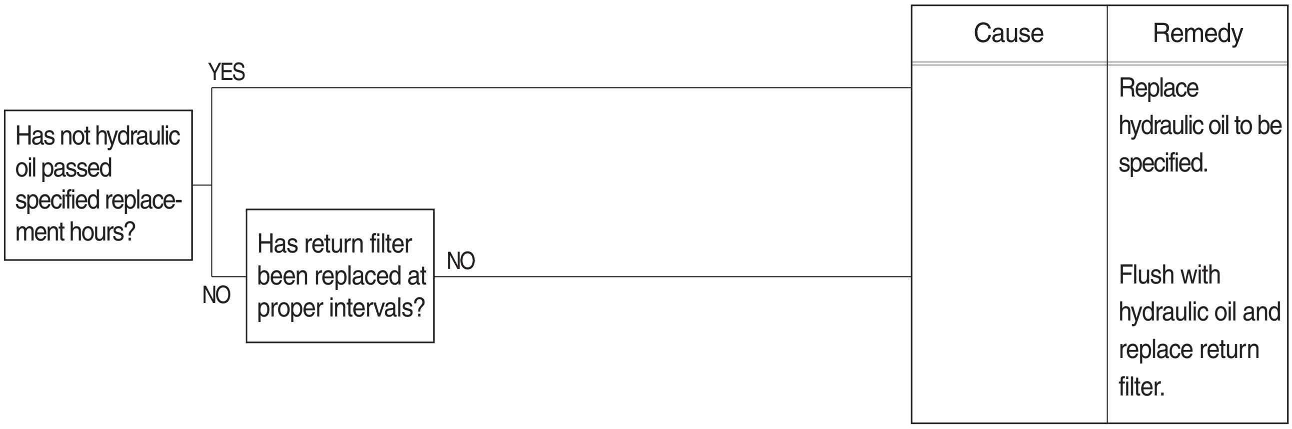
2) HYDRAULIC OIL TEMPERATURE HAS RISEN ABNORMALLY



3) CAVITATION OCCURS WITH PUMP

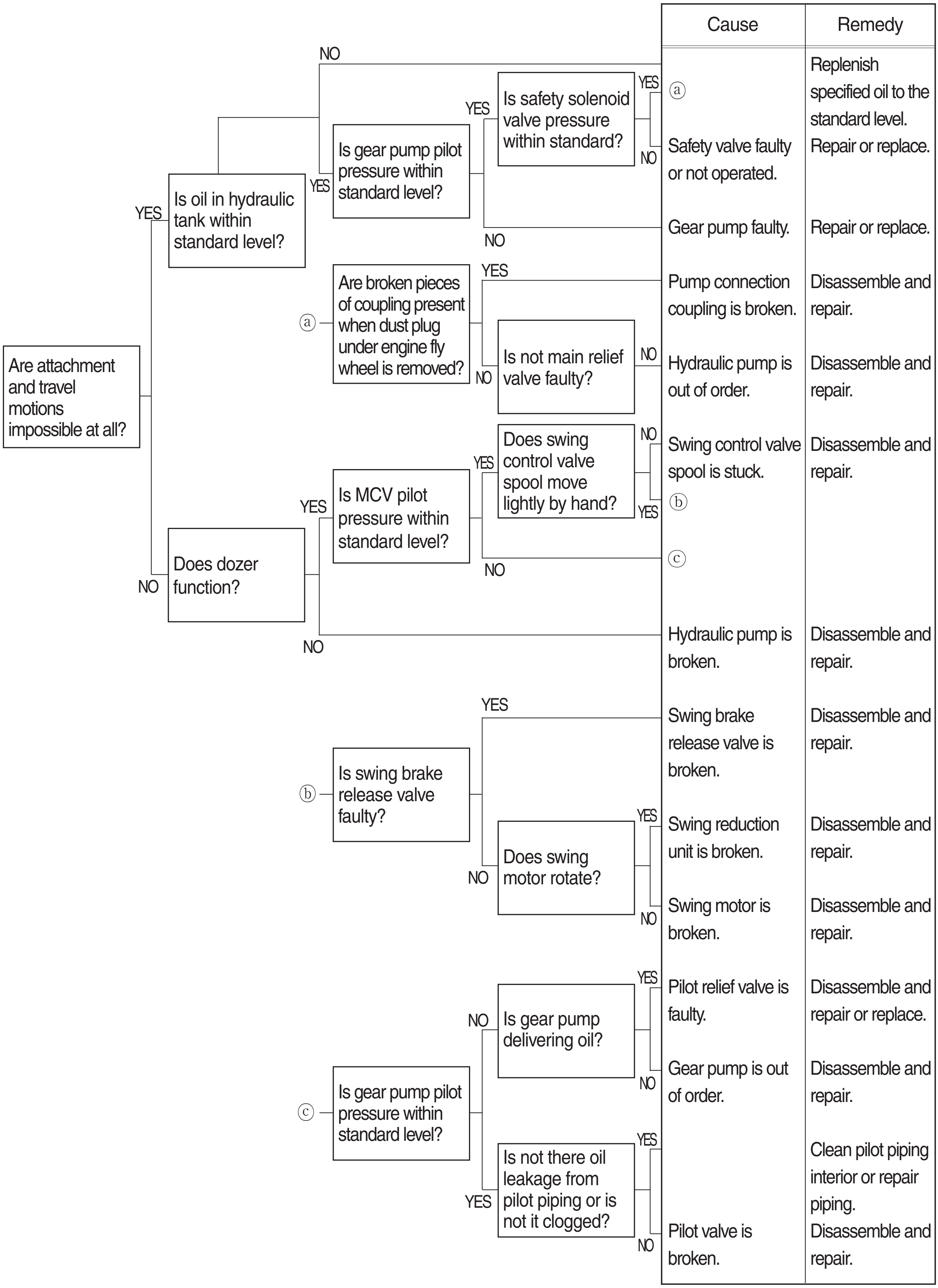


4) HYDRAULIC OIL IS CONTAMINATED

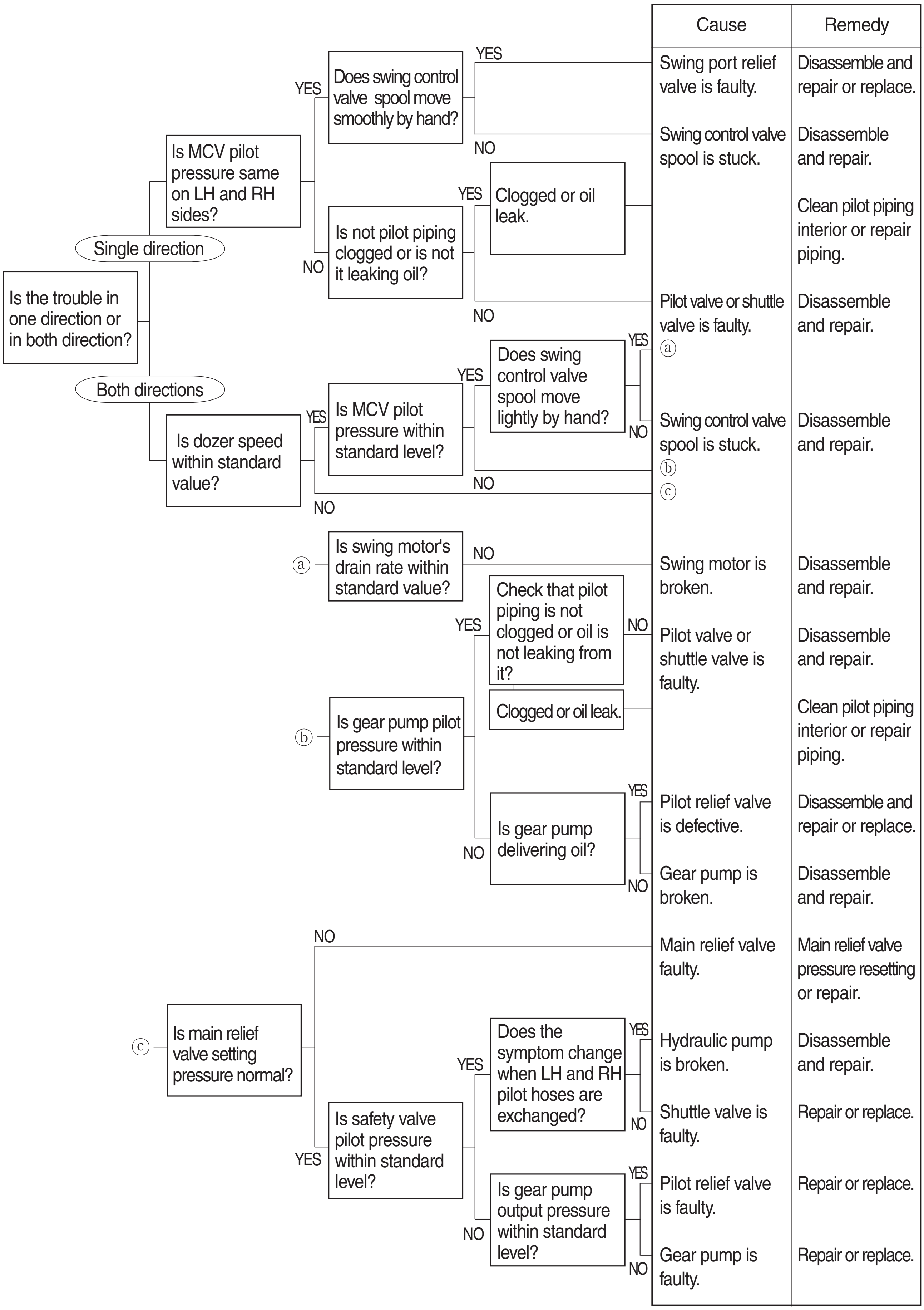


4. SWING SYSTEM

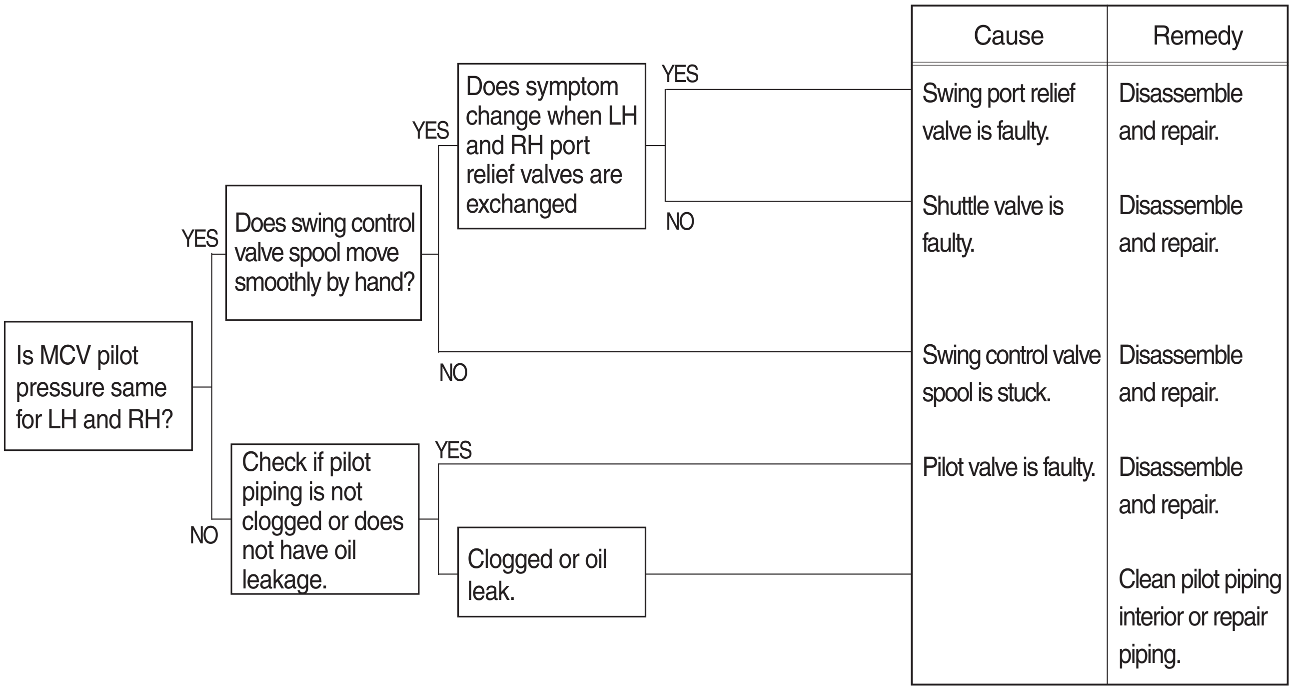
1) BOTH LH AND RH SWING ACTIONS ARE IMPOSSIBLE



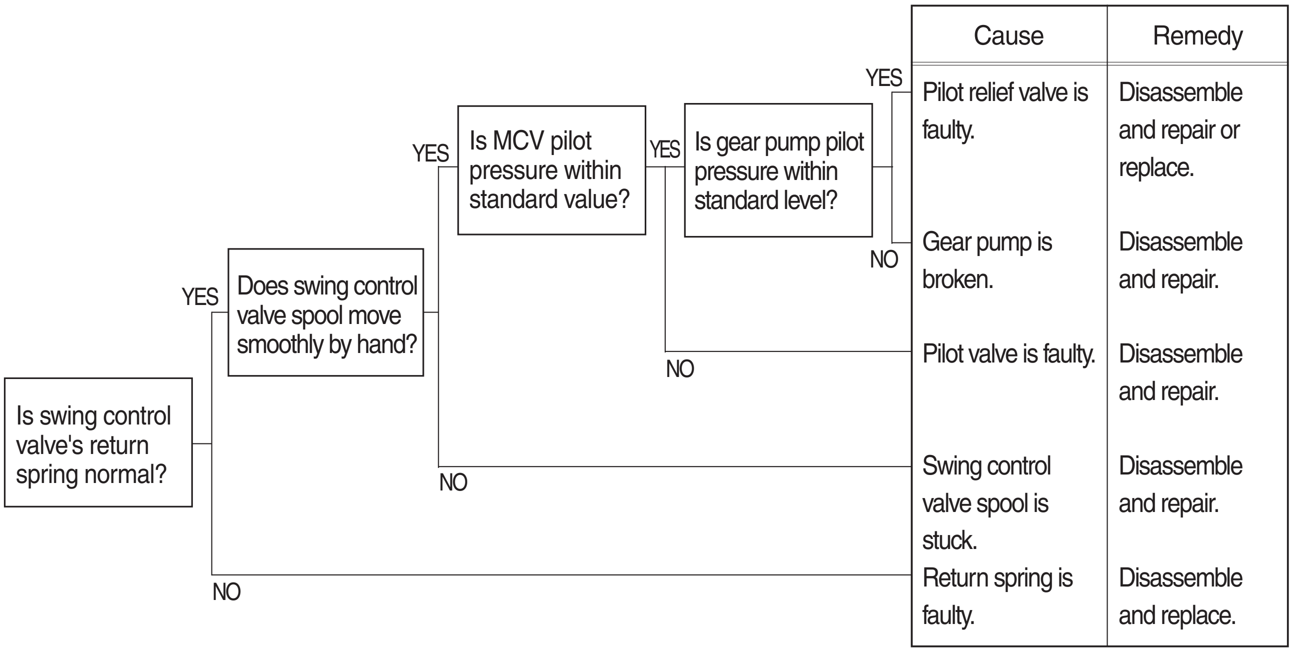
2) SWING SPEED IS LOW



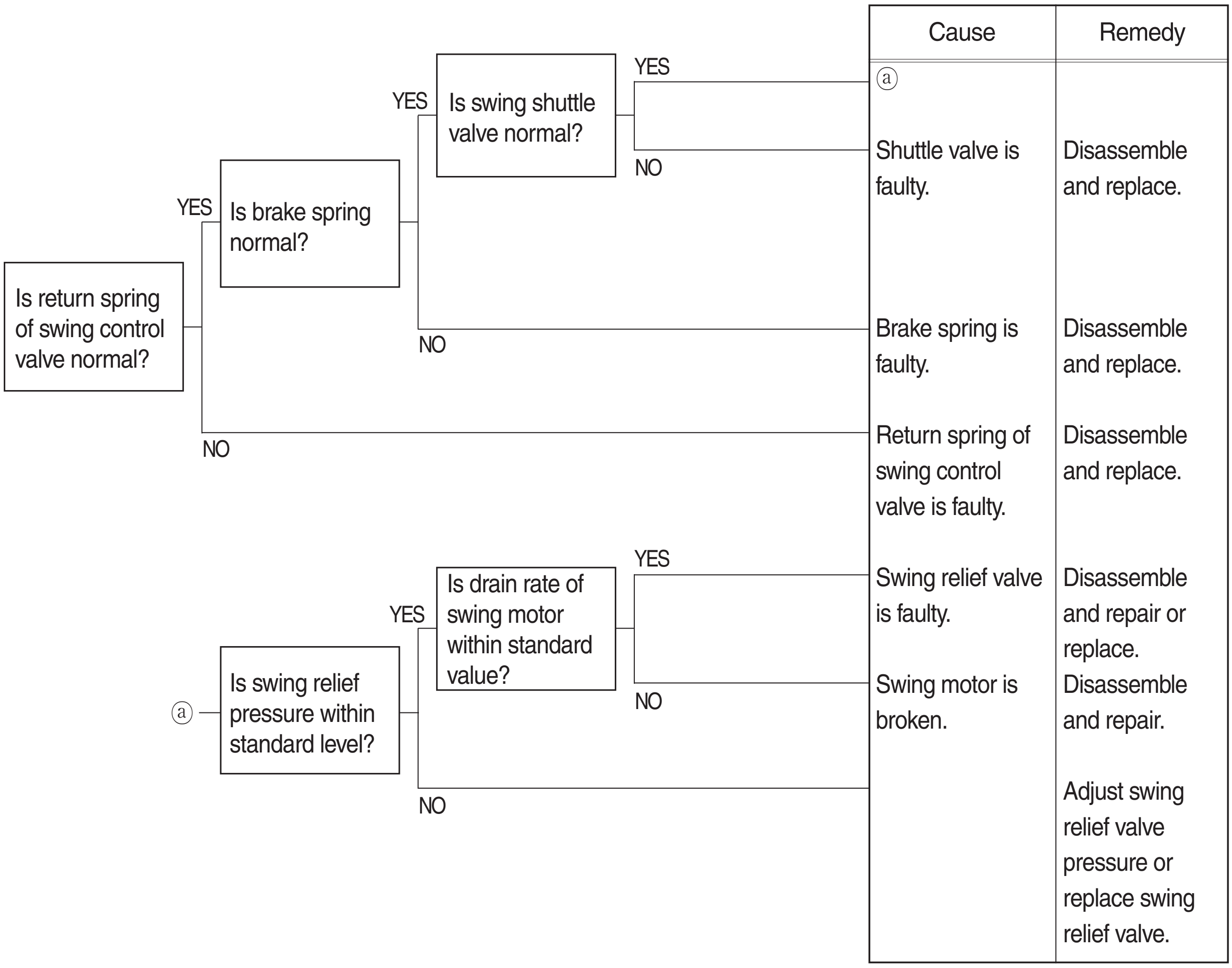
3) SWING MOTION IS IMPOSSIBLE IN ONE DIRECTION



4) MACHINE SWINGS BUT DOES NOT STOP

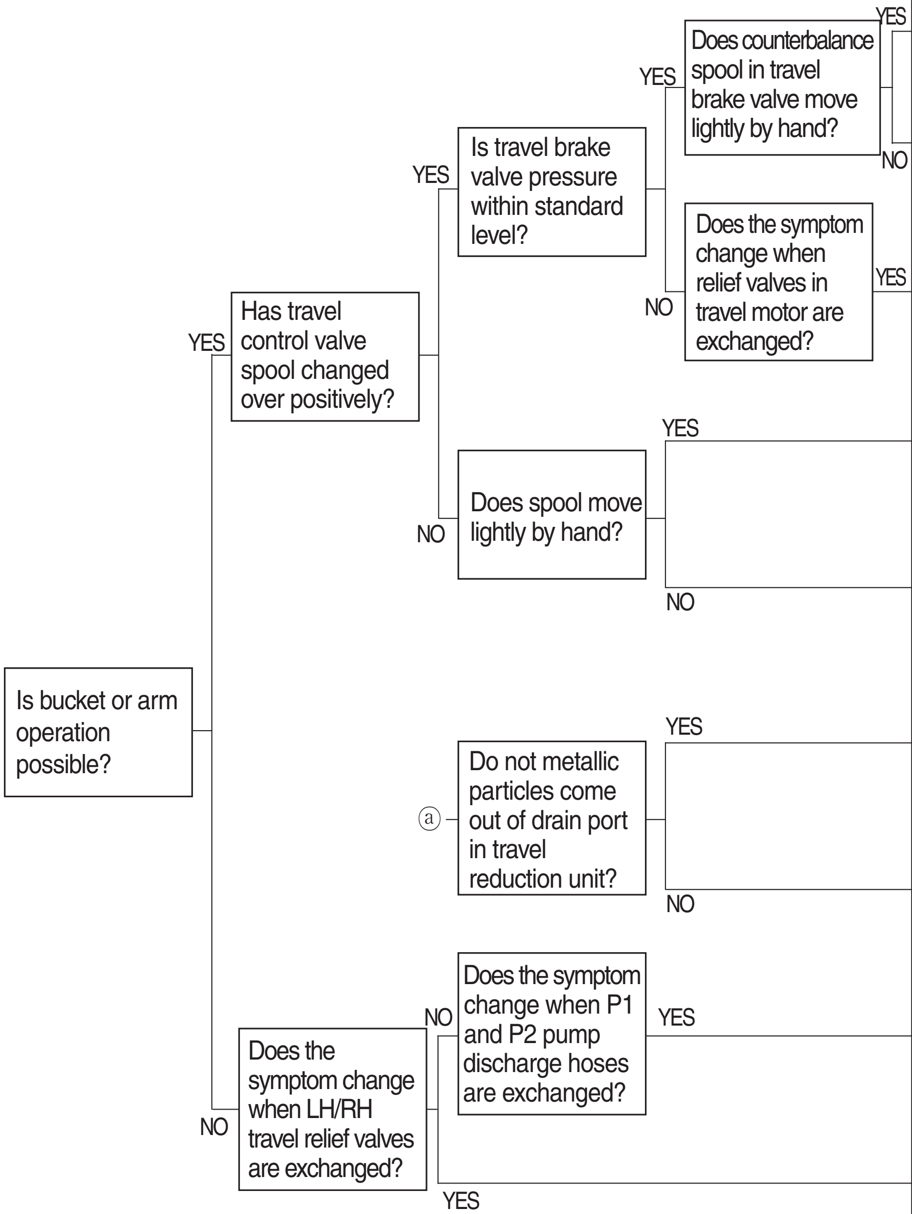


5) THE SWING UNIT DRIFTS WHEN THE MACHINE IS AT REST ON A SLOPE



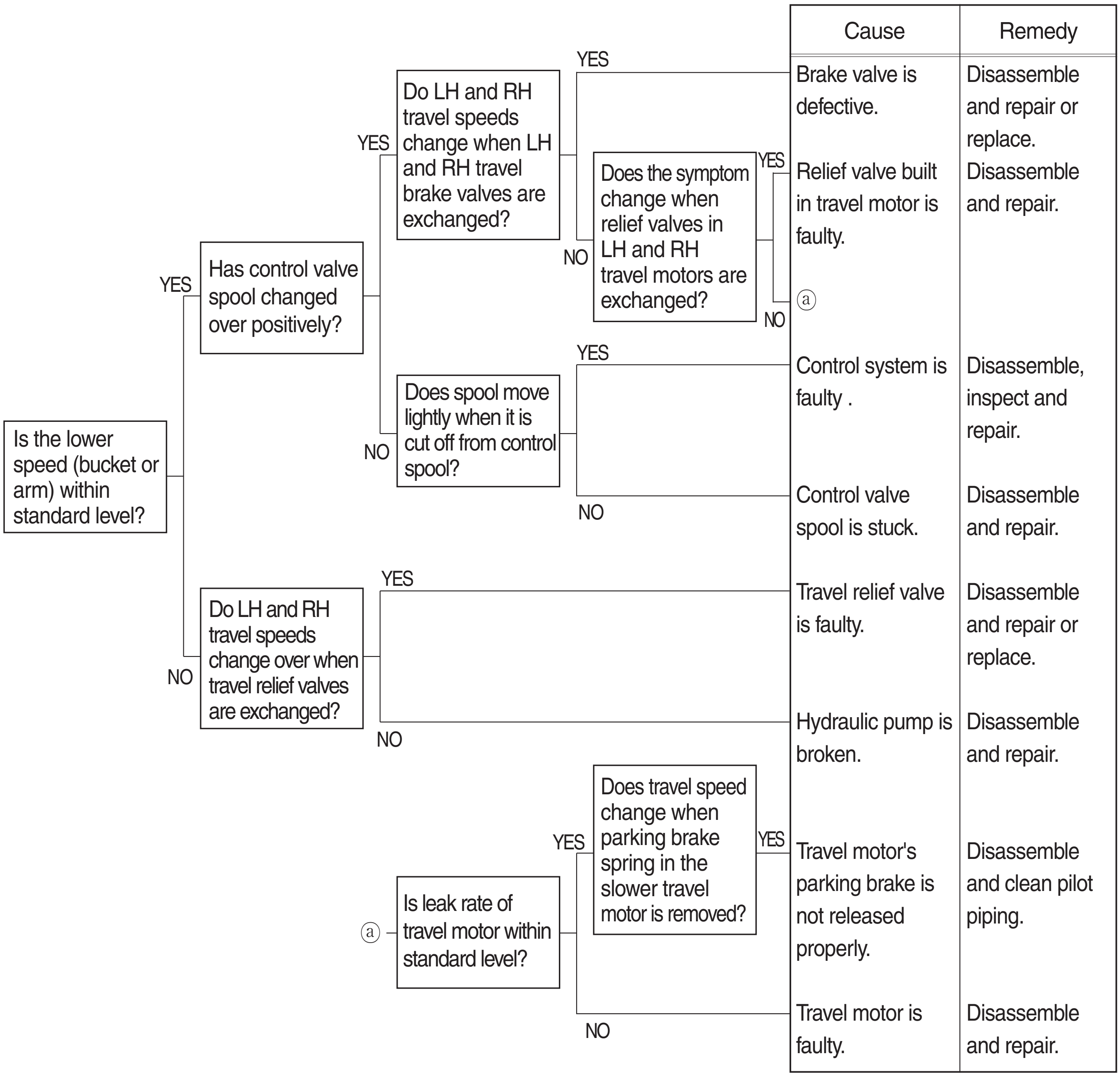
5. TRAVEL SYSTEM

1) TRAVEL DOES NOT FUNCTION AT ALL ON ONE SIDE



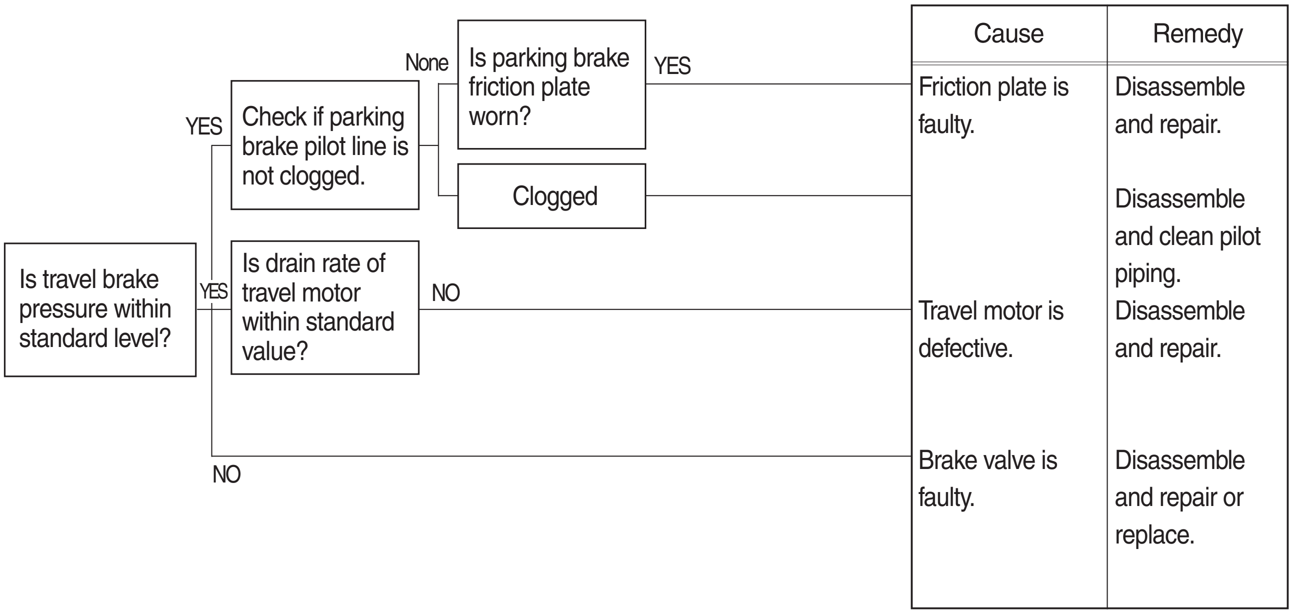
Cause	Remedy
ⓐ	
Counter spool in travel brake valve is stuck.	Disassemble and repair or replace.
Relief valve built in travel motor is faulty.	Disassemble and repair.
Control system is defective.	Disassemble inspect and repair.
Travel control valve spool is stuck.	Disassemble and repair.
Travel reduction unit is faulty.	Disassemble and repair.
Travel motor is out of order.	Disassemble and repair.
Hydraulic pump is broken.	Disassemble and repair.
Travel relief valves are faulty.	Disassemble and repair or replace.

2) SPEED ON ONE SIDE FALLS AND THE MACHINE CURVES

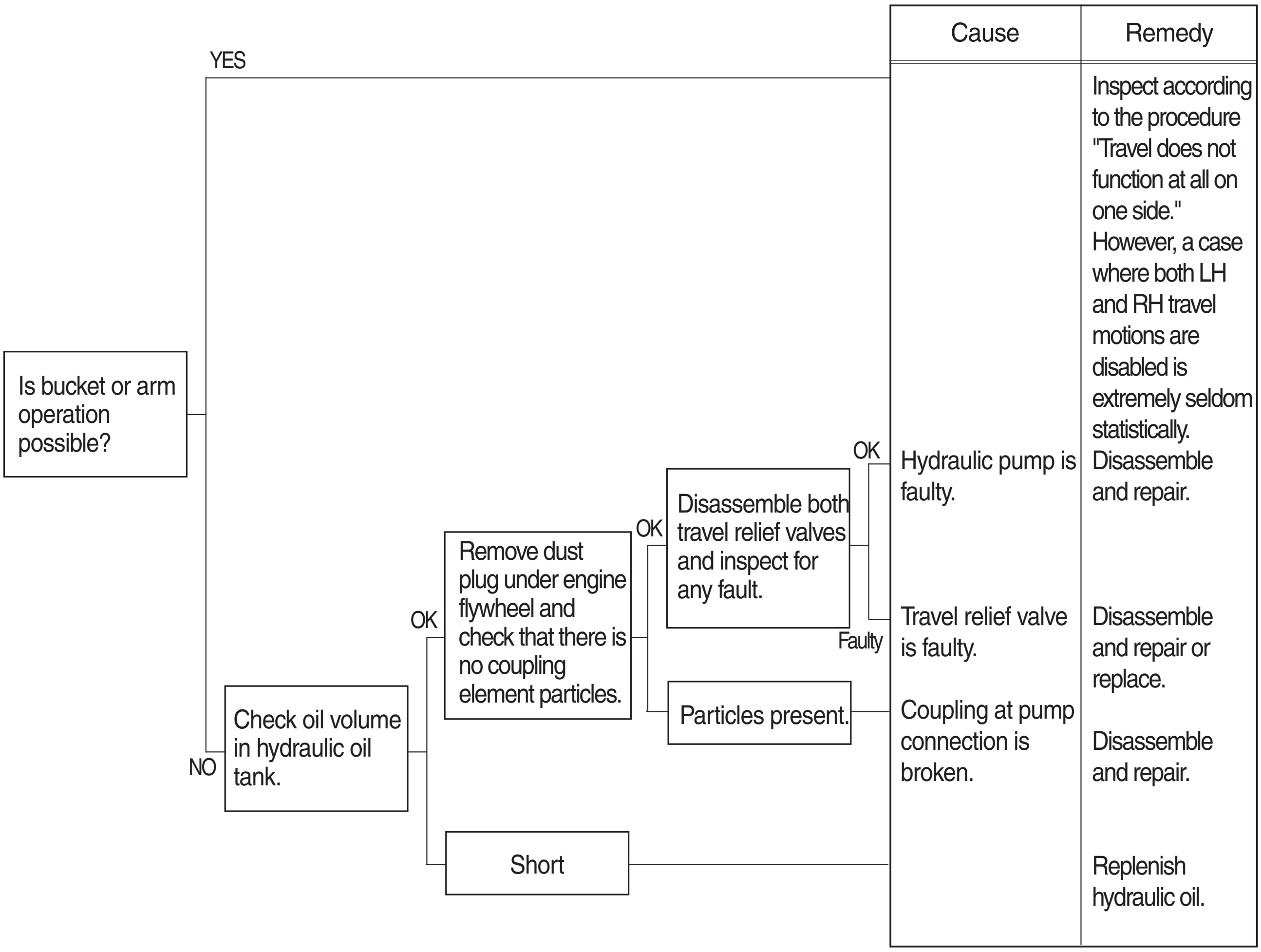


3) MACHINE DOES NOT STOP ON A SLOPE

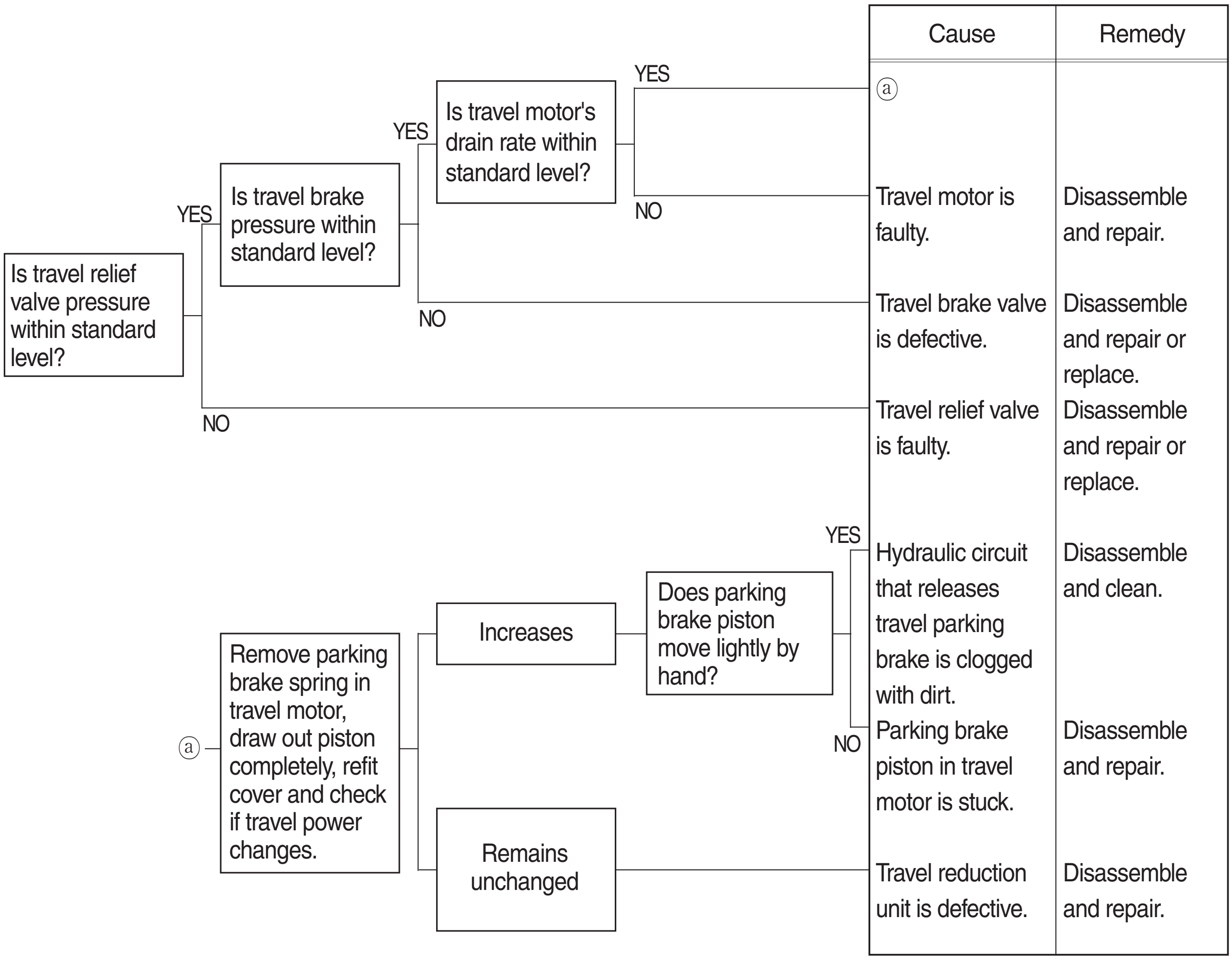
Machine is pulled forward as sprocket rotates during digging operation.



4) LH AND RH TRAVEL MOTIONS ARE IMPOSSIBLE

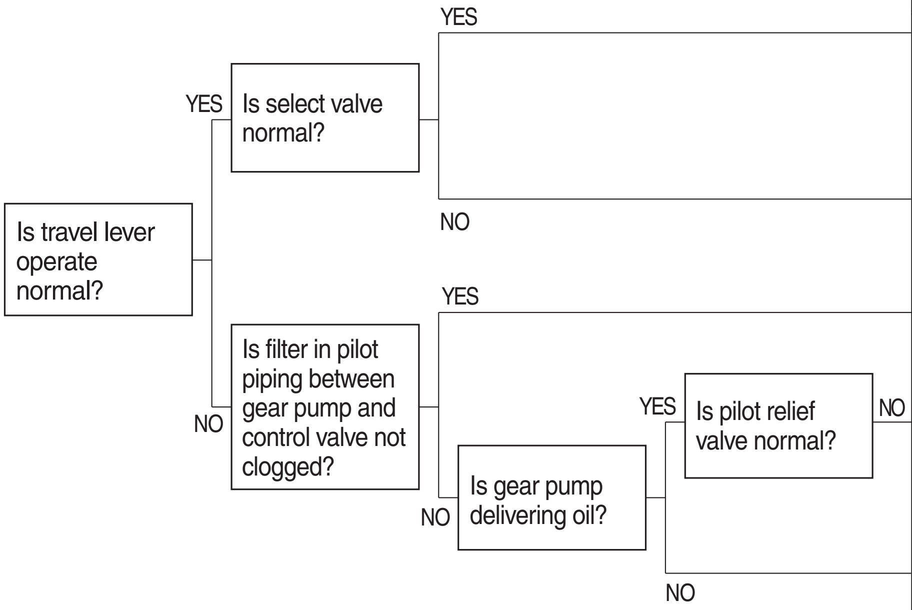


5) TRAVEL ACTION IS POWERLESS (travel only)



6) MACHINE RUNS RECKLESSLY ON A SLOPE

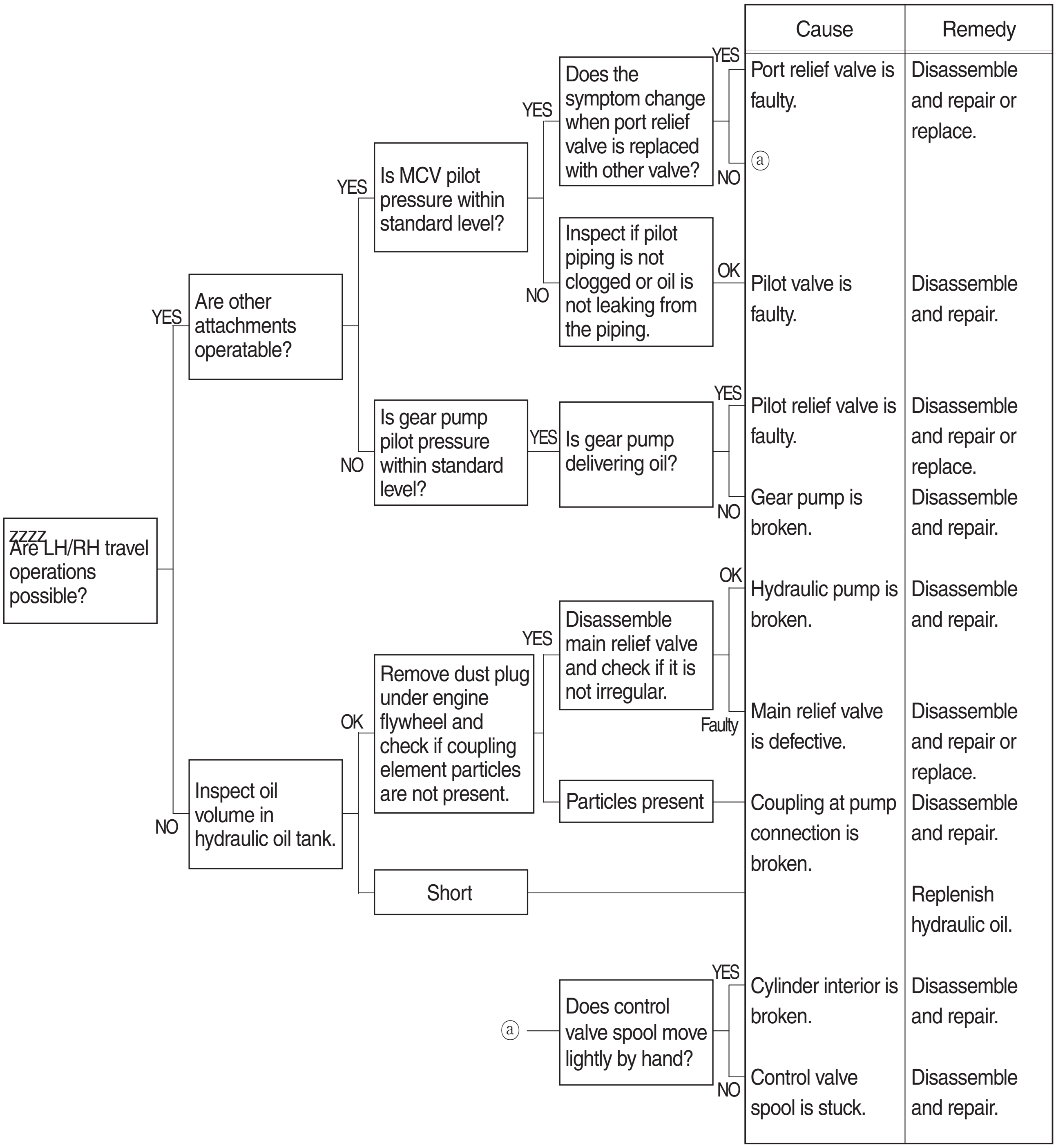
7) MACHINE MAKES A CURVED TRAVEL OR DOES NOT TRAVEL AT ALL WHEN TRAVEL AND ATTACHMENT OPERATIONS ARE EXECUTED AT THE SAME TIME



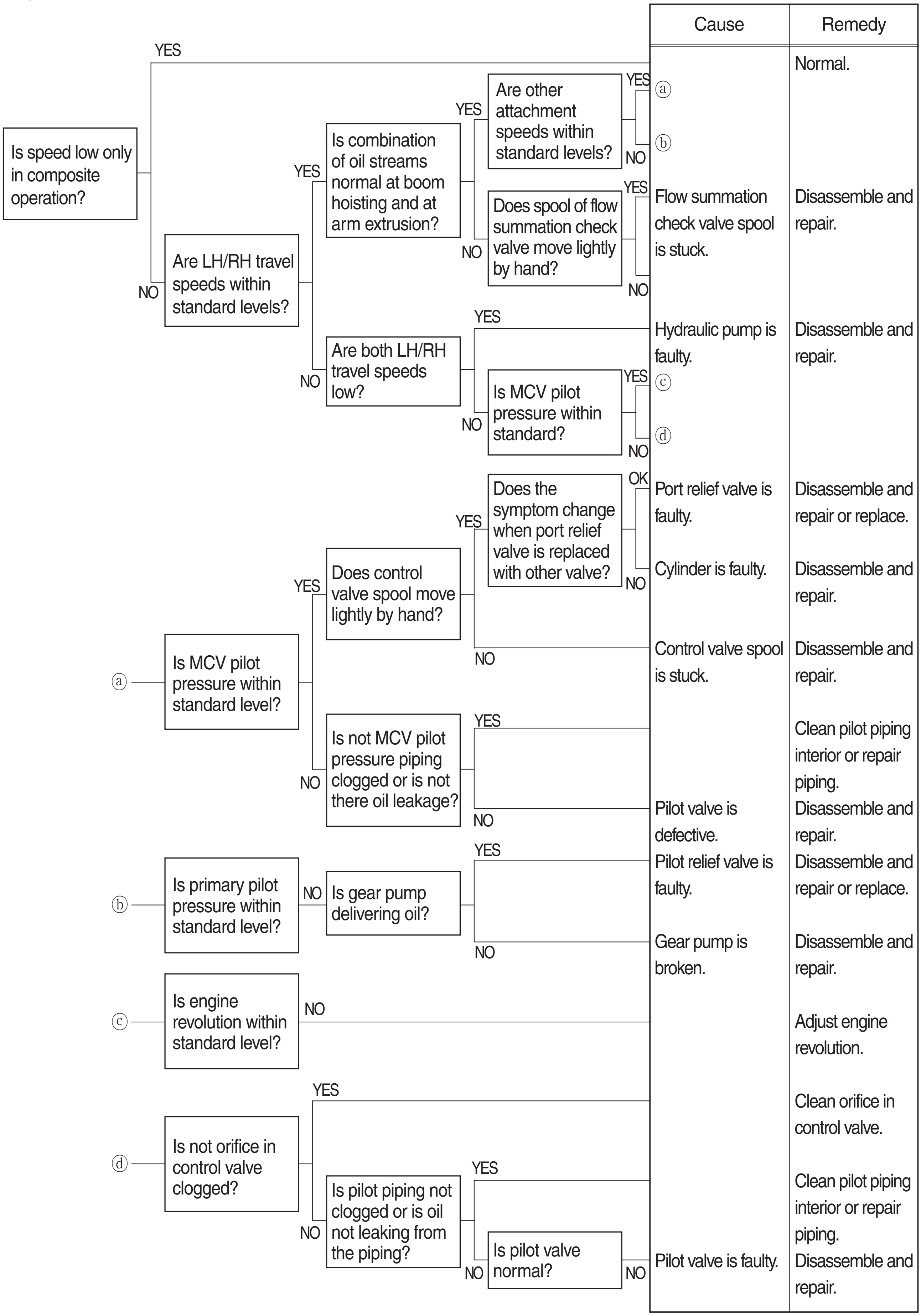
Cause	Remedy
	Normal.
Select valve is faulty.	Repair or replace.
	Remove dirt on pilot line filter.
Pilot relief valve is defective.	Disassemble and repair or replace.
Gear pump is broken.	Disassemble and repair.

6. ATTACHMENT SYSTEM

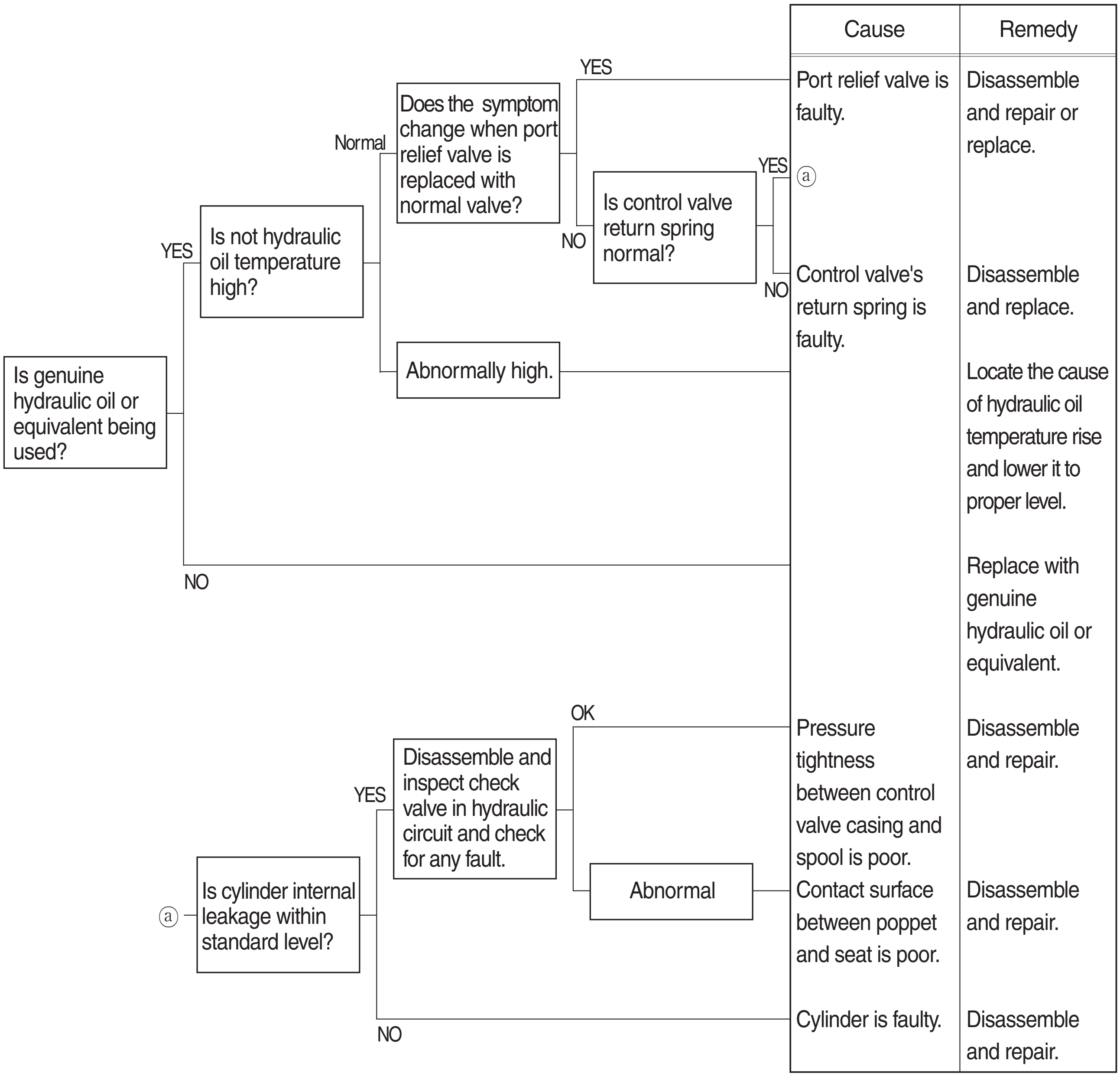
1) BOOM OR ARM ACTION IS IMPOSSIBLE AT ALL



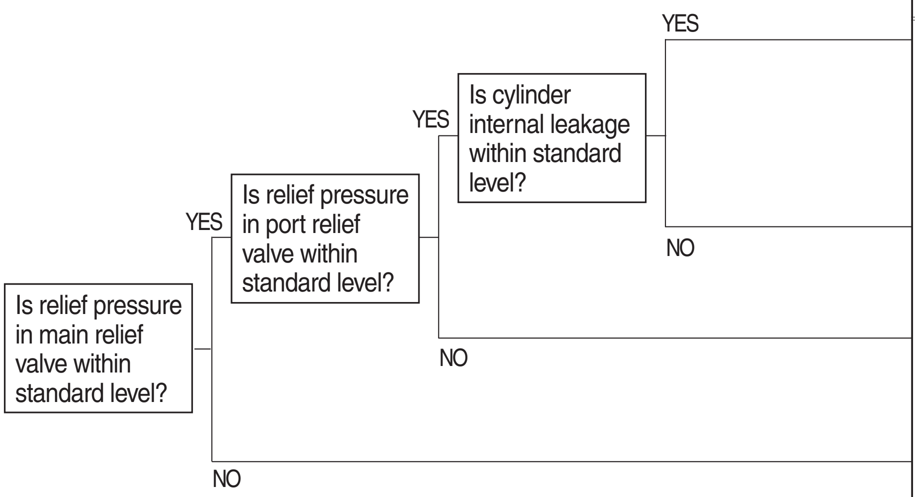
2) BOOM, ARM OR BUCKET SPEED IS LOW



3) BOOM, ARM OR BUCKET CYLINDER EXTENDS OR CONTRACTS ITSELF AND ATTACHMENT FALLS

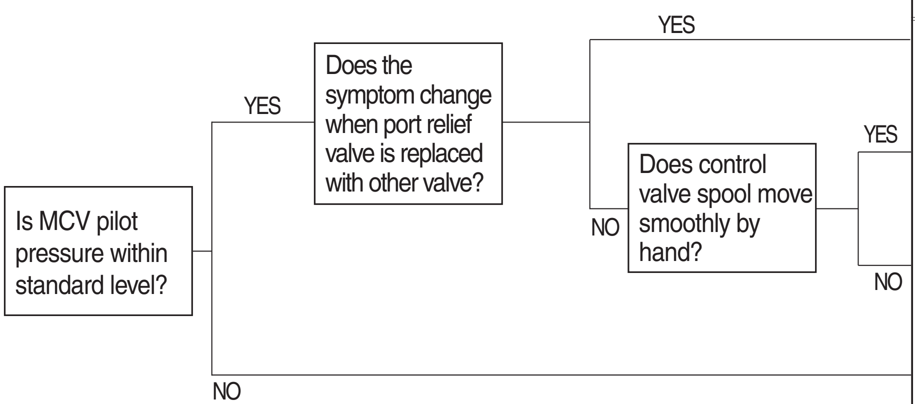


4) BOOM, ARM OR BUCKET POWER IS WEAK



Cause	Remedy
	Check according to the procedure in Item "Speed is low".
Cylinder is faulty.	Disassemble and repair.
Port relief valve is faulty.	Adjust pressure, repair or replace.
Main relief valve is defective.	Adjust pressure, repair or replace.

5) ONLY BUCKET OPERATION IS TOTALLY IMPOSSIBLE



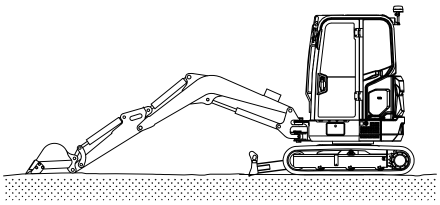
Cause	Remedy
Port relief valve is defective.	Disassemble and repair or replace.
Cylinder interior is broken.	Disassemble and repair.
Control valve spool is stuck.	Disassemble and repair.
Pilot valve is faulty.	Disassemble and repair.

6) BOOM MAKES A SQUEAKING NOISE WHEN BOOM IS OPERATED

Check	Result	Cause	Remedy
Is boom foot pin greased sufficiently?	YES		Frictional noise occurs between the sliding faces of boom cylinder's oil seal and boom proper. ※ Frictional noise will disappear if they are kept used.
	NO	Boom foot pin has run out of grease.	Supply grease to it. ※ If seizure is in an initial stage, supply sufficient grease. If seizure is in a grown state, correct it by paper lapping or with an oil stone.

※ HOW TO CHECK INTERNAL BOOM CYLINDER LEAKAGE

1. Lower the bucket teeth to the ground with bucket cylinder fully retracted and arm cylinder rod retracted almost in full.



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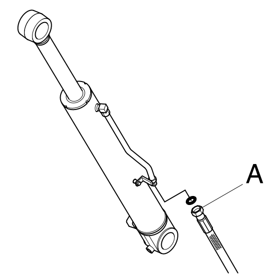
2. Disconnect hose (A) from rod side of boom cylinder and drain oil from cylinders and hose. (Put cups on piping and hose ends)



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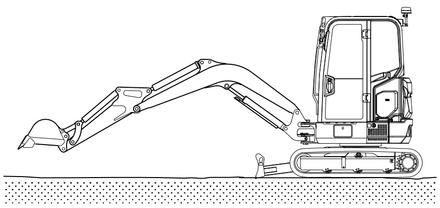
3. Raise bucket OFF the ground by retracting the arm cylinder rod.

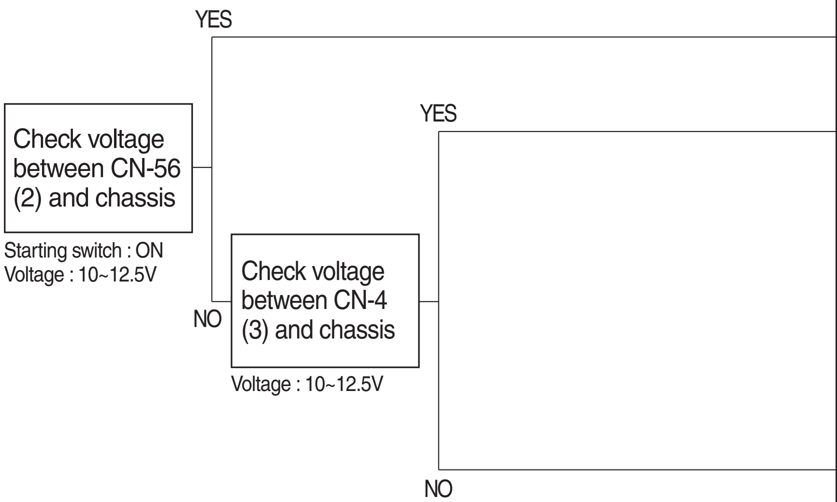
   If oil leaks from piping side and boom cylinder rod is retracted there is an internal leak in the cylinder.
   If no oil leaks from piping side and boom cylinder rod is retracted, there is an internal leak in the control valve.



25AZ5MA02

1. WHEN STARTING SWITCH IS TURNED ON, MONITOR PANEL DISPLAY DOES NOT APPEAR

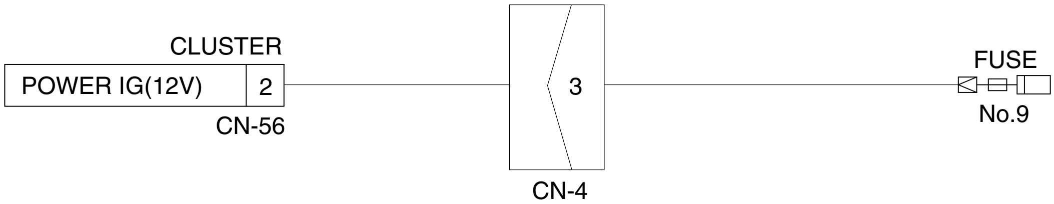
- · Before disconnecting the connector, always turn the starting switch OFF.
- · Before carrying out below procedure, check all the related connectors are properly inserted and short of fuse No.9.
- · After checking, insert the disconnected connectors again immediately unless otherwise specified.



Cause	Remedy
Defective cluster	Replace
Disconnection in wiring harness or poor contact between CN-56 (2) and CN-4 (3)	Repair or replace (after clean)
Disconnection in wiring harness or poor contact between CN-4 (3) and fuse No.9	Repair or replace (after clean)

Check voltage

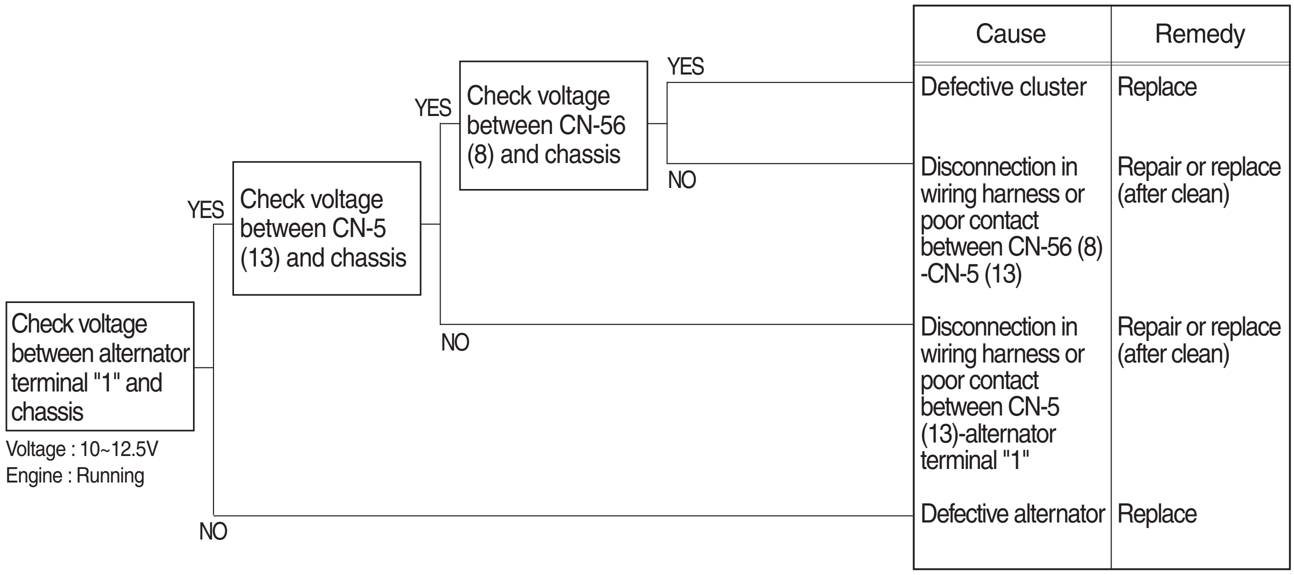
YES	10 ~ 12.5V
NO	0V



25AZ5TS02

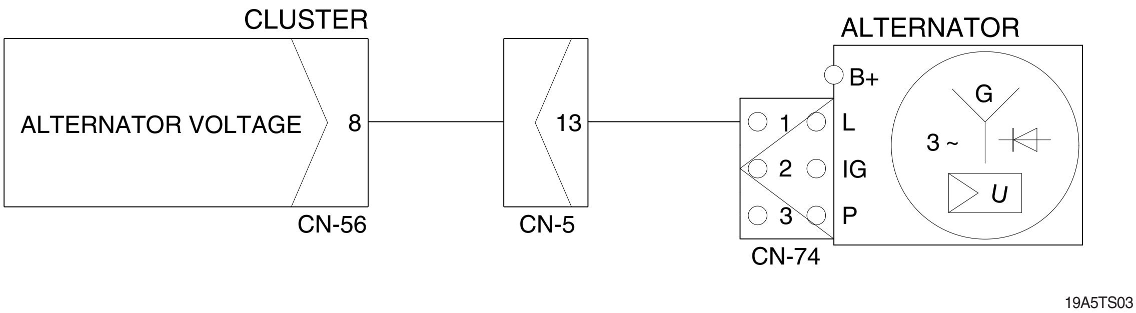
2. BATTERY CHARGING WARNING LAMP LIGHTS UP (starting switch : ON)

· Before disconnecting the connector, always turn the starting switch OFF.
· Before carrying out below procedure, check all the related connectors are properly inserted.
· After checking, insert the disconnected connectors again immediately unless otherwise specified.



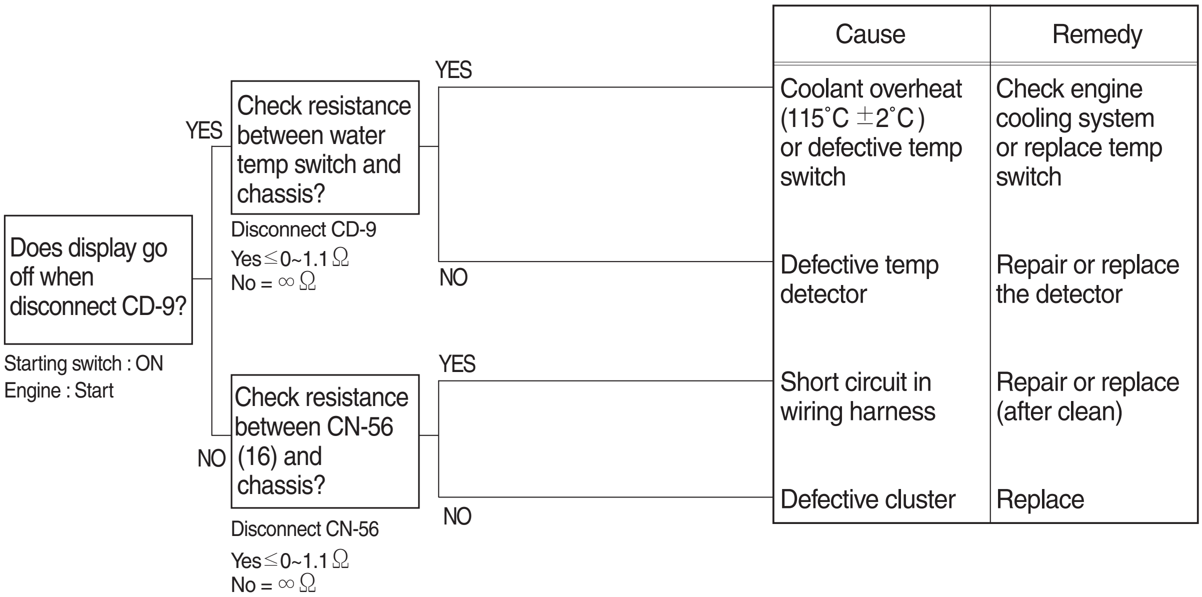
Check voltage

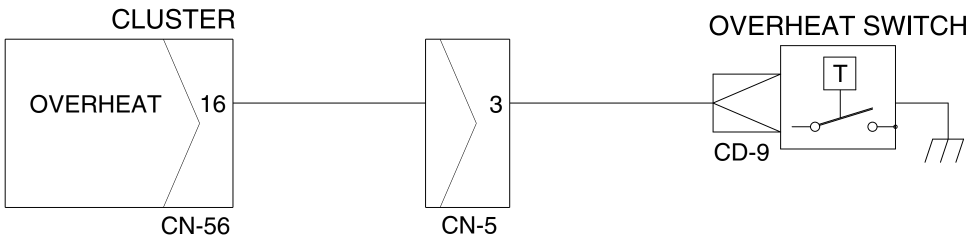
YES	10 ~ 12.5V
NO	0V



3. WHEN COOLANT OVERHEAT WARNING LAMP LIGHTS UP (Engine is started)

· Before disconnecting the connector, always turn the starting switch OFF.
· Before carrying out below procedure, check all the related connectors are properly inserted.
· After checking, insert the disconnected connectors again immediately unless otherwise specified.

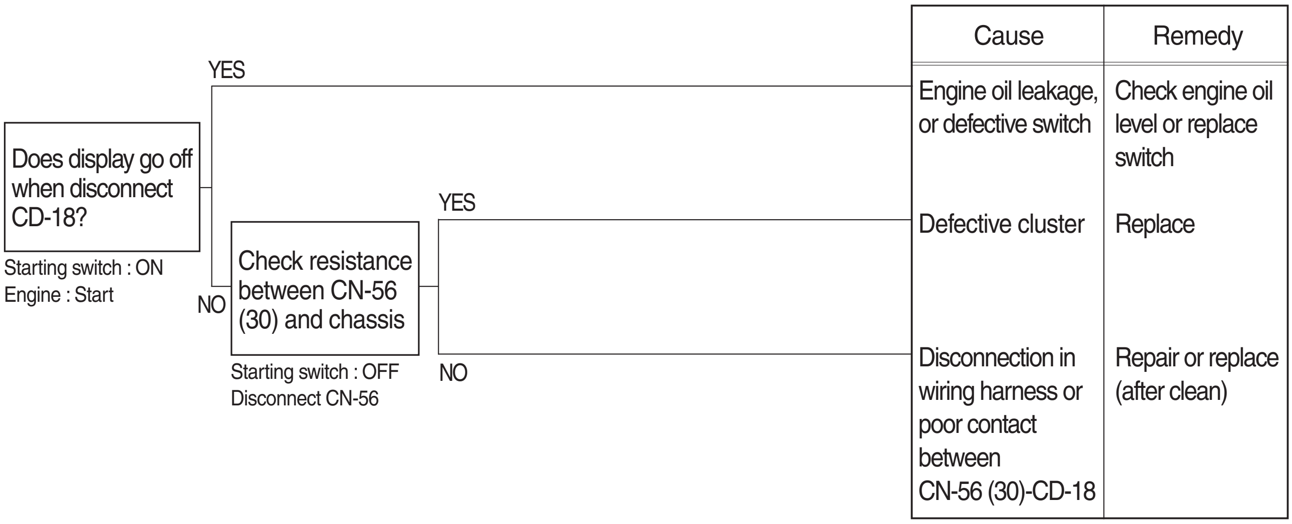




17AZ5TS04

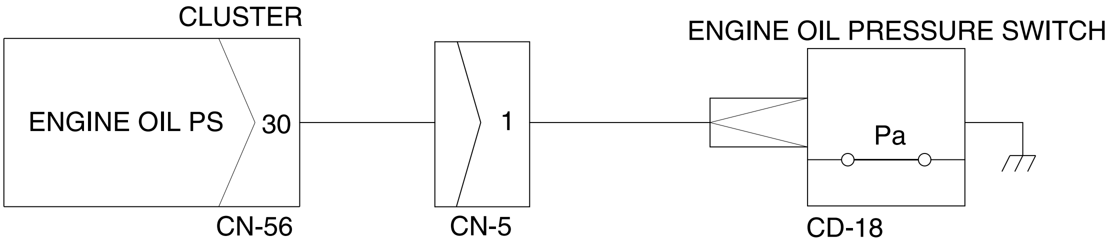
4. WHEN ENGINE OIL PRESSURE WARNING LAMP LIGHTS UP (Engine is started)

· Before disconnecting the connector, always turn the starting switch OFF.
· Before carrying out below procedure, check all the related connectors are properly inserted.
· After checking, insert the disconnected connectors again immediately unless otherwise specified.



Check resistance

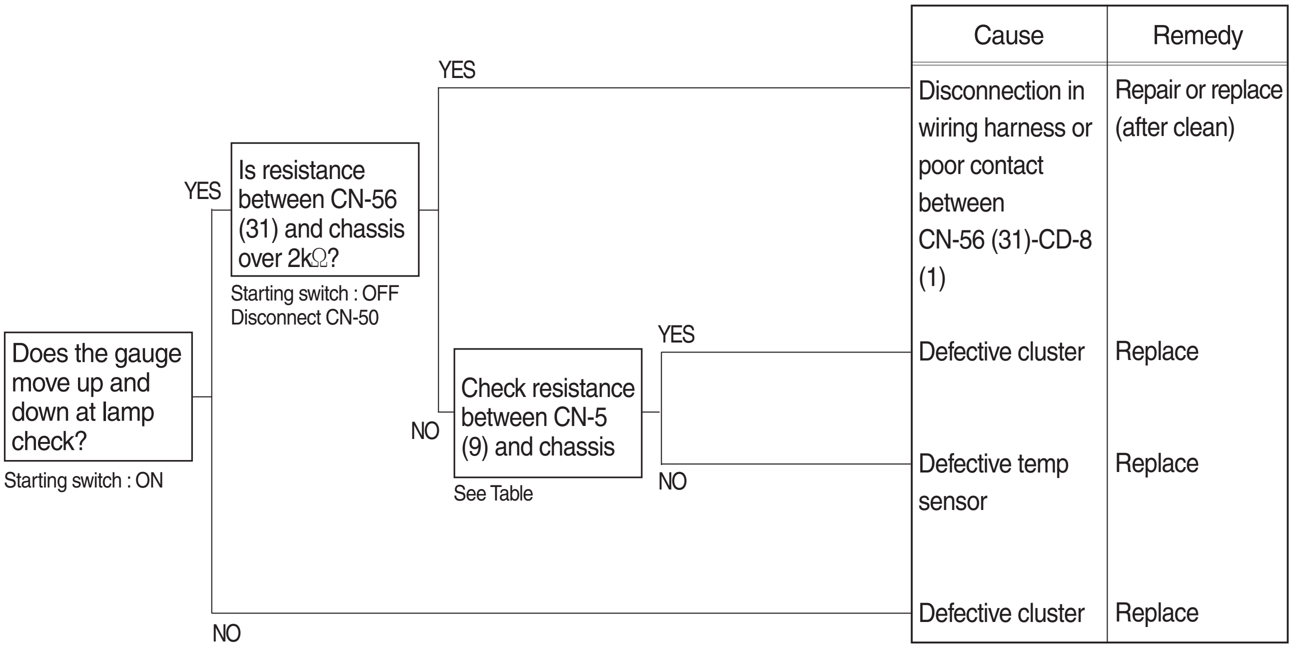
YES	MAX 1Ω
NO	MIN 1MΩ

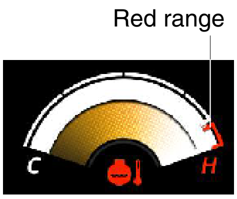


17AZ5TS06

5. WHEN COOLANT TEMPERATURE GAUGE DOES NOT OPERATE

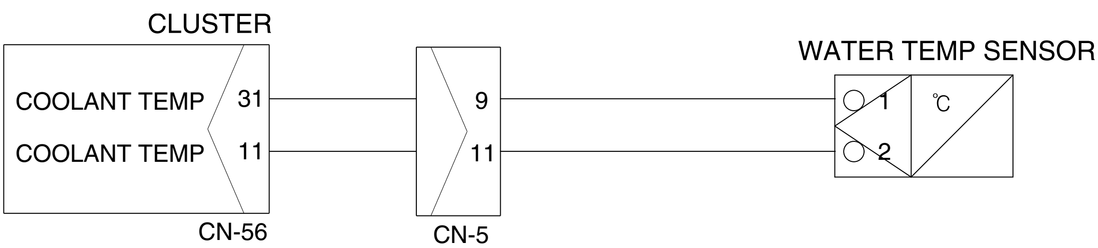
- Before disconnecting the connector, always turn the starting switch OFF.
- Before carrying out below procedure, check all the related connectors are properly inserted.
- After checking, insert the disconnected connectors again immediately unless otherwise specified.





Check Table

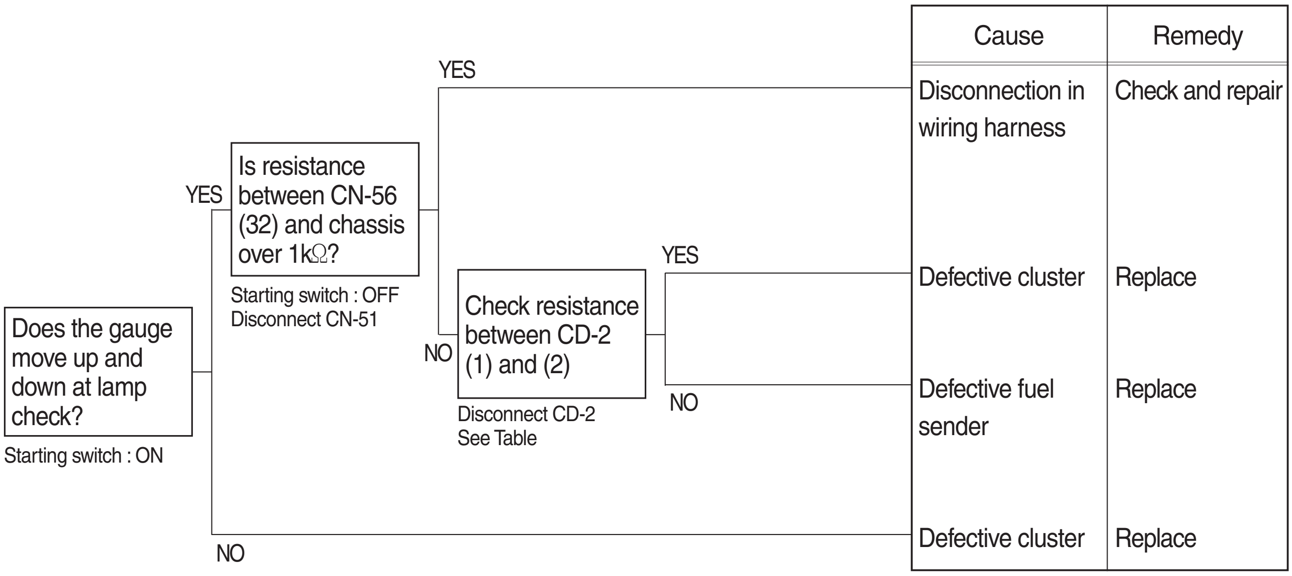
Item \ Temperature	50˚C	80˚C	100˚C	115˚C (red range)
Unit resistance (Ω)	350	118	63.5	36.2

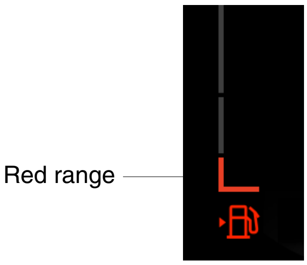


25AZ5TS07

6. WHEN FUEL GAUGE DOES NOT OPERATE (Check warning lamp ON/OFF)

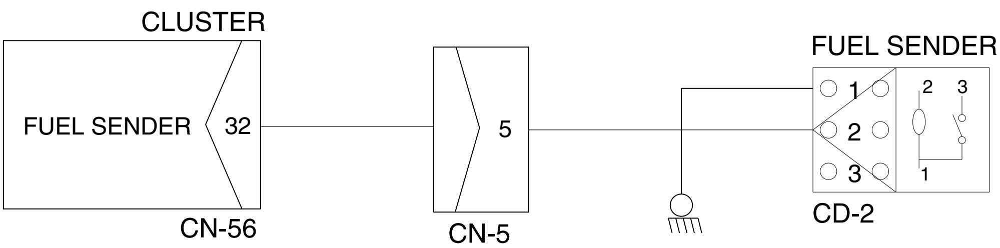
- Before disconnecting the connector, always turn the starting switch OFF.
- Before carrying out below procedure, check all the related connectors are properly inserted.
- After checking, insert the disconnected connectors again immediately unless otherwise specified.





Check Table

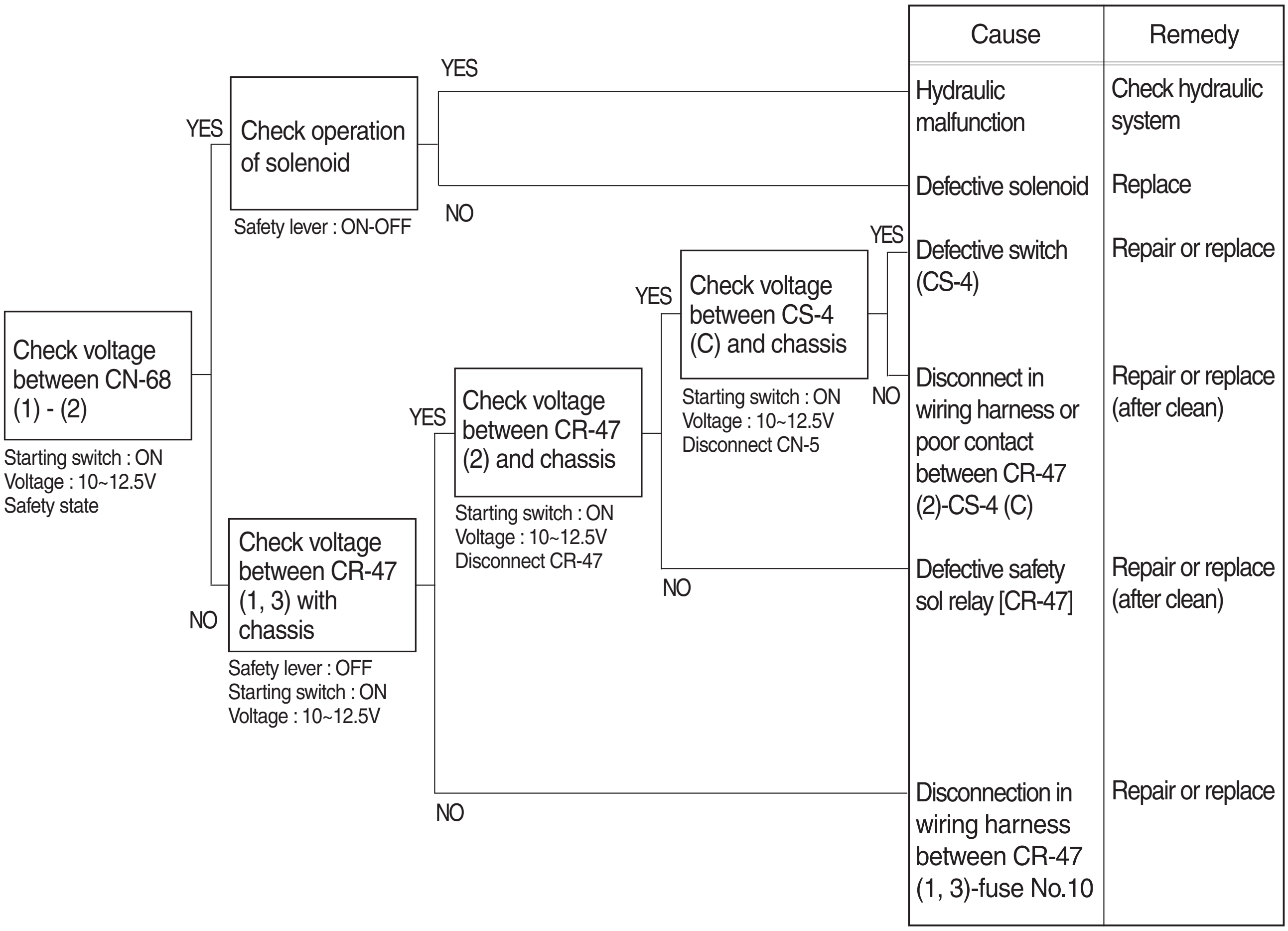
Item \ Temperature	Empty	1/2	Full
Unit resistance (Ω)	90	38	10

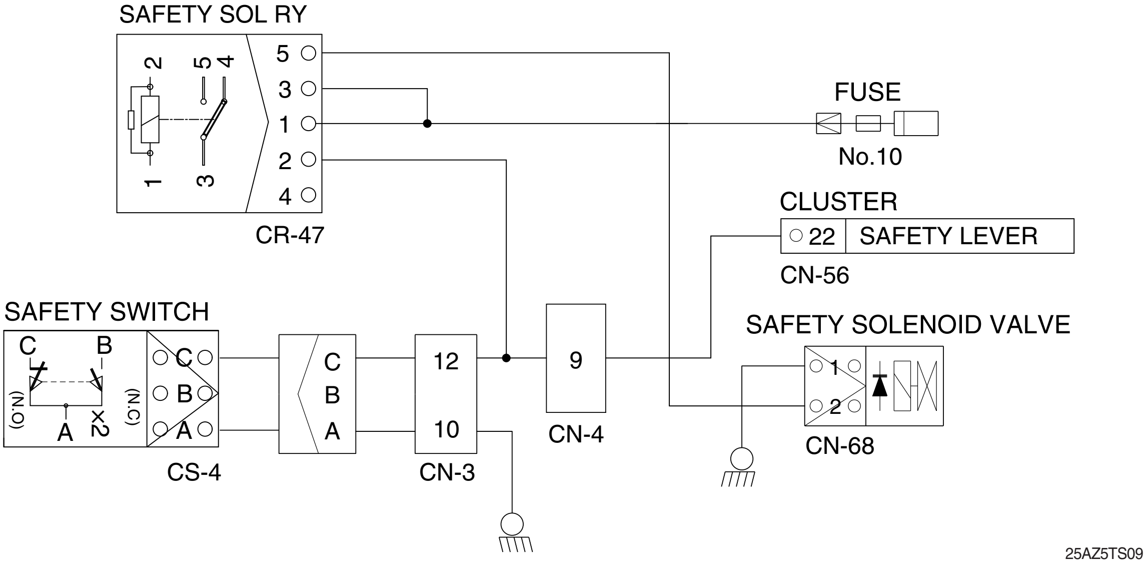


25AZ5TS08

7. WHEN SAFETY SOLENOID DOES NOT OPERATE

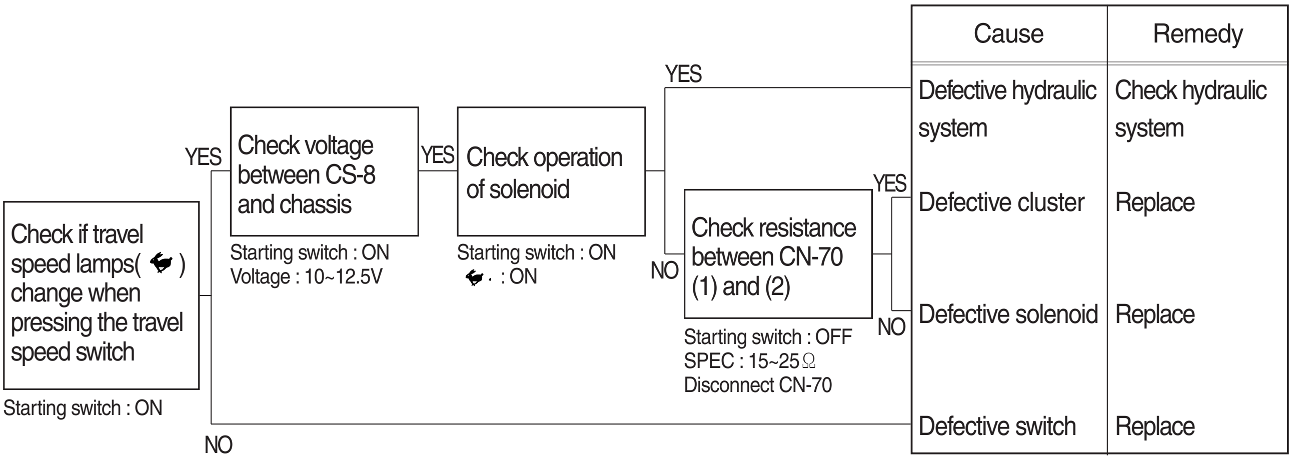
· Before disconnecting the connector, always turn the starting switch OFF.
· Before carrying out below procedure, check all the related connectors are properly inserted and short of fuse No.10.
· After checking, insert the disconnected connectors again immediately unless otherwise specified.

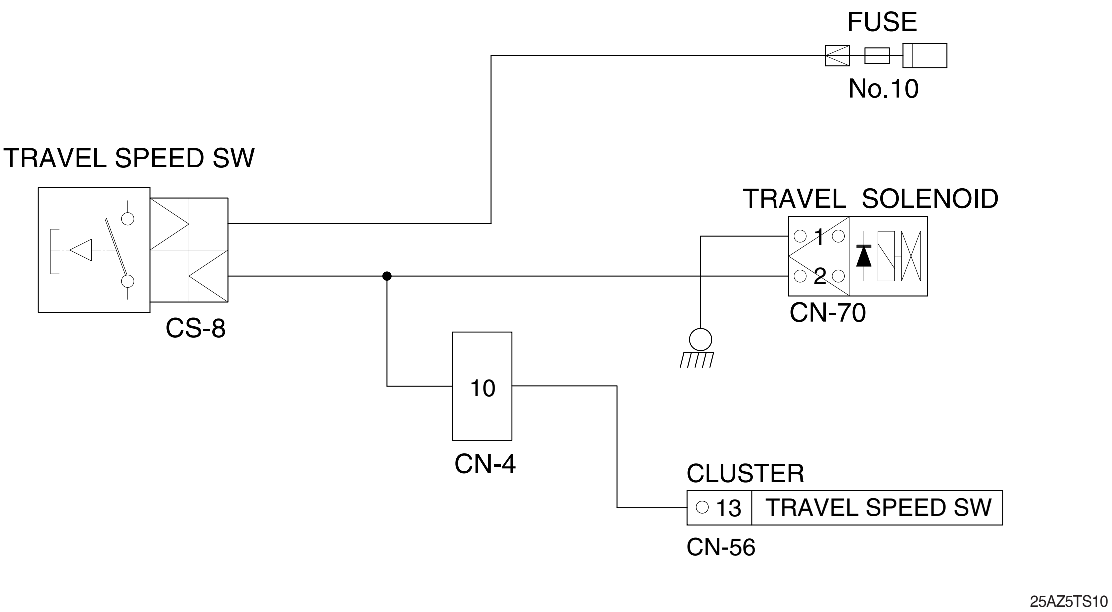




8. WHEN TRAVEL SPEED HIGH, LOW DOES NOT OPERATE

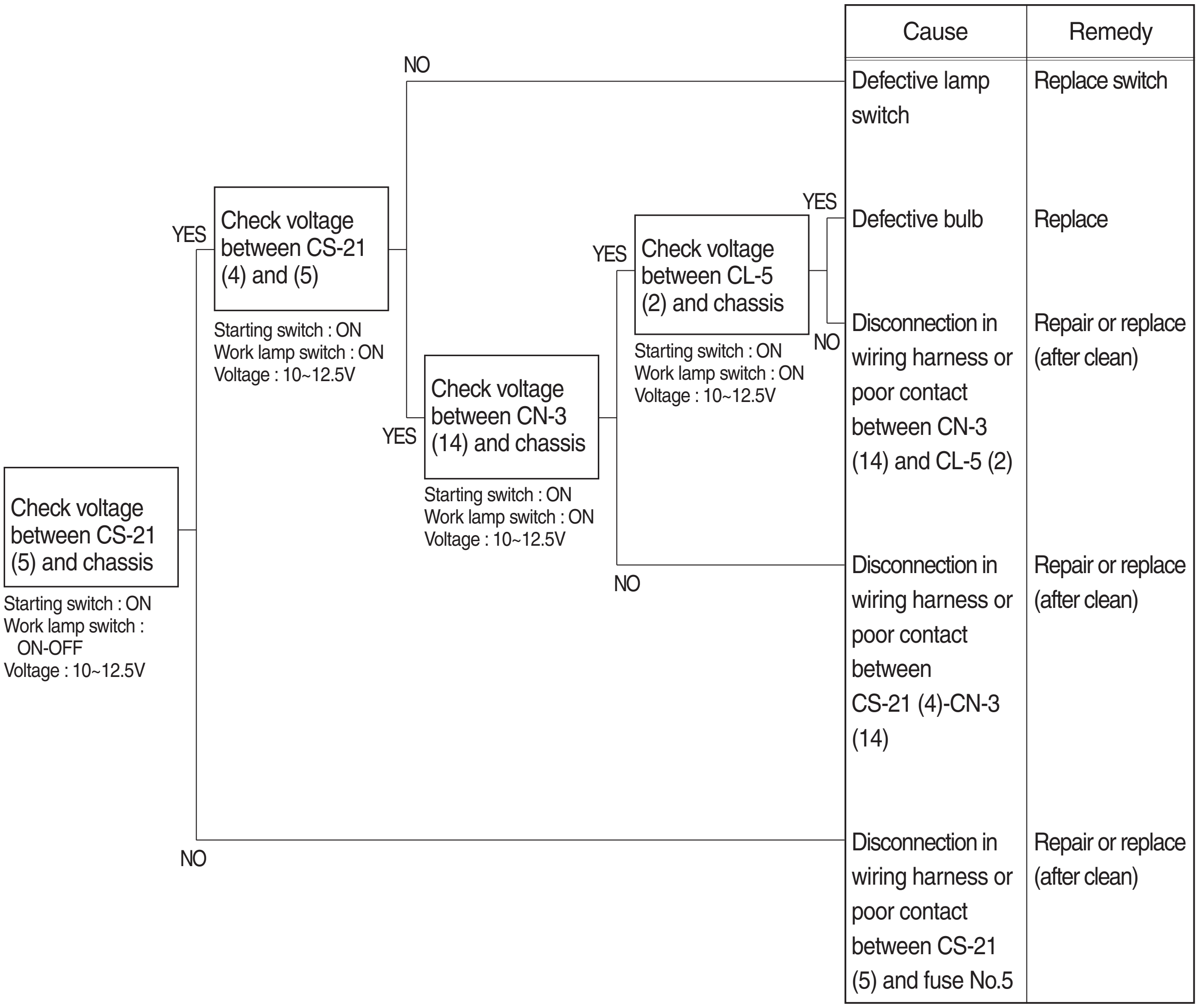
· Before disconnecting the connector, always turn the starting switch OFF.
· Before carrying out below procedure, check all the related connectors are properly inserted and short of fuse No.10.
· After checking, insert the disconnected connectors again immediately unless otherwise specified.

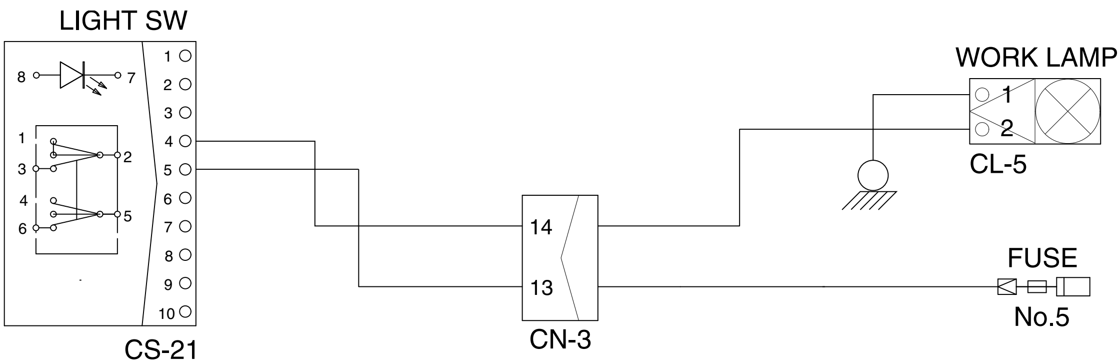




9. WHEN STARTING SWITCH IS TURNED ON, WORK LAMP DOES NOT LIGHTS UP

· Before disconnecting the connector, always turn the starting switch OFF.
· Before carrying out below procedure, check all the related connectors are properly inserted and short of fuse No.5.
· After checking, insert the disconnected connectors again immediately unless otherwise specified.

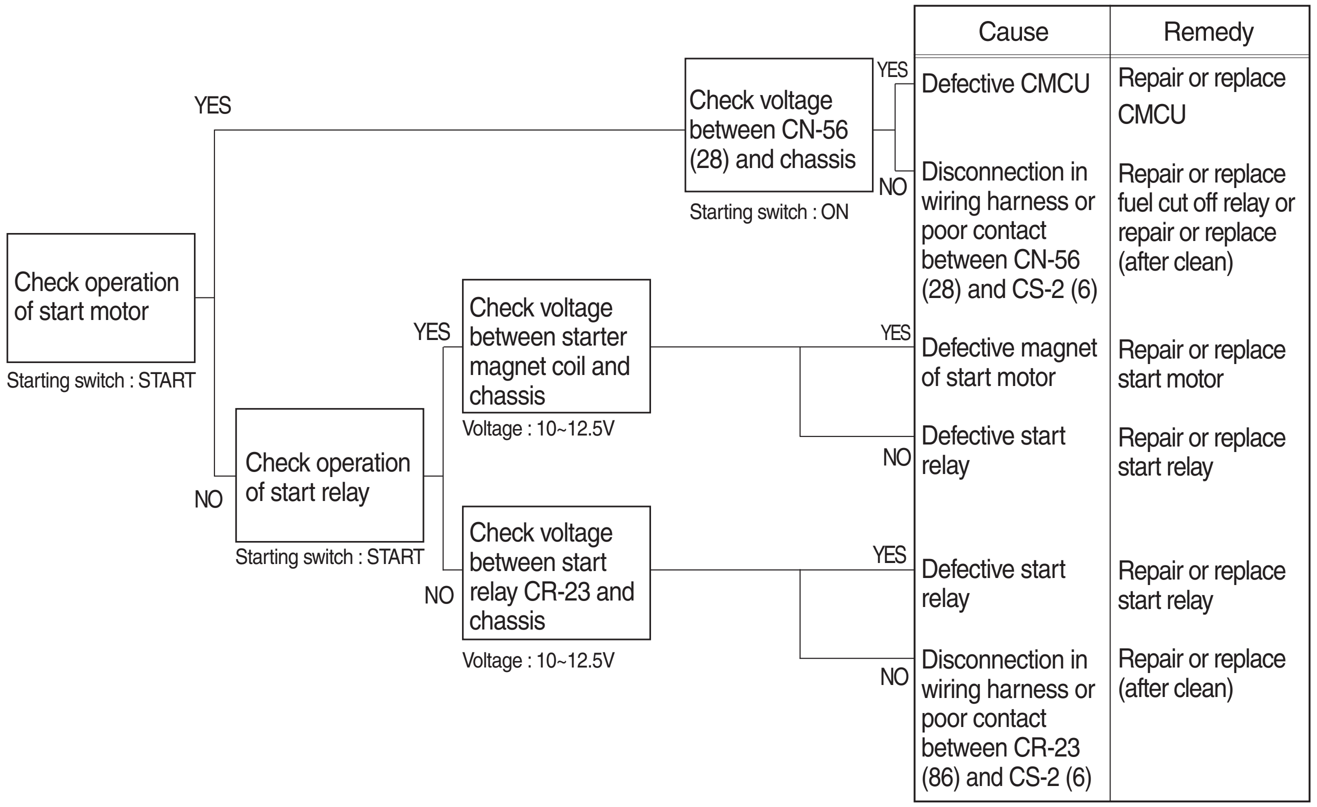


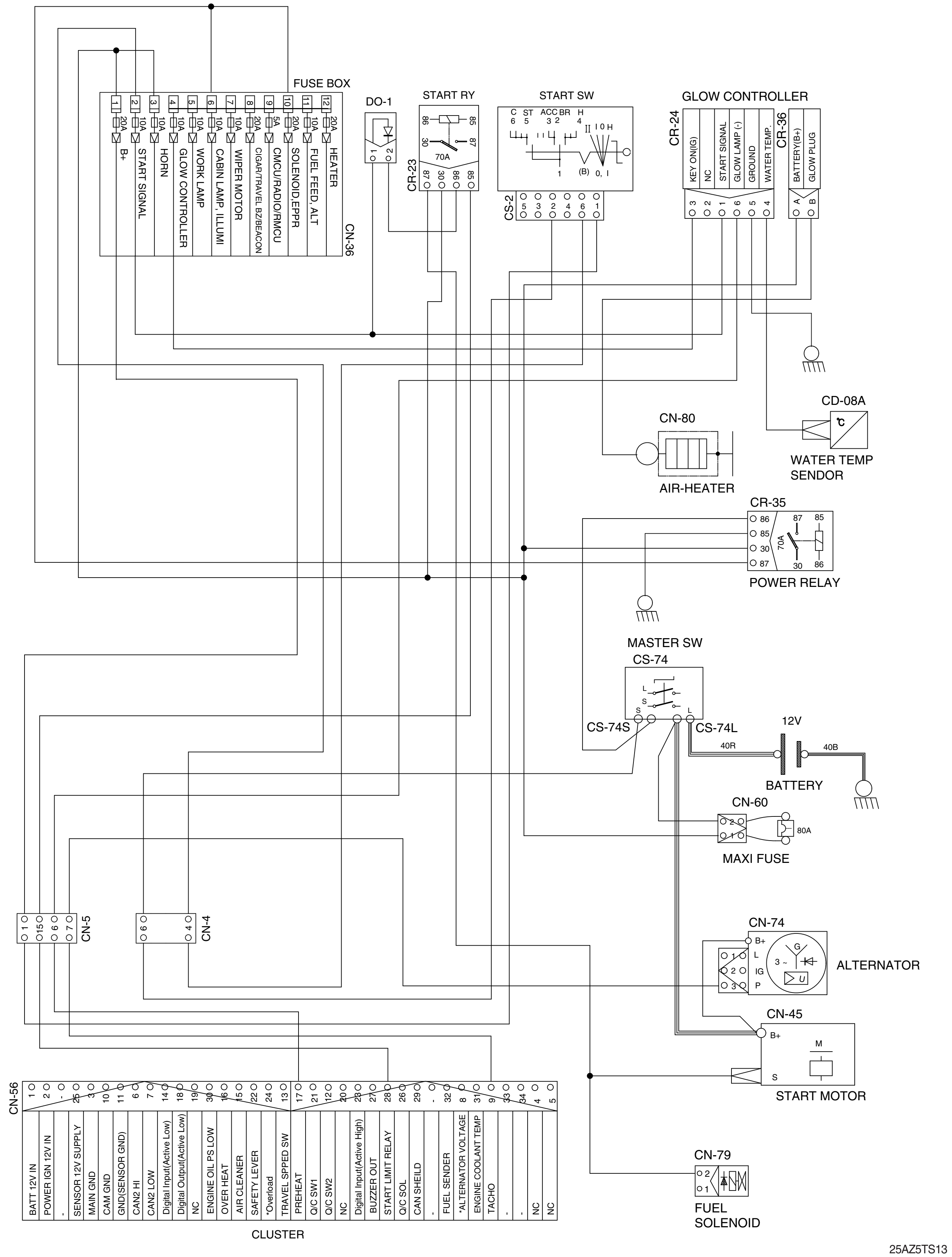


25AZ5TS12

10. WHEN ENGINE DOES NOT START

· Before disconnecting the connector, always turn the starting switch OFF.
· Before carrying out below procedure, check all the related connectors are properly inserted.
· After checking, insert the disconnected connectors again immediately unless otherwise specified.





11. WHEN STARTING SWITCH ON DOES NOT OPERATE

- Before disconnecting the connector, always turn the starting switch OFF.
- Before carrying out below procedure, check all the related connectors are properly inserted and master switch ON.
- After checking, insert the disconnected connectors again immediately unless otherwise specified.

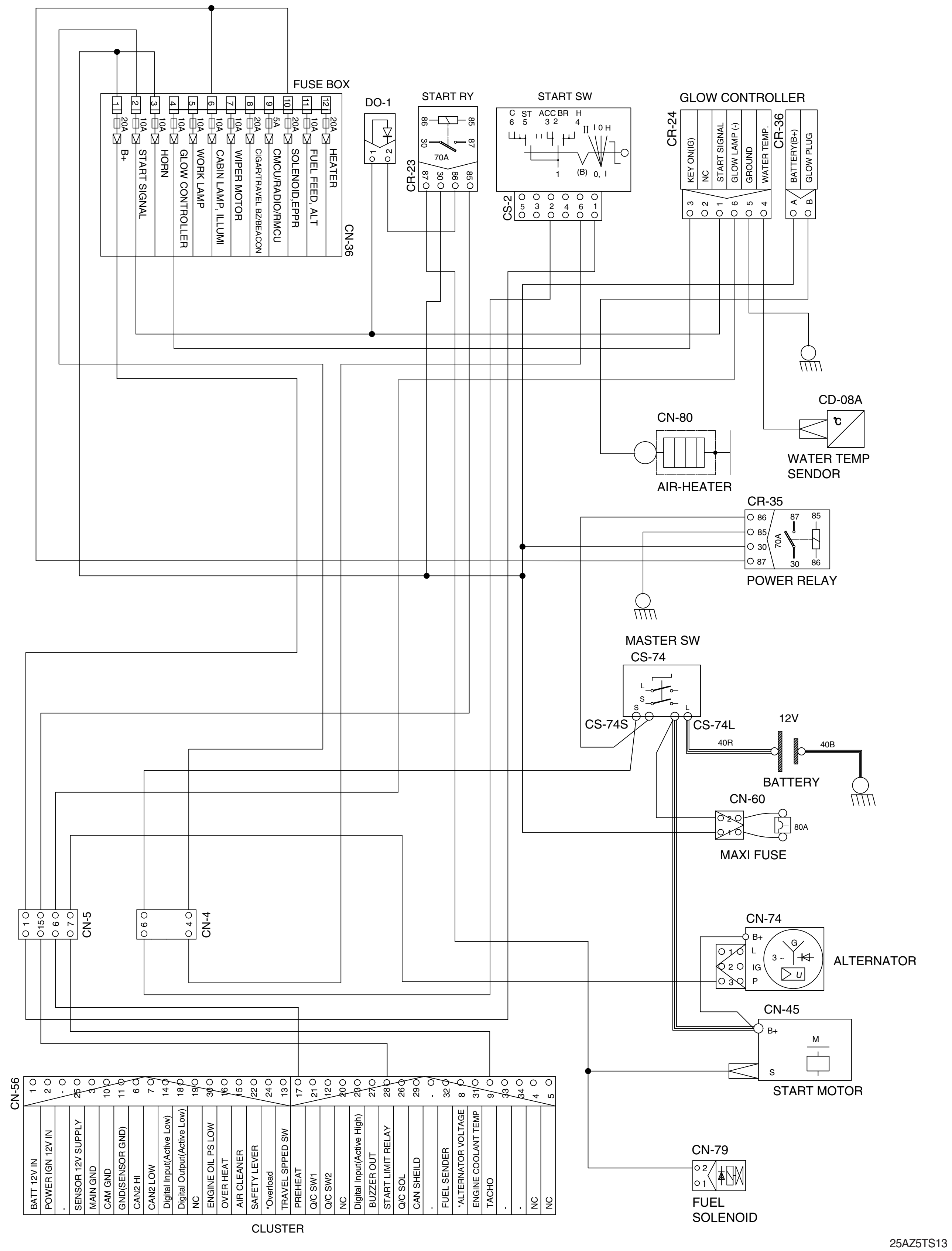
Check voltage and specific gravity of battery
Specific gravity : MIN 1.28
Voltage : MIN 12V

YES → Check voltage between CS-2 (1) and chassis
Voltage : 10~12.5V

YES → Defective start switch
NO → Disconnection in wiring harness or poor contact between CS-2 (1)-Master switch

NO → Battery capacity too low

Cause	Remedy
Defective start switch	Replace
Disconnection in wiring harness or poor contact between CS-2 (1)-Master switch	Replace
Battery capacity too low	Charge or replace (after clean)



SECTION 6 MAINTENANCE STANDARD

GROUP 1 OPERATIONAL PERFORMANCE TEST

1. PURPOSE

Performance tests are used to check:

1) OPERATIONAL PERFORMANCE OF A NEW MACHINE

Whenever a new machine is delivered in parts and reassembled at a customer's site, it must be tested to confirm that the operational performance of the machine meets Hyundai spec.

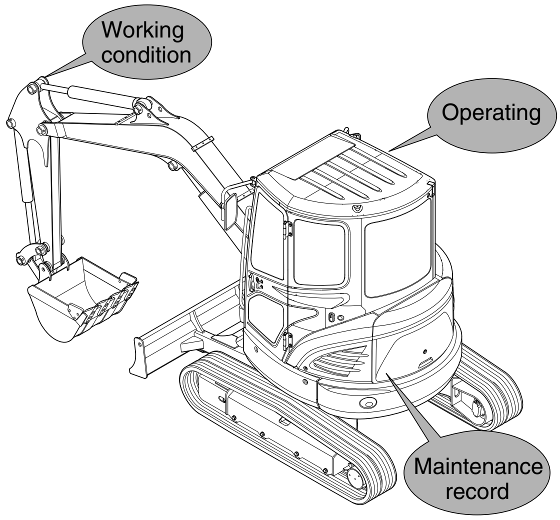
2) OPERATIONAL PERFORMANCE OF A WORKING MACHINE

With the passage of time, the machine's operational performance deteriorates, so that the machine needs to be serviced periodically to restore it to its original performance level.

Before servicing the machine, conduct performance tests to check the extent of deterioration, and to decide what kind of service needs to be done (by referring to the "Service Limits" in this manual).

3) OPERATIONAL PERFORMANCE OF A REPAIRED MACHINE

After the machine is repaired or serviced, it must be tested to confirm that its operational performance was restored by the repair and/or service work done.

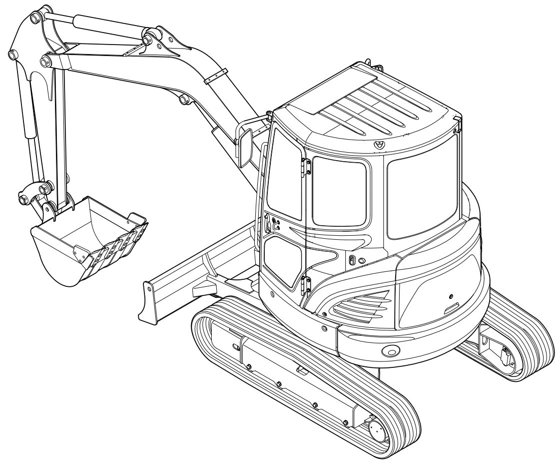


R35Z76MC01

2. TERMINOLOGY

1) STANDARD

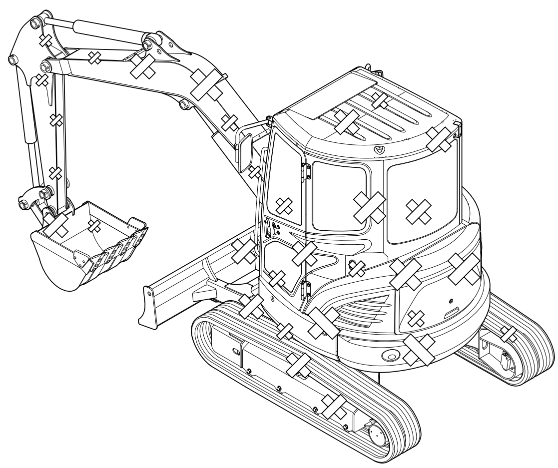
Specifications applied to the brand-new machine, components and parts.



R35Z76MC02

2) SERVICE LIMIT

The lowest acceptable performance level. When the performance level of the machine falls below this level, the machine must be removed from work and repaired. Necessary parts and components must be replaced.



R35Z76MC03

3. OPERATION FOR PERFORMANCE TESTS

1) Observe the following rules in order to carry out performance tests accurately and safely.

(1) The machine

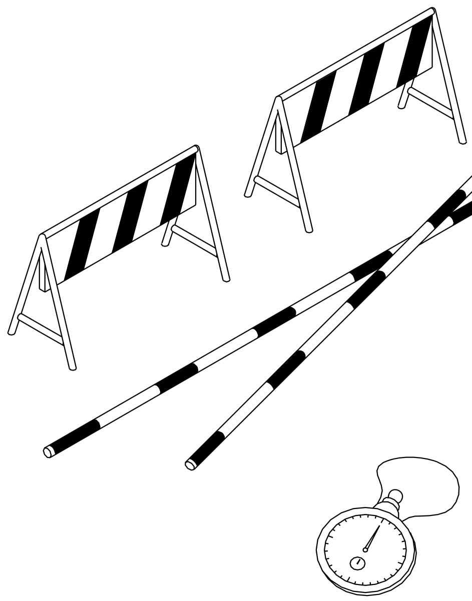
Repair any defects and damage found, such as oil or water leaks, loose bolts, cracks and so on, before starting to test.

(2) Test area

① Select a hard, flat surface.

② Secure enough space to allow the machine to run straight more than 20m, and to make a full swing with the front attachment extended.

③ If required, rope off the test area and provide signboards to keep unauthorized personnel away.



7-3 (140-7)

(3) Precautions

① Before starting to test, agree upon the signals to be employed for communication among coworkers. Once the test is started, be sure to communicate with each other using these signals, and to follow them without fail.

② Operate the machine carefully and always give first priority to safety.

③ While testing, always take care to avoid accidents due to landslides or contact with high voltage power lines. Always confirm that there is sufficient space for full swings.

④ Avoid polluting the machine and the ground with leaking oil. Use oil pans to catch escaping oil. Pay special attention to this when removing hydraulic pipings.

(4) Make precise measurements

① Accurately calibrate test instruments in advance to obtain correct data.

② Carry out tests under the exact test conditions prescribed for each test item.

③ Repeat the same test and confirm that the test data obtained can be procured repeatedly. Use mean values of measurements if necessary.

2) ENGINE SPEED

(1) Measure the engine speed at the maximum RPM.

※ **The engine speed must meet standard RPM; if not, all other operational performance data will be unreliable. It is essential to perform this test first.**

(2) Preparation and measurement

① Warm up the machine, until the engine coolant temperature reaches 50°C or more, and the hydraulic oil is 50±5°C.

② Set the accel lever at the maximum stroke.

③ Measure the engine RPM.

(3) Evaluation

The measured speeds should meet the following specifications.

Unit : rpm

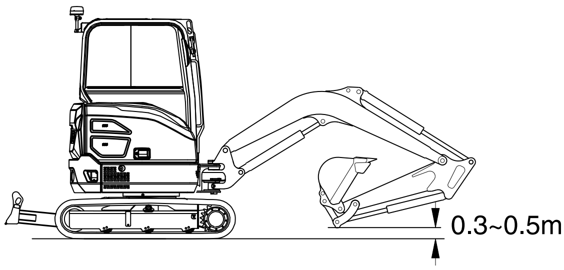
Model	Engine speed	Standard	Remarks
HX27AZ	Low idle	1450±50	
	High idle	2350±50	

3) TRAVEL SPEED

(1) Measure the time required for the excavator to travel a 20m test track.

(2) Preparation

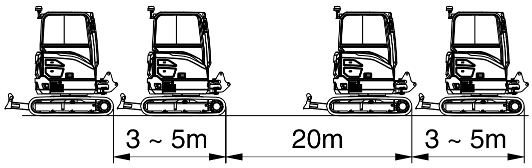
① Adjust the tension of both tracks to be equal.
② Prepare a flat and solid test track 20m in length, with extra length of 3 to 5m on both ends for machine acceleration and deceleration.
③ Hold the bucket 0.3 to 0.5m above the ground with the arm and bucket rolled in.
④ Keep the hydraulic oil temperature at 50±5°C.



25AZ6MS04

(3) Measurement

① Measure both the low and high speeds of the machine.
② Before starting either the low or high speed tests, adjust the travel mode switch to the speed to be tested.
③ Start traveling the machine in the acceleration zone with the travel levers at full stroke.
④ Measure the time required to travel 20m.
⑤ After measuring the forward travel speed, turn the upperstructure 180 ° and measure the reverse travel speed.
⑥ Repeat steps ④ and ⑤ three times in each direction and calculate the average values.



25AZ6MS05

(4) Evaluation

The average measured time should meet the following specifications.

Unit : Seconds / 20m

Model	Travel speed	Standard	Maximum allowable	Remarks
HX27AZ	1 Speed	30.0±2.0	37.5	
	2 Speed	16.5±2.0	21.0	

4) TRACK REVOLUTION SPEED

(1) Measure the track revolution cycle time with the track raised off ground.

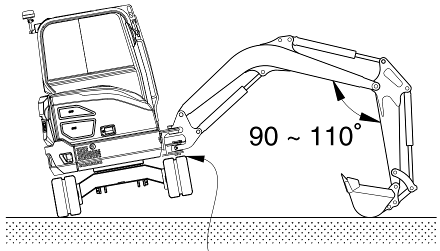
(2) Preparation

① Adjust the tension of both side tracks to be equal.

② On the track to be measured, mark one shoe with chalk.

③ Swing the upperstructure 90° and lower the bucket to raise the track off ground. Keep the boom-arm angle between 90 to 110° as shown. Place blocks under machine frame.

④ Keep the hydraulic oil temperature at 50±5°C.



25AZ6MS06

(3) Measurement

① Select the following switch positions.

· Travel mode switch : 1 or 2 speed

② Operate the travel control lever of the raised track in full forward and reverse.

③ Rotate 1 turn, then measure time taken for next 3 revolutions.

④ Raise the other side of machine and repeat the procedure.

⑤ Repeat steps ③ and ④ three times and calculate the average values.

(4) Evaluation

The revolution cycle time of each track should meet the following specifications.

Unit : Seconds / 3 revolutions

Model	Travel speed	Standard	Maximum allowable
HX27AZ	1 Speed	18.6±2.0	23
	2 Speed	10.0±2.0	12.9

5) TRAVEL DEVIATION

(1) Measure the deviation by the tracks from a 20m straight line.

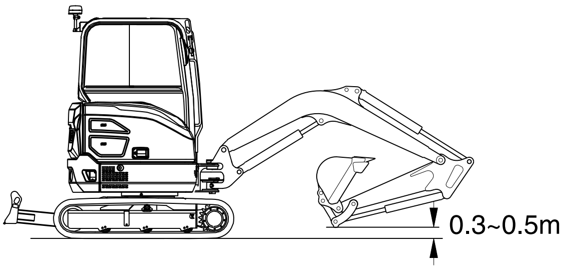
(2) Preparation

① Adjust the tension of both tracks to be equal.

② Provide a flat, solid test yard 20 m in length, with extra length of 3 to 5 m on both ends for machine acceleration and deceleration.

③ Hold the bucket 0.3 to 0.5 m above the ground with the arm and bucket rolled in.

④ Keep the hydraulic oil temperature at 50±5°C.



25AZ6MS04

(3) Measurement

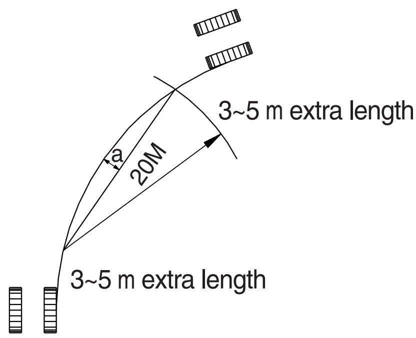
① Measure the amount of mistracking at high and low travel speeds.

② Start traveling the machine in the acceleration zone with the travel levers at full stroke.

③ Measure the distance between a straight 20m line and the track made by the machine. (Dimension a)

④ After measuring the tracking in forward travel, turn the upperstructure 180°and measure that in reverse travel.

⑤ Repeat steps ③ and ④ three times and calculate the average values.



7-7(2) 140-7

(4) Evaluation

Mistrack should be within the following specifications.

Unit : mm / 20 m

Model	Standard	Maximum allowable	Remarks
HX27AZ	200 below	240	

6) SWING SPEED

(1) Measure the time required to swing three complete turns.

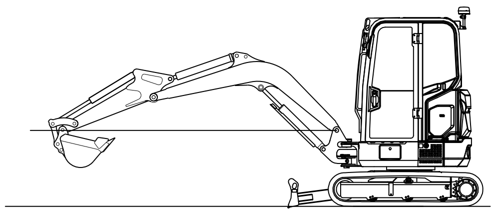
(2) Preparation

① Check the lubrication of the swing gear and swing bearing.

② Place the machine on flat, solid ground with ample space for swinging. Do not conduct this test on slopes.

③ With the arm rolled out and bucket rolled in, hold the bucket so that the height of the bucket pin is the same as the boom foot pin. The bucket must be empty.

④ Keep the hydraulic oil temperature at 50±5°C.



25AZ6MS07

(3) Measurement

① Operate swing control lever fully.

② Swing 1 turn and measure time taken to swing next 2 revolutions.

③ Repeat steps ① and ② three time and calculate the average values.

(4) Evaluation

The time required for 2 swings should meet the following specifications.

Unit : Seconds / 2 revolutions

Model	Standard	Maximum allowable	Remarks
HX27AZ	13.1±1.0	16.5	

7) SWING FUNCTION DRIFT CHECK

(1) Measure the swing drift on the bearing outer circumference when stopping after a 360° full speed swing.

(2) Preparation

① Check the lubrication of the swing gear and swing bearing.

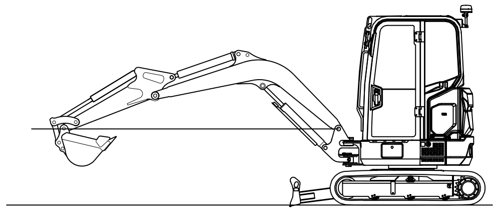
② Place the machine on flat, solid ground with ample space for swinging. Do not conduct this test on slopes.

③ With the arm rolled out and bucket rolled in, hold the bucket so that the height of the bucket pin is the same as the boom foot pin. The bucket must be empty.

④ Make two chalk marks: one on the swing bearing and one directly below it on the track frame.

⑤ Swing the upperstructure 360°.

⑥ Keep the hydraulic oil temperature at 50±5°C.



25AZ6MS07

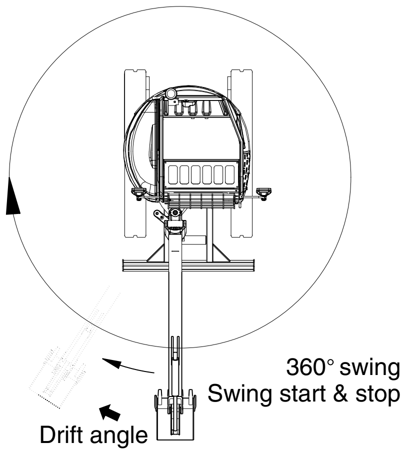
(3) Measurement

① Operate the swing control lever fully and return it to the neutral position when the mark on the upperstructure aligns with that on track frame after swinging 360 °

② Measure the distance between the two marks.

③ Align the marks again, swing 360 °, then test the opposite direction.

④ Repeat steps ② and ③ three times each and calculate the average values.



25AZ6MS08

(4) Evaluation

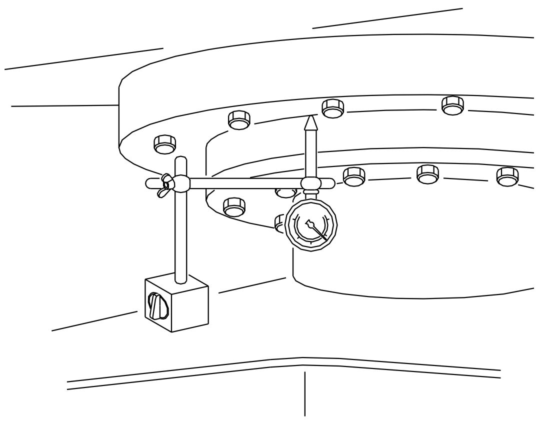
The measured drift angle should be within the following specifications.

Unit : Degree

Model	Standard	Maximum allowable	Remarks
HX27AZ	40 below	50	

8) SWING BEARING PLAY

(1) Measure the swing bearing play using a dial gauge to check the wear of bearing races and balls.



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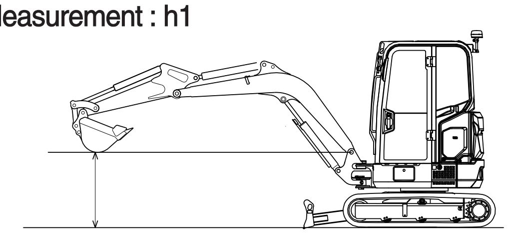
(2) Preparation

① Check swing bearing mounting cap screws for loosening.
② Check the lubrication of the swing bearing. Confirm that bearing rotation is smooth and without noise.
③ Install a dial gauge on the track frame as shown, using a magnetic base.
④ Position the upperstructure so that the boom aligns with the tracks facing towards the front idlers.
⑤ Position the dial gauge so that its needle point comes into contact with the bottom face of the bearing outer race.
⑥ Bucket should be empty.

(3) Measurement

① With the arm rolled out and bucket rolled in, hold the bottom face of the bucket to the same height of the boom foot pin.
Record the dial gauge reading (h1).
② Lower the bucket to the ground and use it to raise the front idler 50 cm.
Record the dial gauge reading (h2).
③ Calculate bearing play (H) from this data (h1 and h2) as follows.
H=h2-h1

Measurement : h1



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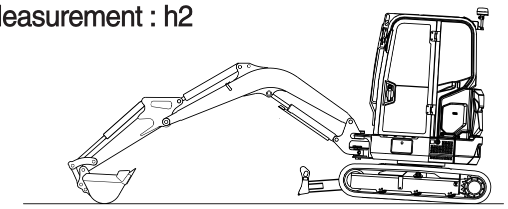
Measurement : h2



25AZ6MS10

(4) Evaluation

The measured drift should be within the following specifications.

Unit : mm

Model	Standard	Maximum allowable	Remarks
HX27AZ	0.5 ~ 1.2	2.4	

9) HYDRAULIC CYLINDER CYCLE TIME

(1) Measure the cycle time of the boom, standard arm, and standard bucket cylinders.

(2) Preparation

① To measure the cycle time of the boom cylinders:
With the arm rolled out and the empty bucket rolled out, lower the bucket to the ground, as shown.

② To measure the cycle time of the arm cylinder.
With the empty bucket rolled in, position the arm so that it is vertical to the ground. Lower the boom until the bucket is 0.5m above the ground.

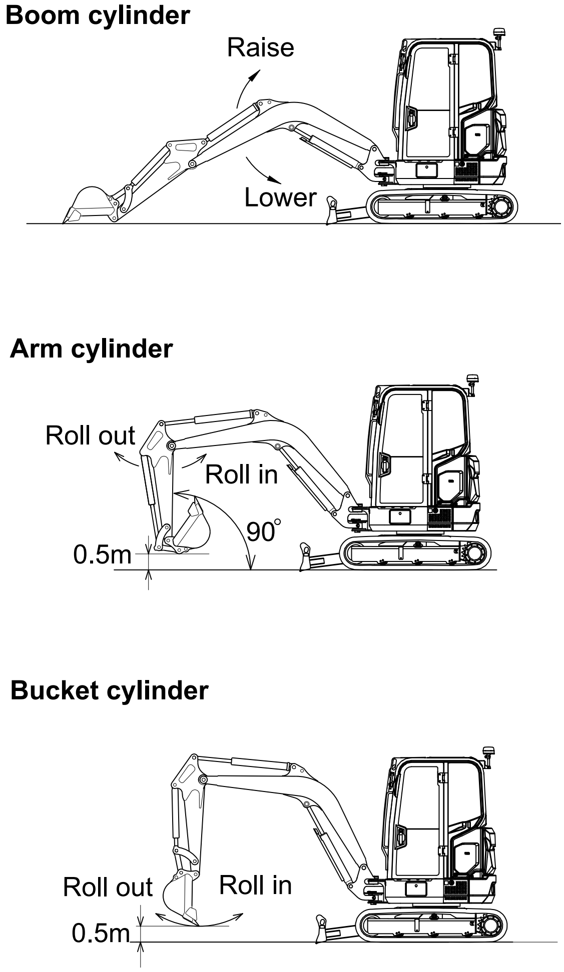
③ To measure the cycle time of the bucket cylinder.
The empty bucket should be positioned at midstroke between roll-in and roll-out, so that the sideplate edges are vertical to the ground.

④ Keep the hydraulic oil temperature at 50±5˚C.

(3) Measurement

① To measure cylinder cycle times.

- Boom cylinders
  Measure the time it takes to raise the boom, and the time it takes to lower the boom. To do so, position the boom at one stroke end then move the control lever to the other stroke end as quickly as possible.
- Arm cylinder
  Measure the time it takes to roll in the arm, and the time it takes to roll out the arm. To do so, position the bucket at one stroke end, then move the control lever to the other stroke end as quickly as possible.



25AZ6MS11

- Bucket cylinders
  Measure the time it takes to roll in the bucket, and the time it takes to roll out the bucket. To do so, position the bucket at one stroke end, then move the control lever to the other stroke end as quickly as possible.
- Repeat each measurement 3 times and calculate the average values.

(4) Evaluation

The average measured time should meet the following specifications.

Unit : Seconds

Model	Function	Standard	Maximum allowable	Remarks
HX27AZ	Boom raise	2.3±0.4	3.0	
	Boom lower	2.4±0.4	3.0	
	Arm in	2.7±0.4	3.4	
	Arm out	1.7±0.4	2.4	
	Bucket load	2.7±0.4	3.4	
	Bucket dump	1.9±0.4	2.4	
	Boom swing (LH)	5.1±0.4	7.1	
	Boom swing (RH)	5.2±0.4	5.4	
	Dozer up	1.9±0.3	2.4	without DPC valve
	Dozer down	2.5±0.3	3.1	
	Dozer up	4.8±0.3	5.3	with DPC valve
	Dozer down	3.0±0.3	3.5	

10) DIG FUNCTION DRIFT CHECK

(1) Measure dig function drift, which can be caused by oil leakage in the control valve and boom, standard arm, and standard bucket cylinders, with the loaded bucket.
When testing the dig function drift just after cylinder replacement, slowly operate each cylinder to its stroke end to purge air.

(2) Preparation

① Load bucket fully. Instead of loading the bucket, weight (W) of the following specification can be used.

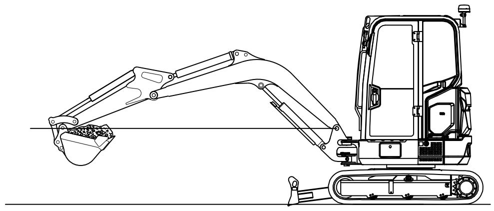
· $W = M^3 \times 1.5$
Where :
M^3 = Bucket heaped capacity(m^3)
1.5= Soil specific gravity

② Position the arm cylinder with the rod 20 to 30㎜ extended from the fully retracted position.

③ Position the bucket cylinder with the rod 20 to 30㎜ retracted from the fully extended position.

④ With the arm rolled out and bucket rolled in, hold the bucket so that the height of the bucket pin is the same as the boom foot pin.

⑤ Keep the hydraulic oil temperature at 50±5°C.



25AZ6MS12

(3) Measurement

① Stop the engine.

② Five minutes after the engine has been stopped, measure the changes in the positions of the boom, arm and bucket cylinders.

③ Repeat step ② three times and calculate the average values.

(4) Evaluation

The measured drift should be within the following specifications.

Unit : mm / 5 min

Model	Drift to be measured	Standard	Maximum allowable	Remarks
HX27AZ	Boom cylinder	10 below	20	
	Arm cylinder	20 below	30	
	Bucket cylinder	20 below	30	

11) CONTROL LEVER OPERATING FORCE

(1) Use a spring scale to measure the maximum resistance of each control lever at the middle of the grip.

(2) Preparation

① Keep the hydraulic oil temperature at 50±5°C.

(3) Measurement

① Start the engine.
② Operate each boom, arm, bucket and swing lever at full stroke and measure the maximum operating force for each.
③ Lower the bucket to the ground to raise one track off the ground. Operate the travel lever at full stroke and measure the maximum operating force required. When finished, lower the track and then jack-up the other track.
④ Repeat steps ② and ③ three times and calculate the average values.

(4) Evaluation

The measured operating force should be within the following specifications.

Unit : kgf

Model	Kind of lever	Standard	Maximum allowable	Remarks
HX27AZ	Boom lever	1.4 or below	1.9	
	Arm lever	1.4 or below	1.9	
	Bucket lever	1.4 or below	1.9	
	Swing lever	1.4 or below	1.9	
	Travel lever	2.0 or below	2.5	

12) CONTROL LEVER STROKE

(1) Measure each lever stroke at the lever top using a ruler.

※ **When the lever has play, take a half of this value and add it to the measured stroke.**

(2) Preparation

Keep the hydraulic oil temperature at 50±5°C.

(3) Measurement

① Stop the engine.

② Measure each lever stroke at the lever top from neutral to the stroke end using a ruler.

③ Repeat step ② three times and calculate the average values.

(4) Evaluation

The measured drift should be within the following specifications.

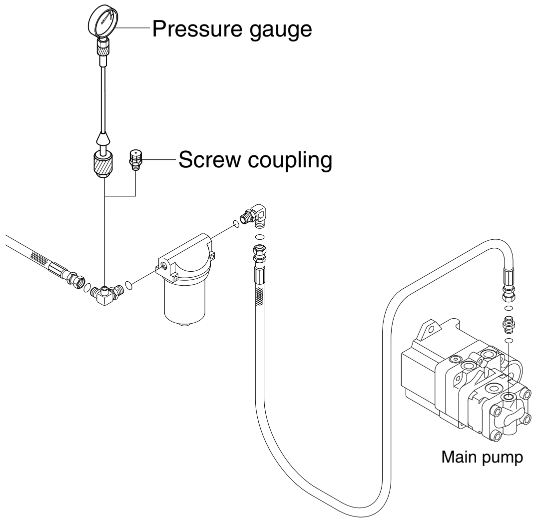
Unit : mm

Model	Kind of lever	Standard	Maximum allowable	Remarks
HX27AZ	Boom lever	87±10	109	
	Arm lever	87±10	109	
	Bucket lever	87±10	109	
	Swing lever	87±10	109	
	Travel lever	86±10	105	

13) PILOT PRIMARY PRESSURE

(1) Preparation

① Stop the engine.
② Loosen the hydraulic tank cap to bleed air.
③ Loosen the cap of screw coupling at the fitting near pilot filter and connect pressure gauge.
④ Start the engine and check for oil leakage from the port.
⑤ Keep the hydraulic oil temperature at 50±5°C.



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(2) Measurement

① Measure the primary pilot pressure.

(3) Evaluation

The average measured pressure should meet the following specifications:

Unit : kgf / cm^2

Model	Standard	Remarks
HX27AZ	30±5	

14) FOR TRAVEL SPEED SELECTING PRESSURE

(1) Preparation

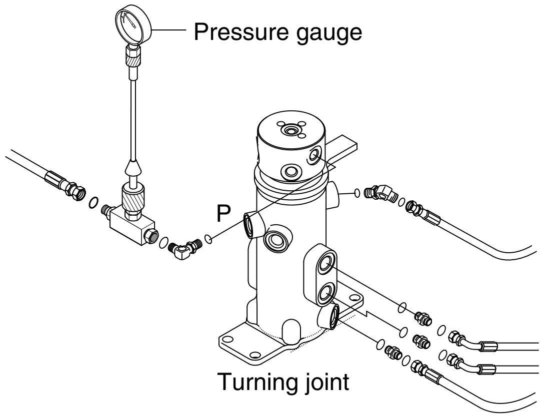
① Stop the engine.

② Loosen the hydraulic tank cap to bleed air.

③ To measure the speed selecting pressure: Install a connector and pressure gauge assembly to turning joint P port as shown.

④ Start the engine and check for on leakage from the adapter.

⑤ Keep the hydraulic oil temperature at 50±5°C.



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(2) Measurement

① Select the following switch positions.
Travel mode switch : 1 speed
2 speed

② Measure the travel speed selecting pressure in the Hi or Lo mode.

③ Lower the bucket to the ground to raise the track off the ground. Operate the travel lever at full stroke and measure the fast speed pressure.

④ Repeat steps ② and ③ three times and calculate the average values.

(3) Evaluation

The average measured pressure should be within the following specifications.

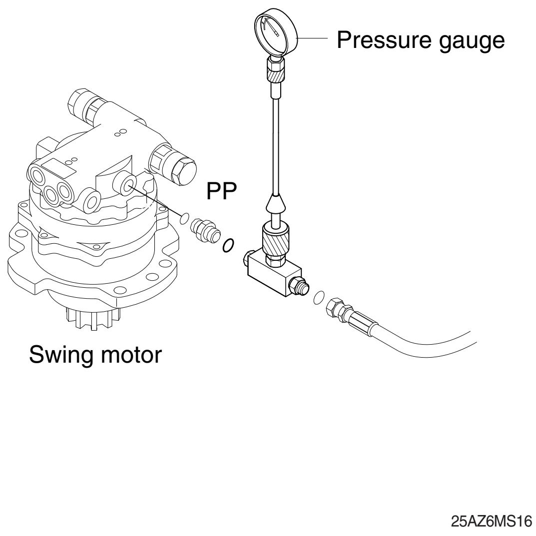
Unit : kgf / cm^2

Model	Travel speed mode	Standard	Maximum allowable	Remarks
HX27AZ	1 Speed	0	-	
	2 Speed	30±5	-	

15) SWING PARKING BRAKE RELEASING PRESSURE

(1) Preparation

① Stop the engine.
② Loosen the hydraulic tank cap to bleed air.
③ Install a connector and pressure gauge assembly to swing motor PP port, as shown.
④ Start the engine and check for oil leakage from the adapter.
⑤ Keep the hydraulic oil temperature at 50±5°C.



(2) Measurement

① Operate the swing function or arm roll in function and measure the swing brake control pressure with the brake disengaged. Release the control lever to return to neutral and measure the control pressure when the brake is applied.
② Repeat three times and calculate the average values.

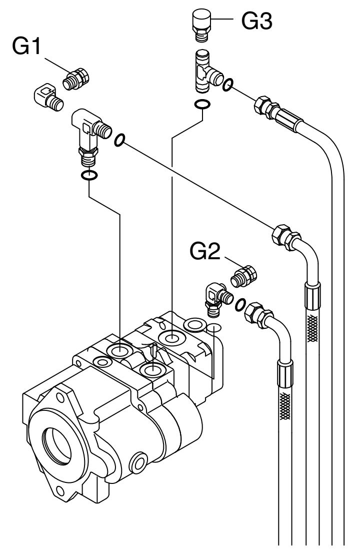
(3) Evaluation

The average measured pressure should be within the following specifications.

Unit : kgf / cm^2

Model	Engine speed	Standard	Remarks
HX27AZ	Brake disengaged	30±5	
	Brake applied	0	

16) MAIN PUMP DELIVERY PRESSURE



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(1) Preparation

① Stop the engine.
② Loosen the hydraulic tank cap to bleed air.
③ To measure the main pump pressure. Loosen the cap of screw coupling and connect pressure gauge to the main pump gauge port (G1, G2, G3) as shown.
④ Start the engine and check for oil leakage from the port.
⑤ Keep the hydraulic oil temperature at 50±5°C.

(2)

① Measurement
Measure the main pump delivery pressure at high idle.

(3) Evaluation

The average measured pressure should meet the following specifications.

Unit : kgf / cm^2

Model	Engine speed	Standard	Allowable limits	Remarks
HX27AZ	High idle	20±5	-	

17) SYSTEM PRESSURE REGULATOR RELIEF SETTING

(1) Preparation

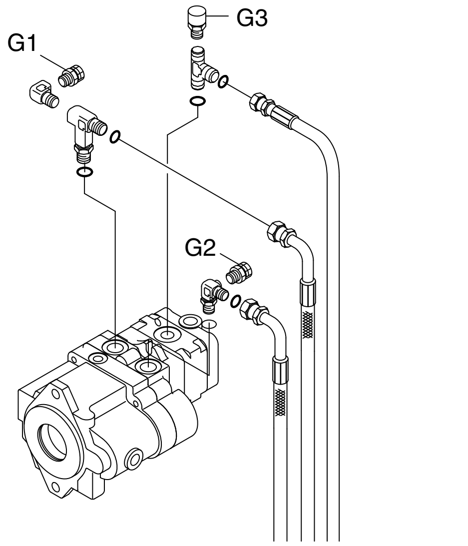
① Stop the engine.

② Loosen the hydraulic tank cap to bleed air.

③ To measure the system relief pressure. Loosen the cap of screw coupling and connect pressure gauge to the main pump gauge port (G1, G2, G3) as shown.

④ Start the engine and check for oil leakage from the port.

⑤ Keep the hydraulic oil temperature at 50±5°C.



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(2) Measurement

① Slowly operate each control lever of boom, arm and bucket functions at full stroke over relief and measure the pressure.

② In the swing function, place bucket against an immovable object and measure the relief pressure.

③ In the travel function, lock undercarriage with an immovable object and measure the relief pressure.

(3) Evaluation

The average measured pressure should be within the following specifications.

Unit : kgf / cm^2

Model	Function to be tested	Standard
HX27AZ	Boom, Arm, Bucket	220±10
	Travel	220±10
	Swing	170±10

GROUP 2 MAJOR COMPONENT

1. MAIN PUMP

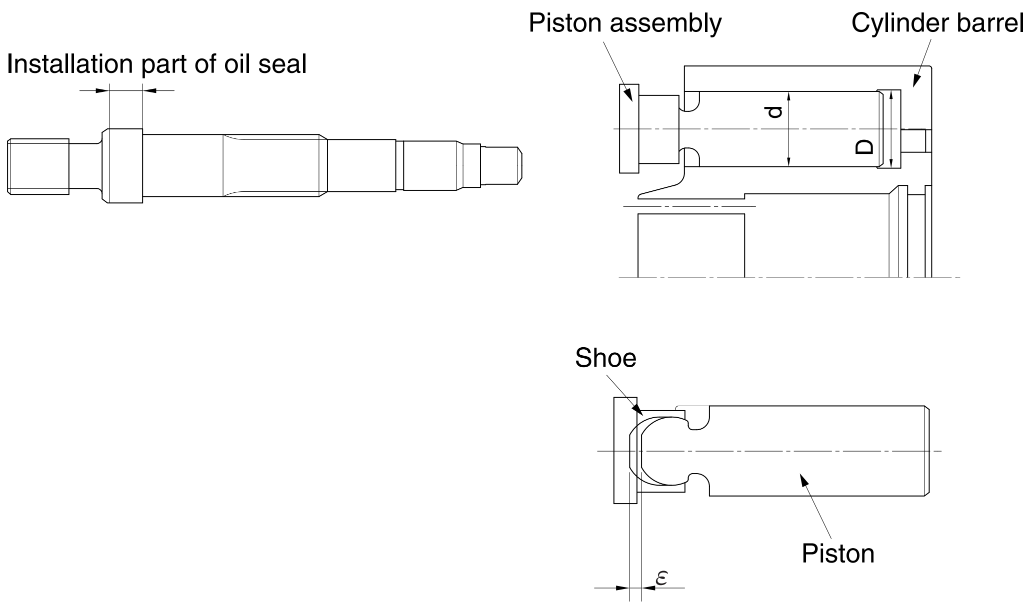
Before inspection, wash the parts well and dry them completely.

Inspect the principal parts with care and replace them with new parts when any abnormal wear exceeding the allowable limit or damage considered harmful is found.

Replace the seal also when any remarkable deformation and damage are found.

1) INSPECTION POINTS WHEN DISASSEMBLED

Part	Extent of the damage	Inspection standard	Action
Shaft (3)	Excessive wear on the seal surface.	Worn depth : 0.025 mm or more	Replace the shaft.
Valve plate (5)	Excessive wear or damages on the sliding surface.	Worn depth : 0.020 mm or more	Replace the cylinder barrel kit.
Cylinder barrel (4)	Excessive wear or damages on the sliding surface.	Worn depth : 0.020 mm or more	Replace the cylinder barrel kit.
	Clearance between the pistons (D-d).	0.050 mm or more	Replace the cylinder barrel kit.
Piston (6), Shoe (7)	Wear of joint section	Play (ε) between the shoe and the piston (0.2 mm or more by hand operation).	Replace the cylinder barrel kit.
Seals (O-rings, gasket, etc.)	Damage, excessive rust	-	Replace each part.



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2) TROUBLESHOOTING AND COUNTERMEASURE

No.	Trouble	Possible cause	Countermeasure
1	Overload to engine	· Speed is higher than standard · Setting pressure is higher than specifications · Damage of internal parts of pump	· Readjust it as standard · Readjust it as spec · Repair or replace
2	Low pump flow or low pressure	· Speed down of engine · Wrong coupling · Damage of internal parts of pump	· Readjust of engine speed · Repair or replace · Repair or replace
3	Abnormal noise or abnormal vibration (cavitations)	· Air in the oil · Water in the oil · Clog of suction filter · High suction pressure · Damage of piston shoe · Installation condition is no good · Wrong coupling	· Check piping Bleed the air in the hydraulic circuit · Replace oil · Clean or replace · Correction · Replace · Correction · Replace
4	Oil leakage	· Damage of O-ring or packing · Loosened plug · Leaking from oil seal	· Replace · Tight up · Replace Replace of oil seal

2. MAIN CONTROL VALVE

Part name	Inspection item	Criteria & measure
Block	· Existence of scratch, rusting or corrosion.	· In case of damage in following section, replace part. - Sliding sections of casing fore and spool, especially land sections applied with holded pressure. - Seal pocket section where spool is inserted. - Seal section of port where O-ring contacts. - Seal section of each relief valve for main, travel, and port. - Other damages that may damage normal functions.
Spool	· Existence of scratch, gnawing, rusting or corrosion. · O-ring seal sections at both ends. · Insert spool in casing hole, rotate and reciprocate it.	· Replacement when its outside sliding section has scratch (Especially on seals-contacting section). · Replacement when its sliding section has scratch. · Correction or replacement when O-ring is damaged or when spool does not move smoothly.
Poppet	· Damage of poppet or spring · Insert poppet into casing and function it.	· Correction or replacement when sealing is incomplete. · Normal when it can function lightly without being caught.
Around spring	· Rusting, corrosion, deformation or breaking of spring, spring seat, plug or cover.	· Replacement for significant damage.
Around seal for spool	· External oil leakage. · Rusting, corrosion or deformation of seal plate.	· Correction or replacement. · Correction or replacement.
Main relief valve & port relief valve	· External rusting or damage. · Contacting face of valve seat. · Contacting face of poppet. · Abnormal spring. · O-rings, back up rings and seals.	· Replacement. · Replacement when damaged. · Replacement when damaged. · Replacement. · 100% replacement in general.

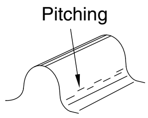
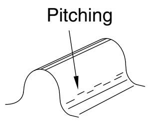
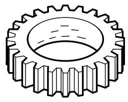
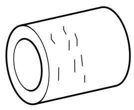
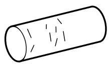
3. SWING MOTOR

1) POSSIBLE REASONS FOR THE TROUBLE AND ITS COUNTERMEASURES

Trouble	Possible reasons		Countermeasure
Motor does not move. The supplied pressure is enough.	Relief valve	Setting pressure is too low.	Replace the relif valve assembly.
		Faulty operation.	
	Hydraulic motor	Burned inner parts.	Replace the hydraulic motor assembly.
		Too much internal leakage.	
	Reduction gear	Damage to the gears.	Replace the reduction gear assembly.
	Overload	-	Remove the overload.
Insufficient torque	Relief valve	Setting pressure is too low.	Replace the relief valve assembly.
		Faulty operation.	
	Hydraulic motor	Burned sliding parts.	Replace the hydraulic motor assembly.
		Too much internal leakage.	
	Reduction gear	Damage to the gears.	Replace the pinion kit, carrier kit.
		Damage to bearings.	
Abnormal noise	Cavitation noise	Insufficient flow.	Adjust the piping.
	Hydraulic motor	Damage to sliding parts.	Replace the hydraulic motor assembly.
	Reduction gear	Damage to the gears.	Replace the pinion kit, carrier kit.
		Damage to bearings	
	Pinion gear	Damage to the gear surface.	Replace the pinion kit.
Oil leakage	Body gasket	Damage to O-rings.	Replace the O-ring
		Loose bolts.	Re-tighten the loose bolts.
	Pinion gear	Damage to oil seal.	Replace the pinion kit.
Delay in start up, or delay in stopping	Relief valve	Faulty operation.	Replace the relief valve assembly.
	Check valve	Internal leakage.	Replace the body H kit.
Excessive heat generation	Hydraulic motor	Burned or damaged sliding parts.	Replace the hydraulic motor assembly.
	Reduction gear	Damage to the gears.	Replace the pinion kit, carrier kit.
		Damage to bearings	

2) STANDARD FOR PARTS INSPECTION

(1) Reduction gear section

Part	Extent of the damage	Inspection standard	Action
A internal gear	Excessive wear of the surface	Pitching area 5% or more of the gear surface 	Replace the pinion kit.
Carrier 1 Carrier 2	Damage to spline section	By visual	Replace the carrier kit.
S1 gear S2 gear b1 gear b2 gear	Excessive wear of the surface	Pitching area 5% or more of the gear surface 	Replace the carrier kit.
	Excessive wear of the bearing surface	By visual pitching, flaking 	
Ring	Excessive wear of the bearing surface	By visual pitching, flaking 	Replace the carrier kit.
Roller	Excessive wear of the bearing surface	By visual pitching, flaking 	Replace the carrier kit.
Other (O-ring, screw, etc.)	Damage, excessive rust	-	Replace each part.

(2) Hydraulic motor section

Part	Extent of the damage	Inspection standard	Action
Shaft	Excessive wear of the spline section	Worn depth : 25 μm or more	Replace the hydraulic motor assembly.
Cylinder barrel	Excessive wear to the sliding surface of the valve plate	Worn depth : 20 μm or more	Replace the cylinder barrel kit.
Valve plate	Excessive wear to the sliding surface of the cylinder barrel	Worn depth : 20 μm or more	Replace the cylinder barrel kit.
Piston shoe	Wear of joint section of shoe	Play of piston and shoe : 0.3 mm or more by hand operation	Replace the cylinder barrel kit.
Swash plate	Excessive wear to the sliding surface of the shoe	Worn depth : 0.1 mm or more	Replace the swash plate kit.
Other (O-ring, screw, etc.)	Damage, excessive rust	-	Replace each part.

4. TRAVEL MOTOR

1) MAINTENANCE STANDARD FOR TRAVEL MOTOR

Travel motors basically don't require maintenance except changing the reducer lubricant. Don't disassemble the motor unless there are problem with it. Refer to the following standards for parts (kits) replacement.

(1) Reducer

No.	Part name	Point to be checked	Standard	Action
1	Body (internal gear)	Engaging tooth surface with B1 and B2 gears	No pitching with 5% or greater (ratio of engaging area to tooth surface) No abnormal damage	Replace
2	Carrier 2	Spline tooth surface	No abnormal damage, wear	Replace whole carrier 2 kit
		Loose of B2 pins	No loose by hand	
3	B1 gears	Tooth surface	No pitching with 5% or greater (ratio of engaging area to tooth surface) No abnormal damage	Replace
		Needle rolling contact surface	No flaking and pitching	
4	B2 gears	Tooth surface	No pitching with 5% or greater (ratio of engaging area to tooth surface) No abnormal damage	Replace whole carrier 2 kit
		Needle rolling contact surface	No flaking and pitching	
5	S1 gear	Tooth surface	No pitching with 5% or greater (ratio of engaging area to tooth surface) No abnormal damage	Replace whole carrier 2 kit
6	S2 gear	Engaging tooth surface with B2 gears	No pitching with 5% or greater (ratio of engaging area to tooth surface) No abnormal damage	Replace
		Spline tooth surface	No abnormal damage, wear	
7	B2 pins	Needle rolling contact surface	No flaking and pitching	Replace whole carrier 2 kit
8	Floating seals	Seat surface	No abnormal damage, wear	Replace
		O-ring surface	No damage, deformation, and hardening	
9	Angular ball bearings	Rolling contact surface	No abnormal damage, flaking	Replace
10	Needles	Rolling contact surface	No flaking and pitching	Replace whole carrier 2 kit
11	O-rings	Surface, hardness	No damage, deformation, and hardening	Replace

(2) Hydraulic valve and motor

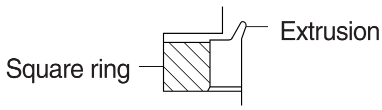
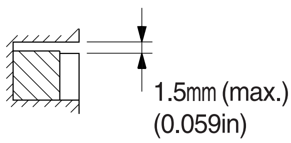
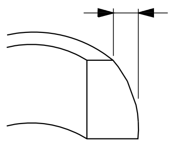
No.	Part name	Point to be checked	Standard	Action
12	Body 1	Spool sliding contact surface	No abnormal damage, wear	Relpace whole body 1 kit
13	Counter valve spool Two-speed spool Shuttle spool	Body 1 sliding contact surface	No abnormal damage, wear	Relpace whole body 1 kit
14	Body 2	Spline tooth surface	No abnormal damage, wear	Replace whole body 2 kit
		Control piston sliding contact surface	No abnormal damage, wear Clearance between piston and body 2 is 0.023 mm or smaller	
		Swash plate installaion surface	No abnormal damage, wear	
		Ball sliding contact surface	No abnormal damage, wear	
15	Shaft	Spline tooth surface	No abnormal damage, wear	Replace shaft kit
		Oil seal sliding contact surface	No abnormal damage, wear (0.025 mm or greater)	
16	Cylinder barrel	Piston sliding contact surface	No abnormal damage, wear Clearance between piston and cylinder barrel is 0.030 mm or smaller	Replace cylinder barrel kit
		Valve place sliding contact surface	No abnormal damage, wear (0.020 mm or greater)	Lap or replace cylicder barrel kit
17	Valve plate	Cylinder barrel sliding contact surface	No abnormal damage, wear (0.020 mm or greater)	Lap or replace cylicder barrel kit
18	Pistons Shoes	Cylinder barrel sliding contact surface	No abnormal damage, wear (0.020 mm or greater)	Replace cylinder barrel kit
		Swash plate sliding contact surface	No abnormal damage, wear (0.020 mm or greater)	Lap or replace cylicder barrel kit
		Loose of shoe calking part	Loose is smaller than 0.3 mm	Replace cylinder barrel kit
19	Shoe holder	Barrel holder sliding contact surface	No abnormal damage, wear	Replace cylinder barrel kit
20	Barrel holder	Spline tooth surface	No abnormal damage, wear	Replace cylinder barrel kit
		Shoe holder sliding contact surface	No abnormal damage, wear	
21	Swash plate	Shoe sliding contact surface	No abnormal damage, wear (0.020 mm or greater)	Lap or replace
		Ball sliding contact surface	No abnormal damage, wear	Replace
22	Control piston	Body 2 sliding contact surface	Clearance between piston and body 2 is 0.023 mm or smaller	Replace body 2 kit
23	Oil seal	Lip surface	No abnormal damage, wear and deformation	Replace
24	Ball bearing	Rolling contact surface	No abnormal damage, flaking	Replace
25	Springs	Surface	No crack	Replace
26	O-rings	Surface and hardness	No damage, deformation, and hardening	Replace

2) FAILURE DIAGNOSIS OF TRAVEL MOTOR

Failure detail	Major causes	Countermeasure
Doesn't start	Operating defect in hydraulic equipment except travel motors	Inspect and repair or replace each equipment. Check that normal working pressure is supplied to the motor inlet port.
	Defect in reducer - Damage of inner parts	 Replace the damaged part (kit).
	Defect in hydraulic motor - Oil leakage due to abnormal wear of the sliding parts - Damage of inner parts	 Replace the worn part (kit). Replace the damaged part (kit).
	Defect in hydraulic valve - Spool doesn't move Foreign object is caught in the spool sliding part. Choke is clogged	 Remove the foreign object. In case of much leakage, replace the body 1 kit. Remove the foreign object.
Doesn't stop or stop slowly	Defect in hydraulic valve - Spool doesn't return Foreign object is caught in the spool sliding part. Choke is clogged. Spring is damaged. - Check valve doesn't close due to foreign object being caught on the seat.	 Remove the foreign object. In case of much leakage, replace the body 1 kit. Remove the foreign object. Replace the body 1 kit. Remove the foreign object. In case of much leakage, replace the body 1 kit.
Rotating speed is slow	Prescribed flow rate is not supplied to the motor due to operating defect in the pump.	Inspect and repair or replace the pump.
	Volumetric efficiency declines due to defect in the motor. - Abnormal wear of sliding parts	 Replace the worn part (kit).
	Volumetric efficiency declines due to defect in the hydraulic valve. - Abnormal wear of main spool and two speed spool sliding part	 Replace body 1 kit.

Failure detail	Major causes	Countermeasure
Doesn't change to two speed	Operating defect in hydraulic equipment except travel motors	Inspect and repair or replace each equipment. Check that normal pressure is supplied to the pilot port.
	Defect in the hydraulic valve	
	- Two speed spool doesn't move due to foreign object being caught in the spool sliding part.	Remove the foreign object. In case of much leakage, replace the body 1 kit.
	- Choke in the two speed pilot line is clogged.	Remove the foreign object.
	Defect in the hydraulic motor	
	- Control piston doesn't move.	
	Foreign object is caught in the piston sliding part.	Remove the foreign object. In case of much leakage, replace the body 2 kit.
	Oil leakage due to abnormal wear of the sliding part.	Replace the worn part (kit).
	Oil leakage due to damage of O-ring located between body 1 and body 2.	Replace the O-ring.
Doesn't change to one speed	Operating defect in hydraulic equipment except travel motors	Inspect and repair or replace each equipment. Check that normal pressure is supplied to the pilot port.
	Defect in the hydraulic valve	
	- Two speed spool doesn't move. Foreign object is caught in the spool sliding part.	Remove the foreign object. In case of much leakage, replace the body 1 kit.
	Damage of spring	Replace the body 1 kit.
	- Choke in the two speed pilot line is clogged.	Remove the foreign object.
Tracking deviation	Same as No.3, 4 and 5	-
Oil leakage	Oil leakage due to damage of O-rings.	
	- Damage of O-ring located in the reducer cover.	Replace the O-ring.
	- Damage of O-rings located between body 1 and body 2.	Replace the O-ring.
	Oil leakage from the floating seals	
	- Abnormal wear of the seat surface or damage of the O-ring.	Replace the floating seal.
	- Pressure in the reducer casing rises due to damage of the oil seal.	Replace the oil seal.

5. TURNING JOINT

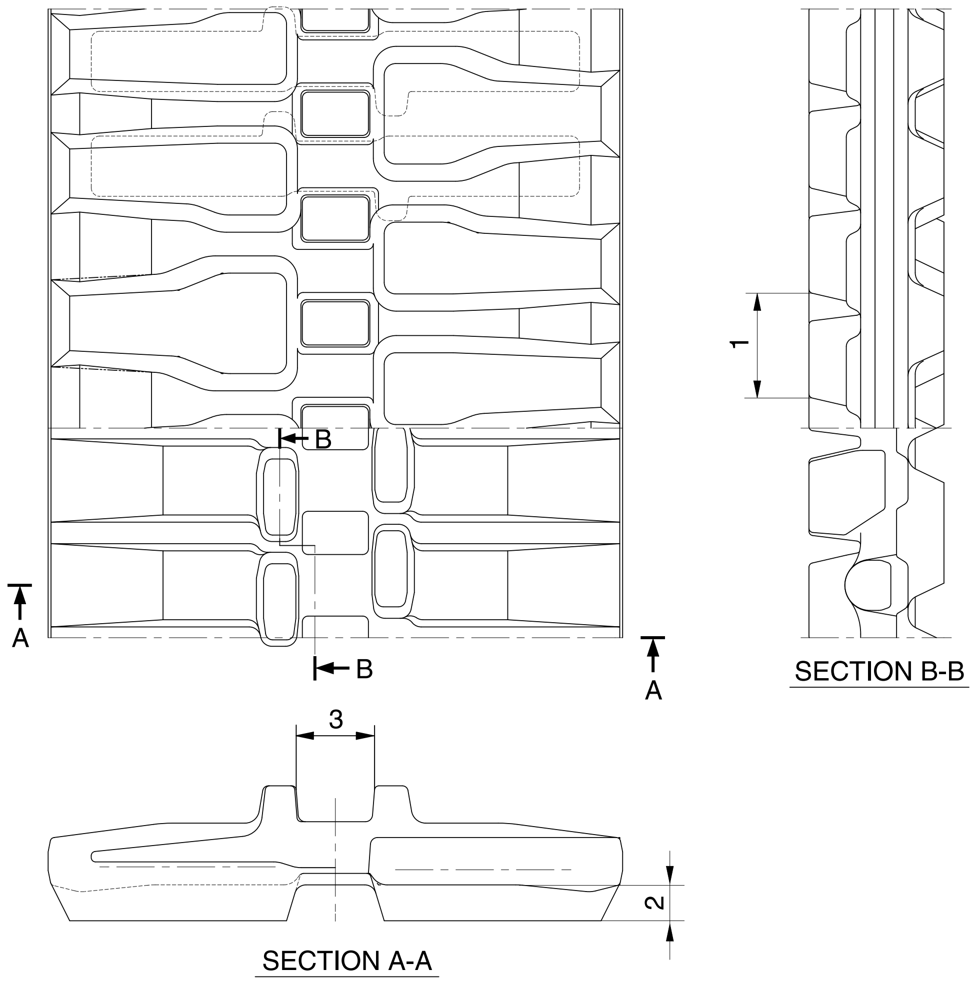
Parts Name		Check Points	Measures
Body, Stem	Sliding surface with sealing sections.	Plating worn or peeled due to seizure or contamination.	Replace
	Sliding surface between body and stem other than sealing section.	· Worn abnormality or damaged more than 0.1 mm (0.0039 in) in depth due to seizure contamination.	Replace
		· Damaged more than 0.1 mm (0.0039 in) in depth.	Smooth with oilstone.
	Sliding surface with thrust plate.	· Worn more than 0.5 mm (0.02 in) or abnormality.	Replace
		· Worn less than 0.5 mm (0.02 in).	Smooth
		· Damage due to seizure or contamination remediable within wear limit (0.5 mm) (0.02 in).	Smooth
Cover	Sliding surface with thrust plate.	· Worn more than 0.5 mm (0.02 in) or abnormality.	Replace
		· Worn less than 0.5 mm (0.02 in).	Smooth
		· Damage due to seizure or contamination remediable within wear limit (0.5 mm) (0.02 in).	Replace
Seal set	-	· Extruded excessively from seal groove square ring. 	Replace
	-	· Slipper ring 1.5 mm (0.059 in) narrower than seal groove, or narrower than back ring. 	Replace
	-	· Worn more than 0.5 mm (0.02 in) ~ 1.5 mm (MAX.) (0.059 in) 	Replace

6. CYLINDER

Part name	Inspecting section	Inspection item	Remedy
Piston rod	· Neck of rod pin	· Presence of crack	· Replace
	· Weld on rod hub	· Presence of crack	· Replace
	· Stepped part to which piston is attached.	· Presence of crack	· Replace
	· Threads	· Presence of crack	· Recondition or replace
	· Plated surface	· Plating is not worn off to base metal. · Rust is not present on plating. · Scratches are not present.	· Replace or replate · Replace or replate · Recondition, replate or replace
	· Rod	· Wear of O.D.	· Recondition, replate or replace
	· Bushing at mounting part	· Wear of I.D.	· Replace
Cylinder tube	· Weld on bottom	· Presence of crack	· Replace
	· Weld on head	· Presence of crack	· Replace
	· Weld on hub	· Presence of crack	· Replace
	· Tube interior	· Presence of faults	· Replace if oil leak is seen
	· Bushing at mounting part	· Wear on inner surface	· Replace
Gland	· Bushing	· Flaw on inner surface	· Replace if flaw is deeper than coating

1. TRACK SHOE

1) RUBBER SHOE SPEC



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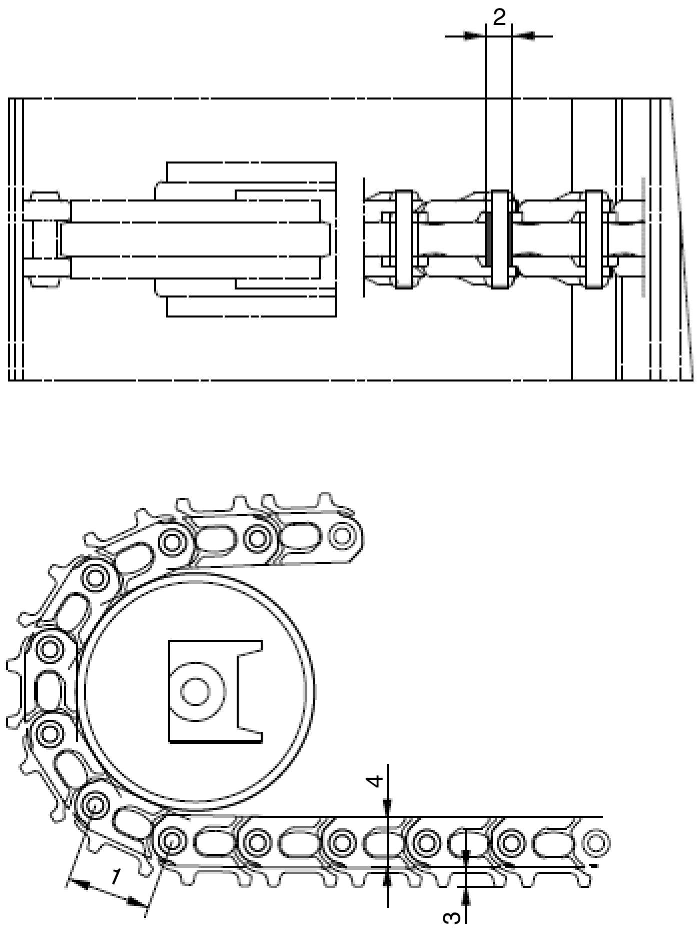
Unit : mm

No	Check item	Criteria		Remedy
		Standard size	Repair limit	
1	Link pitch	52.5	54.5	Turn or replace
2	Height of grouser	28.5	5	
3	Width of link	34	46	

2) STEEL SHOE



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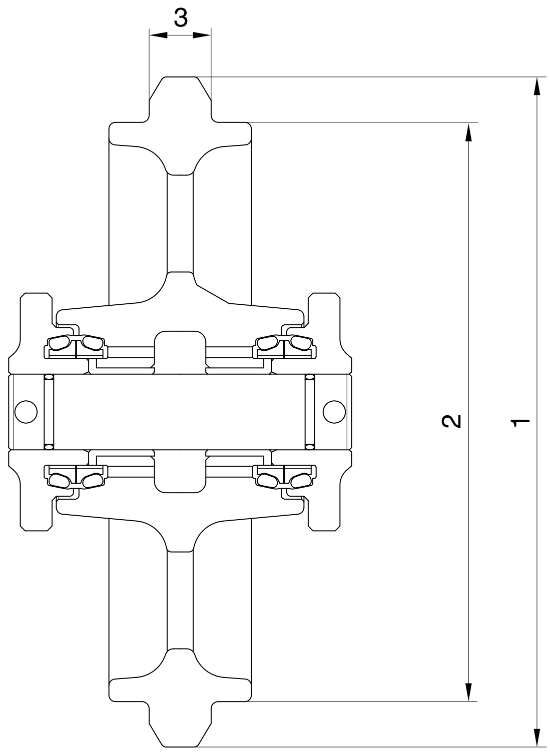
Unit : mm

No	Check item	Criteria		Remedy
		Standard size	Repair limit	
1	Link pitch	101.6	105.0	Replace bushing and pin and link assembly
2	Outside diameter of bushing	32.17	28.77	
3	Height of grouser	16.5	12.5	Lug welding, rebuild or replace
4	Height of link	65	60	

2. IDLER

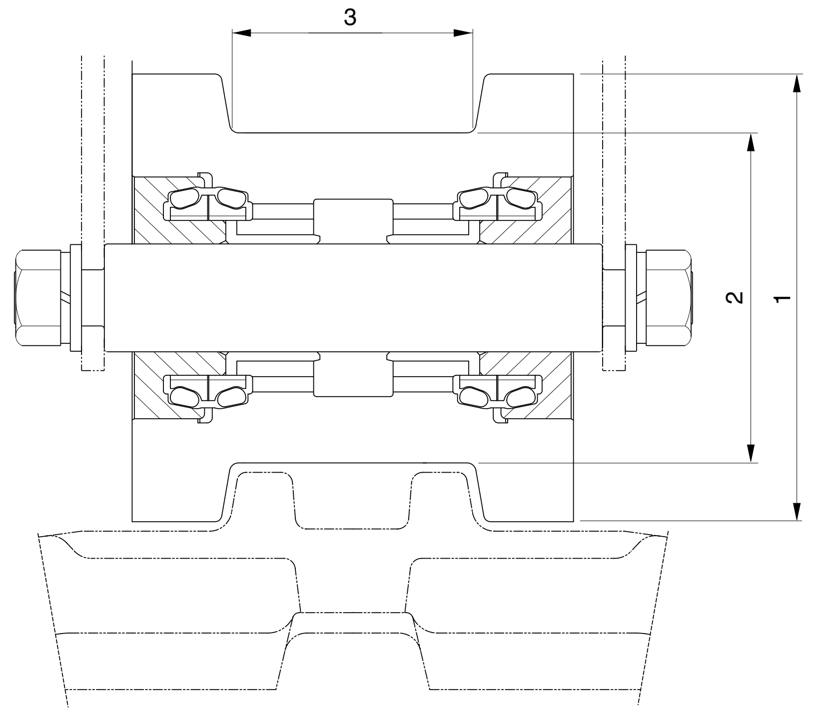


R25Z9A6MC23

Unit : mm

No	Check item		Criteria		Remedy
			Standard size	Repair limit	
1	Outside diameter of flange	Rubber	Ø 311	-	Rebuild or replace
2	Outside diameter of thread	Rubber	Ø 269	Ø 263	
3	Width of flange		29	23	

3. TRACK ROLLER

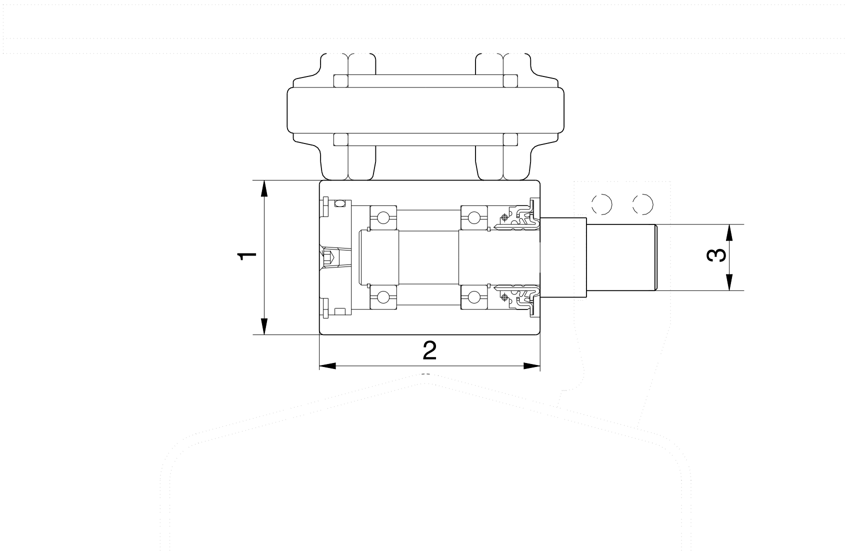


R25Z9AK6MC19

Unit : mm

No	Check item		Criteria		Remedy
			Standard size	Repair limit	
1	Outside diameter of flange	Rubber	Ø124	-	Rebuild or replace
2	Outside diameter of thread	Rubber	Ø80	Ø75	
3	Width of flange		78	83	

4. CARRIER ROLLER

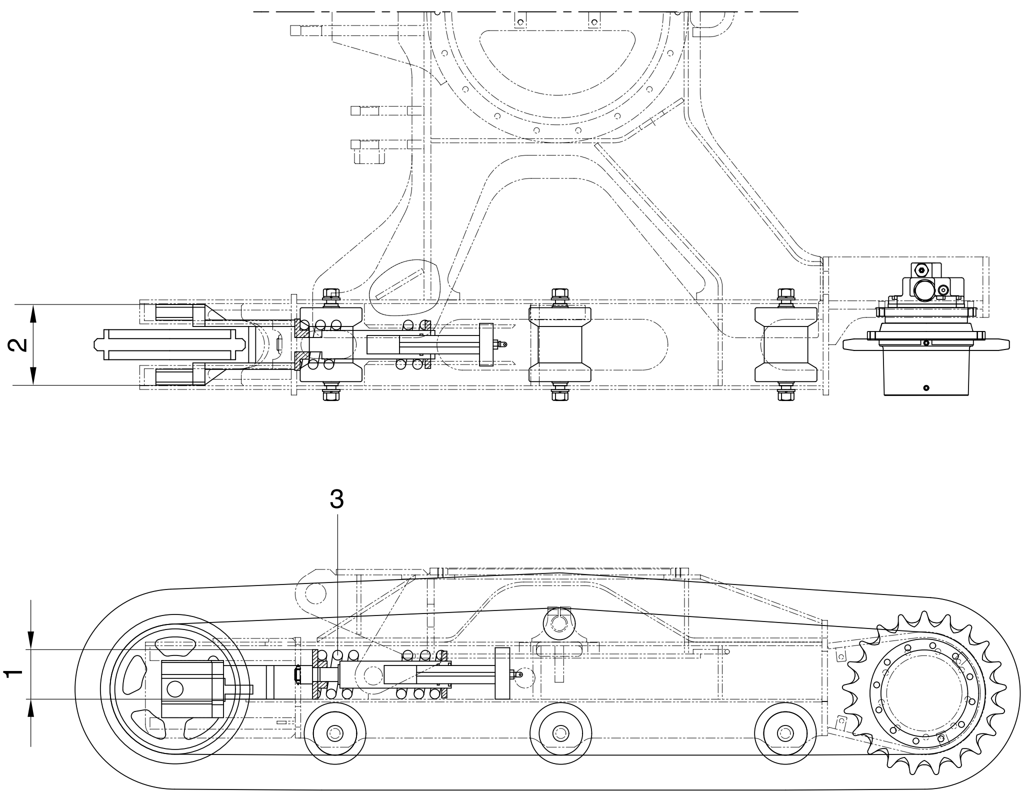


R35Z76MC20

Unit : ㎜

No	Check item	Criteria		Remedy
		Standard size	Repair limit	
1	Outside diameter of flange	Ø70	Ø66	Replace
2	Width of tread	Ø86	-	
3	Diameter of shaft	Ø30	-	

5. TENSION CYLINDER

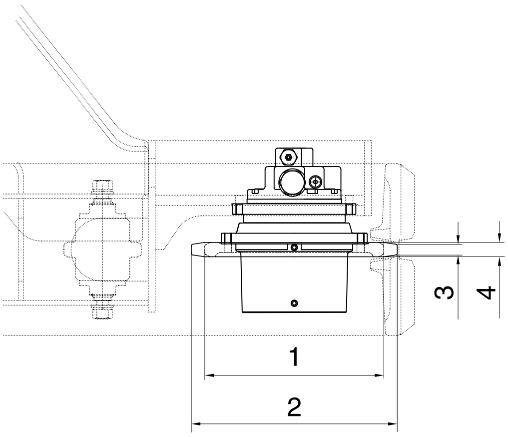


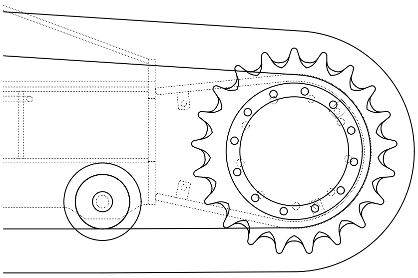
R25Z9AK6MC20

Unit : mm

<table>
<tr><th rowspan="2">No</th><th rowspan="2">Check item</th><th colspan="5">Criteria</th><th rowspan="2">Remedy</th></tr>
<tr><th></th><th colspan="2">Standard size</th><th colspan="2">Repair limit</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Vertical width of idler guide</td><td>Track frame</td><td colspan="2">91</td><td colspan="2">93</td><td rowspan="2">Rebuild or replace</td></tr>
<tr><td>Idler support</td><td colspan="2">90</td><td colspan="2">88</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Horizontal width of idler guide</td><td>Track frame</td><td colspan="2">162</td><td colspan="2">164</td><td rowspan="2">Rebuild or replace</td></tr>
<tr><td>Idler guide</td><td colspan="2">160</td><td colspan="2">156</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Recoil spring</td><td colspan="3">Standard size</td><td colspan="2">Repair limit</td><td rowspan="3">Replace</td></tr>
<tr><td>Free length</td><td>Installed length</td><td>Installed load</td><td>Free length</td><td>Installed load</td></tr>
<tr><td>218</td><td>178</td><td>2150 kg</td><td>-</td><td>1720 kg</td></tr>
</table>

6. SPROCKET



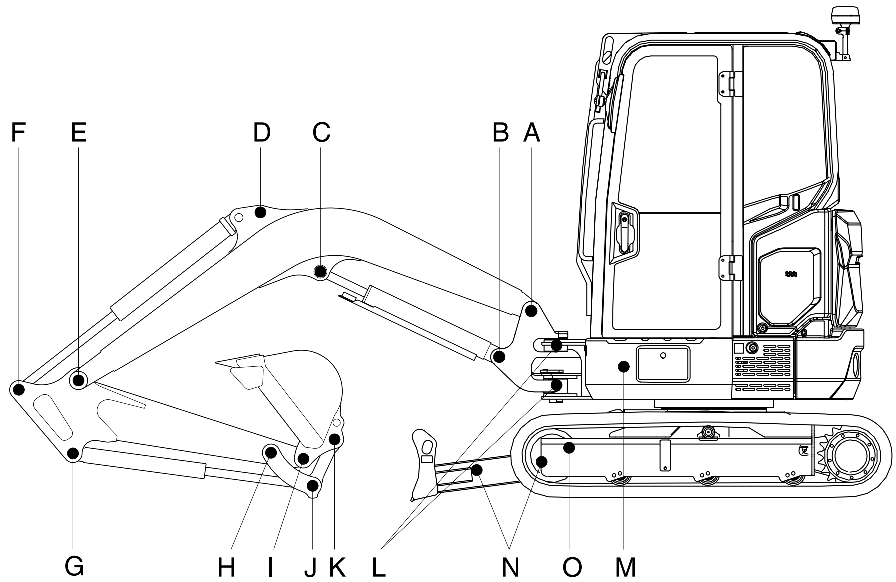


R27Z96MC22

Unit : mm

No	Check item	Criteria		Remedy
		Standard size	Repair limit	
1	Wear out of sprocket tooth lower side diameter	Ø327.75	Ø319.75	Repair or Replace
2	Wear out of sprocket tooth upper side diameter	Ø359.75	-	
3	Wear out of sprocket tooth upper side width	18	-	
4	Wear out of sprocket tooth lower side width	25	-	

7. WORK EQUIPMENT



25AZ6MS30

Unit : ㎜

Mark	Measuring point (Pin and Bushing)	Normal value	Pin		Bushing		Remedy & Remark
			Recomm. service limit	Limit of use	Recomm. service limit	Limit of use	
A	Boom rear	40	39	38.5	40.5	41	Replace
B	Boom cylinder head	40	39	38.5	40.5	41	〃
C	Boom cylinder rod	40	39	38.5	40.5	41	〃
D	Arm cylinder head	35	34	33.5	35.5	36	〃
E	Boom front	35	34	33.5	35.5	36	〃
F	Arm cylinder rod	35	34	33.5	35.5	36	〃
G	Bucket cylinder head	35	34	33.5	35.5	36	〃
H	Arm link	35	34	33.5	35.5	36	〃
I	Bucket and arm link	35	34	33.5	35.5	36	〃
J	Bucket cylinder rod	35	34	33.5	35.5	36	〃
K	Bucket link	35	34	33.5	35.5	36	〃
L	Boom swing post	70	69	68.5	70.5	71	〃
M	Boom swing cylinder	35	34	33.5	35.5	36	〃
N	Blade cylinder	35	34	33.5	35.5	36	〃
O	Blade and frame link	35	34	33.5	35.5	36	〃

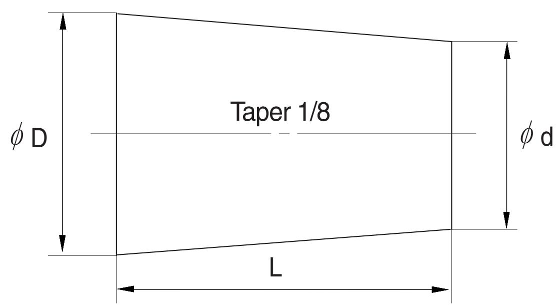
SECTION 7 DISASSEMBLY AND ASSEMBLY

GROUP 1 PRECAUTIONS

1. REMOVAL WORK

1) Lower the work equipment completely to the ground.
   If the coolant contains antifreeze, dispose of it correctly.
2) After disconnecting hoses or tubes, cover them or fit blind plugs to prevent dirt or dust from entering.
3) When draining oil, prepare a container of adequate size to catch the oil.
4) Confirm the match marks showing the installation position, and make match marks in the necessary places before removal to prevent any mistake when assembling.
5) To prevent any excessive force from being applied to the wiring, always hold the connectors when disconnecting the connectors.
6) Fit wires and hoses with tags to show their installation position to prevent any mistake when installing.
7) Check the number and thickness of the shims, and keep in a safe place.
8) When raising components, be sure to use lifting equipment of ample strength.
9) When using forcing screws to remove any components, tighten the forcing screws alternately.
10) Before removing any unit, clean the surrounding area and fit a cover to prevent any dust or dirt from entering after removal.
11) When removing hydraulic equipment, first release the remaining pressure inside the hydraulic tank and the hydraulic piping.
12) If the part is not under hydraulic pressure, the following corks can be used.

Nominal number	Dimensions		
	D	d	L
06	6	5	8
08	8	6.5	11
10	10	8.5	12
12	12	10	15
14	14	11.5	18
16	16	13.5	20
18	18	15	22
20	20	17	25
22	22	18.5	28
24	24	20	30
27	27	22.5	34



2. INSTALL WORK

1) Tighten all bolts and nuts (sleeve nuts) to the specified torque.

2) Install the hoses without twisting or interference.

3) Replace all gaskets, O-rings, cotter pins, and lock plates with new parts.

4) Bend the cotter pin or lock plate securely.

5) When coating with adhesive, clean the part and remove all oil and grease, then coat the threaded portion with 2-3 drops of adhesive.

6) When coating with gasket sealant, clean the surface and remove all oil and grease, check that there is no dirt or damage, then coat uniformly with gasket sealant.

7) Clean all parts, and correct any damage, dents, burrs, or rust.

8) Coat rotating parts and sliding parts with engine oil.

9) When press fitting parts, coat the surface with antifriction compound (LM-P).

10) After installing snap rings, check that the snap ring is fitted securely in the ring groove (Check that the snap ring moves in the direction of rotation).

11) When connecting wiring connectors, clean the connector to remove all oil, dirt, or water, then connect securely.

12) When using eyebolts, check that there is no deformation or deterioration, and screw them in fully.

13) When tightening split flanges, tighten uniformly in turn to prevent excessive tightening on one side.

14) When operating the hydraulic cylinders for the first time after repairing and reassembling the hydraulic cylinders, pumps, or other hydraulic equipment or piping, always bleed the air from the hydraulic cylinders as follows:

(1) Start the engine and run at low idling.

(2) Operate the control lever and actuate the hydraulic cylinder 4-5 times, stopping 100 mm before the end of the stroke.

(3) Next, operate the piston rod to the end of its stroke to relieve the circuit. (The air bleed valve is actuated to bleed the air.)

(4) After completing this operation, raise the engine speed to the normal operating condition.

※ If the hydraulic cylinder has been replaced, carry out this procedure before assembling the rod to
※ the work equipment.
Carry out the same operation on machines that have been in storage for a long time after completion of repairs.

3. COMPLETING WORK

1) If the coolant has been drained, tighten the drain valve, and add water to the specified level. Run the engine to circulate the water through the system. Then check the water level again.

2) If the hydraulic equipment has been removed and installed again, add engine oil to the specified level. Run the engine to circulate the oil through the system. Then check the oil level again.

3) If the piping or hydraulic equipment, such as hydraulic cylinders, pumps, or motors, have been removed for repair, always bleed the air from the system after reassembling the parts.

4) Add the specified amount of grease (Molybdenum disulphide grease) to the work equipment related parts.

GROUP 2 TIGHTENING TORQUE

1. MAJOR COMPONENTS

No.	Descriptions		Bolt size	Torque	
				kgf · m	lbf · ft
1	Engine	Engine mounting bolt (engine-bracket)	M10 × 1.25	6.9±1.4	49.9±10.1
2		Engine mounting bolt (bracket-frame)	M12 × 1.75	13.0±1.0	94±7.2
3		Radiator mounting bolt, nut	M12 × 1.75	12.8±3.0	92.6±21.7
4		Coupling mounting bolt	M12 × 1.75	9.3±0.5	67.3±3.6
5		Flywheel housing mounting bolt, nut	M10 × 1.5	6.9±1.4	49.9±10.1
6		Fuel tank mounting bolt	M10 × 1.5	6.9±1.4	49.9±10.1
7	Hydraulic system	Main pump mounting bolt	M12 × 1.75	13.0±1.0	94±7.2
8		Main control valve mounting bolt	M10 × 1.5	6.9±1.4	49.9±10.1
9		Hydraulic oil tank mounting bolt	M12 × 1.75	12.8±3.0	92.6±21.7
10		Turning joint mounting bolt, nut	M10 × 1.5	6.9±1.4	49.9±10.1
11	Power train system	Swing motor mounting bolt	M16 × 2.0	29.7±4.5	215±32.5
12		Swing bearing upper mounting bolt	M12 × 1.75	12.8±3.0	92.6±21.7
13		Swing bearing lower mounting bolt	M12 × 1.75	12.8±3.0	92.6±21.7
14		Travel motor mounting bolt	M12 × 1.75	12.8±3.0	92.6±21.7
15		Sprocket mounting bolt	M12 × 1.75	12.3±1.2	89±8.7
16	Under carriage	Upper roller mounting bolt, nut	M12 × 1.75	12.3±1.2	89±8.7
17		Lower roller mounting bolt	M16 × 1.5	31.3±3.0	226±21.7
18	Others	Counterweight mounting bolt	M20 × 2.5	59.7±8.7	419±62.9
19		Canopy/Cab mounting bolt, nut	M12 × 1.75	12.8±3.0	92.6±21.7
20		Operator's seat mounting bolt	M 8 × 1.25	2.5±0.5	18.1±3.6
21		Lower frame lower cover mounting bolt	M10 × 1.5	6.9±1.4	49.9±10.1
22		Travel motor cover mounting bolt	M10 × 1.5	6.9±1.4	49.9±10.1

2. TORQUE CHART

Use following table for unspecified torque.

1) BOLT AND NUT

(1) Coarse thread

Bolt size	8T		10T	
	kgf · m	lbf · ft	kgf · m	lbf · ft
M 6 × 1.0	0.85 ~ 1.25	6.15 ~ 9.04	1.14 ~ 1.74	8.2 ~ 12.6
M 8 × 1.25	2.0 ~ 3.0	14.5 ~ 21.7	2.7 ~ 4.1	19.5 ~ 29.7
M10 × 1.5	4.0 ~ 6.0	28.9 ~ 43.4	5.5 ~ 8.3	39.8 ~ 60
M12 × 1.75	7.4 ~ 11.2	53.5 ~ 81.0	9.8 ~ 15.8	70.9 ~ 114
M14 × 2.0	12.2 ~ 16.6	88.2 ~ 120	16.7 ~ 22.5	121 ~ 163
M16 × 2.0	18.6 ~ 25.2	135 ~ 182	25.2 ~ 34.2	182 ~ 247
M18 × 2.5	25.8 ~ 35.0	187 ~ 253	35.1 ~ 47.5	254 ~ 344
M20 × 2.5	36.2 ~ 49.0	262 ~ 354	49.2 ~ 66.6	356 ~ 482
M22 × 2.5	48.3 ~ 63.3	349 ~ 458	65.8 ~ 98.0	476 ~ 709
M24 × 3.0	62.5 ~ 84.5	452 ~ 611	85.0 ~ 115	615 ~ 832
M30 × 3.0	124 ~ 168	898 ~ 1214	169 ~ 229	1223 ~ 1656
M36 × 4.0	174 ~ 236	1261 ~ 1704	250 ~ 310	1808 ~ 2242

(2) Fine thread

Bolt size	8T		10T	
	kgf · m	lbf · ft	kgf · m	lbf · ft
M 8 × 1.0	2.2 ~ 3.4	15.9 ~ 24.6	3.0 ~ 4.4	21.7 ~ 31.8
M10 × 1.2	4.5 ~ 6.7	32.5 ~ 48.5	5.9 ~ 8.9	42.7 ~ 64.4
M12 × 1.25	7.8 ~ 11.6	56.4 ~ 83.9	10.6 ~ 16.0	76.7 ~ 116
M14 × 1.5	13.3 ~ 18.1	96.2 ~ 131	17.9 ~ 24.1	130 ~ 174
M16 × 1.5	19.9 ~ 26.9	144 ~ 195	26.6 ~ 36.0	192 ~ 260
M18 × 1.5	28.6 ~ 43.6	207 ~ 315	38.4 ~ 52.0	278 ~ 376
M20 × 1.5	40.0 ~ 54.0	289 ~ 391	53.4 ~ 72.2	386 ~ 522
M22 × 1.5	52.7 ~ 71.3	381 ~ 516	70.7 ~ 95.7	511 ~ 692
M24 × 2.0	67.9 ~ 91.9	491 ~ 665	90.9 ~ 123	658 ~ 890
M30 × 2.0	137 ~ 185	990 ~ 1339	182 ~ 248	1314 ~ 1796
M36 × 3.0	192 ~ 260	1390 ~ 1880	262 ~ 354	1894 ~ 2562

2) PIPE AND HOSE (FLARE type)

Thread size (PF)	Width across flat (mm)	kgf · m	lbf · ft
1/4"	19	4	28.9
3/8"	22	5	36.2
1/2"	27	9.5	68.7
3/4"	36	18	130
1"	41	21	152
1-1/4"	50	35	253

3) PIPE AND HOSE (ORFS type)

Thread size (UNF)	Width across flat (mm)	kgf · m	lbf · ft
9/16-18	19	4	28.9
11/16-16	22	5	36.2
13/16-16	27	9.5	68.7
1-3/16-12	36	18	130
1-7/16-12	41	21	152
1-11/16-12	50	35	253

4) FITTING

Thread size	Width across flat (mm)	kgf · m	lbf · ft
1/4"	19	4	28.9
3/8"	22	5	36.2
1/2"	27	9.5	68.7
3/4"	36	18	130
1"	41	21	152
1-1/4"	50	35	253

GROUP 3 PUMP DEVICE

1. REMOVAL AND INSTALL

1) REMOVAL

(1) Lower the work equipment to the ground and stop the engine.

(2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping

(3) Loosen the breather slowly to release the pressure inside the hydraulic tank.

13031GE18

⚠ **Escaping fluid under pressure can penetrate the skin causing serious injury.**

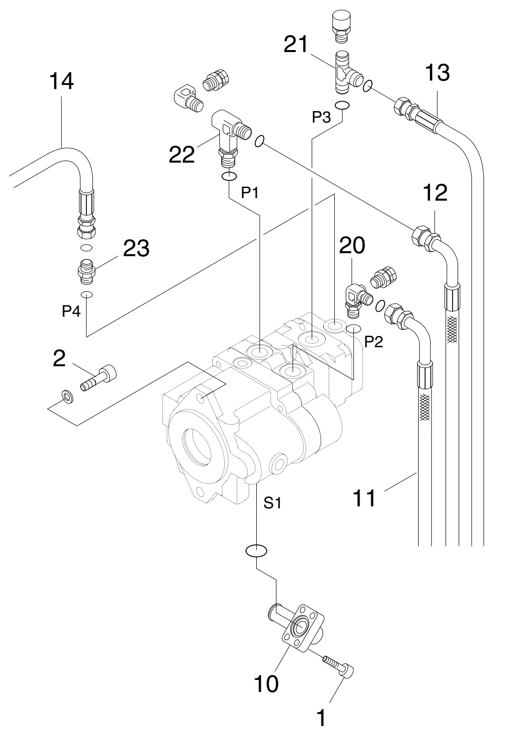
(4) Loosen the drain plug under the hydraulic tank and drain the oil from the hydraulic tank.
  · Hydraulic tank quantity : 27 ℓ (7.1 U.S.gal)

(5) Disconnect hoses (11, 12, 13) and remove connectors (20, 21, 22).

(6) Disconnect pilot line hoses (14) and remove connectors (23).

(7) Remove socket bolts (1) and disconnect pump suction tube (10).
  · Tightening torque : 8.27±1.7 kgf·m (59.8±12.3 lbf·ft)

※ When pump suction tube is disconnected, the oil inside the piping will flow out, so catch it in oil pan.



25AZ7MP01

(8) Sling the pump assembly and remove the pump mounting bolts (2).
  · Weight : 19 kg (42 lb)
  · Tightening torque : 13.0±1.0 kgf·m (94±7.2 lbf·ft)

※ Pull out the pump assembly from housing. When removing the pump assembly, check that all the hoses have been disconnected.

2) INSTALL

(1) Carry out installation in the reverse order to removal.

(2) Remove the suction strainer and clean it.

(3) Replace return filter with new one.

(4) Remove breather and clean it.

(5) After adding oil to the hydraulic tank to the specified level.

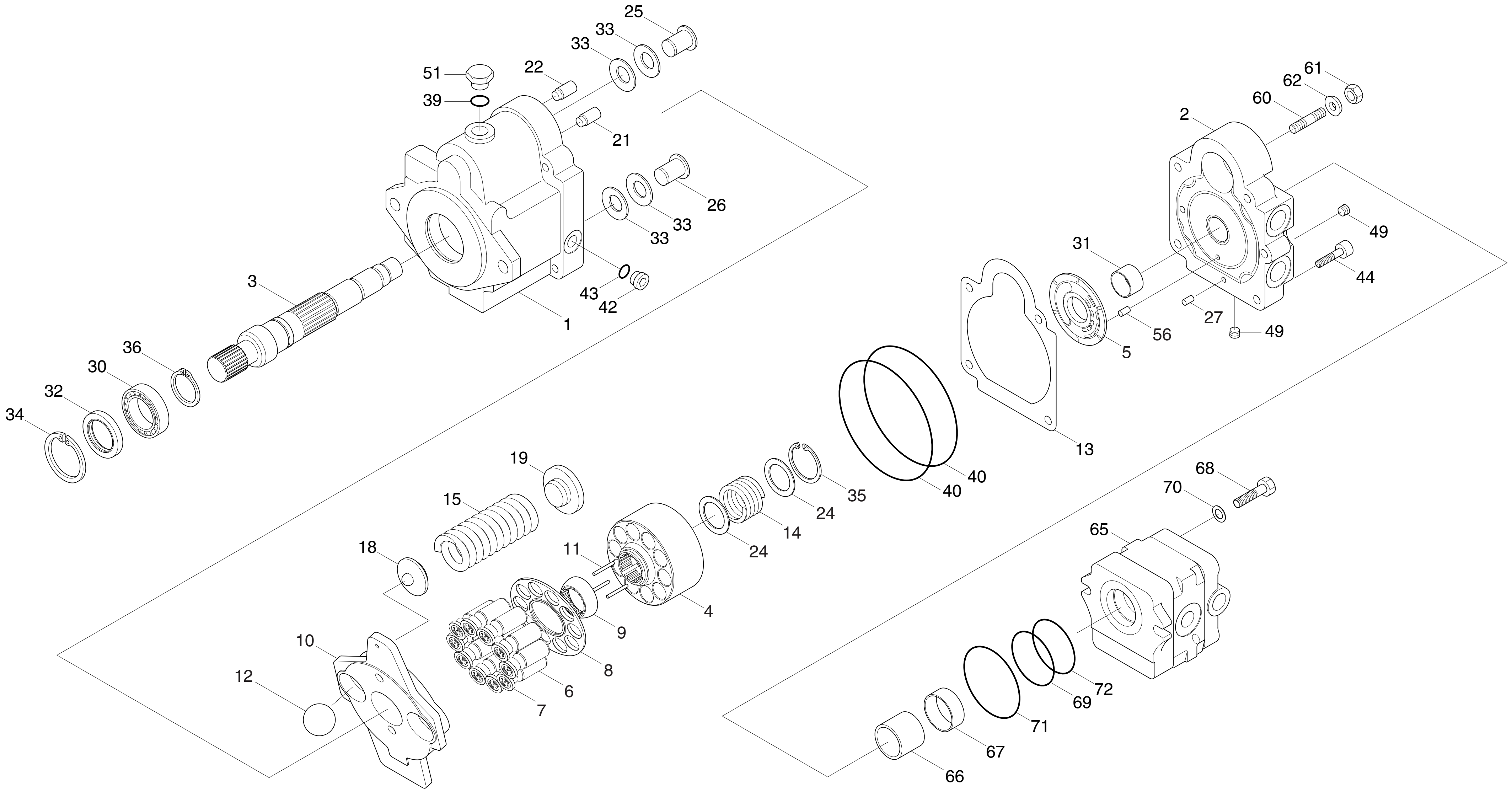
(6) Bleed the air from the hydraulic pump.
① Remove the air vent plug (1EA).
② Tighten plug lightly.
③ Start the engine, run at low idling, and check oil come out from plug.
④ Tighten plug.

(7) Start the engine, run at low idling (3~5 minutes) to circulate the oil through the system.

(8) Confirm the hydraulic oil level and check the hydraulic oil leak or not.

2. MAIN PUMP

1) STRUCTURE



R27Z97MP102

1	Body S	10	Swash plate	21	Rod G	33	Dish spring	49	Plug	68	Screw
2	Body H	11	Needle	22	Rod C	34	Snap ring	51	Plug	69	O-ring
3	Shaft	12	Ball	24	Retainer	35	Snap ring	56	Spring pin	70	Washer
4	Cylinder barrel	13	Packing	25	Stopper pin A	36	Snap ring	60	Screw	71	O-ring
5	Valve plate	14	Spring C	26	Stopper pin B	39	O-ring	61	Nut	72	O-ring
6	Piston	15	Spring T	27	Pin	40	O-ring	62	Seal washer		
7	Shoe	18	Spring holder	30	Ball bearing	42	Plug	65	Gear pump		
8	Shoe holder	19	Spring guide	31	Needle bearing	43	O-ring	66	Coupling		
9	Barrel holder	20	Pin	32	Oil seal	44	Screw	67	Collar		

3. ASSEMBLE AND DISASSEMBLE

1) General precautions

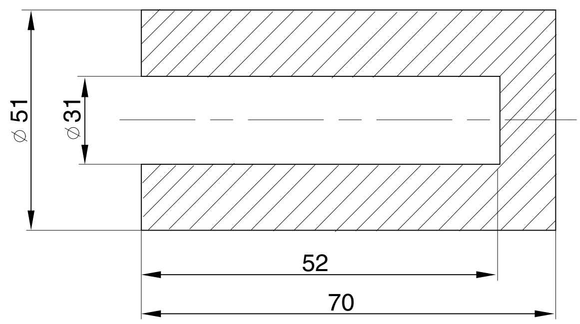
(1) Before disassembling, it is important to have fully understood the internal structure of the pump.

※ The gasket (13), oil seal (32) and O-rings will be probably damaged when you disassemble it, so be sure to have prepared spares.

(2) After having drained oil inside the pump, wash the pump and put it on a working bench covered with clean paper, cloth, or rubber mat for disassembling and assembling. Then, disassemble and assemble the pump slowly and carefully with necessary tools. Use care not to scratch even slightly, and take proper measures to prevent foreign matters from entering the assembly.

2) Tools

Tool name	Size	Quantity
Hexagon wrench	4, 6, 8 mm	1 each
Circlip player	For hole	1
Spanner wrench	13 mm	1
Torque wrench	45N (JIS B 4650) 90N (JIS B 4650)	1 1
Resin hammer	-	1
Special tooling for oil seal	See below	1
Seal kit	-	1 set
Grease	-	Small amount



Special tooling for oil seal

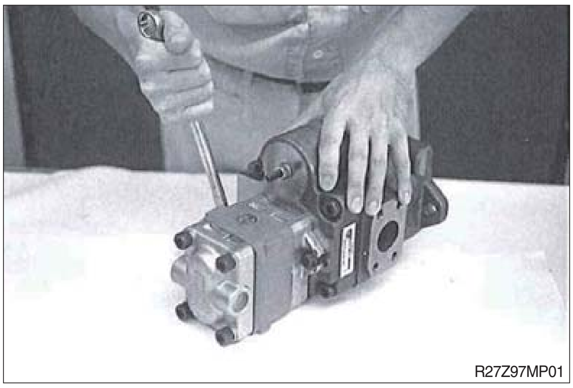
R27Z97MP98

3) DISASSEMBLING

(1) Disassembling of gear pump

Remove two screws (68) with spanner wrench 13 mm, and after that remove gear pump (65), collar (67) and coupling (66).

※ Coupling (66) and collar (67) may be attached with gear pump kit (65).

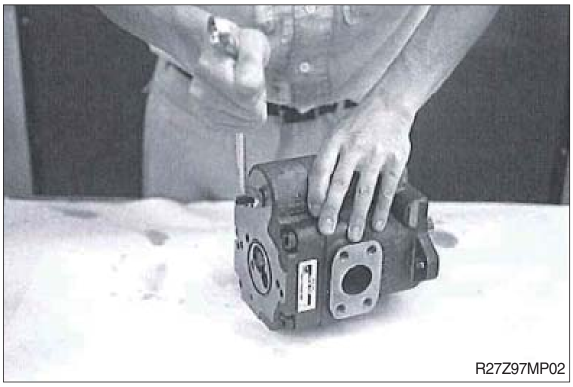


R27Z97MP01

(2) Remove the adjustment screw

Loose hexagon nut (61) with spanner wrench 13 mm, then remove the adjustment screw (60) with hexagon wrench 4 mm.

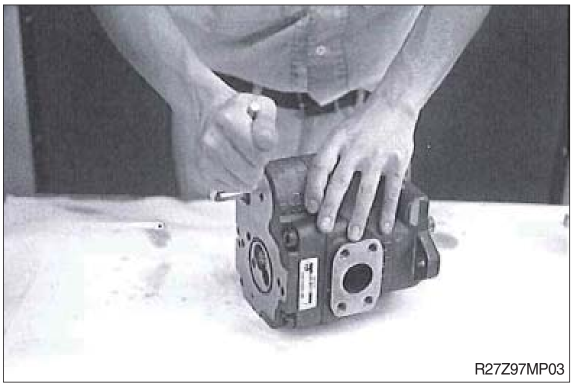
※ Suggest you to measure the outside length of the adjustment screw. Because it is a good help when you readjust it after reassembling.



R27Z97MP02

(3) Separation of body S and body H

Remove five screws (44) with hexagon wrench 8 mm.



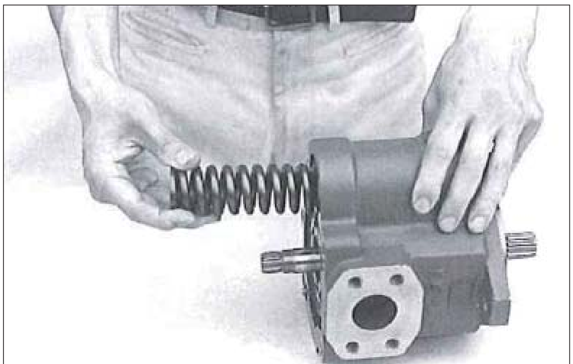
R27Z97MP03

※ If you tap the part of inserted spring of body H with hummer softly, it is easy for separation.

R27Z97MP04

(4) Disassembling of body S kit

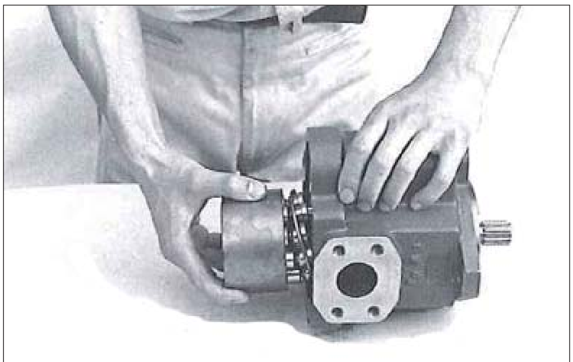
Remove spring T (15) from body S kit, then take off spring holder (18).



R27Z97MP05

(5) Disassembling of body S kit

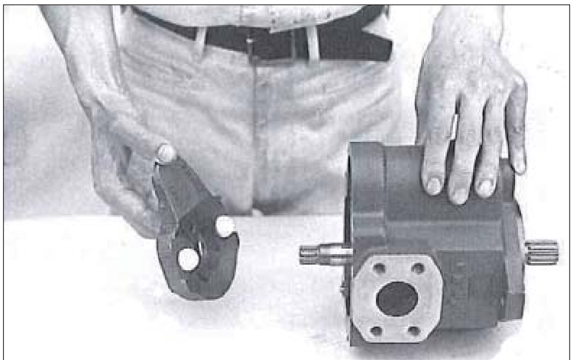
Remove cylinder barrel kit.



R27Z97MP06

(6) Disassembling of body S kit

Remove swash plate (10) and two balls (12).

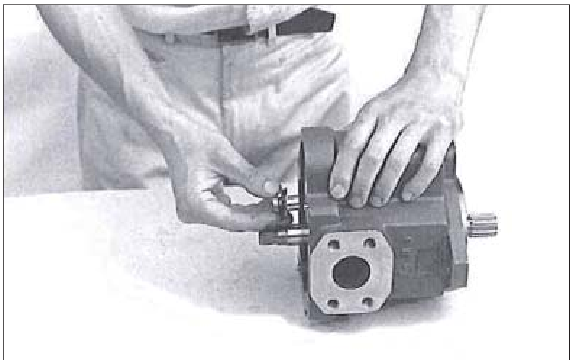


R27Z97MP07

(7) Disassembling of body S kit

Remove stopper pin A (25), stopper pin B (26), dish springs (33), rod G (21) and rod C (22).

※ The length of the stopper pin A and B is different. Pay attention not to swap when reassembling.



R27Z97MP08

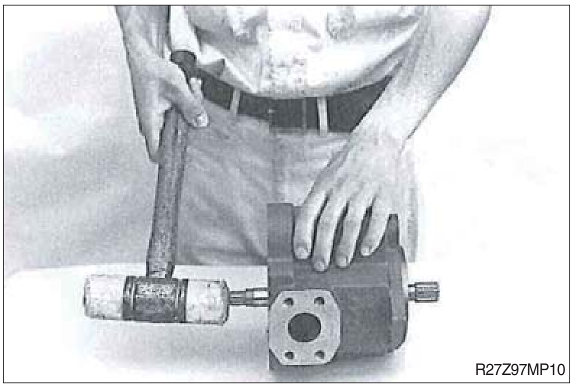
(8) Disassembling of body S kit

Remove snap ring (34) from body S (1).

R27Z97MP09

(9) Disassembling of body S kit

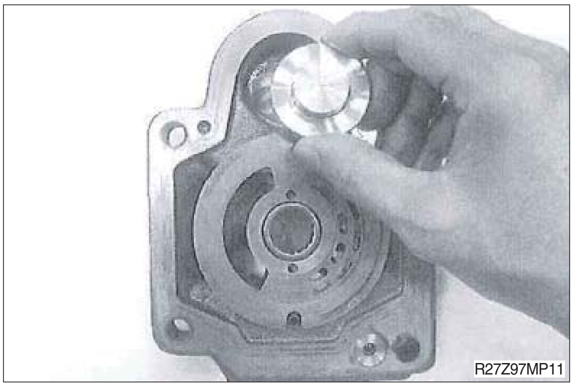
Tap the end of shaft (3) with hammer, then oil seal (32) and shaft with bearing (30) come off.



R27Z97MP10

(10) Disassembling of body H kit

Remove spring guide (19) and valve plate (5) from body H.

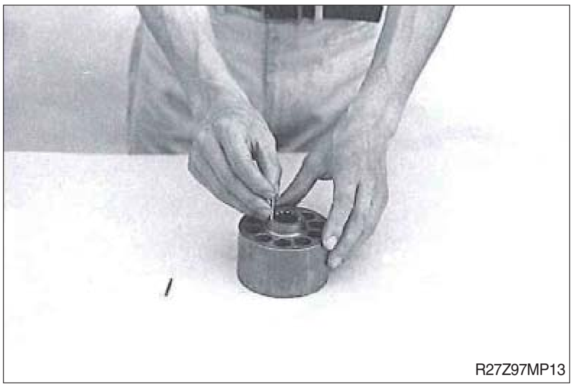


R27Z97MP11

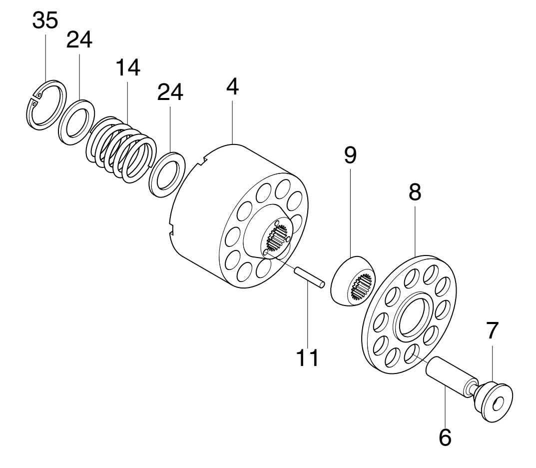
(11) Disassembling of cylinder barrel kit

Remove shoe holder (8) on which piston shoe assemblies (6) and (7) are set and disassemble it in the order of barrel holder (9) and needle (11).
Also, take off snap ring (35), retainer (24), spring C (14) and retainer (24), which are set in the cylinder barrel (4) in this order.

R27Z97MP12



R27Z97MP13



R27Z97MP14

4) ASSEMBLING

(1) Precautions during assembling

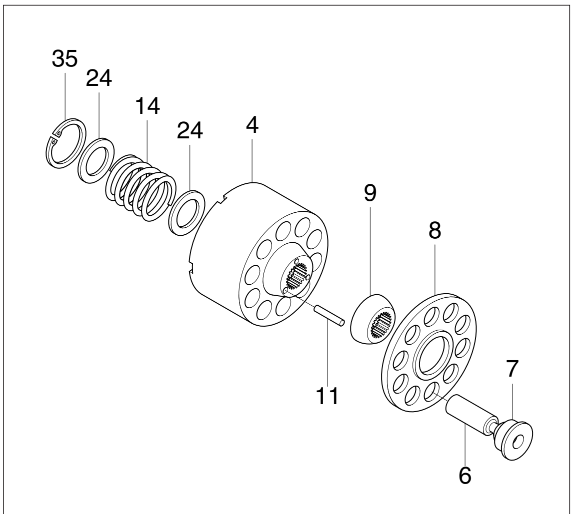
Reverse the above procedures for assembling.

When assembling, be very careful to wash parts in clean oil, to prevent dusts and water from adhering to parts entering assemblies and not to scratch on the sliding surfaces of all parts.

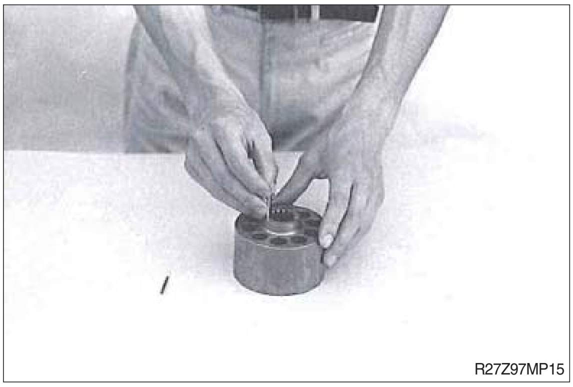
※ Apply small quantity of grease to the periphery of O-rings to be set in socket and spigot joints to prevent the O-rings from being damaged.

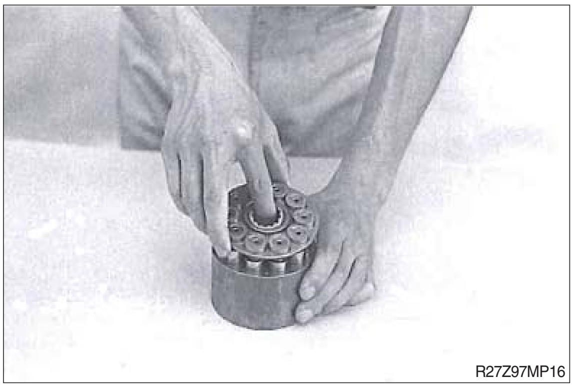
(2) Assembling of cylinder barrel kit

Set retainer (24), spring C (14), retainer (24) and snap ring (35) in the shaft center hole of cylinder barrel (4) in this order, and carefully set shoe holder (8), on which needle (11), barrel holder (9) and ten piston shoe assemblies have already been set, in cylinder barrel from the opposite side.



R27Z97MP14

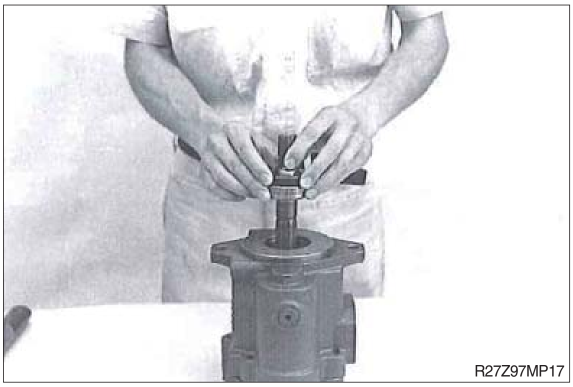

R27Z97MP15


R27Z97MP16

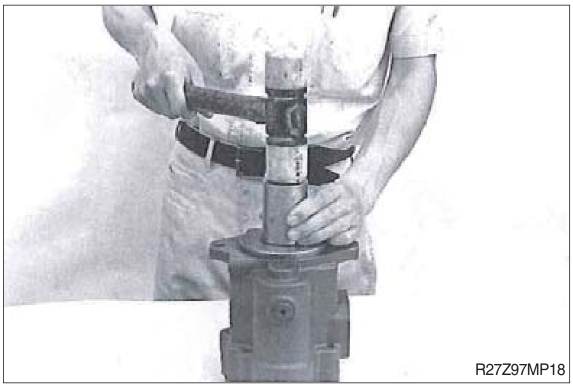
(3) Assembling of body S kit

Set shaft (3) with bearing (30), oil seal (32) and snap ring (34) in this order into body S (1).

※ Use new oil seal for assembling. Before assembling, apply a small quantity of grease to the periphery of oil seal lip and tap it together with the special tooling with hammer.
When assembling, put body S (1) onto body H (2) tentatively for easy work.



R27Z97MP17



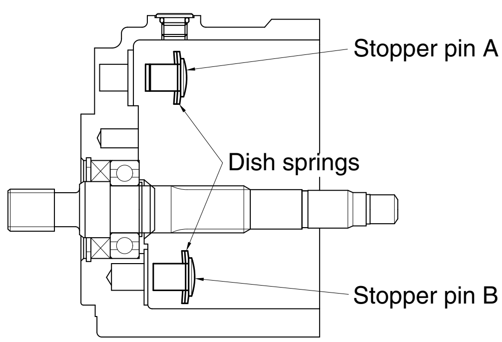
R27Z97MP18

(4) Assembling of body S kit

Set each four dish springs (33) to stopper pin A (25) and stopper pin B (26), then set them into body S (1).

※ Pay attention to the direction of the dish washer.

※ Pin A and pin B have different length. Set them to the original position. Otherwise, pump displacement changes, and engine stall or insufficient speed can occur.

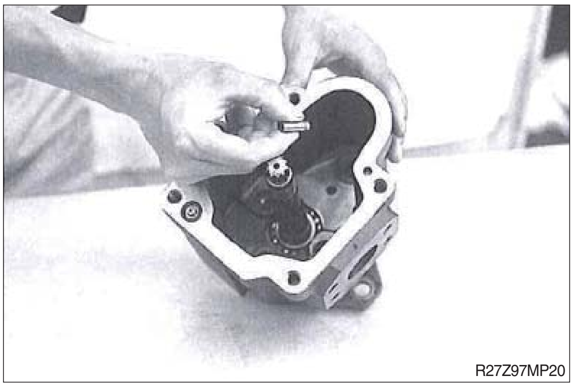


R27Z97MP19

(5) Assembling of body S kit

Set rod G (21) and rod C (22) into body S (1).

※ Pay attention to the direction of the rod G and rod C. (See cross section drawing for the direction.)

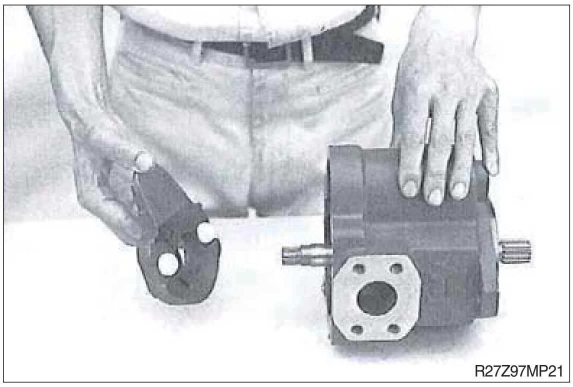


R27Z97MP20

(6) Assembling of body S kit

Put two balls (12) in the hole of swash plate (10) and install it in body S.

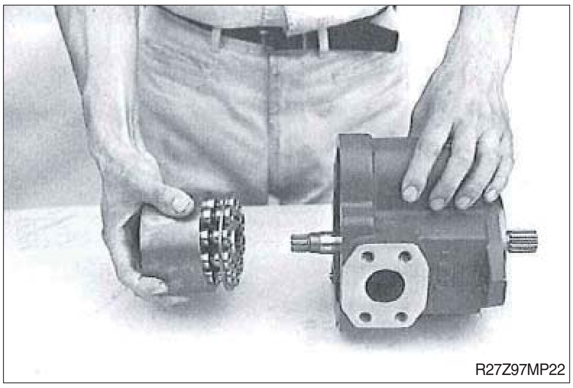
※ Apply grease on the balls if they drop out.



R27Z97MP21

(7) Assembling of body S kit

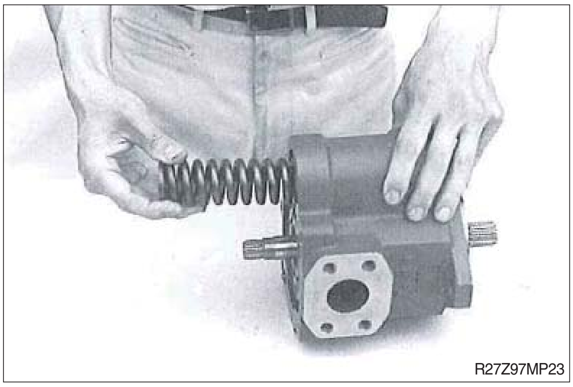
Assemble cylinder barrel kit into the body S (1).



R27Z97MP22

(8) Assembling of body S kit

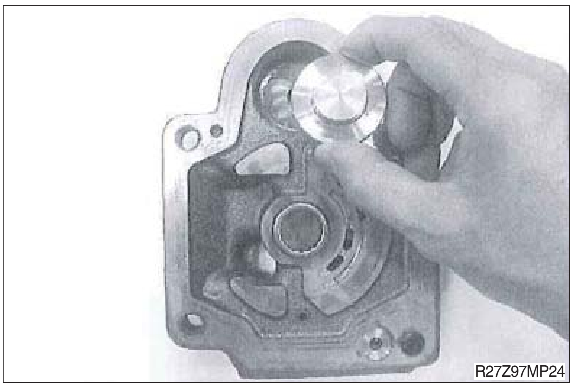
Set spring T (15) to spring holder (18), then set them together into the hole on swash plate (10).



R27Z97MP23

(9) Assembling of body H kit

Set spring guide (19) in body H (2).

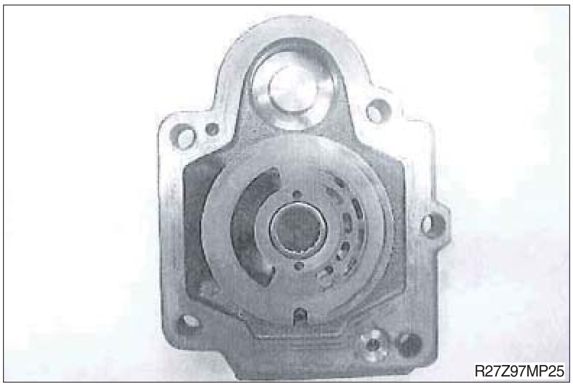


R27Z97MP24

(10) Assembling of body H kit

Place valve plate (5) slowly on body H (2) by positioning it with spring pin (56).

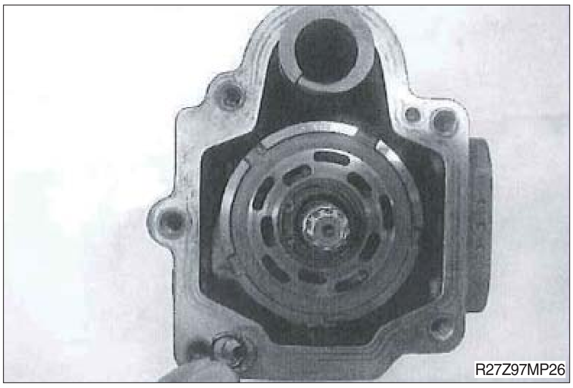
※ V notch copper alloy side of valve plate slides with cylinder barrel (4) and be careful not to set the valve plate to a wrong direction.



(11) Assembling of body S kit with body H kit

Place O-ring (40) on body S.

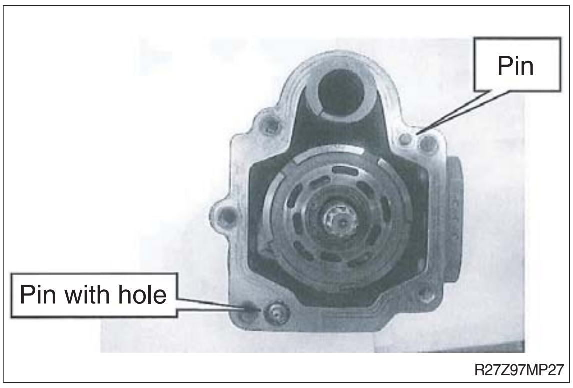
※ Use new O-ring for assembling.



(12) Assembling of body S kit with body H kit

Set pin (20) and pin (27) on body S.

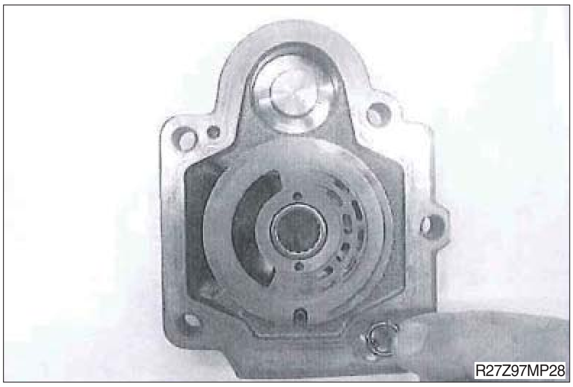
※ Pay attention to the position of each pin. Pin (27) has a hole.



(13) Assembling of body S kit with body H kit

Place O-ring (40) on body H.

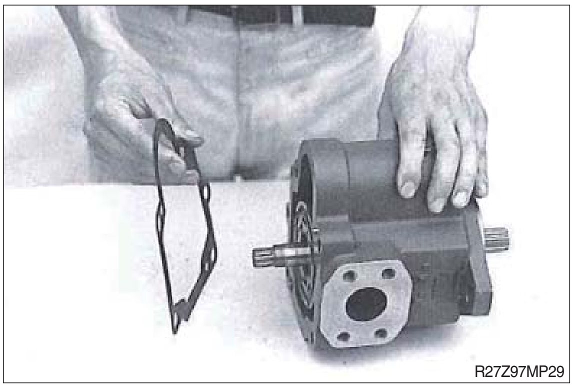
※ Use new O-ring for assembling.



(14) Assembling of body S kit with body H kit

Place packing (13), position it with locating pin (27) on body S.

※ Use new packing for assembling.



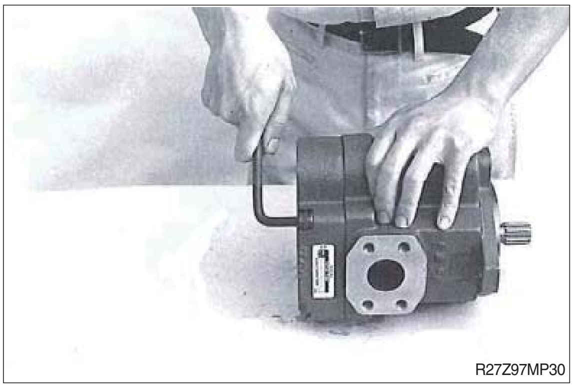
R27Z97MP29

(15) Assembling of body S kit with body H kit

Set two screws (M10×65) into the upper side two screw holes, and tighten them until the distance between body S and body H comes to 5 to 10 mm.

Then set three screws (44) into the three screw holes, after that, replace the upper side two screws (M10×65) to the regular size screws (44) and fix them.

· Tightening torque : 5.2~6.6 kgf · m (37.6~47.7 lbf · ft)

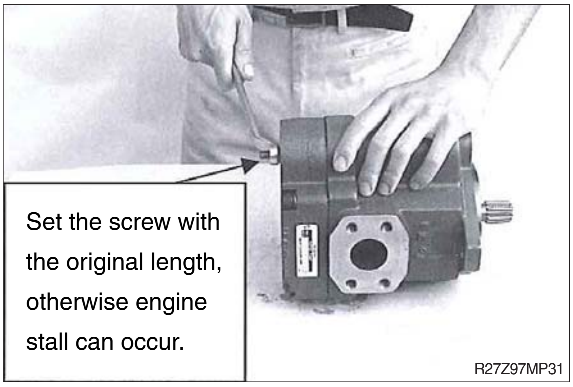


R27Z97MP30

(16) Installation of the adjusting screw

Fasten the adjusting screw (60) with hexagon wrench 4 mm, then adjust the outside length of adjusting screw and fix locknut (61) with spanner wrench 13 mm. At that time, change the seal washer (62) to new one.

· Tightening torque : 1.5~2.0 kgf · m (10.8~14.5 lbf · ft)

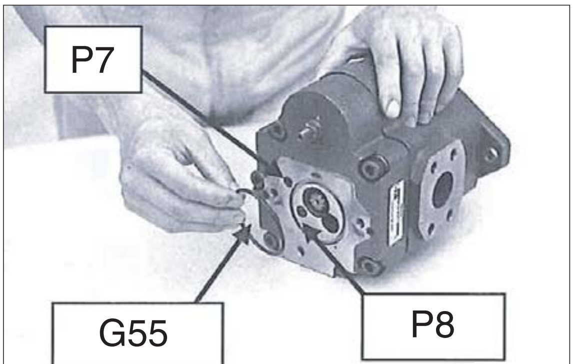


R27Z97MP31

(17) Installation of gear pump kit

Place O-ring (69, 71, 72) on the installation side of body H.

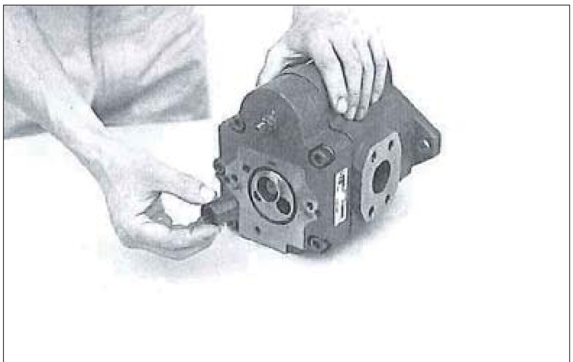
※ Use new O-ring for assembling.



R27Z97MP32

(18) Installation of gear pump kit

Set collar (67) and coupling (66).

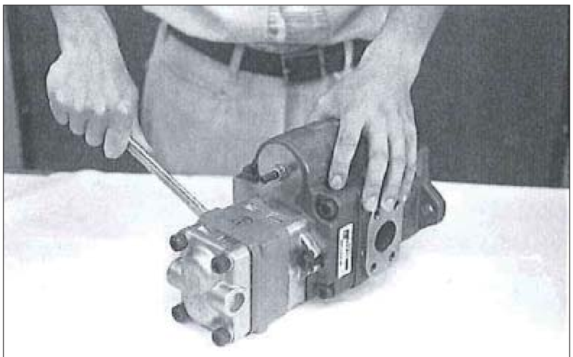


R27Z97MP33

(19) Installation of gear pump kit

Install gear pump kit (65) and fix it by two screws (68) and washers (70) with spanner wrench 13 mm.

· Tightening torque : 2.0~2.4 kgf · m
(14.5~17.3 lbf · ft)



R27Z97MP34

(20) Inspection of assembling

After completed the assembling of pump, make sure that pump shaft rotates smoothly by hand.

GROUP 4 MAIN CONTROL VALVE

1. REMOVAL AND INSTALL OF MOTOR

1) REMOVAL

(1) Lower the work equipment to the ground and stop the engine.

(2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

(3) Loosen the breather slowly to release the pressure inside the hydraulic tank.

⚠ **Escaping fluid under pressure can penetrate the skin causing serious injury.**

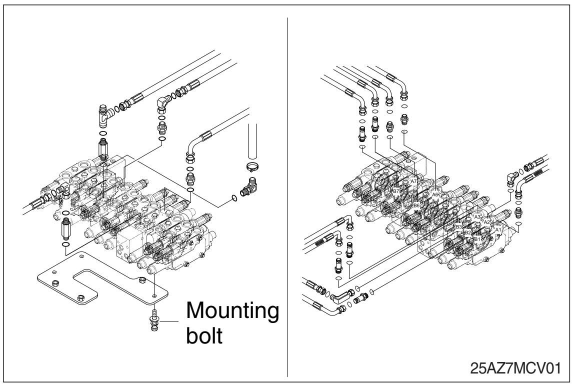
※ When pipes and hoses are disconnected, the oil inside the piping will flow out, so catch it in oil pan.


13031GE18

(4) Disconnect hydraulic hose.

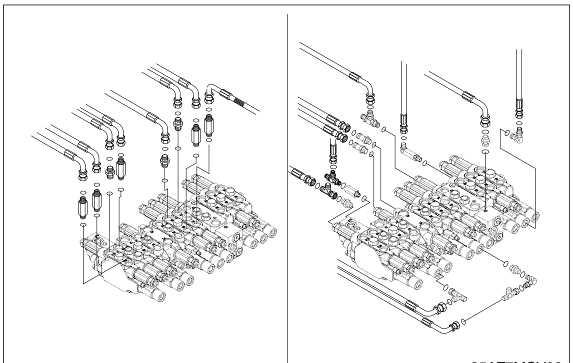
(5) Disconnect pilot line hoses.

(6) Sling the control valve assembly and remove the control valve mounting bolt.
  · Weight : 25 kg (55 lb)
  · Tightening torque : 6.9±1.4 kgf·m (49.9±10.1 lbf·ft)



25AZ7MCV01

(7) Remove the control valve assembly.
When removing the control valve assembly, check that all the piping have been disconnected.

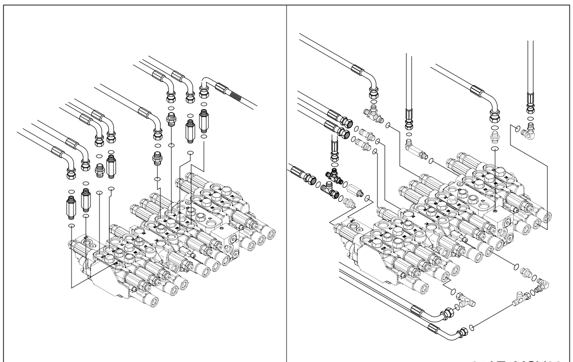

25AZ7MCV02

2) INSTALL

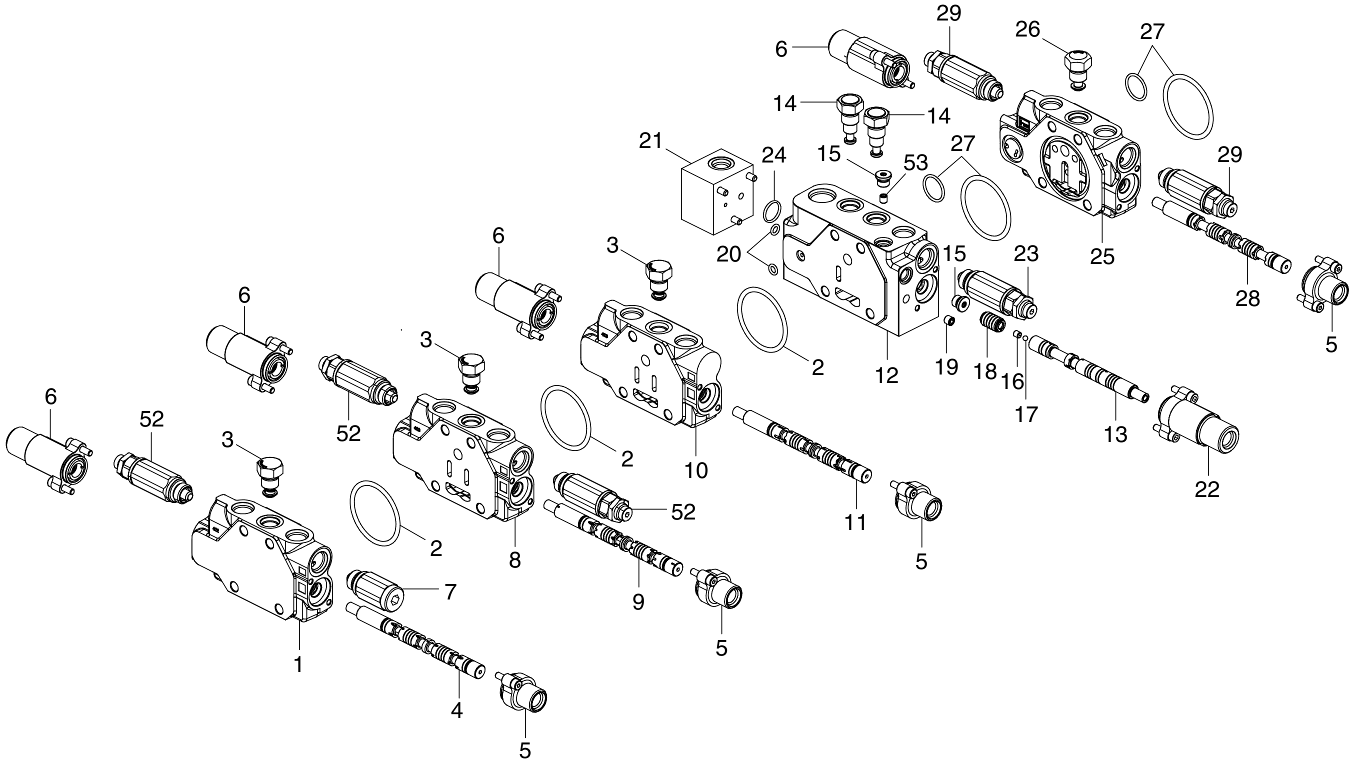
(1) Carry out installation in the reverse order to removal.

(2) Bleed the air from below items.
① Cylinder (boom, arm, bucket)
② Swing motor
③ Travel motor
※ See each item removal and install.

(3) Confirm the hydraulic oil level and recheck the hydraulic oil leak or not.

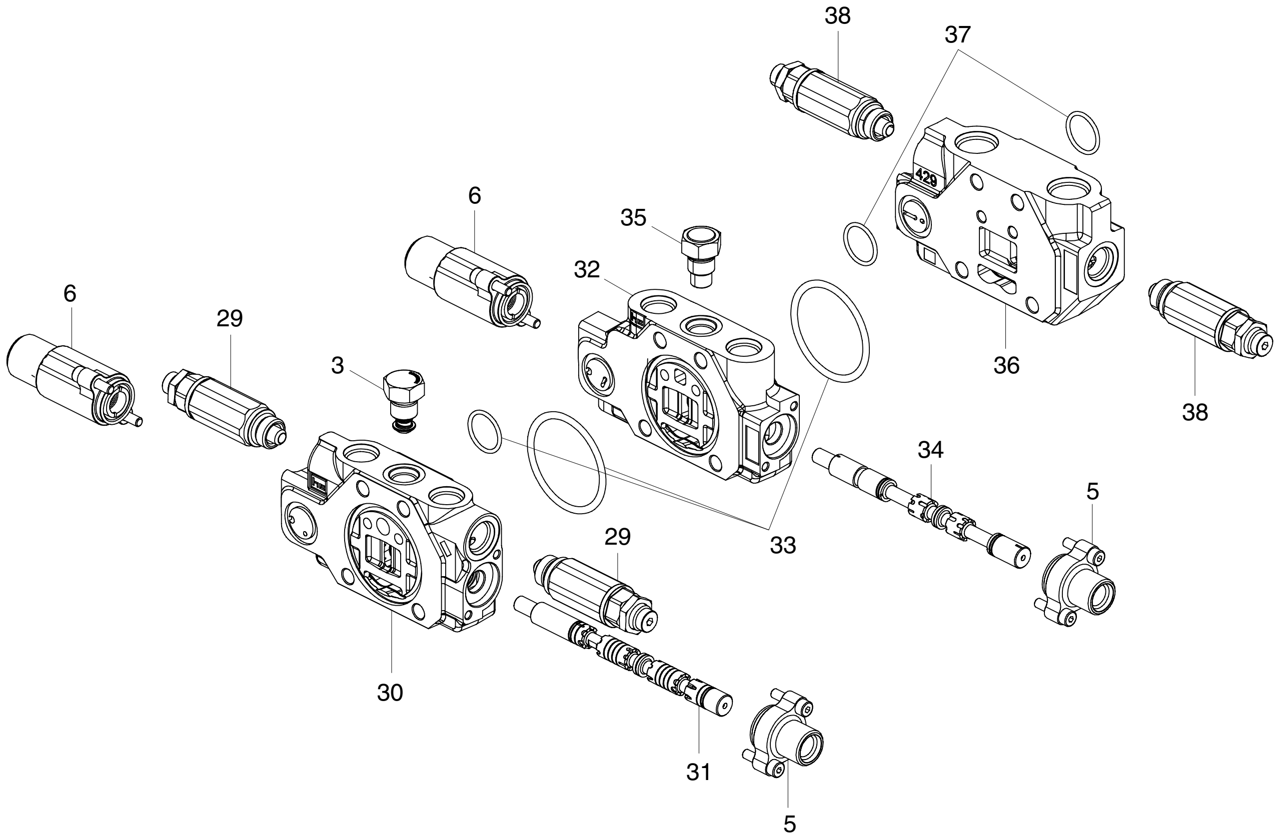

25AZ7MCV02

2. STRUCTURE (1/3)



1	Dozer block assy	11	Swing spool assy	21	Pilot body
2	O-ring	12	Confluence block body	22	Pilot cover
3	Plug	13	Confluence spool assy	23	Relief valve assy
4	Dozer spool assy	14	Plug	24	O-ring
5	Pilot cover	15	Plug	25	PTO block body
6	Pilot cover	16	Piston	26	Plug
7	Relief valve assy	17	Ball	27	O-ring
8	Boom swing block	18	Spring	28	PTO 1 spool assy
9	Boom swing spool assy	19	Piston	29	Relief valve assy
10	Swing block assy	20	O-ring	52	Relief valve assy

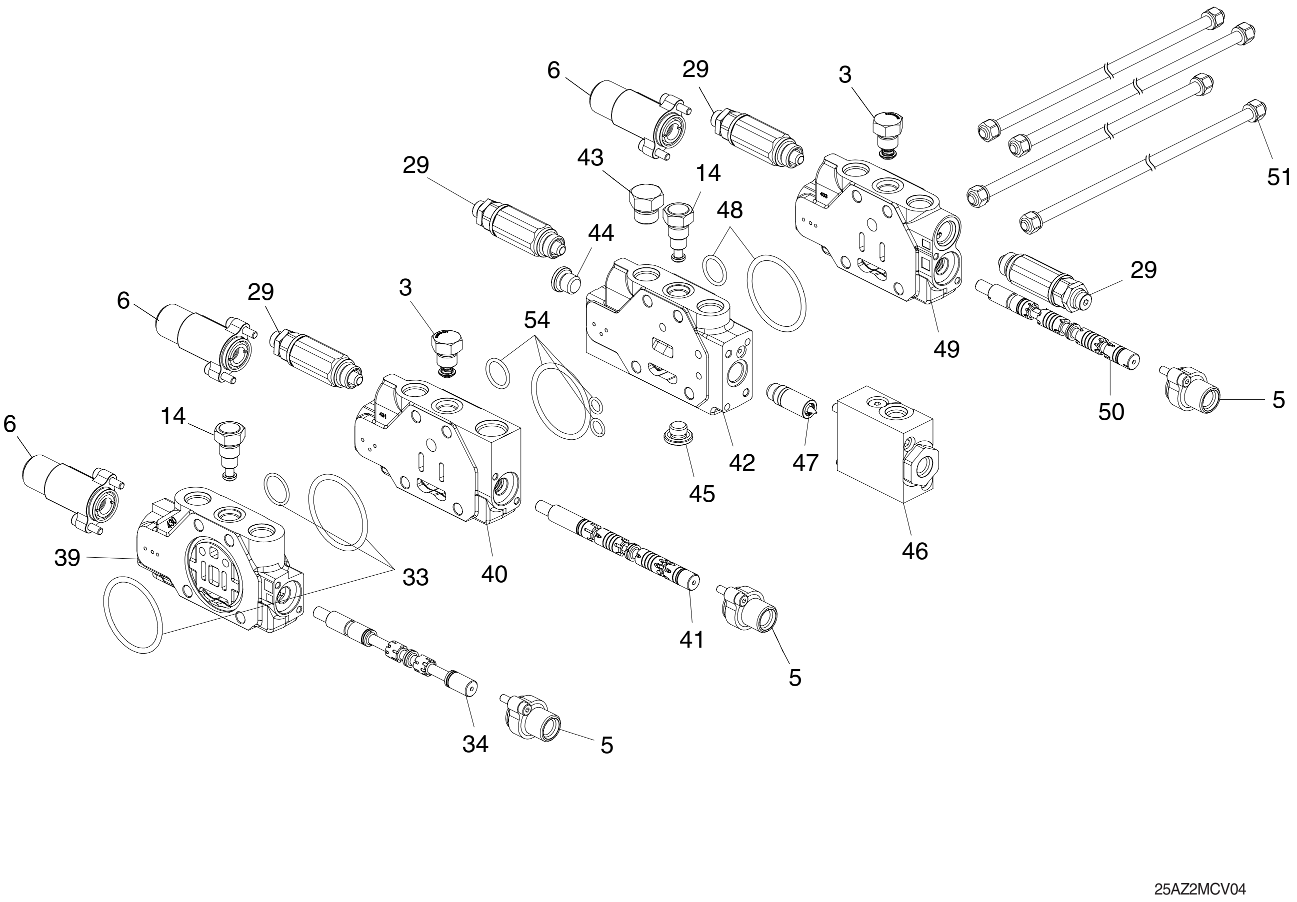
STRUCTURE (2/3)



25AZ2MCV03

3	Plug	31	Arm spool assy	35	Plug
5	Pilot cover	32	LH travel block assy	36	Inlet block assy
6	Pilot cover	33	O-ring	37	O-ring
29	Relief valve assy	34	Travel spool assy	38	Relief valve assy
30	Arm block assy				

STRUCTURE (3/3)



3	Plug	39	RH travel block assy	46	Lock valve cover
5	Pilot cover	40	Boom block body	47	Lock valve
6	Pilot cover	41	Boom spool assy	48	O-ring
14	Plug	42	Boom lock block assy	49	Bucket block assy
29	Relief valve assy	43	Plug	50	Bucket spool assy
33	O-ring	44	Plug	51	Socket bolt
34	Travel spool assy	45	Plug	54	O-ring

3. DISASSEMBLY AND ASSEMBLY

1) GENERAL PRECAUTIONS

(1) All hydraulic components are manufactured to a high precision. Consequently, before disassembling and assembling them, it is essential to select an especially clean place.

(2) In handling a control valve, pay full attention to prevent dust, sand, etc. from entering into it.

(3) When a control valve is to be remove from the machine, apply caps and masking seals to all ports. Before disassembling the valve, recheck that these caps and masking seals are fitted completely, and then clean the outside of the assembly. Use a proper bench for working. Spread paper or a rubber mat on the bench, and disassemble the valve on it.

(4) Support the body section carefully when carrying or transferring the control valve. Do not lift by the exposed spool, end cover section etc.

(5) After disassembling and assembling of the component it is desired to carry out various tests (for the relief characteristics, leakage, flow resistance, etc.), but hydraulic test equipment is necessary for these tests. Therefore, even when its disassembling can be carried out technically, do not disassemble such components that cannot be tested, adjusted, and so on. Additionally one should always prepare clean cleaning oil, hydraulic oil, grease, etc. beforehand.

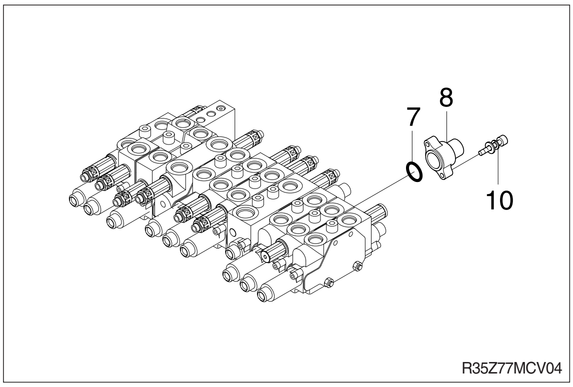
2) TOOLS

Before disassembling the control valve, prepare the following tools beforehand.

Name of tool	Quantity	Size (mm)
Vice mounted on bench (soft jaws)	1 unit	
Hexagon wrench	Each 1 piece	5, 6, 10, 12 and 14
Socket wrench	Each 1 piece	5 and 6
Spanner	Each 1 piece	13, 21 and 30
Rod	1 piece	Less than 10×250

3) DISASSEMBLY

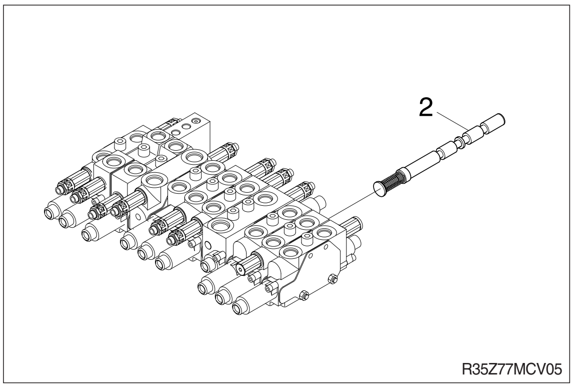
(1) Disassembly of spools (pilot type)



① Loosen hexagon socket head bolts (10) with washer.
(Hexagon wrench : 5 ㎜)

② Remove the pilot cover (8).

※ Pay attention not to lose the O-ring (7) under the pilot cover.



③ Remove the spool assembly (2) from the body by hand slightly.

※ When extracting each spool from its body, pay attention not to damage the body.

※ When extracting each spool assembly, it must be extracted from spring side only.

※ When any abnormal parts are found, replace it with completely new spool assembly.

※ When disassembled, tag the components for identification so that they can be reassembled correctly.

(2) Disassembly of holding valve (boom 1)

① Loosen hexagon socket head bolts(120). (Hexagon wrench : 5 ㎜)

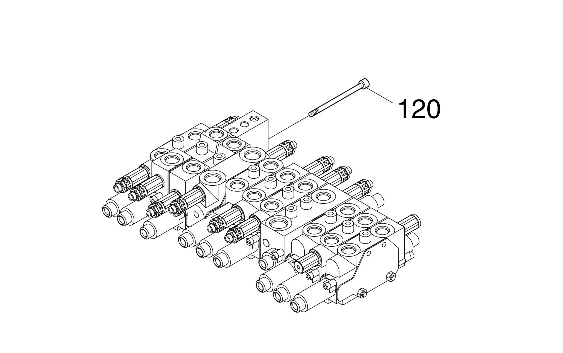
② Remove the holding valve.

※ Pay attention not to lose the O-ring and the poppet under the pilot cover.

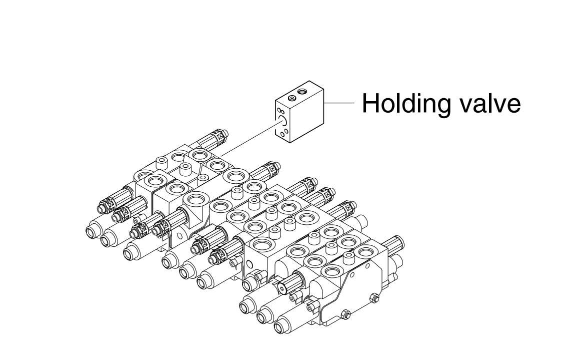
※ Pay attention not to damage the "piston A" under pilot cover.

※ When any abnormal parts are found, replace it with completely new holding valve assembly.

※ When disassembled, tag the components for identification so that they can be reassembled correctly.



R35Z77MCV13



R35Z77MCV14

(3) Disassembly of the load check valve and the negative relief valve

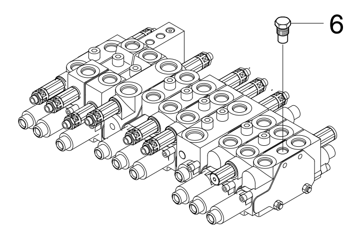
① The load check valve

a. Fix the body to suitable work bench.

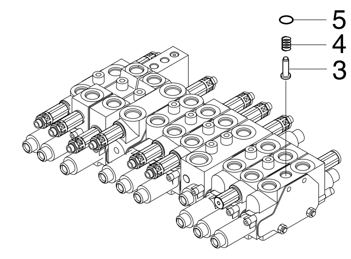
※ Pay attention not to damage the body.

b. Loosen the plug (6)
(Hexagon wrench : 10 ㎜).

c. Remove the O-ring (5), spring (4) and the load check valve (3) with pincers or magnet.



R35Z77MCV11



R35Z77MCV12

(4) Disassembly of the main and overload relief valve

① Fix the body to suitable work bench.

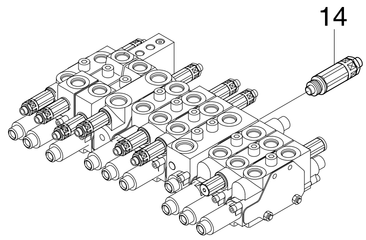
② Remove the main relief valve (14).
(Spanner : 30 ㎜)

③ Remove the overload relief valve (15).
(Spanner : 22 ㎜)

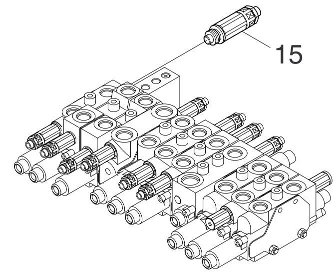
※ When disassembled, tag the relief valve for identification so that they can be reassembled correctly.

※ Pay attention not to damage seat face.

※ When any abnormal parts are found, replace it with completely new relief valve assembly.



R35Z77MCV09

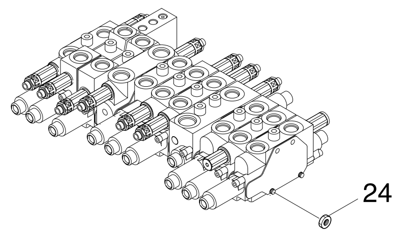


R35Z77MCV10

(5) Disassembly of the block assembly

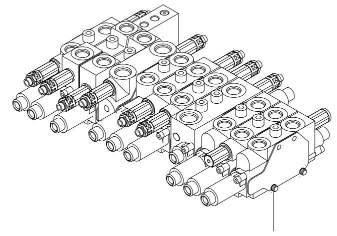
① Fix the body to suitable work bench.

② Remove the nut (24).
(Spanner : 13 ㎜)



R35Z77MCV15

※ Do not removed the tie bolt (23).



R35Z77MCV16

(6) Inspection after disassembly

Clean all disassembled parts with clean mineral oil fully, and dry them with compressed air. Then, place them on clean papers or cloths for inspection.

① Control valve

a. Check whole surfaces of all parts for burrs, scratches, notches and other defects.
b. Confirm that seal groove faces of body and block are smooth and free of dust, dent, rust etc.
c. Correct dents and damages and check seat faces within the body, if any, by lapping.
※ Pay careful attention not to leave any lapping agent within the body.
d. Confirm that all sliding and fitting parts can be moved manually and that all grooves and path's are free foreign matter.
e. If any spring is broken or deformed, replace it with new one.
f. When a relief valve does not function properly, repair it, following it's the prescribed disassembly and assembly procedures.
g. Replace all seals and O-rings with new ones.

② Relief valve

a. Confirm that all seat faces at ends of all poppets and seats are free of defects and show uniform and consistent contact faces.
b. Confirm manually that main poppet and seat can slide lightly and smoothly.
c. Confirm that outside face of main poppet and inside face of seat are free from scratches and so on.
d. Confirm that springs are free from breakage, deformation, and wear.
e. Confirm that orifices of main poppet and seat section are not clogged with foreign matter.
f. Replace all O-rings with new ones.
g. When any light damage is found in above inspections, correct it by lapping.
h. When any abnormal part is found, replace it with a completely new relief valve assembly.

4) ASSEMBLY

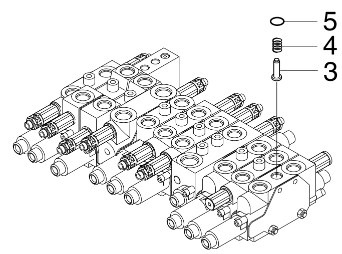
(1) General precaution

① In this assembly section, explanation only is shown.
For further understanding, please refer to the figures shown in the previous structure & disassembly section.
② Pay close attention to keeping all seals free from handling damage and inspect carefully for damage before using them.
③ Apply clean grease or hydraulic oil to the seal so as to ensure it is fully lubricated before assembly.
④ Do not stretch seals so much as to deform them permanently.
⑤ In fitting O-rings, pay close attention not to roll them into their final position in addition, a twisted O-ring cannot easily untwist itself naturally and could thereby cause inadequate sealing and thereby both internal and external oil leakage.
⑥ Tighten fitting bolts for all sections with a torque wrench adjusted to the respective tightening torque.
⑦ Do not reuse removed O-rings and seals.

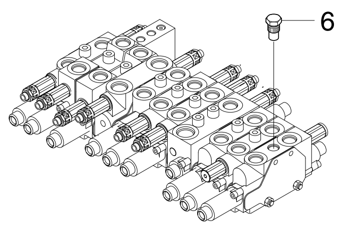
(2) Load check valve

① Assemble the load check valve (3) and O-ring (5), spring (4).
② Put O-rings on to plug (6).
③ Tighten plug to the specified torque.

· Hexagon wrench : 8 mm
· Tightening torque : 3.7 kgf · m
(26.7 lbf · ft)



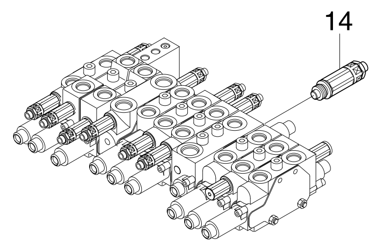
R35Z77MCV12



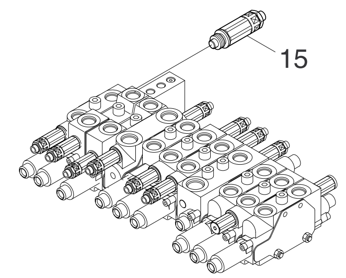
R35Z77MCV11

(3) Main relief, port relief valves

① Install the main relief valve (14).
  · Spanner : 30 mm
  · Tightening torque : 6 kgf · m (43.4 lbf · ft)
② Install the over load relief valve (15).
  · Spanner : 22 mm
  · Tightening torque : 4 kgf · m (28.9 lbf · ft)



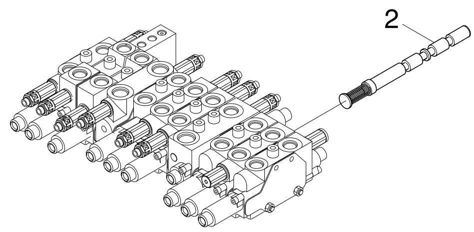
R35Z77MCV09



R35Z77MCV10

(4) Main spools

① Carefully insert the previously assembled spool assemblies into their respective bores within of body.
※ Fit spool assemblies into body carefully and slowly. Do not under any circumstances push them forcibly in.



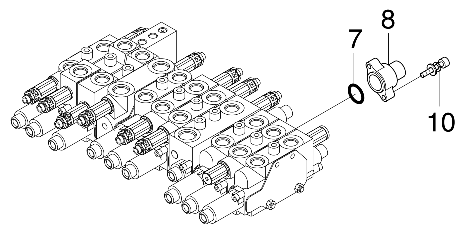
R35Z77MCV05

(5) Covers of pilot type

① Fit spool covers (8) tighten the hexagonal socket head bolts (10) with washer to the specified torque.

  · Hexagon wrench : 5mm
  · Tightening torque : 1~1.1kgf · m (7.2~7.9lbf · ft)

※ Confirm that O-rings (7) have been fitted.

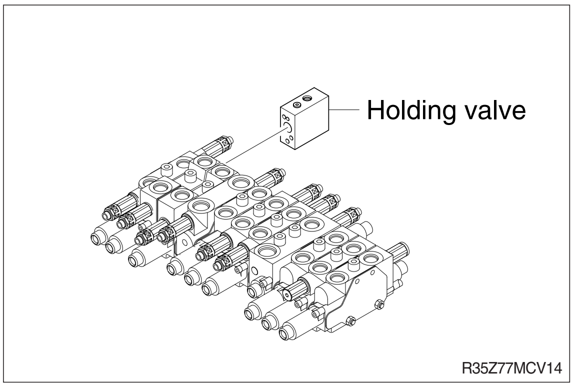


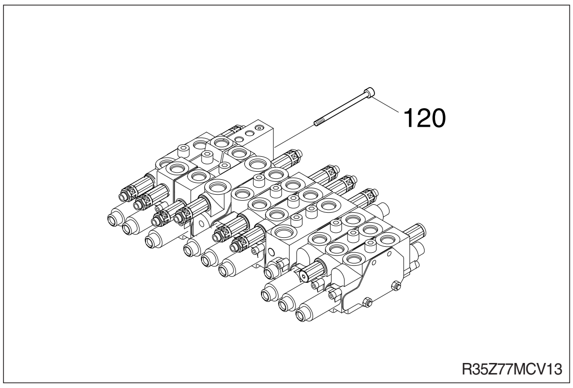
R35Z77MCV04

(6) Holding valve

① Fit the holding valve to the body and tighten hexagon socket head bolt (120) to specified torque.

· Hexagon wrench : 5 mm
· Tightening torque :1.1 kgf · m (7.9 lbf · ft)





GROUP 5 SWING DEVICE

1. REMOVAL AND INSTALL OF MOTOR

1) REMOVAL

(1) Lower the work equipment to the ground and stop the engine.

(2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

(3) Loosen the breather slowly to release the pressure inside the hydraulic tank.

⚠ **Escaping fluid under pressure can penetrate the skin causing serious injury.**

※ When pipes and hoses are disconnected, the oil inside the piping will flow out, so catch it in oil pan.

13031GE18

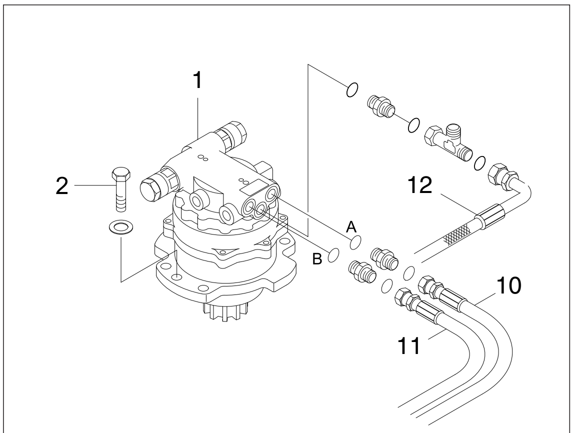
(4) Disconnect hose assembly (10, 11, 12, 13, 14).

(5) Disconnect pilot line hoses (15).

(6) Sling the swing motor assembly (1) and remove the swing motor mounting bolts (2).

※ Motor device weight : 34 kg (75 lb)

· Tightening torque : 19.6±2.9 kgf·m (142±21.0 lbf·ft)



25AZ7SM01

(7) Remove the swing motor assembly.

※ When removing the swing motor assembly, check that all the piping have been disconnected.

2) INSTALL

(1) Carry out installation in the reverse order to removal.

(2) Bleed the air from the swing motor.

① Remove the air vent plug.

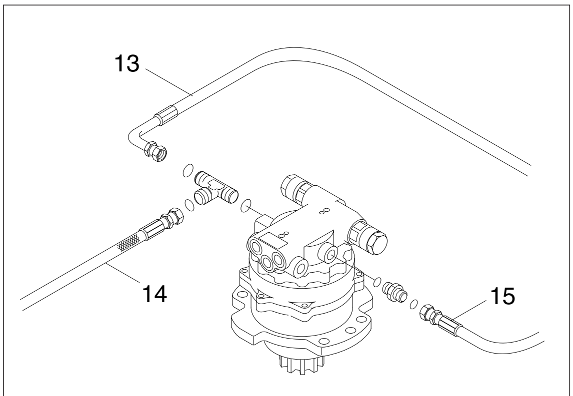
② Pour in hydraulic oil until it overflows from the port.

③ Tighten plug lightly.

④ Start the engine, run at low idling and check oil come out from plug.

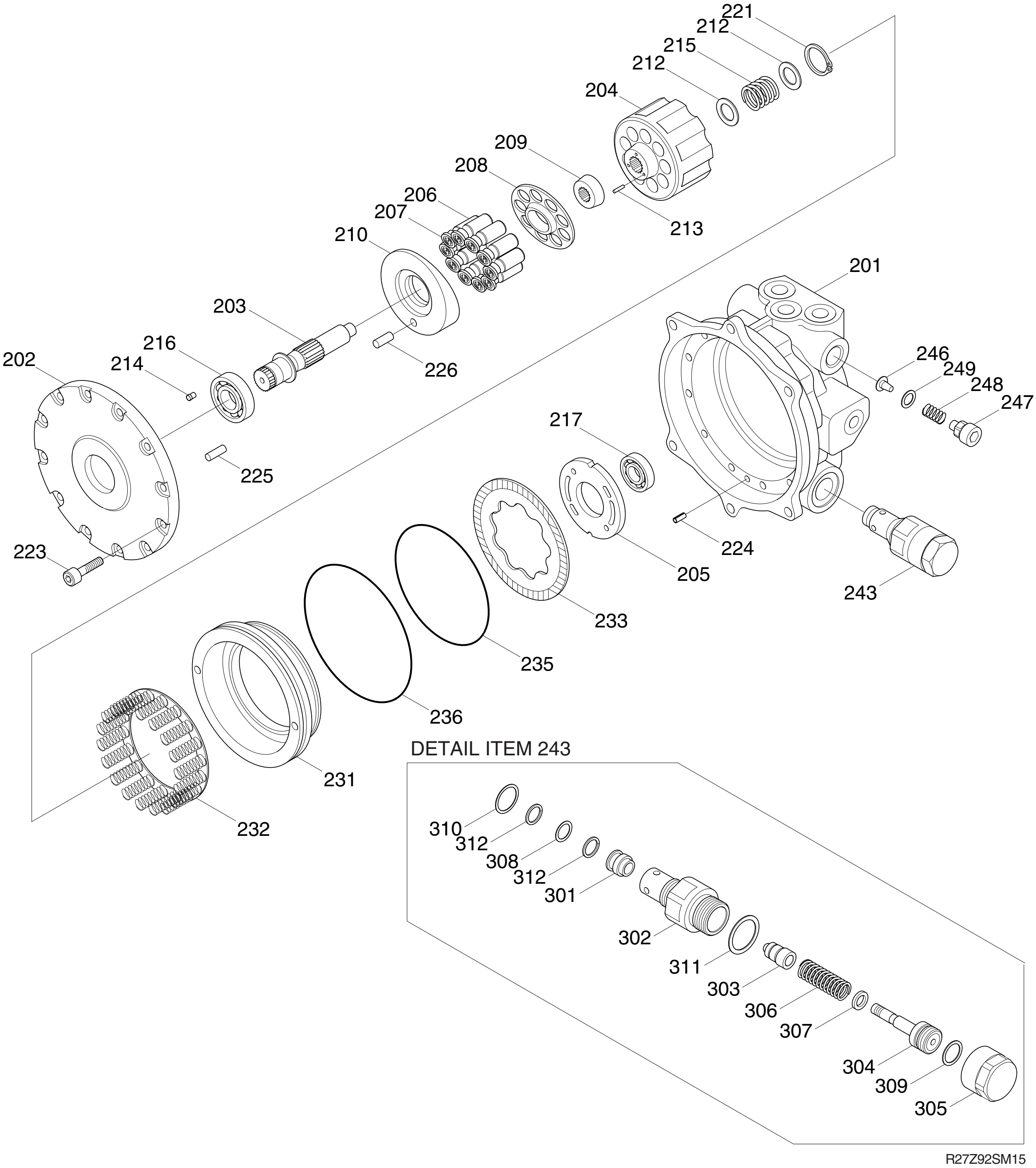
⑤ Tighten plug fully.

(3) Confirm the hydraulic oil level and check the hydraulic oil leak or not.



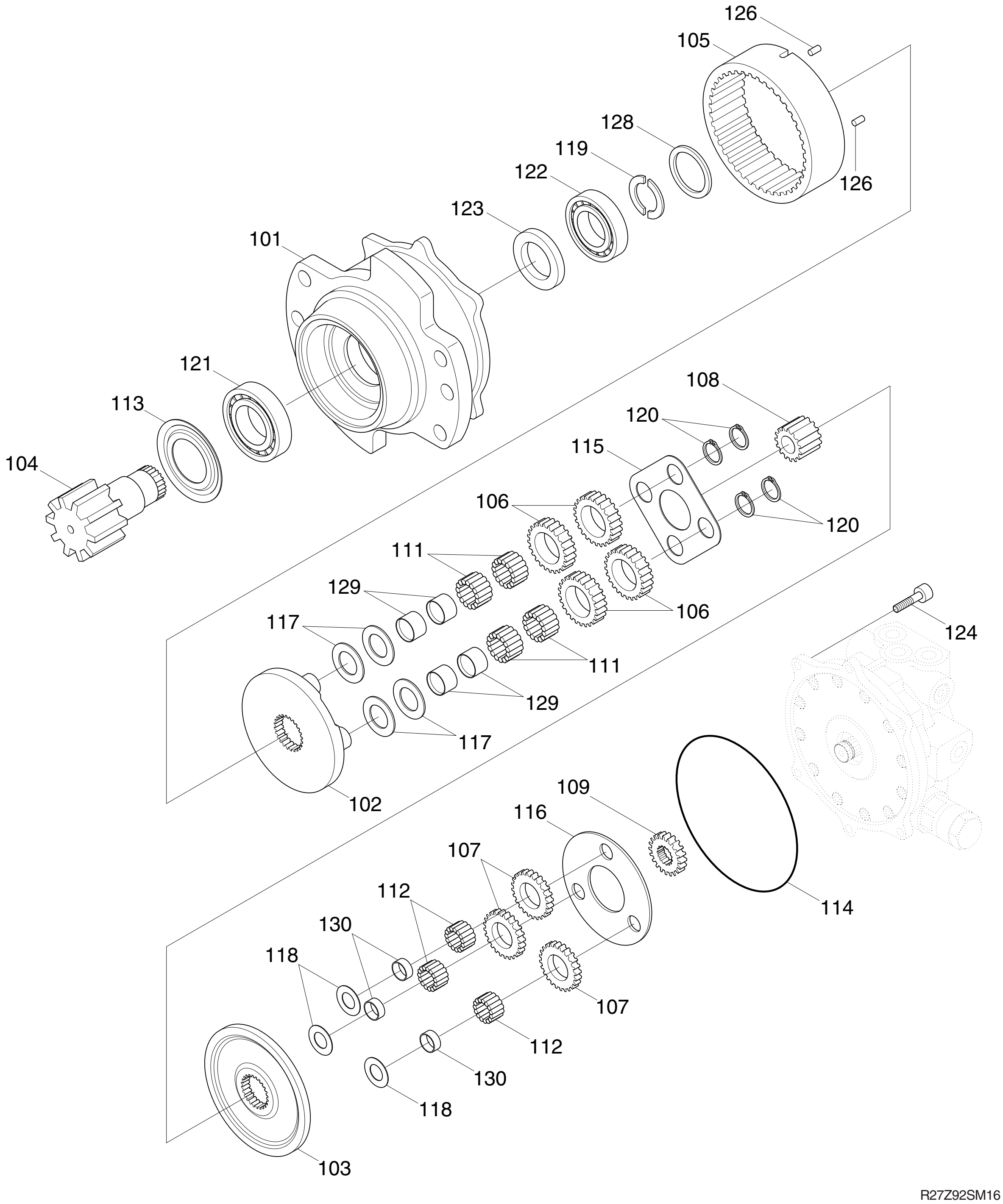
25AZ7SM02

2. COMPONENTS (1/2)



201	Body	213	Pin	232	Spring assy	303	Poppet
202	Plate	214	Filter	233	Disk plate	304	Piston
203	Shaft	215	Spring C	235	O-ring	305	Cap
204	Cylinder barrel	216	Bearing	236	O-ring	306	Spring
205	Valve plate	217	Bearing	243	Relief valve	307	Spacer
206	Piston	221	Snap ring	246	Check valve	308	O-ring
207	Shoe	223	Screw	247	Plug	309	O-ring
208	Shoe holder	224	Spring pin	248	Spring	310	O-ring
209	Barrel holder	225	Pin	249	O-ring	311	O-ring
210	Swash plate	226	Pin	301	Seat	312	Back up-ring
212	Retainer	231	Brake piston	302	Retainer		

COMPONENTS (2/2)



101	Body	111	Needle	120	Snap ring
102	Carrier 1	112	Needle	121	Bearing
103	Carrier 2	113	Seal ring	122	Bearing
104	Pinion shaft	114	O-ring	123	Oil seal
105	Internal gear	115	Thrust plate 1	124	Screw
106	Gear B1	116	Thrust plate 2	126	Pin
107	Gear B2	117	Thrust washer 1	128	Ring
108	Gear S1	118	Thrust washer 2	129	Ring 1
109	Gear S2	119	Preload collar	130	Ring 2

3. DISASSEMBLY AND ASSEMBLY

1) GENERAL ATTENTION

Please pay attention following points.

(1) Working should be done at the clean place and pay attention not to attach dust, paint cake and water. And prepare the clean box to put into the disassembled parts.

(2) Before disassembling, clean up the dust which is attached to the outside of the swing motor and take out paint which is attached to the binding parts by the wire brush.

(3) To make the original position when assembling, make a marking before disassembling.

(4) Give special care to protect parts from damage.

(5) Wash parts with washing oil sufficiently.

(6) Check parts whether there is friction loss or seize and take out burr with sand paper.

(7) Change the seals and snap rings to new ones.

2) DISASSEMBLY AND ASSEMBLY PROCEDURE

As the swing motor composes 2 blocks (hydraulic motor and reduction gear), explain each block disassembly and assembly procedure.
And please refer to the page 7-36~37.

3) TOOLS FOR DISASSEMBLY AND ASSEMBLY

No.	Tool	
1 2	Preset type hand torque wrench	45 N (JIS B4650) 90 N (JIS B4650)
3 4 5	Hexagon bar bit for above wrench	Two-plane width 6 Two-plane width 8
6	Single purpose type hand torque	T = 15 $\pm$ 1.5 kgf · m (108 $\pm$ 10.8 lbf · ft) Two-plane 36
7 8 9	Hexagon bar wrench	Two-plane width 6 Two-plane width 8
10	Spanner	Two-plane width 36
11	Minus driver	Width 6~10
12 13	Snap ring pliers	Ø28 For hole Ø22 For shaft
14	Hammer	-
15	Plastic hammer	-
16 17 18 19 20	Other	Grease (Oil designated hydraulic oil) Wire brush Sand paper Anti-loose adhesive (three bond #1305)

4. DISASSEMBLY

1) HYDRAULIC MOTOR

(1) Loose the hexagon socket head cap bolts (124), and take out the hydraulic motor assembly from the reduction gear body.

· Tools required :
Hexagon bar wrench : 6 ㎜

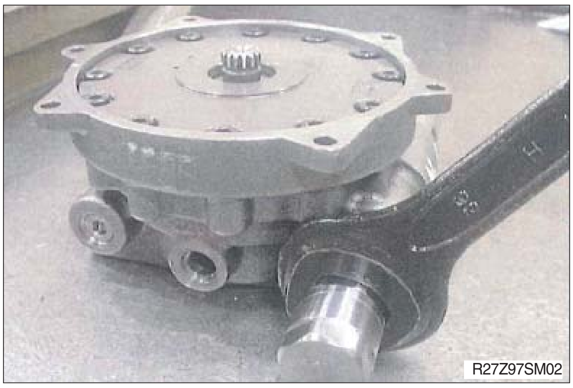
※ When taking out the hydraulic motor assembly from the reduction gear body, the drain port should be open.
When it is difficult to take out, insert the minus driver into the binding face to the body and take out the burr completely.

R27Z97SM01

(2) Take out the relief valve assembly.

· Tools required :
Spanner : 36 ㎜

※ Do not disassemble the relief valve assembly, unless it is necessary.



R27Z97SM02

(3) Loose the hexagon socket head cap bolts (223), and take out it.

· Tools required :
Hexagon bar wrench : 6 ㎜

R27Z97SM03

(4) Take out the plate S (202).

※ Pay attention not to drop off swash plate.

R27Z97SM04

(5) Take out the swash plate (210) and the shaft kit from the plate S (202).

※ When it is difficult to take out the shaft, hit the opposite side slightly by the plastic hammer.
As the bearing (216) is pressed into the shaft, do not disassemble unless it is necessary to change the bearing.


R27Z97SM05

(6) Take out the filter (214) and the parallel pin (225) from the plate S (202).

· Filter (214) : 1 pcs
· Parallel pin (225) : 3 pcs


R27Z97SM06

(7) Take out the spring assembly (232) from the body H (201).

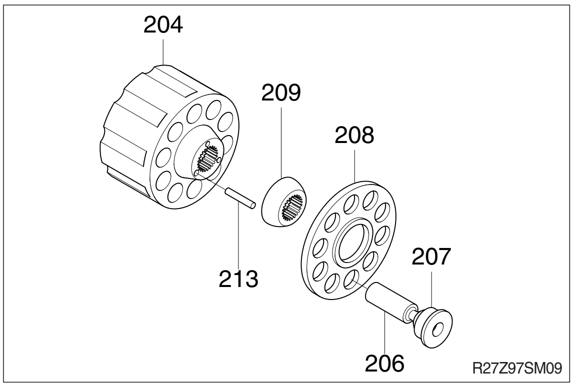

R27Z97SM07

(8) Take out the cylinder barrel kit.

※ The small parts are easily dispersed, pay attention not to miss.
The valve plate (205) is sometime attached, pay attention not to drop out.

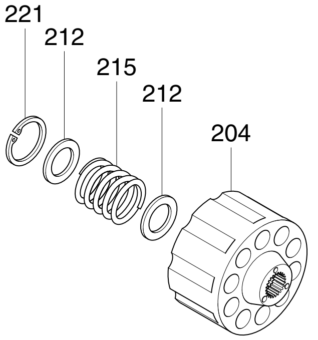

R27Z97SM08

(9) Take out the piston (206) and the shoe (207) assembly, the shoe holder (208), the barrel holder (209) and the pin (213).



R27Z97SM09

(10) Take out the snap ring (221), the retainer (212) and the spring C (215).
- Tools required :
  Snap ring plier : Ø28 for hole

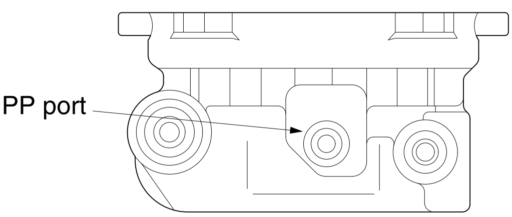


R27Z97SM10


R27Z97SM11

(11) Take out the brake piston (231) and the O-ring (235, 236).

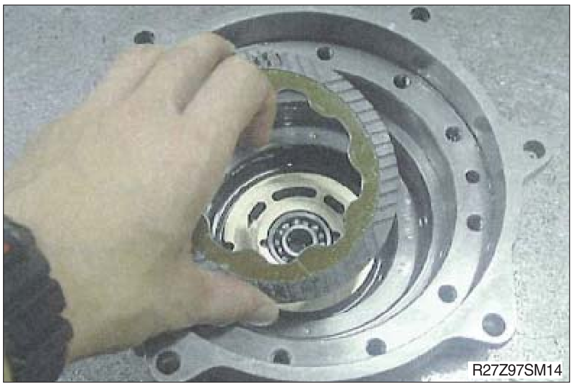
※ The brake piston is drawn out by the air blowing gradually from the PP port.
Pay attention not to draw out the brake piston rapidly by the air blowing gradually.



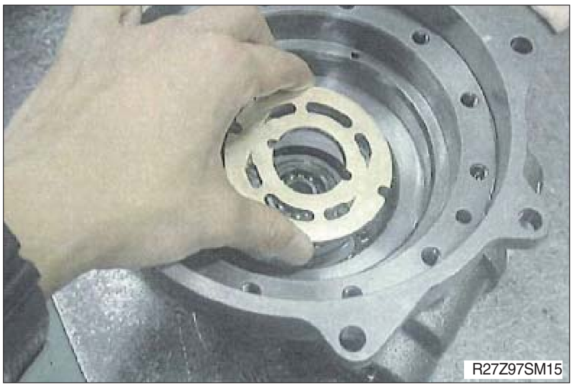
R27Z97SM12


R27Z97SM13

(12) Take out the disk plate (233).


R27Z97SM14

(13) Take out the valve plate (205).


R27Z97SM15

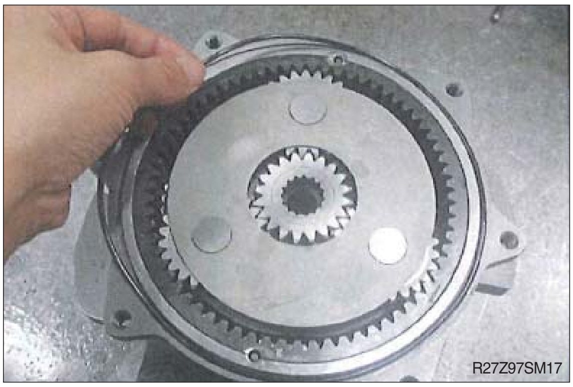
(14) Loose the plug (247), and take out the check valve (246) and the spring (248). (2 locations)

· Tools required :
Hexagon bar wrench : 8 mm


R27Z97SM16

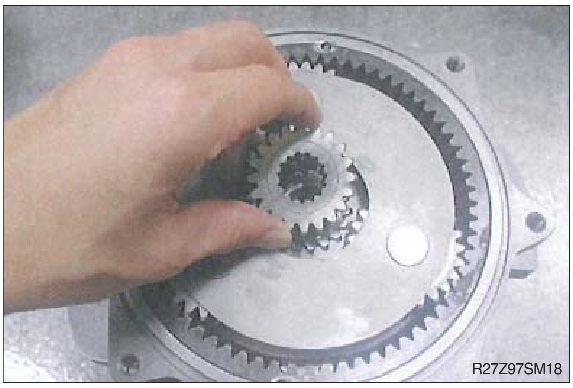
2) REDUCTION GEAR

(1) Take out the O-ring (114).



R27Z97SM17

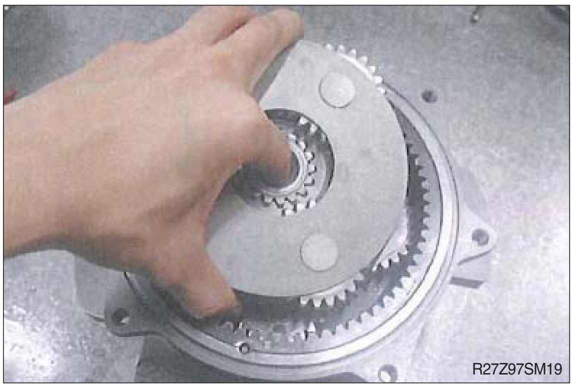
(2) Take out the S2 gear (109).



R27Z97SM18

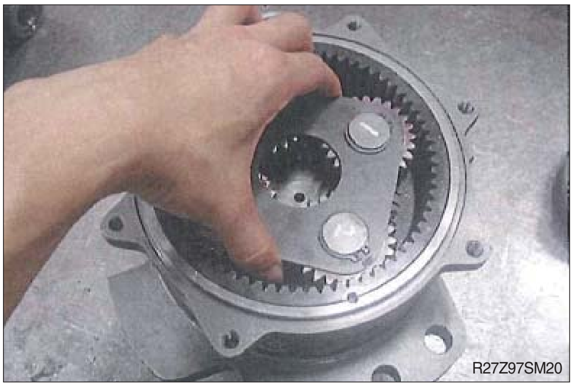
(3) Take out the carrier 2 kit.

※ Pay attention not to scattered each parts as lifting S1 gear up.



R27Z97SM19

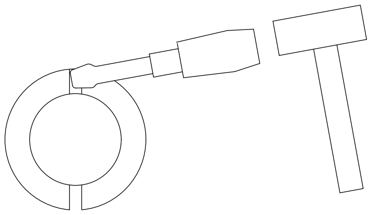
(4) Take out the carrier 1 kit.



R27Z97SM20

(5) Take out the ring (128) and the pre-load collar (119).

※ To attach the minus driver to the gap of 2 pcs pre-load collar, and take out by hitting with the hammer.
As pre-adjusted the gap with the bearing, do not disassemble unless it is necessary.



R27Z97SM21

R27Z97SM22

(6) Take out the pinion kit.

※ To secure the drawing space of the pinion shaft, attach the approximate 130 mm pad to the flange part, and push out the pinion shaft (104) by the press.

As pre-adjusted the gap with the bearing, do not disassemble unless it is necessary.

R27Z97SM23

(7) Take out the thrust plate 2 (116) from the carrier 2 kit.

R27Z97SM24

(8) Take out the b2 gears (107) and the needles 2 (112) from the carrier 2 kit.

R27Z97SM25

(9) Take out the rings 2 (130) and thrust washers 2 (118) from the carrier 2 kit.


R27Z97SM26

(10) Take out the thrust plate 1 (115) from the carrier 1 kit.
- · Tools required :
  Snap ring plier : Ø22 for shaft


R27Z97SM27

(11) Take out the b1 gears (116) and needles 1 (111) from the carrier 1 kit.


R27Z97SM28

(12) Take out the rings 1 (129) and the thrust washers 1 (117) from the carrier 1 kit.


R27Z97SM29

5. ASSEMBLY

1) HYDRAULIC MOTOR SECTION

(1) Press-fit the bearing (217) and spring pin (224) into the body H (201).

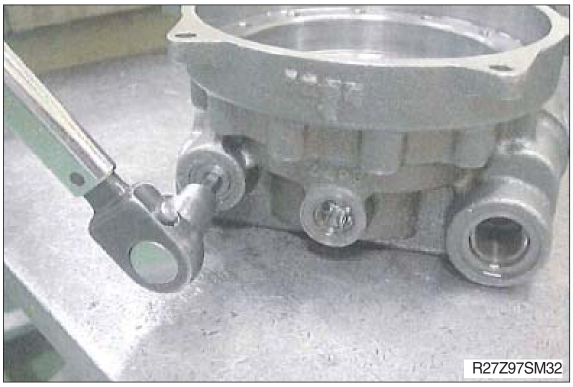

R27Z97SM30

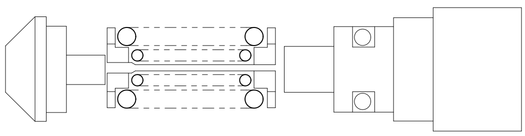
(2) Insert the 2 check valves (246) (1 pc/side), 2 springs (248) (1pc/side) and 2 plugs (247) (1pc/side) with O-ring (249) in that order into the body H (201).

· Tools required :
Hexagon bar wrench : 8 mm
Torque wrench

※ Apply grease slightly to the O-ring and assemble to pay attention not biting the seals.

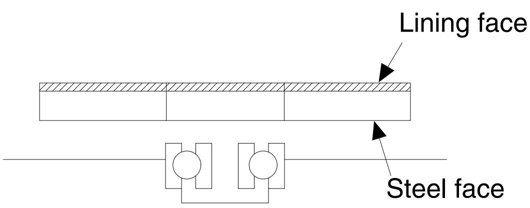
· Plug tightening torque :
6±0.3 kgf · m (43.4±2.17 lbf · ft)


R27Z97SM32

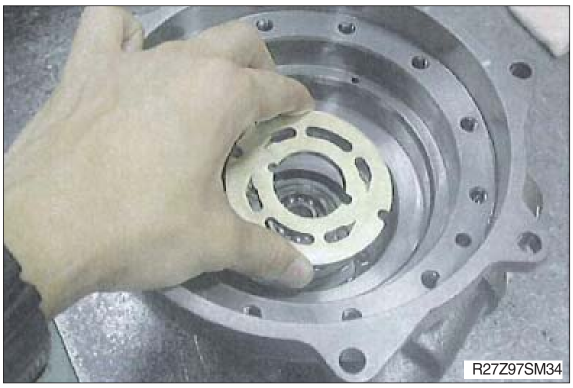

R27Z97SM31

(3) Place the valve plate (205) onto the body H (201).

※ The steel face of the valve plate should be downside and assemble.



R27Z97SM33


R27Z97SM34

(4) Assemble the disk plate (233).

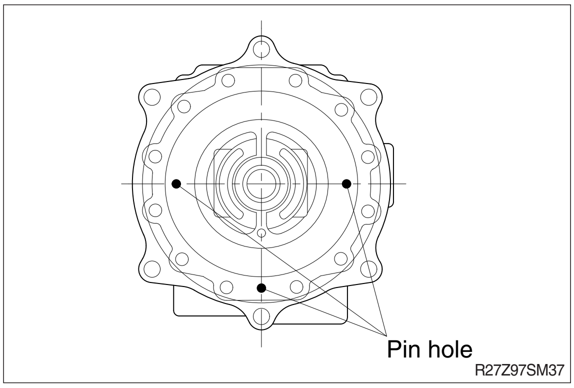
R27Z97SM35

(5) Make the brake piston assembly which placed O-rings (235, 236) on brake piston (231), and place it onto the body H (201).

Place the brake piston assembly onto plate S placed 3 pins, then place it onto the body H as matched pin hole position. After that, press-fit it by tightening hexagon bolts little by little.
Check no pushed out, scratches and dust on O-ring at this time.
For prevention of brake piston assembly, apply grease on plate S.
Take out the plate S after placed brake piston assembly.

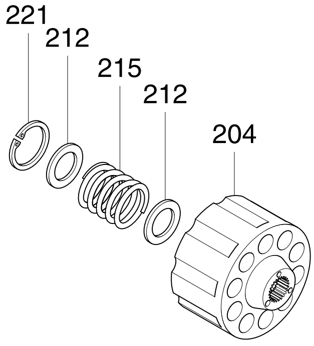
※ Pay attention to jam seal parts, install them applying grease on O-rings.

R27Z97SM36



R27Z97SM37

(6) Place the retainer (212), spring C (215) and retainer (212) in that order into the cylinder barrel (204), and then secure them with the snap ring (221).
   · Tools required :
   Snap ring plier : Ø28 for hole



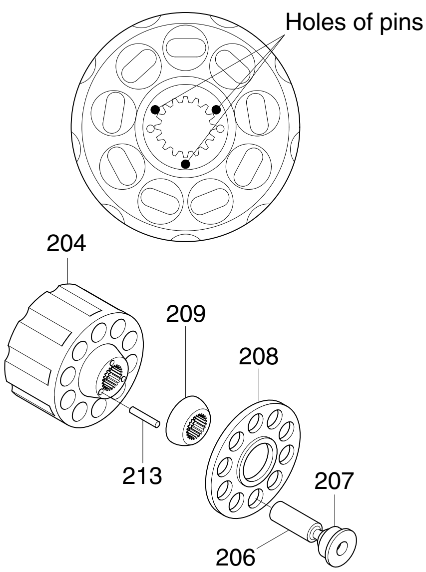
R27Z97SM38

R27Z97SM39

(7) Make the shoe holder assembly which has the 9 piston-shoe (206, 207) assemblies placed on the shoe holder (208).

R27Z97SM40

(8) Place the 3 pins (213), barrel holder (209) and the shoe holder assembly onto the cylinder barrel (204) to make up a cylinder barrel assembly.



R27Z97SM41

R27Z97SM42

(9) Insert cylinder barrel assembly along ditch of disk plate into body H (201).

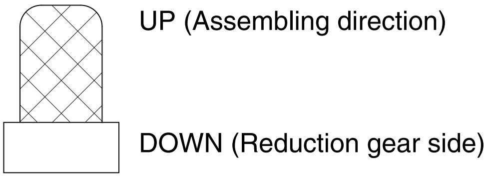

R27Z97SM43

(10) Insert the spring assembly (232) into the body H (201).


R27Z97SM44

(11) Place the filter (214) and the parallel pins (225) into the plate S (202).

※ Filter (214) : 1 pc
Parallel pin (225) : 3 pcs



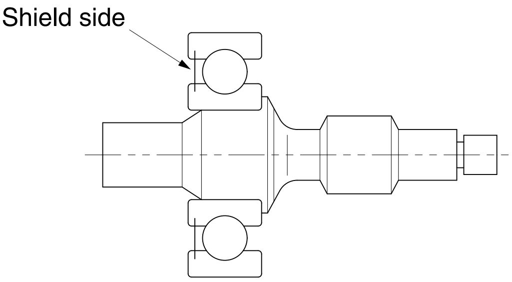
R27Z97SM45


R27Z97SM46

Use a plastic hammer when it is tight.

※ Pay attention height of pins are 8 mm from surface after installation.

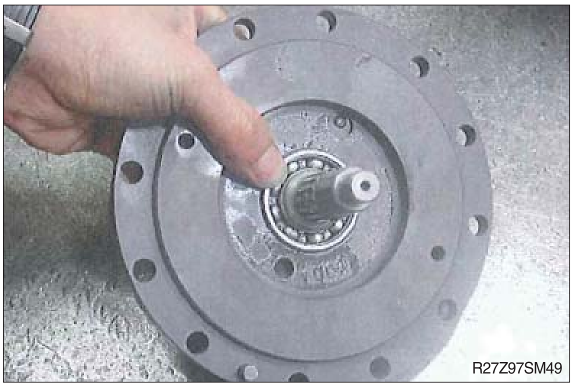
(12) Press-fit bearing (216) with shaft (203).



R27Z97SM47


R27Z97SM48

(13) Place the shaft kit into the plate S (202).

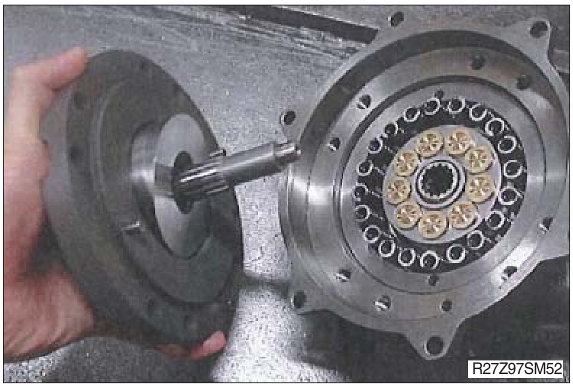


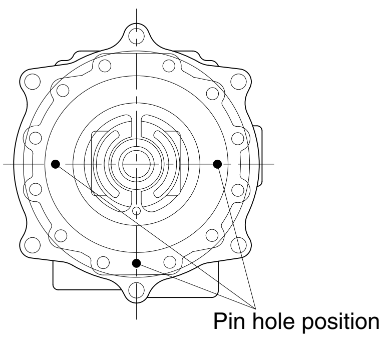
(14) Place the swash plate (210) onto the plate S (202).

※ In case the swash plate drops out, apply grease to the plate S side of it.

(15) Join the body H (201) and the plate S (202).

※ Align the serration of the shaft which is assembled to the plate S to the serration of the cylinder barrel assembly which is assembled to the body H.





R27Z97SM51

(16) Bolt the plate S (202) together with the 12 hexagon socket head cap bolts (223).

· Tools required :
Hexagon bar wrench : 6 mm
Torque wrench

· Plug tightening torque :
3±0.3 kgf · m (21.7±2.17 lbf · ft)

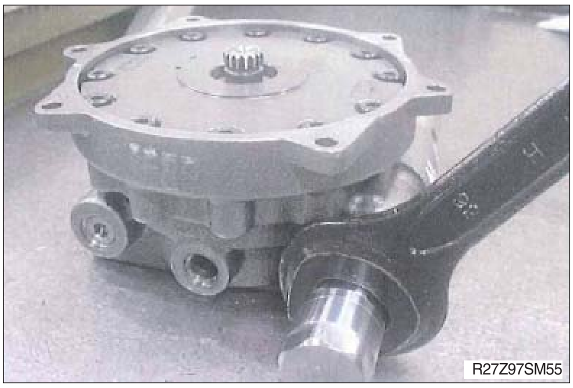

R27Z97SM53

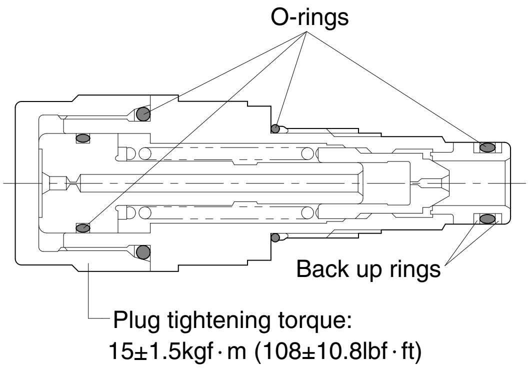
(17) Screw up the relief valve assembly. (both side)

· Tools required :
Spanner : 36 mm
Torque wrench

· Plug tightening torque :
15±1.5 kgf · m (108±10.8 lbf · ft)

※ Once the relief valve is disassembled, replace the O-ring and the back up ring in the below, and screw the cap with the following torque.


R27Z97SM55



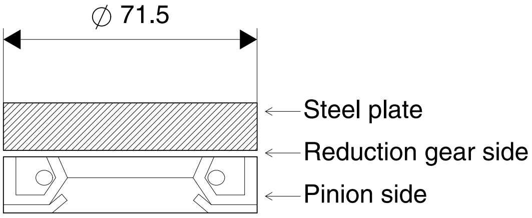
R27Z97SM54

2) REDUCTION GEAR SECTION

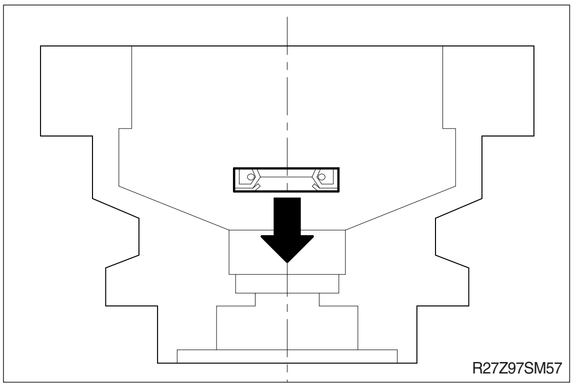
(1) Press-fit the oil seal (123) into the body (101).

※ Pay attention to the direction of the oil seal, use round steel plate for pressing to prevent misalignment.

Steel plate outer diameter : Ø71.5



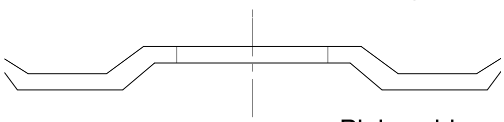
R27Z97SM56



R27Z97SM57

(2) Place the ring seal (113) onto the pinion shaft (104).

※ Pay attention to direction of the ring seal.



R27Z97SM58

R27Z97SM59

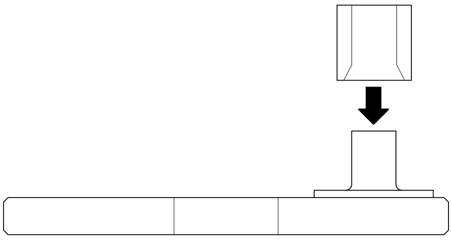
(3) Press-fit the inner ring of the bearing (121) to the pin pinion shaft (104).

※ After press fitting, apply grease onto the surface of the rollers, and turn them manually so that the grease can spread to the whole roller surface.

R27Z97SM60

(4) Place the 4 rings (129) (1 pc/pin) and the 4 thrust washers 1 (117) (1 pc/pin) in that order onto the 4 pins of the carrier 1 (102).

※ Pay attention to direction of the ring. Beveling part of the ring should be down side.



R27Z97SM61

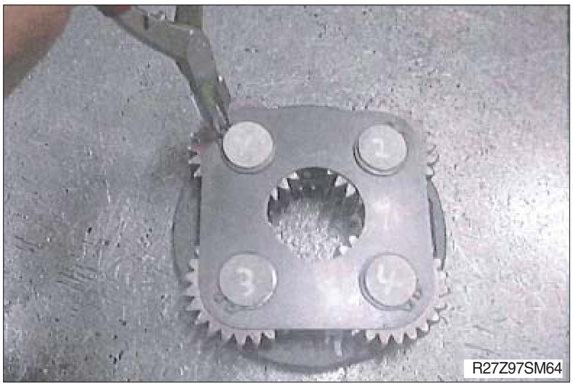
R27Z97SM62

(5) Place the 4 b1 gears (106) (1 pc/pin) and the 92 needles 1 (111) (23 pcs/pin) in that order onto the 4 pins of the carrier 1 (102).

R27Z97SM63

(6) Place the thrust plate 1 (115) and the 4 snap rings (120) (1 pc/pin) to make up a carrier 1 kit.

· Tools required :
Snap ring plier : Ø22 for shaft

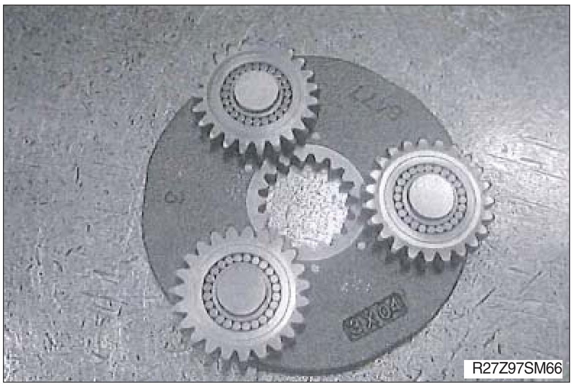


R27Z97SM64

(7) Place the 3 thrust washers 2 (118) (1 pc/pin) and the 3 rings 2 (130) (1 pc/pin) in that order onto the 3 pins of the carrier 2 (103).

R27Z97SM65

(8) Place the 3 b2 gears (107) (1 pc/pin) and the 72 needles 2 (112) (24 pcs/pin) in that order onto the 3 pins of the carrier 2 (103).


R27Z97SM66

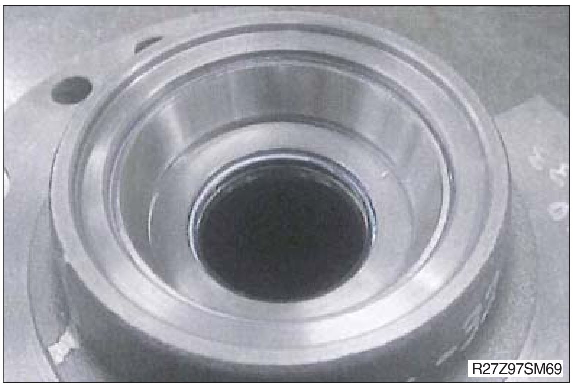
(9) Place the thrust plate 2 (116) and the S1 gear (108) to make up a carrier 2 kit.


R27Z97SM67

(10) Press-fit the outer ring of the bearing (122) into the body (101).

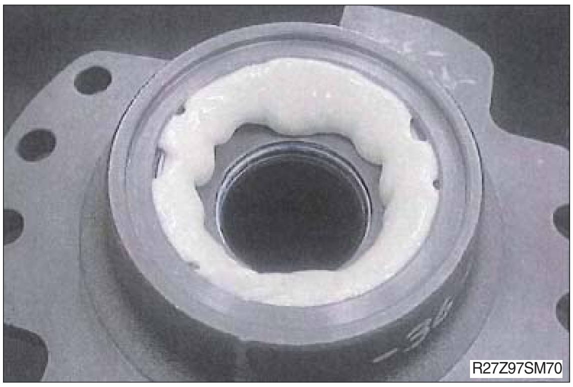

R27Z97SM68

(11) Press-fit the outer ring of the bearing (121) into the body (101).


R27Z97SM69

(12) Fill grease in the bearing (121) section of the body (101).

※ Grease amount : approx. 80% of the space inside the outer ring.



R27Z97SM70

(13) Insert the pinion shaft (104) into the body (101).

※ Pay attention not to damage the lip of the oil seal.

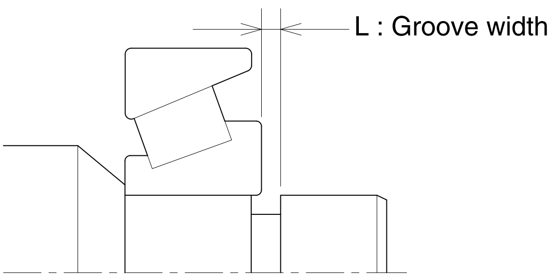
R27Z97SM71

(14) Turn over the body (101), then press-fit inner ring of the bearing (122).

R27Z97SM72

(15) Fix the pinion shaft (104) with the 2 pre-load collars (119).

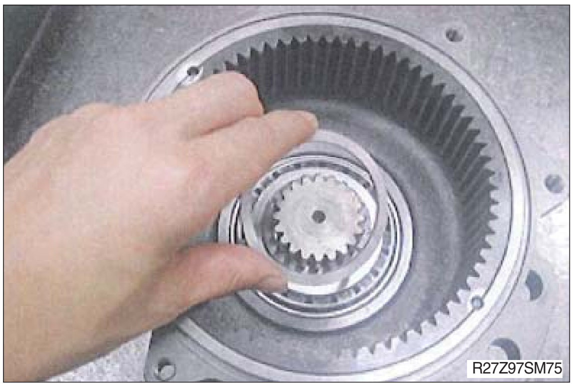
※ Thickness of the pre-load collar must be adjusted for the below L dimension. Standard's +0 to +0.05 mm



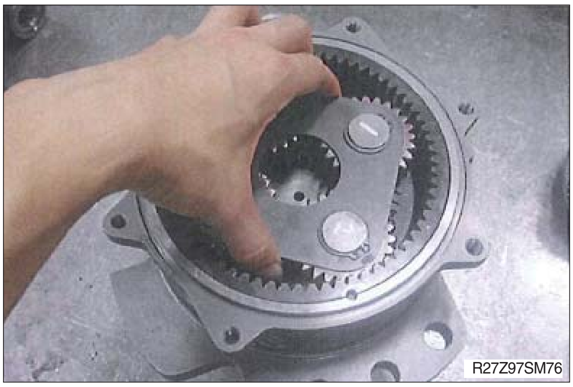
R27Z97SM73

R27Z97SM74

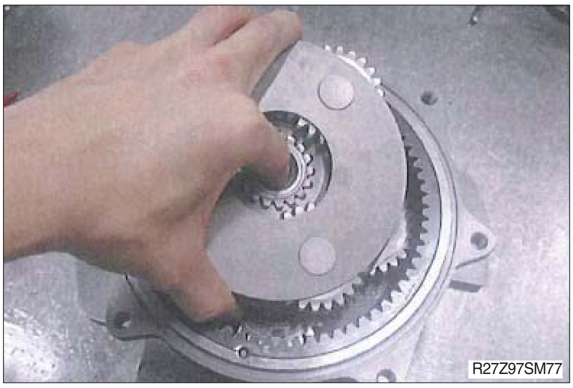
(16) Place the ring (128) over the pre-load collars.



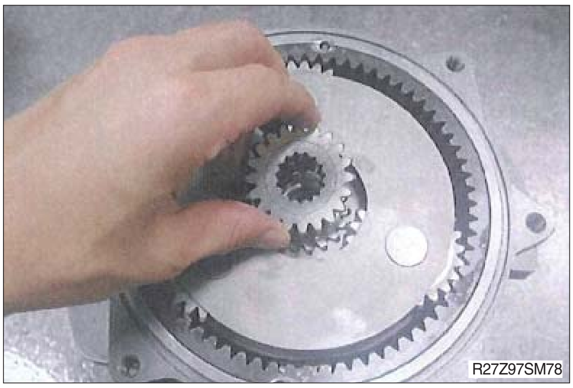
(17) Place the carrier 1 assembly into the body (101) align spline of carrier to the pinion shaft (104).



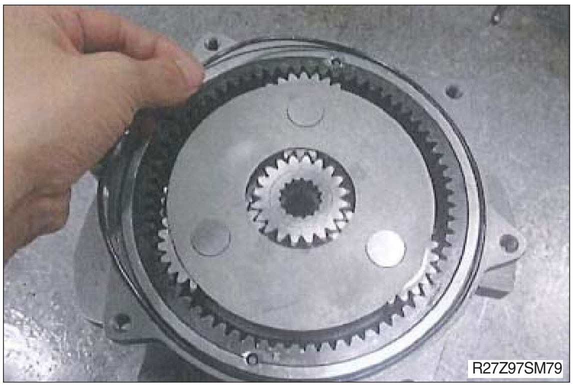
(18) Place the carrier 2 assembly into the body (101) align spline of S1 gear to the b1 gear.



(19) Place the S2 gear (109) into the carrier 2 assembly.



(20) Place the O-ring (114) onto the body (101).



R27Z97SM79

(21) Fill body (101) with hydraulic oil.

※ Oil : ISO VG 46 or equivalent
Oil amount : 2 to 3 mm below top of the thrust plate 2
Wipe oil off flange surface if it is spilled.

R27Z97SM80

(22) Join the hydraulic motor and the body, and then bolt them together with the 4 hexagon socket head cap bolts (124).

· Tools required :
Hexagon bar wrench : 6 mm
Torque wrench

※ Align the shaft of the motor to the S2 gear. Apply anti-loose adhesive to the screws.

· Plug tightening torque :
3±0.3 kgf · m (21.7±2.17 lbf · ft)

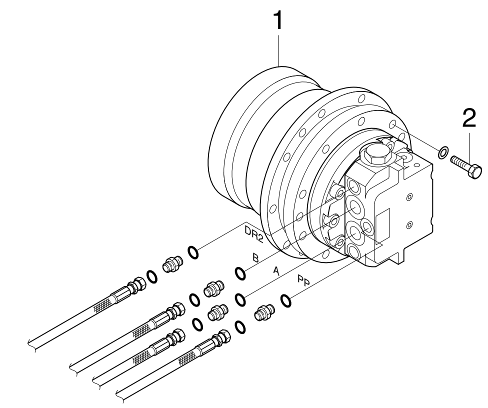
R27Z97SM81

GROUP 6 TRAVEL DEVICE

1. REMOVAL AND INSTALL

1) REMOVAL

13031GE18



R27Z97TM101

(1) Swing the work equipment 90˚ and lower it completely to the ground.

(2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

(3) Loosen the breather slowly to release the pressure inside the hydraulic tank.

⚠ **Escaping fluid under pressure can penetrate the skin causing serious injury.**

※ When pipes and hoses are disconnected, the oil inside the piping will flow out, so catch it in oil pan.

(4) Remove the track shoe assembly.
For details, see removal of track shoe assembly.

(5) Remove the cover.

(6) Remove the hose.

※ Fit blind plugs to the disconnected hoses.

(7) Remove the bolts and the sprocket.

(8) Sling travel device assembly (1).

(9) Remove the mounting bolts (2), then remove the travel device assembly.

· Weight : 36 kg (80 lb)

· Tightening torque : 12.8±3.0 kgf·m
(92.3±21.7 lbf·ft)

2) INSTALL

(1) Carry out installation in the reverse order to removal.

(2) Bleed the air from the travel motor.

① Remove the air vent plug.

② Pour in hydraulic oil until it overflows from the port.

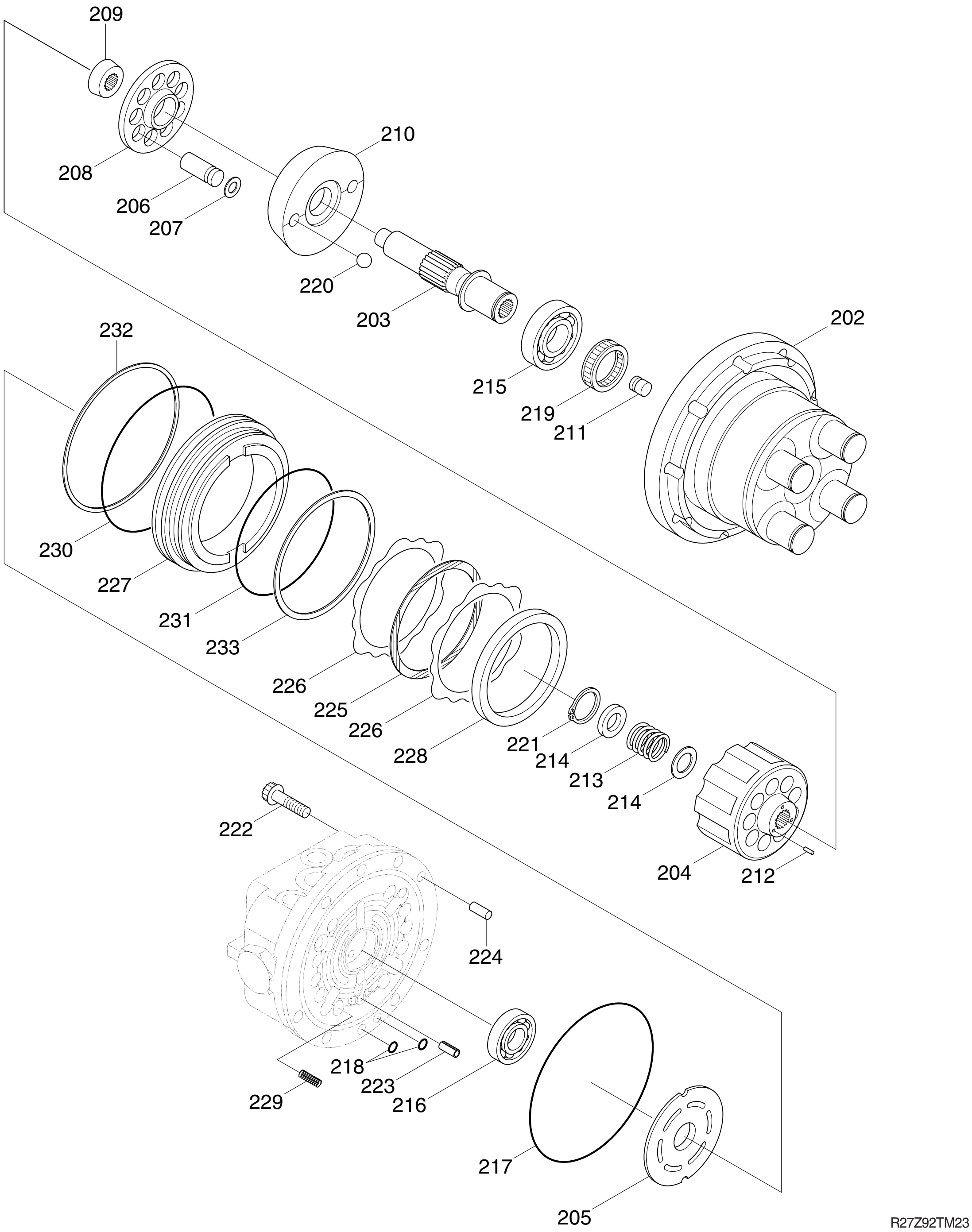
③ Tighten plug lightly.

④ Start the engine, run at low idling, and check oil come out from plug.

⑤ Tighten plug fully.

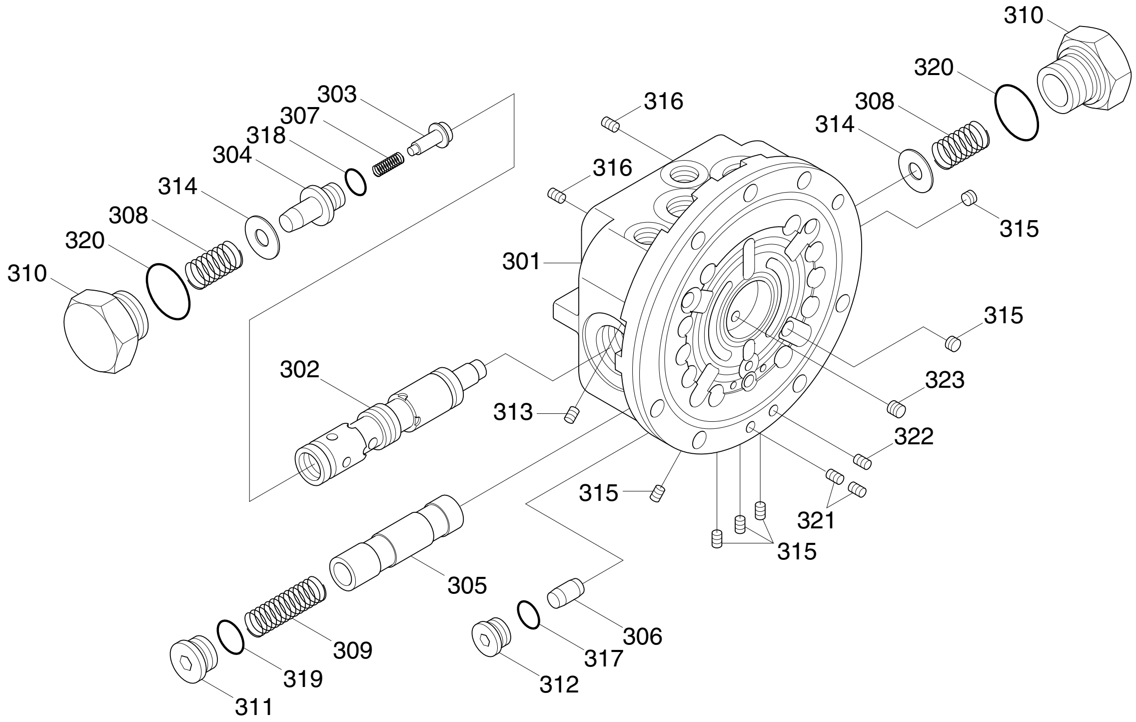
(3) Confirm the hydraulic oil level and check the hydraulic oil leak or not.

2. STRUCTURE (1/3)



202	Body 2	213	Spring C	224	Pin
203	Shaft	214	Retainer	225	Disk plate
204	Cylinder barrel	215	Bearing	226	Steel plate
205	Valve plate	216	Bearing	227	Brake piston
206	Piston	217	O-ring	228	Brake spacer
207	Shoe	218	O-ring	229	Spring B
208	Shoe holder	219	Oil seal	230	O-ring
209	Barrel holder	220	Ball	231	O-ring
210	Swash plate	221	Snap ring	232	Back up-ring
211	Control piston	222	Screw	233	Back up-ring
212	Pin	223	Spring pin		

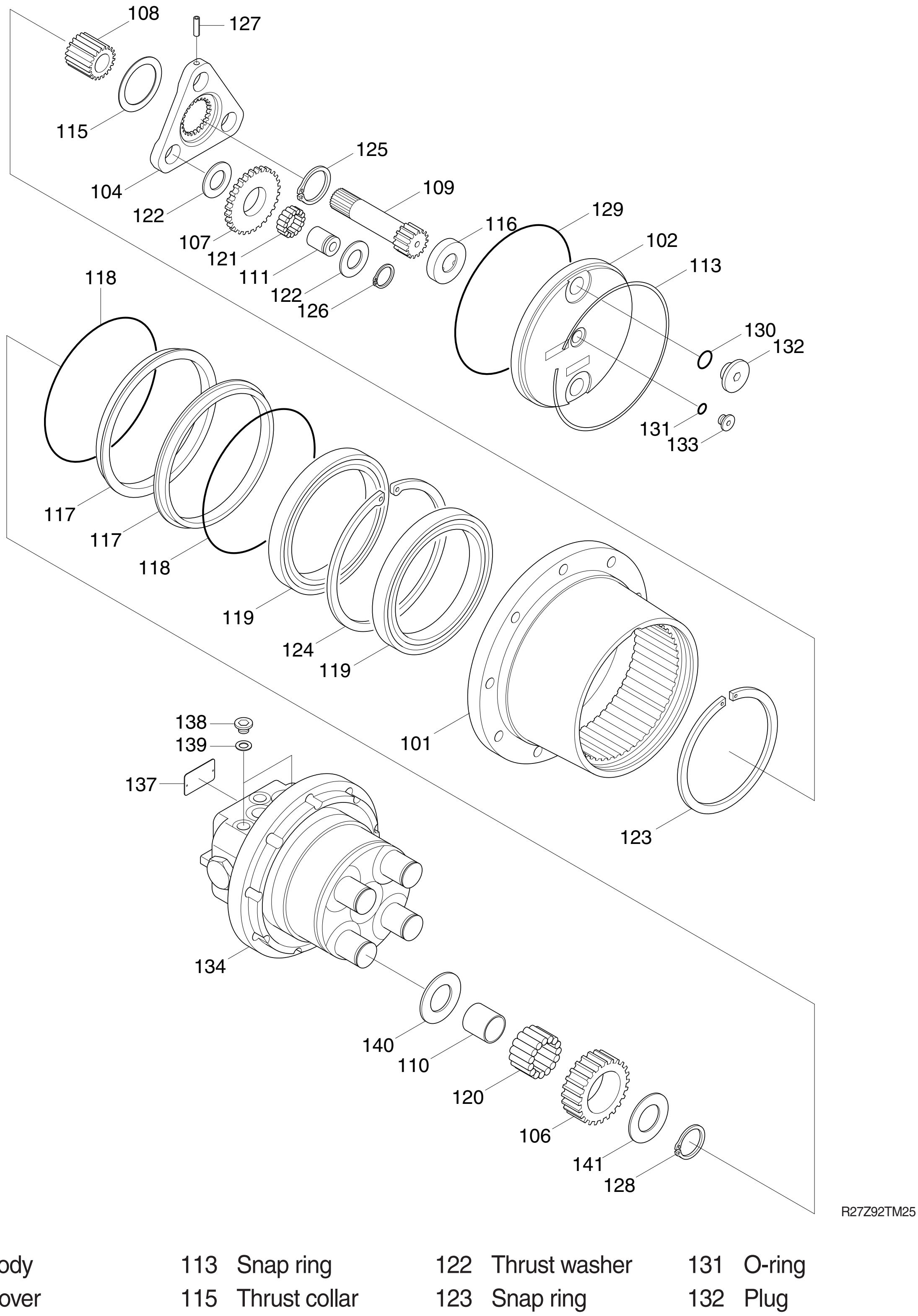
STRUCTURE (2/3)



R27Z92TM24

301	Body 1	309	Spring V3	317	O-ring
302	Spool	310	Plug	318	O-ring
303	Check valve	311	Plug	319	O-ring
304	Spring guide	312	Plug	320	O-ring
305	Spool	313	Choke	321	Choke
306	spool	314	Ring	322	Choke
307	Spring V1	315	Plug	323	Plug
308	Spring V2	316	Plug		

STRUCTURE (3/3)



101	Body	113	Snap ring	122	Thrust washer	131	O-ring
102	Cover	115	Thrust collar	123	Snap ring	132	Plug
104	Carrier 2	116	Slide ring	124	Snap ring	133	Plug
106	Gear B1	117	Floating seal	125	Snap ring	134	Hydraulic motor
107	Gear B2		(Incl 118)	126	Snap ring	137	Name plate
108	Gear S1	118	O-ring	127	Spring pin	138	Plug
109	Gear S2	119	Bearing	128	Snap ring	139	O-ring
110	Ring	120	Needle	129	O-ring	140	Thrust washer
111	Pin B2	121	Needle	130	O-ring	141	Thrust washer

3. DISASSEMBLY

1) TOOLS FOR DISASSEMBLY AND ASSEMBLY

No.	Necessary tool	
1 2 3	Torque wrenches	45N (JIS B4650) 90N (JIS B4650) 280N (JIS B4650)
4 5	Hexagon socket	Hexagon size : 5 mm Hexagon size : 8 mm
6	Socket wrenches	Hexagon size : 36 mm
7 8	Hexagon socket wrenches	Hexagon size : 5 mm Hexagon size : 8 mm
9	Screwdrivers	Width : 6~10 mm
10 11 12 13 14	Snap ring pliers	Ø28 mm for hole Ø25 mm for shaft Ø28 mm for shaft Ø30 mm for shaft Ø130 mm for shaft
15	Plastic hammer	-
16 17 18 19	Other	Grease Oil Sand paper C-clamps

2) GENERAL PRECAUTIONS

(1) Before disassembling the TM motors, check the items to be inspected and, for remedy against trouble, closely examine the nature of the trouble, so that the motor can be disassembled effectively.

(2) To disassemble the motor, use the disassembling procedures described in section 2-2, and select a clean place.

(3) Place a rubber or vinyl sheet or other such protective materials on your working bench to protect the surface of the motor to be serviced.

(4) During disassembly, give a match mark to the mating surfaces of each part.

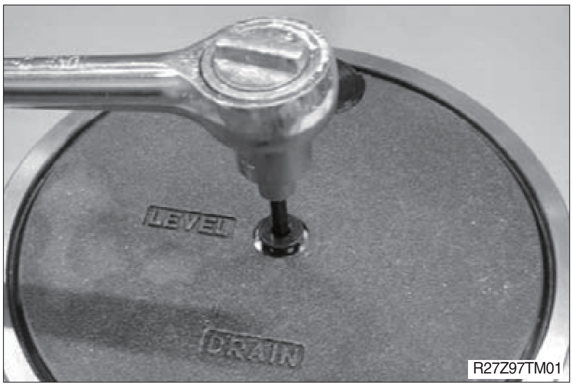
(5) Arrange removed parts in order so that they will not become damaged or missing during disassembly.

(6) Once seals have been disassembled, they should be replaced even if damage is not observed. Have replacement seals ready on hand before starting your disassembling job.

3) REDUCTION GEAR SECTION

(1) Remove the three plugs (PF3/8 and PF1/8).

· Tools required :
  Hexagon size : 8 mm
  Hexagon size : 5 mm



R27Z97TM01

(2) Remove the snap-ring.

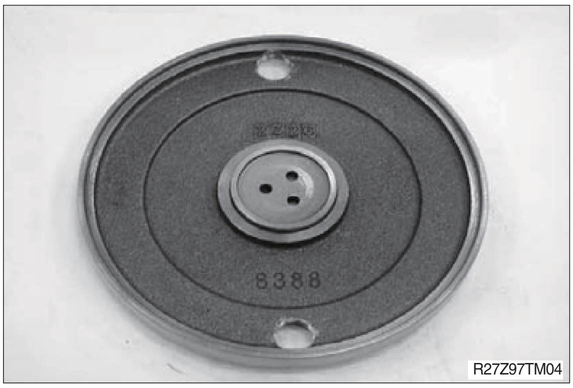
※ Put the screwdriver into the notch of the body, and then pull the snap-ring.


R27Z97TM02

(3) Remove the cover.

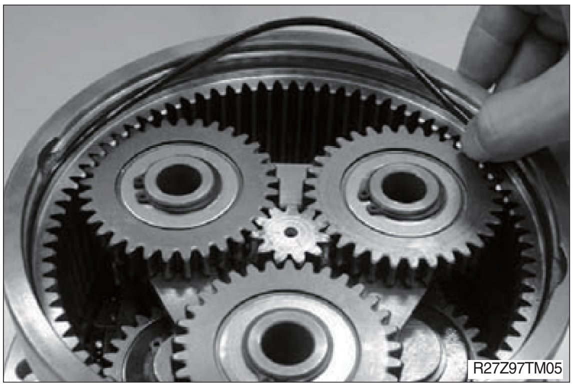
R27Z97TM03

(4) Remove the slide ring from the cover.



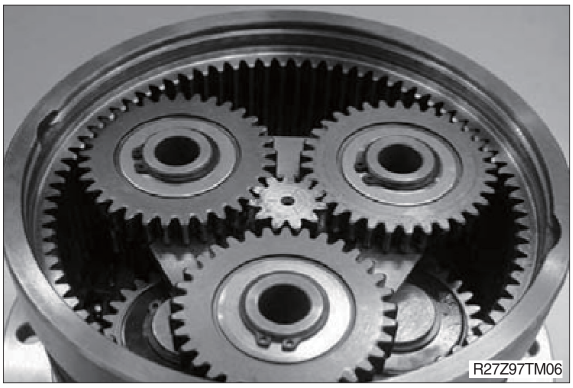
R27Z97TM04

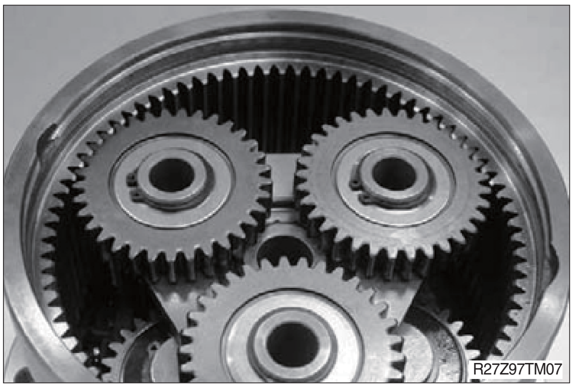
(5) Remove the O-ring from the body.



(6) Remove the s2 gear, the carrier 2 kit and thrust collar from the body.

※ There is possibility the thrust collar sticks to the carrier 2 kit.

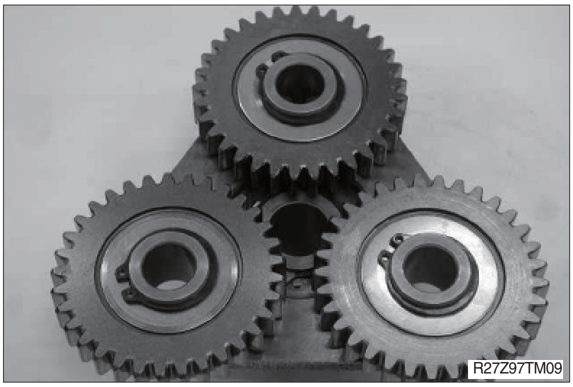




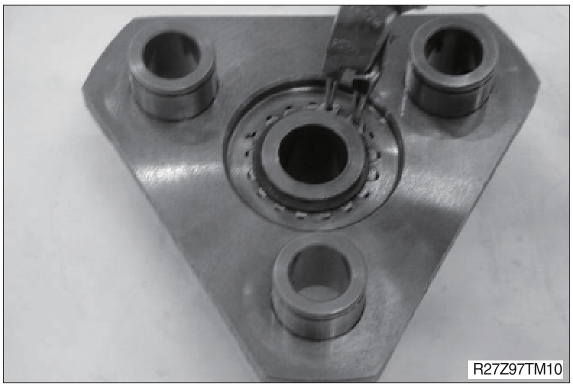
(7) Remove the three snap rings, three thrust washers, three b2 gears, forty-eight needles and three thrust washers.

※ The thrust washers on both sides of the b2 gears are the same.

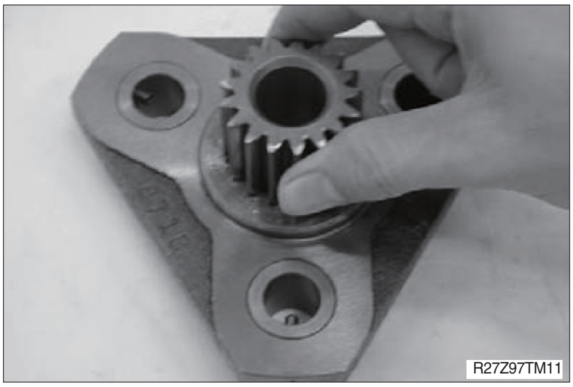
※ The b2 pins and spring pins are not able to disassemble, because they are press-fitted.


R27Z97TM09

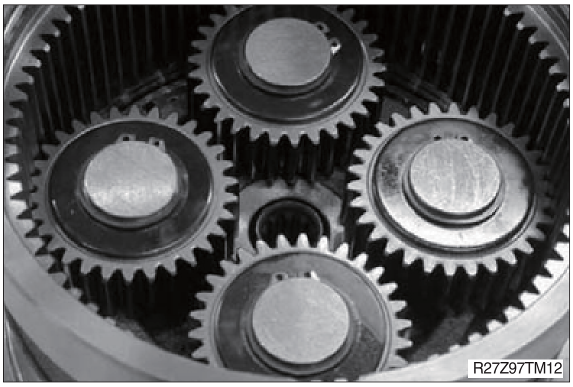
(8) Remove the snap ring from the carrier 2.


R27Z97TM10

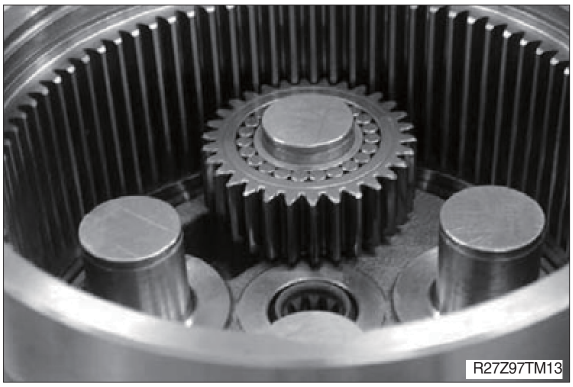
(9) Remove the s1 gear from the carrier 2.


R27Z97TM11

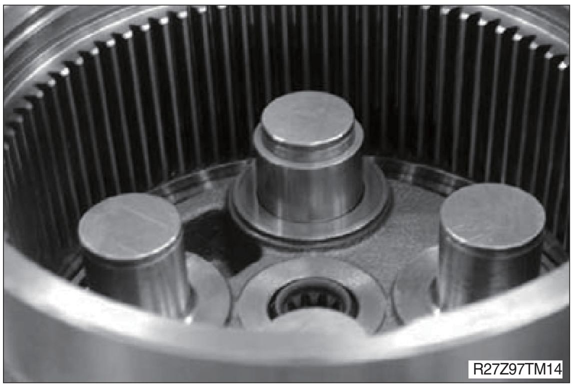
(10) Remove the four snap rings and the four thrust washers.


R27Z97TM12

(11) Remove the four b1 gears, ninety-two needles, four thrust washers and four rings.



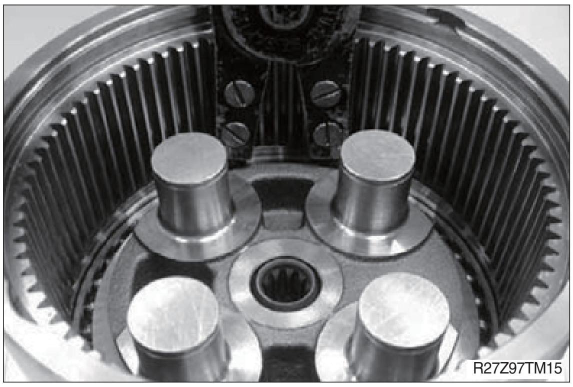
R27Z97TM13



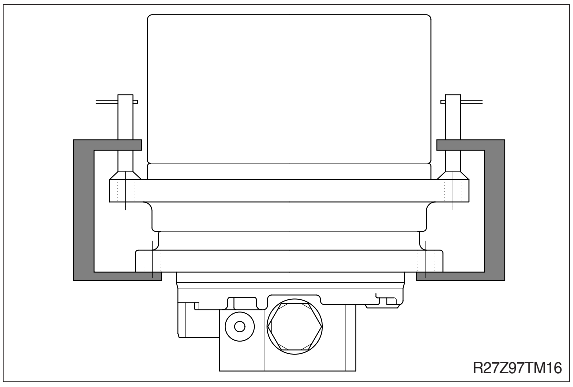
R27Z97TM14

(12) Remove the snap ring and remove the body from the hydraulic motor.

※ Tighten the speed reducer flange and the motor flange with C-clamps or a hydraulic press (see the illustration) to make it easy.



R27Z97TM15



R27Z97TM16

(13) Remove the floating seal with O-ring from the body.

R27Z97TM17

(14) Remove the floating seal with O-ring from the hydraulic motor.

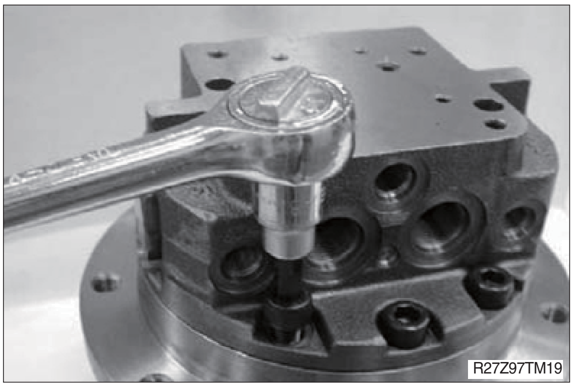
R27Z97TM18

4) HYDRAULIC MOTOR SECTION

(1) Remove the seven hexagon socket head cap bolts.

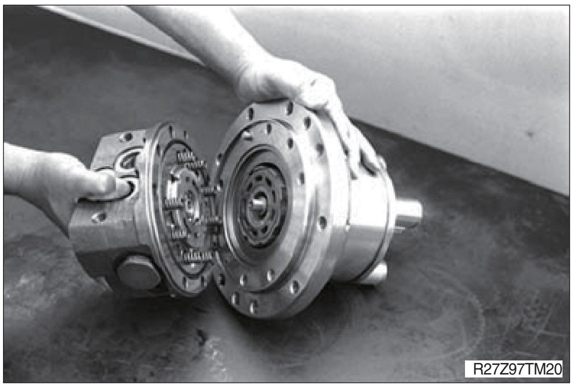
· Tools required :
Hexagon size : 8 mm

※ If you fix the motor with a vice, protect it with aluminum plates or equivalent.

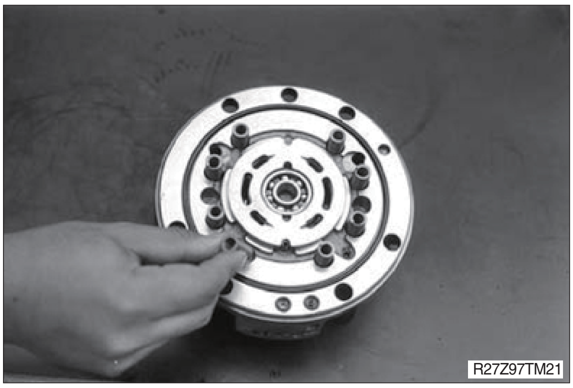

R27Z97TM19

(2) Remove the body 1 from the body 2.

※ Pay attention not to come off and damage the valve plate.


R27Z97TM20

(3) Remove the valve plate and the ten spring B.


R27Z97TM21

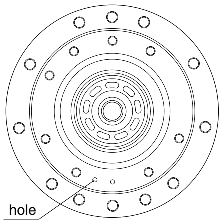
(4) Remove the three O-rings from the body 1.

※ The bearing and spring pins are not able to disassemble, because they are press-fitted.


R27Z97TM22

(5) Remove the brake piston assembly from the body 2.

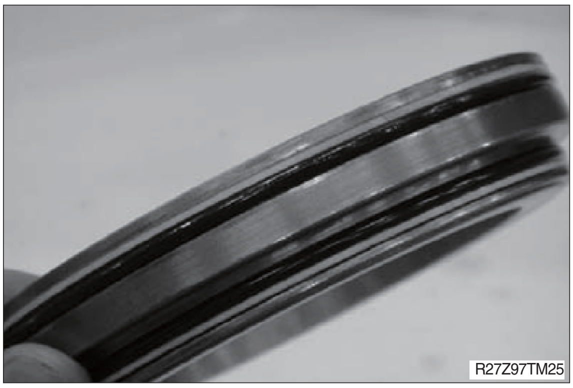
※ The brake piston removes when the air comes into the inside from the hole. Do not blow it suddenly, the brake piston assembly fly out.



R27Z97TM23

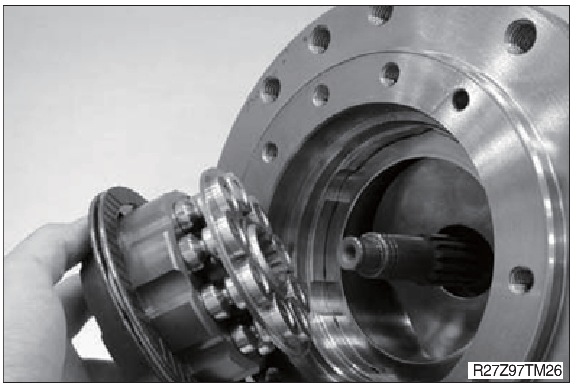

R27Z97TM24

(6) Remove the two O-rings and two back up rings from the brake piston.

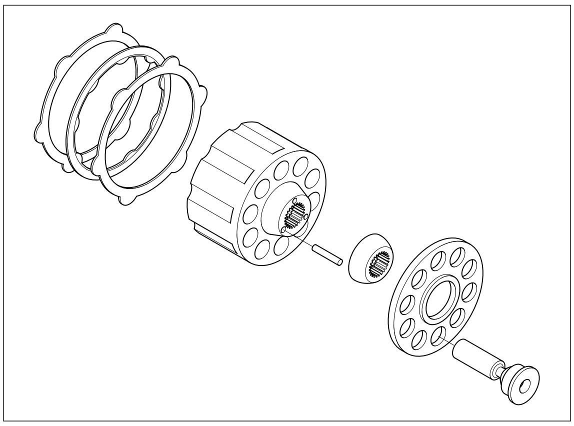

R27Z97TM25

(7) Remove the cylinder barrel assembly and brake spacer from the body 2.

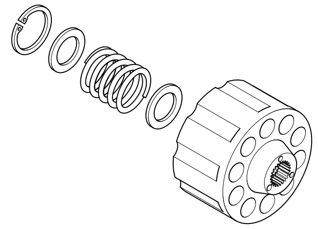
※ Pay attention not to lose the each part.


R27Z97TM26

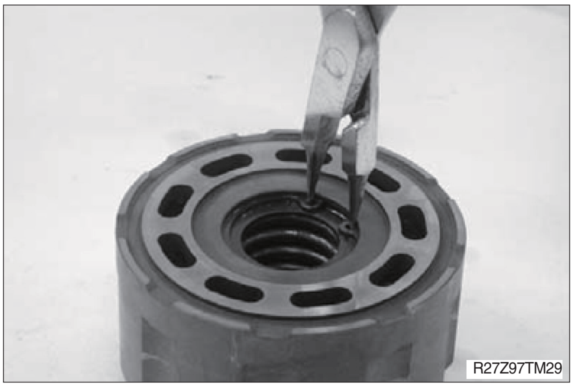
(8) Remove the nine piston-shoe assemblies, shoe holder, barrel holder, three pins, two steel plates and disk plate.


R27Z97TM27

(9) Remove the snap ring, retainer, spring-C and retainer.

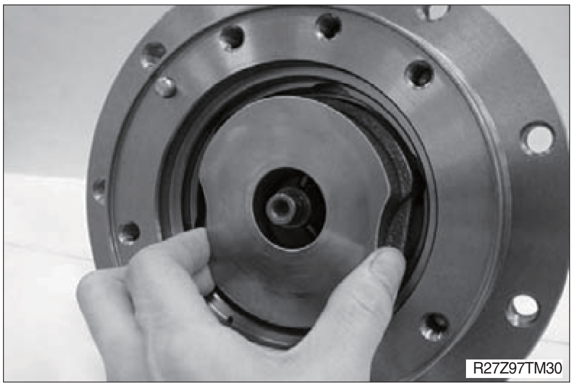


R27Z97TM28



R27Z97TM29

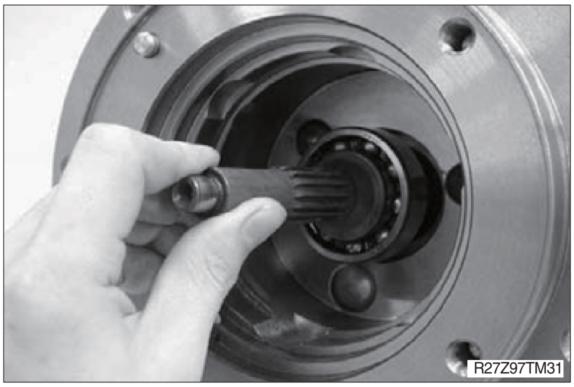
(10) Remove the swash plate and two balls from the body 2.



R27Z97TM30

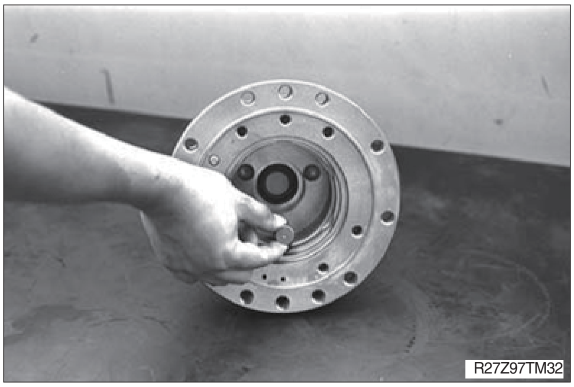
(11) Remove the shaft from the body 2.

※ The bearing is not able to disassemble, because they are press-fitted.



R27Z97TM31

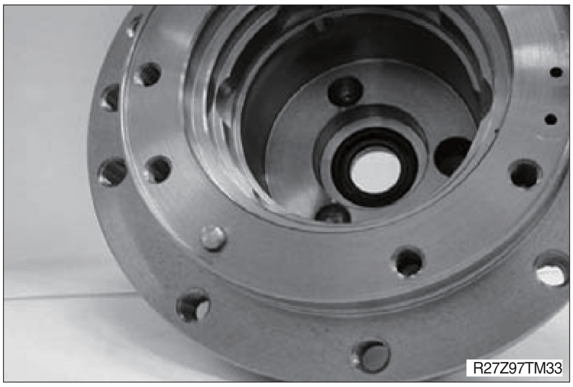
(12) Remove the control piston from the body 2.



R27Z97TM32

(13) Remove the oil seal from the body 2.

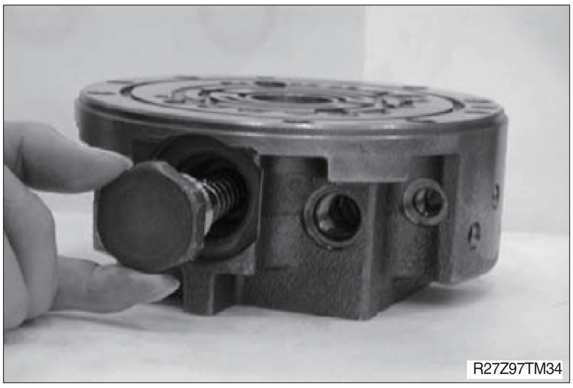
(14) Remove the pin from the body 2.



R27Z97TM33

(15) Remove the two plugs with O-rings from the body 1.

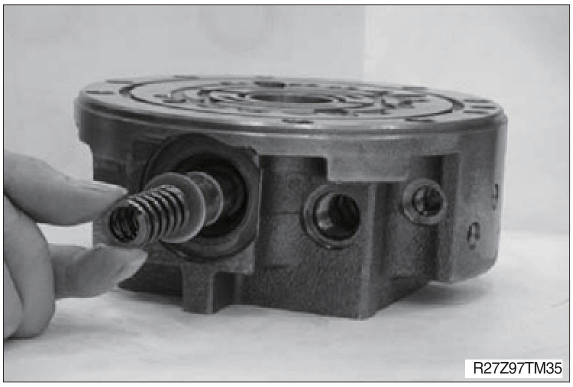
· Tools required :
Hexagon size : 36 mm



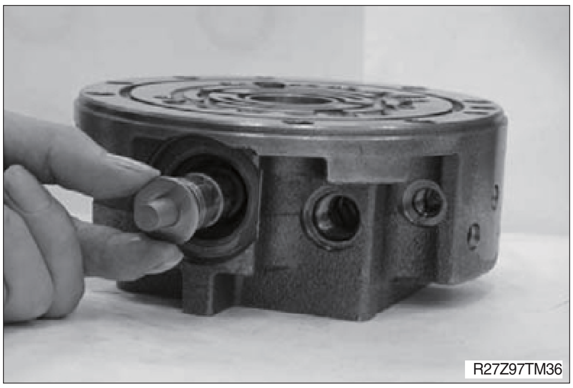
R27Z97TM34

(16) Remove the two spring V2, two rings and spool assembly.

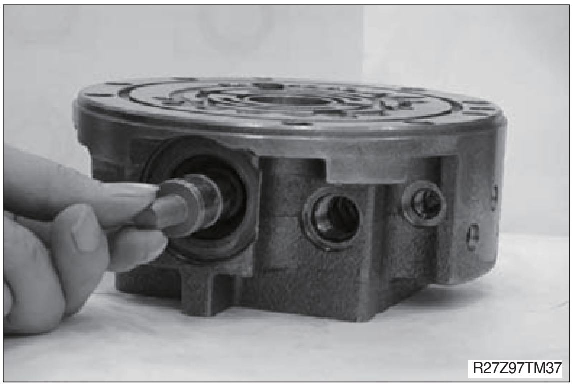
※ The spool assembly is not able to disassemble.



R27Z97TM35



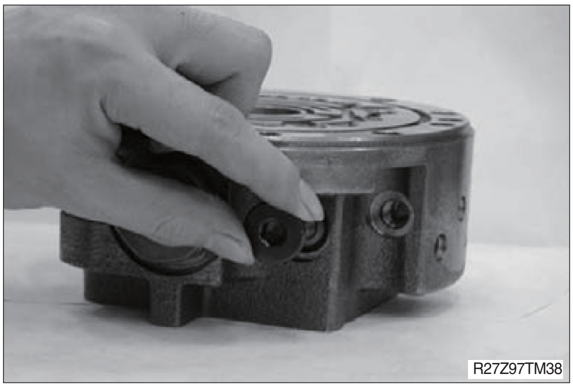
R27Z97TM36



R27Z97TM37

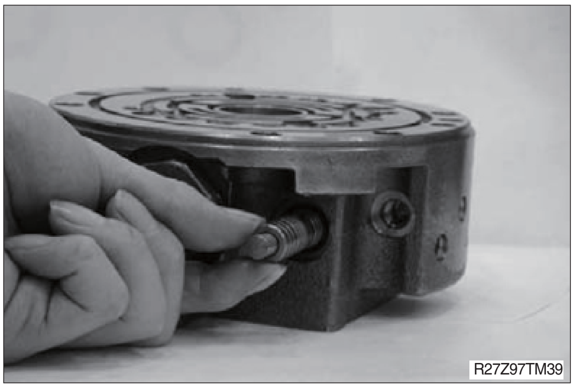
(17) Remove the two plugs with O-rings from the body 1.

· Tools required :
Hexagon size : 8 mm



R27Z97TM38

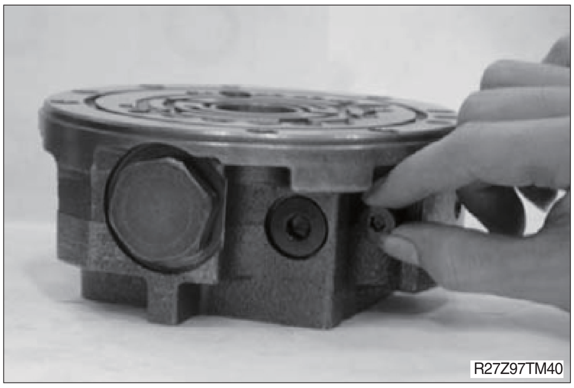
(18) Remove the spring V3 and two speed spool.



R27Z97TM39

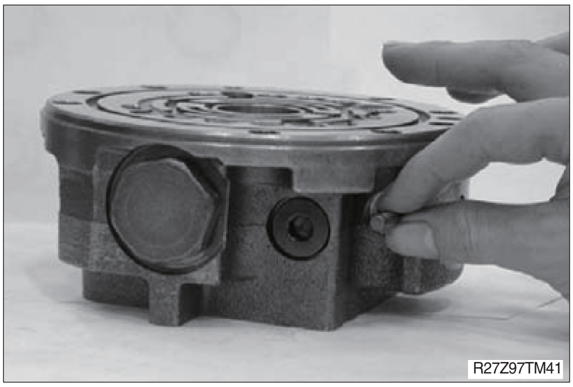
(19) Remove the plugs with O-rings from the body 1.

· Tools required :
Hexagon size : 5 mm



R27Z97TM40

(20) Remove the shuttle spool.



4. ASSEMBLY

1) HYDRAULIC MOTOR SECTION

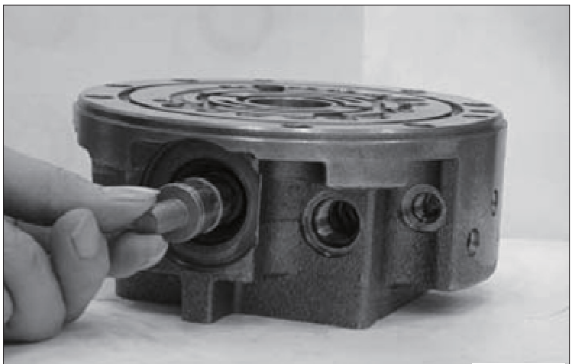
(1) Press-fit the bearing and the spring pin into the body 1.

R27Z97TM42

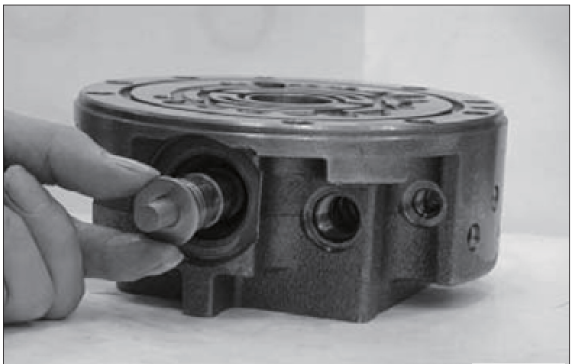
(2) Insert the spool assembly, two rings (1pc/side) and two springs (1pc/side) in that order into the body 1, and then screw the two plugs (1pc/side) with two O-rings (1pc/side).

※ The spool assembly is not able to disassemble.

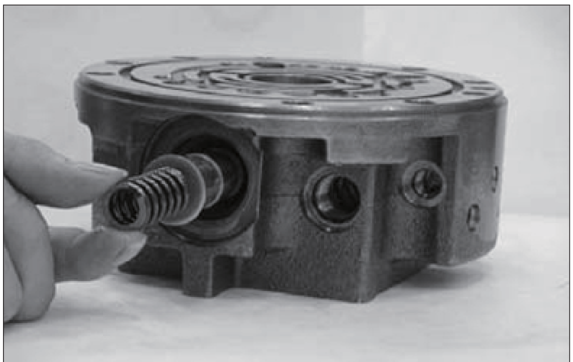
- · Plugs tightening torque : 20~25 kgf · m (145~180 lbf · ft)
- · Hexagon size : 36 mm



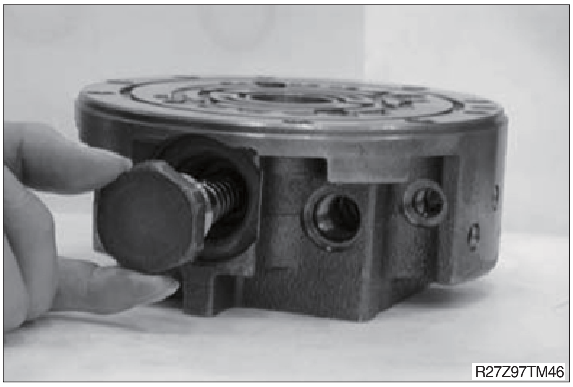
R27Z97TM43



R27Z97TM44



R27Z97TM45

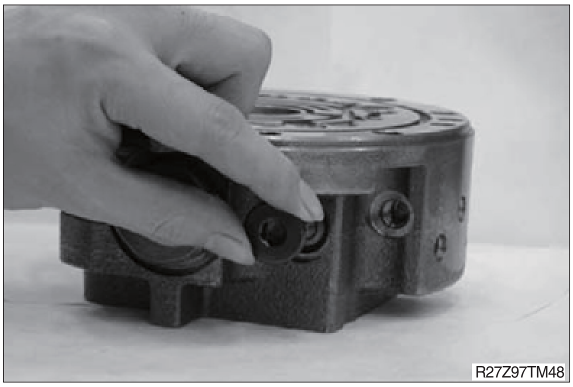

R27Z97TM46

(3) Insert the spring V3 and two speed spool into the body 1, and screw the two plugs (1pc/side) with two O-rings (1pc/side).

· Plugs tightening torque :
4.69~5.2 kgf · m (33.9~37.6 lbf · ft)
· Hexagon size : 8 mm

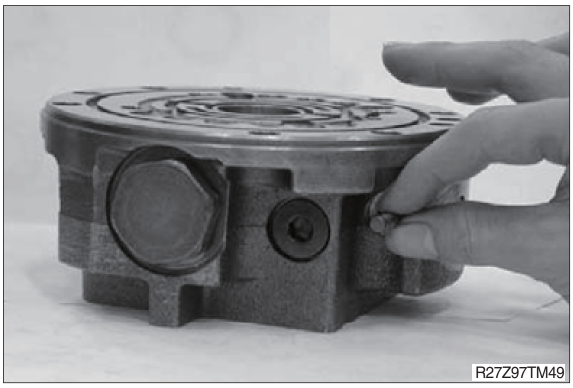
※ Pay attention to the direction of the spool. (See cross sectional drawing for the direction, page 7-59~61).

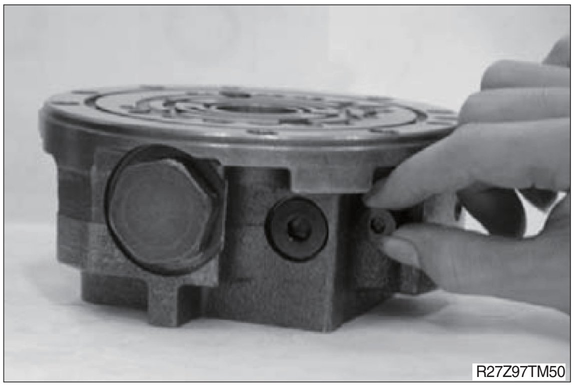

R27Z97TM47


R27Z97TM48

(4) Insert the shuttle spool into the body 1, and then screw the two plugs (1pc/side), with two O-rings (1pc/side).

· Plugs tightening torque :
1.22~1.84 kgf · m (8.82~13.3 lbf · ft)
· Hexagon size : 5 mm


R27Z97TM49



R27Z97TM50

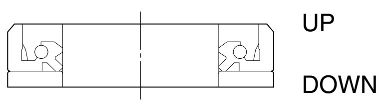
(5) Place three O-rings onto the body 1.

R27Z97TM51

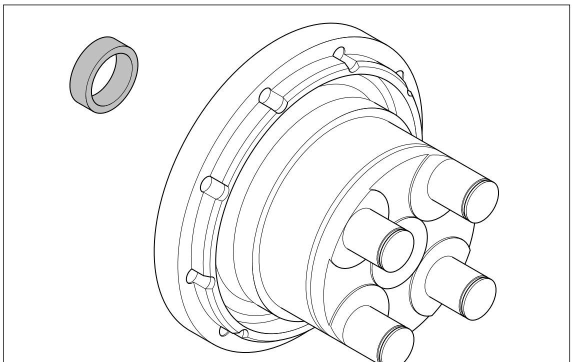
(6) Press-fit the oil seal into the body 2.

※ Apply grease to the periphery of the oil seal.

※ Pay attention to the direction of the oil seal, and do not slant it.

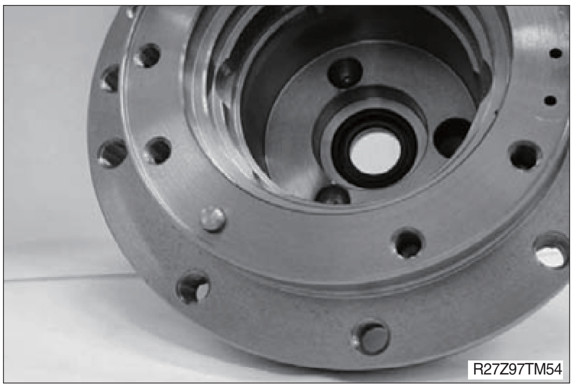


R27Z97TM52



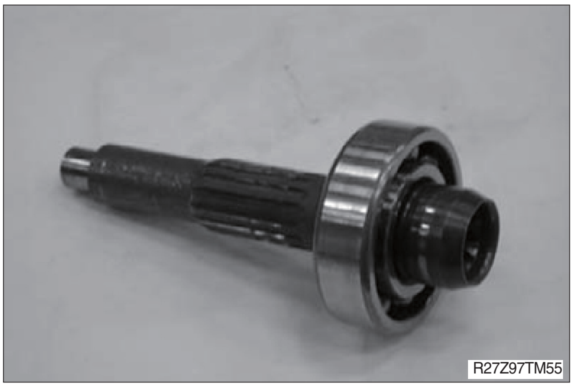
R27Z97TM53

(7) Place the pin into the body 2.



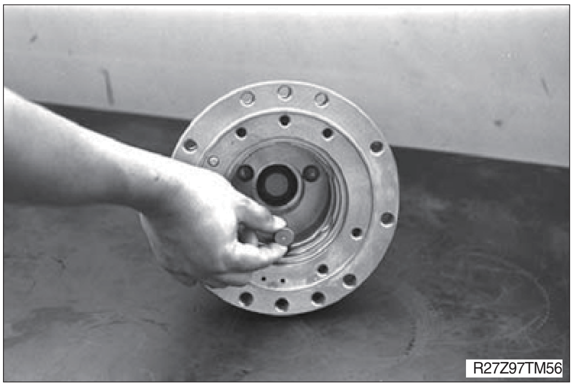
R27Z97TM54

(8) Press-fit the bearing with the shaft.



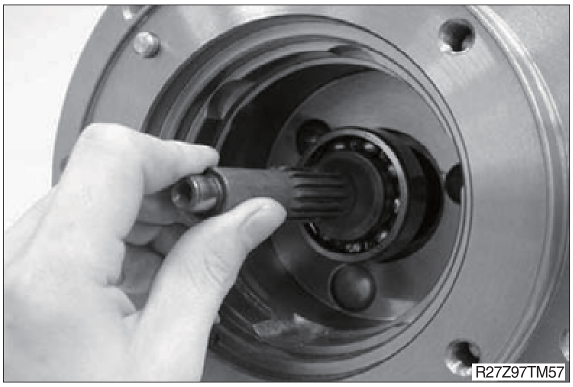
(9) Insert the control piston into the body 2.

※ Pay attention to the direction of the control piston. (See cross sectional drawing for the direction, page 7-59~61).



(10) Place the shaft into the body 2.

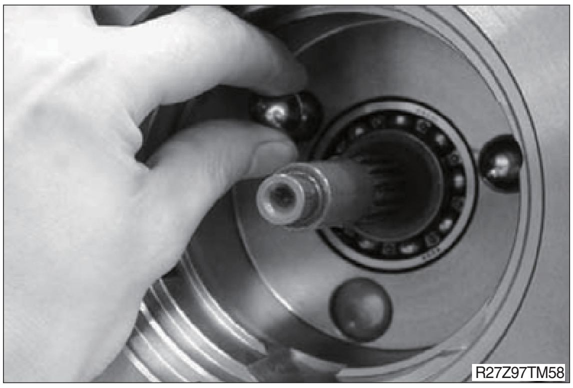
※ Pay attention not to damage the oil seal with the shaft.
A oil which damaged should be replaced.

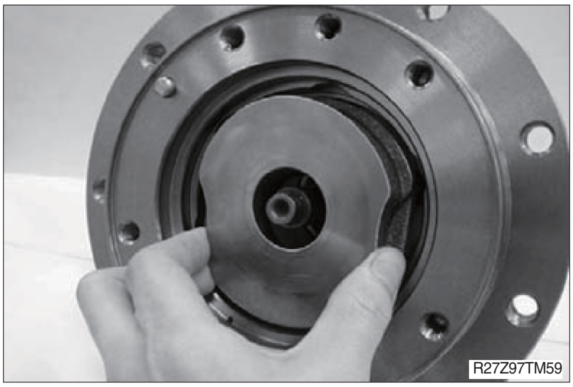


(11) Place the two balls and the swash plate onto the body 2.

※ Apply oil to the working face of the swash plate.

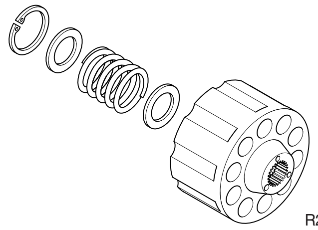
※ In case the swash plate drops out, apply grease to the back of it.





R27Z97TM59

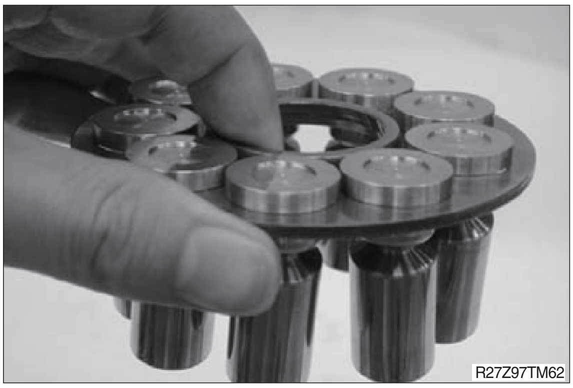
(12) Place the retainer, spring and retainer in that order into the cylinder barrel, and then secure them with the snap ring.



R27Z97TM60

R27Z97TM61

(13) Place the piston-shoe assemblies into the shoe holder.

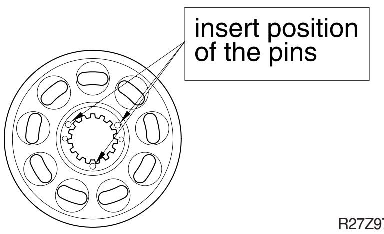


R27Z97TM62

(14) Place the three pins, barrel holder and piston-shoe assemblies in that order into the cylinder barrel.

※ Apply oil to the inside of the cylinders, then lower the pistons into the cylinder barrel.

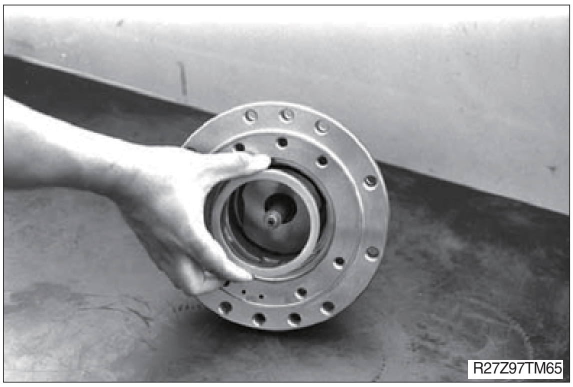
※ Pay attention to the order of pins, barrel holder and piston-shoe assemblies.



R27Z97TM63

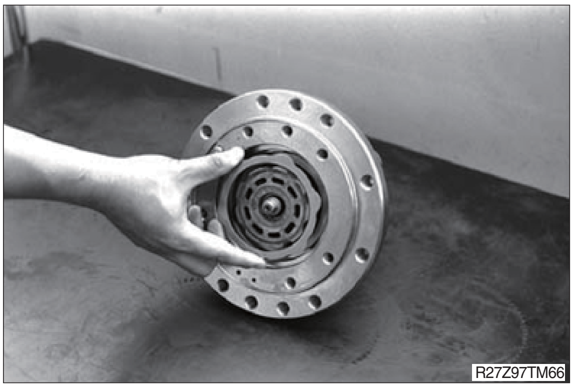
R27Z97TM64

(15) Place the brake spacer plate into the body 2.



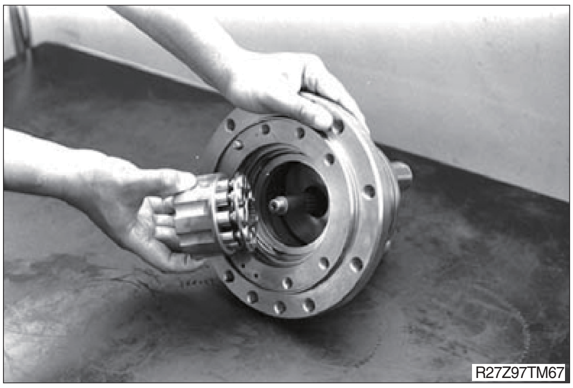
R27Z97TM65

(16) Place the steel plate into the body 2 along the groove.



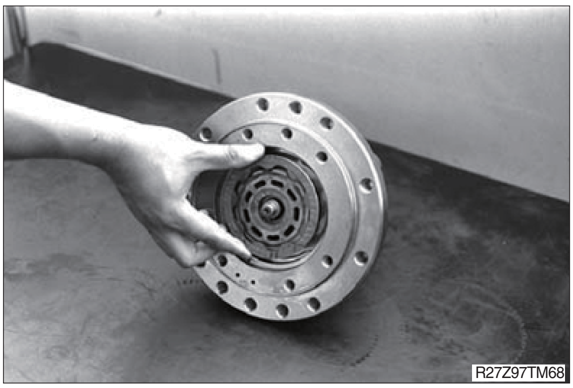
R27Z97TM66

(17) Insert the cylinder barrel assembly into the body 2 so that the shoes contact the swash plate.



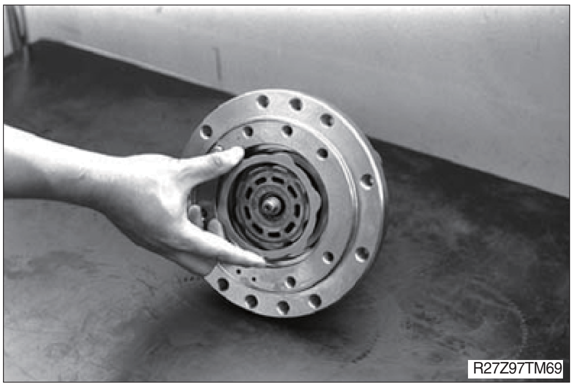
R27Z97TM67

(18) Place the disk plate into the body 2 along the groove.



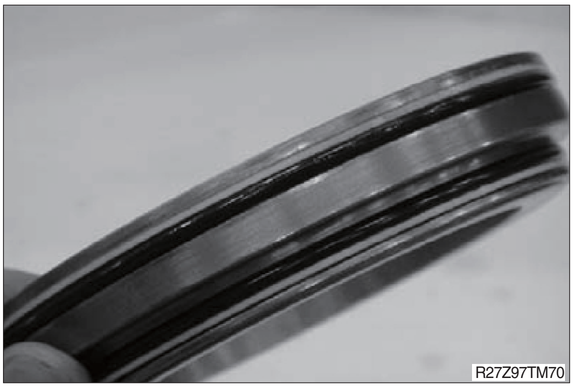
R27Z97TM68

(19) Place the steel plate into the body 2 along the groove.



(20) Place the two O-rings and two back up rings onto the brake piston.

※ Pay attention to the direction of O-rings and back up rings.
(See cross sectional drawing for the direction.)



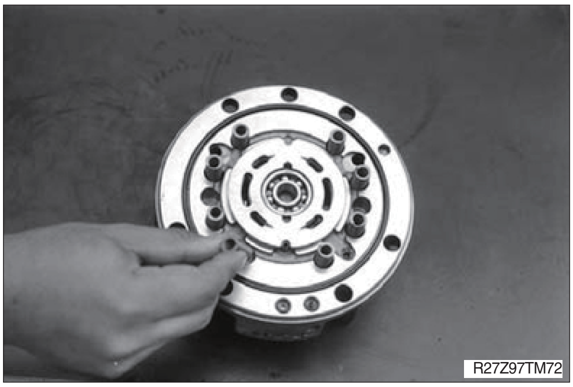
(21) Inset the brake piston assembly into the body 2.

※ Apply grease to the O-ring to make it easy.

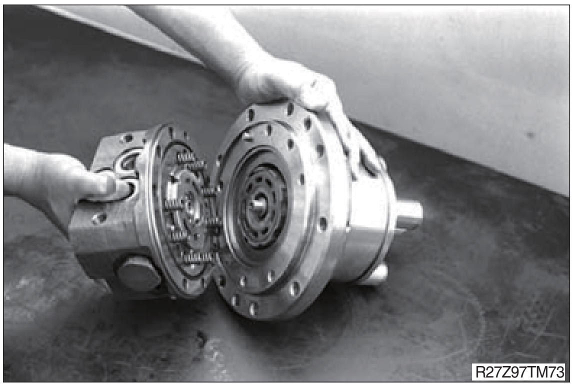
(22) Fill the body 2 with 0.1ℓ hydraulic oil for lubrication.

(23) Place the valve plate and ten springs onto the body 1.

※ The copper face of the valve plate should be uppermost.
※ Apply oil to the copper face of the valve plate.
※ In case the valve plate drops out, apply grease to the steel face of it.
※ In case the springs drop out, apply grease to the bottom of it.
※ Please refer to the parts list for the number and the position with the spring B.



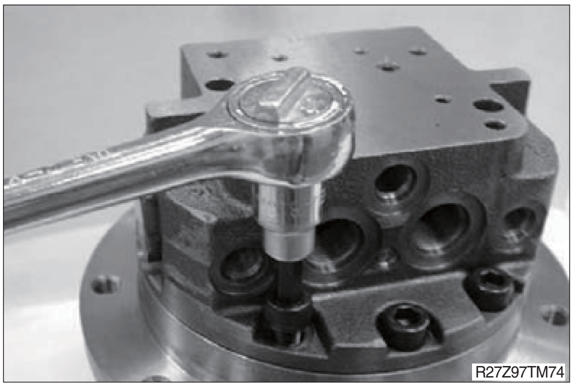
(24) Join the body 1 to the body 2.



(25) Bolt them with seven hexagon socket head cap bolts.

· Bolt tightening torque :
5.2~6.6 kgf · m (37.6~47.7 lbf · ft)
· Hexagon size : 8 mm

※ If you fix the motor with a vice, protect it with aluminum plates or equivalent.



2) REDUCTION GEAR SECTION

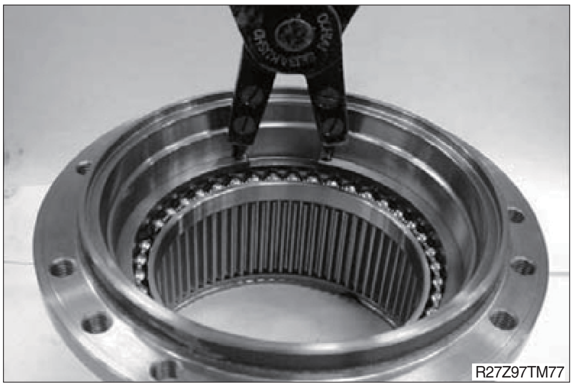
(1) Place the floating seal with O-ring into the hydraulic motor.


R27Z97TM75

(2) Join the bearing and snap ring to the body.

※ Pay attention to the direction of the bearings.
(See cross sectional drawing for the direction, page 7-59~61).


R27Z97TM76


R27Z97TM77


R27Z97TM78

(3) Put the floating seal with O-ring onto the body.


R27Z97TM79

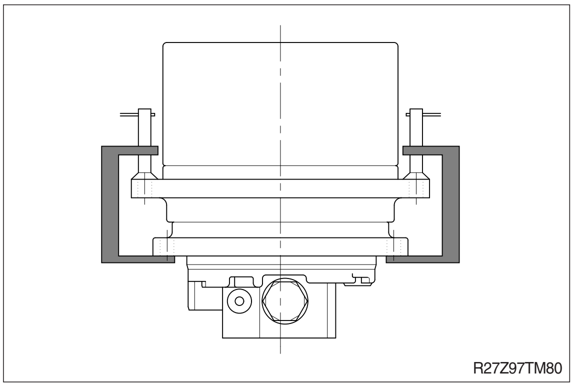
(4) Join the body to the motor, and secure it with snap ring.

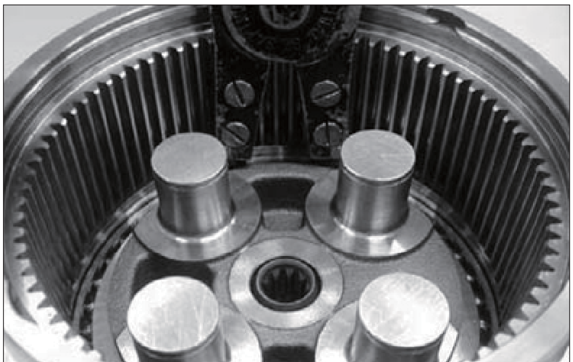
※ Degrease the surface of floating seal.

※ Hit around the body by the resinous hammer equally to make it easy.

※ Tighten the speed reducer flange and the motor flange with C-clamps or a hydraulic press when the snap ring is fastened.

※ The pre-load for the bearings is adjusted by thickness of the snap ring.


R27Z97TM80

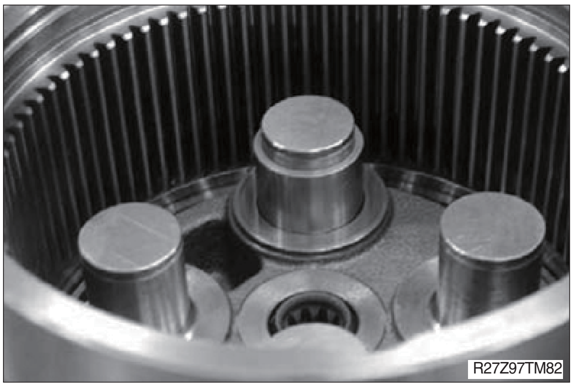

R27Z97TM81

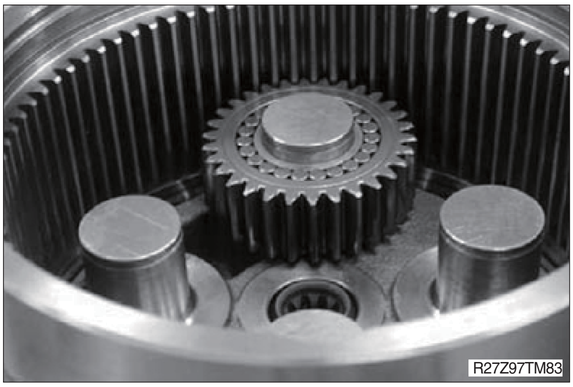
(5) Place the four rings (1pc/1pin), four thrust washers (1pc/1pin), four b1 gears (1pc/1pin) and ninety-two needles (23pcs/1pin), and four thrust washers in that order onto the body 2, and secure it with four snap rings.

※ Pay attention to the direction of the b1 gears (see cross sectional drawing for the direction, page 7-59~61).

※ Pay attention to the direction of the snap ring. The edge side should be uppermost.

※ Pay attention not to open the snap ring too much. A snap ring which loses tension should be replaced.


R27Z97TM82

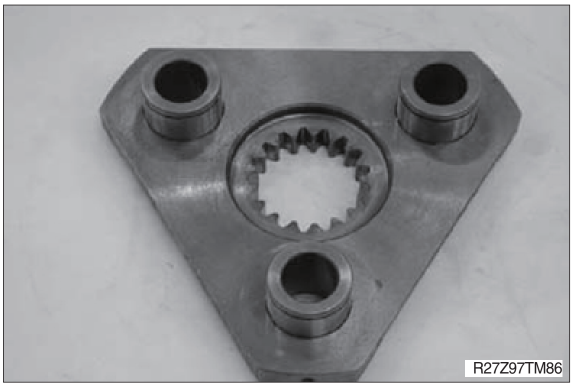

R27Z97TM83


R27Z97TM84

(6) Place thrust collar onto the gears.


R27Z97TM85

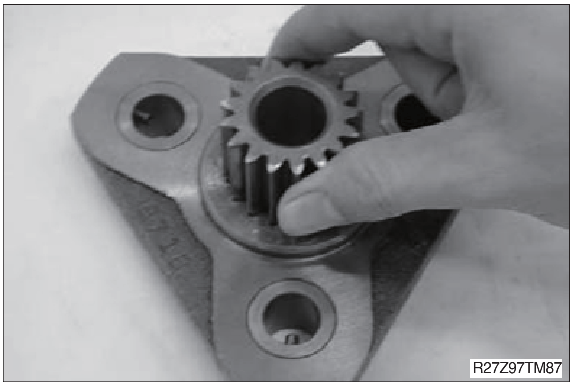
(7) Press-fit the three b2 pins and three spring pins (1pc/pin) into the carrier 2.

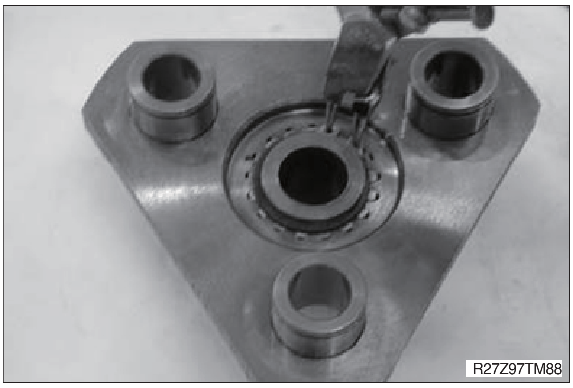


(8) Put the S1 gear to the carrier 2, and then secure them with the snap ring.

※ Pay attention to the direction of the snap ring. The edge side should be uppermost.

※ Pay attention not to open the snap ring too much. A snap ring which loses tension should be replaced.



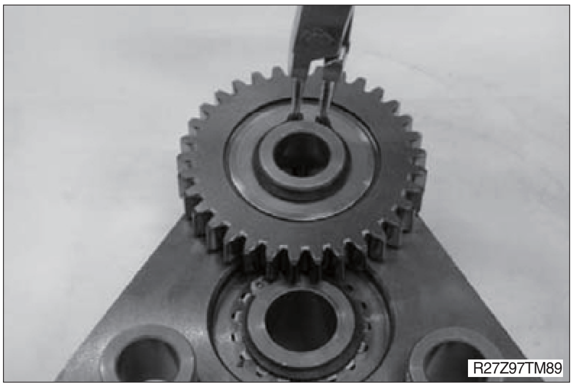


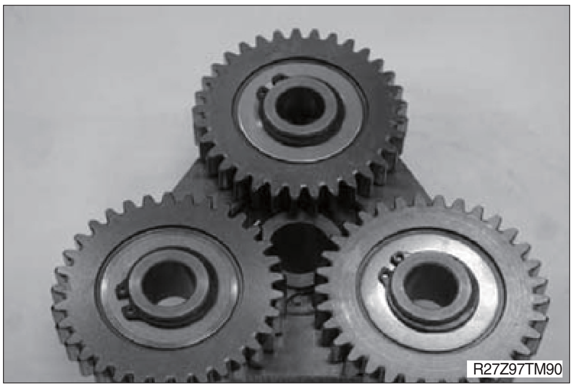
(9) Place the three thrust washers (1pc/1pin), three b2 gears (1pc/1pin), forty-eight needles (16pcs/1pin) and the three thrust washers (1pc/1pin), and secure it with three snap rings.

※ Pay attention to the direction of the b2 gears (see cross sectional drawing for the direction).

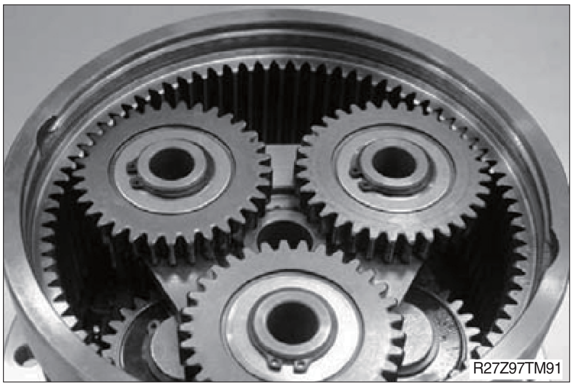
※ Pay attention to the direction of the snap ring. The edge side should be uppermost.

※ Pay attention not to open the snap ring too much. A snap ring which loses tension should be replaced.


R27Z97TM89


R27Z97TM90

(10) Place the carrier 2 assembly into the body.


R27Z97TM91

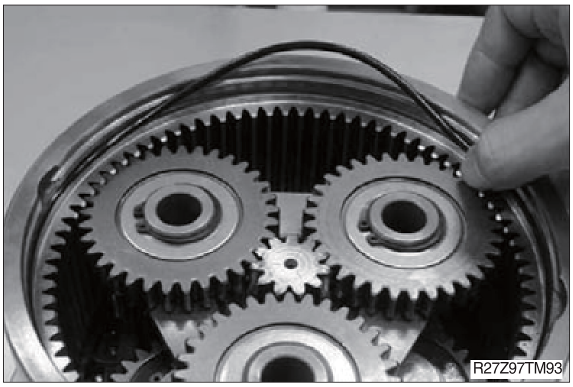
(11) Join the S2 gear to the body.


R27Z97TM92

(12) Place the O-ring to the body.

※ Apply grease to the O-ring.

※ Pay attention not the rubbish in the O-ring groove.



R27Z97TM93

(13) Fill 0.6 ℓ (0.16 U.S. gal) gear oil in the body.

(14) Insert the slide ring in the cover.

※ Pay attention to the direction of the slide ring (see cross sectional drawing for the direction, page 7-59~61).

※ Apply grease to the slide ring to prevent it dropping out.

R27Z97TM94

(15) Insert cover in the body.

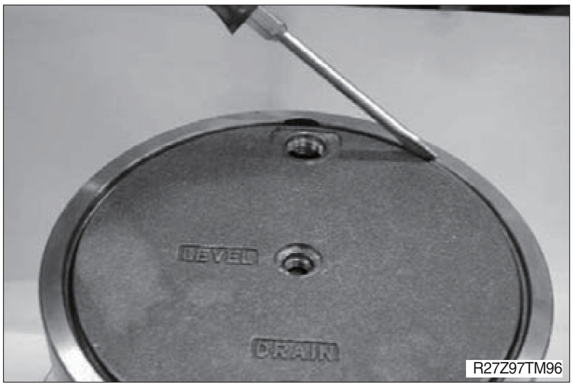
※ Pay attention not to damage the O-ring.

※ The vertical tapped hole should be aligned with notches of the body.

R27Z97TM95

(16) Put the snap ring into the groove of the body to secure the cover.

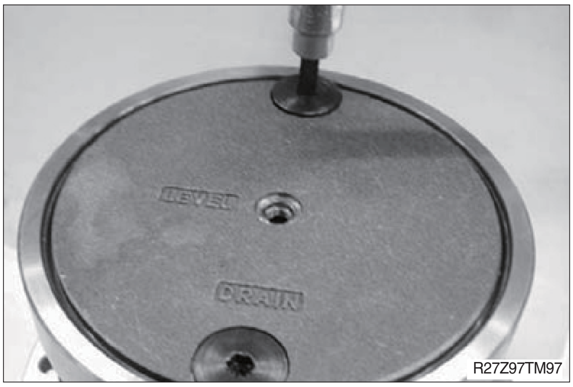
※ Put the flat blade-flared tip screwdriver to the end of the snap ring, and tap it in the direction of the circumference.



R27Z97TM96

(17) Screw the two plugs (size : PF3/8) with O-rings to the cover.

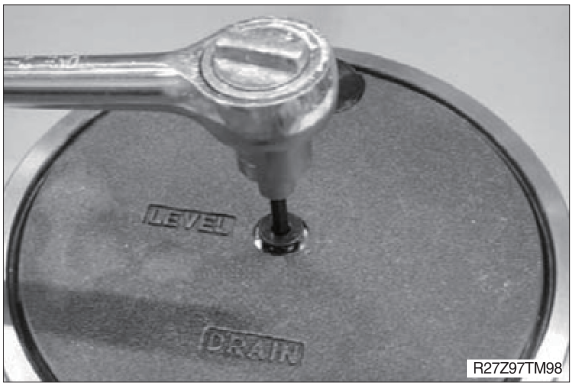
· Plug tightening torque :
4.69~5.2 kgf · m (33.9~37.6 lbf · ft)
· Hexagon size : 8 mm



R27Z97TM97

(18) Screw the three plugs (size : PF3/8, PF1/8) with O-rings (1pc/plug) to the cover.

· Plug tightening torque (PF3/8) :
4.69~5.2 kgf · m (33.9~37.6 lbf · ft)
· Hexagon size : 8 mm (PF3/8)
· Plug tightening torque (PF1/8) :
1.22~1.84 kgf · m (8.82~13.3 lbf · ft)
· Hexagon size : 5 mm (PF1/8)



R27Z97TM98

GROUP 7 RCV LEVER

1. REMOVAL AND INSTALL

1) REMOVAL

13031GE18

(1) Lower the work equipment to the ground and stop the engine.

(2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

(3) Loosen the breather slowly to release the pressure inside the hydraulic tank.

⚠ **Escaping fluid under pressure can penetrate the skin causing serious injury.**

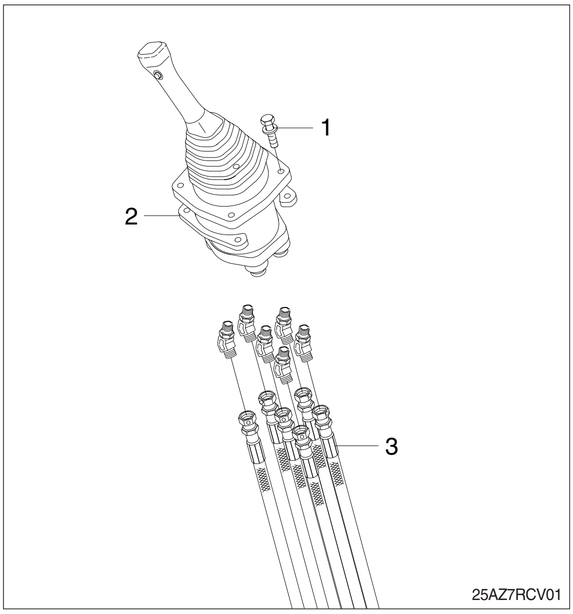
(4) Loosen the socket bolt(1).

(5) Remove the cover of the console box.

(6) Disconnect pilot line hoses(3).

(7) Remove the pilot valve assembly(2).

※ When removing the pilot valve assembly, check that all the hoses have been disconnected.



25AZ7RCV01

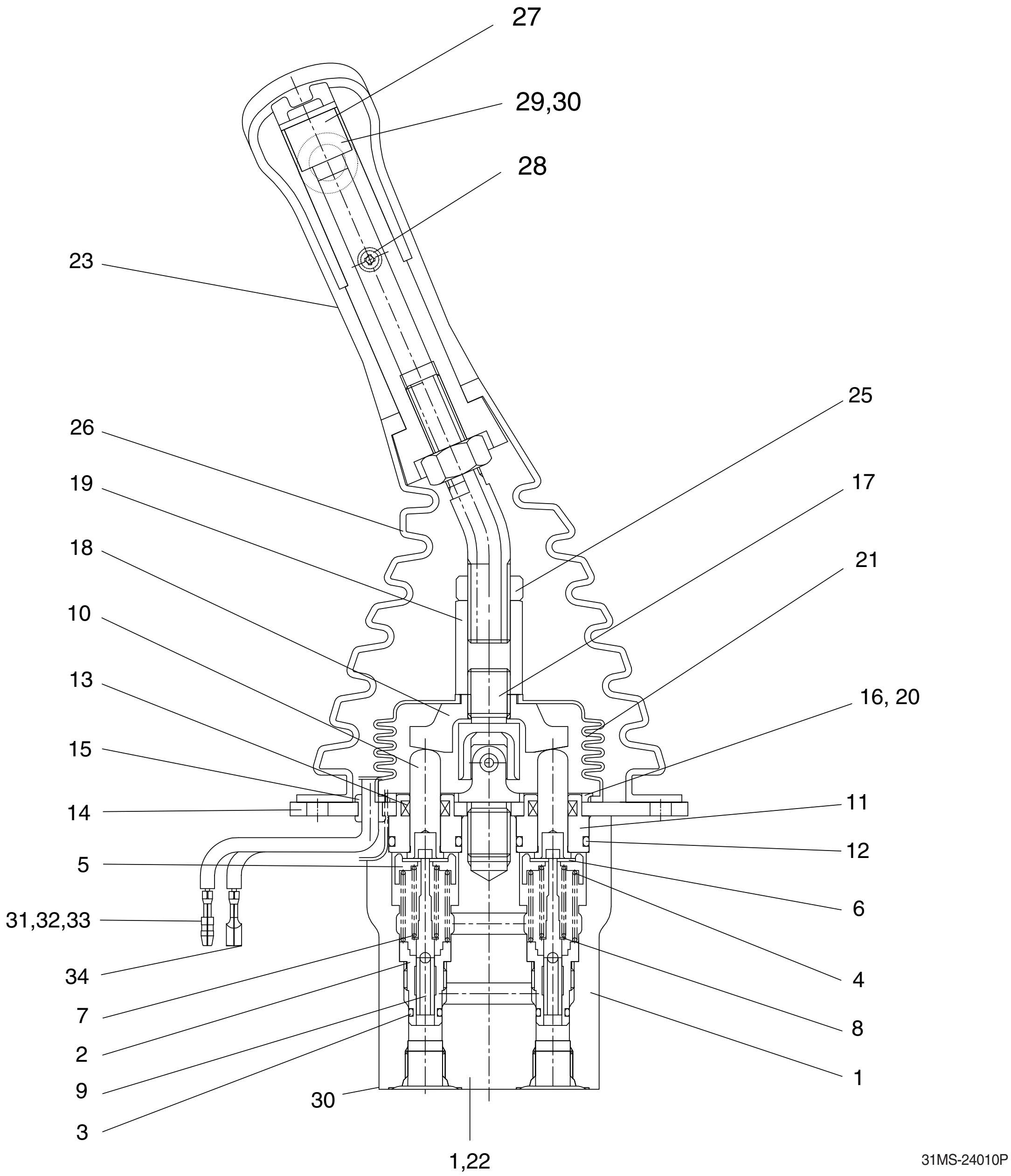
2) INSTALL

(1) Carry out installation in the reverse order to removal.

(2) Confirm the hydraulic oil level and check the hydraulic oil leak or not.

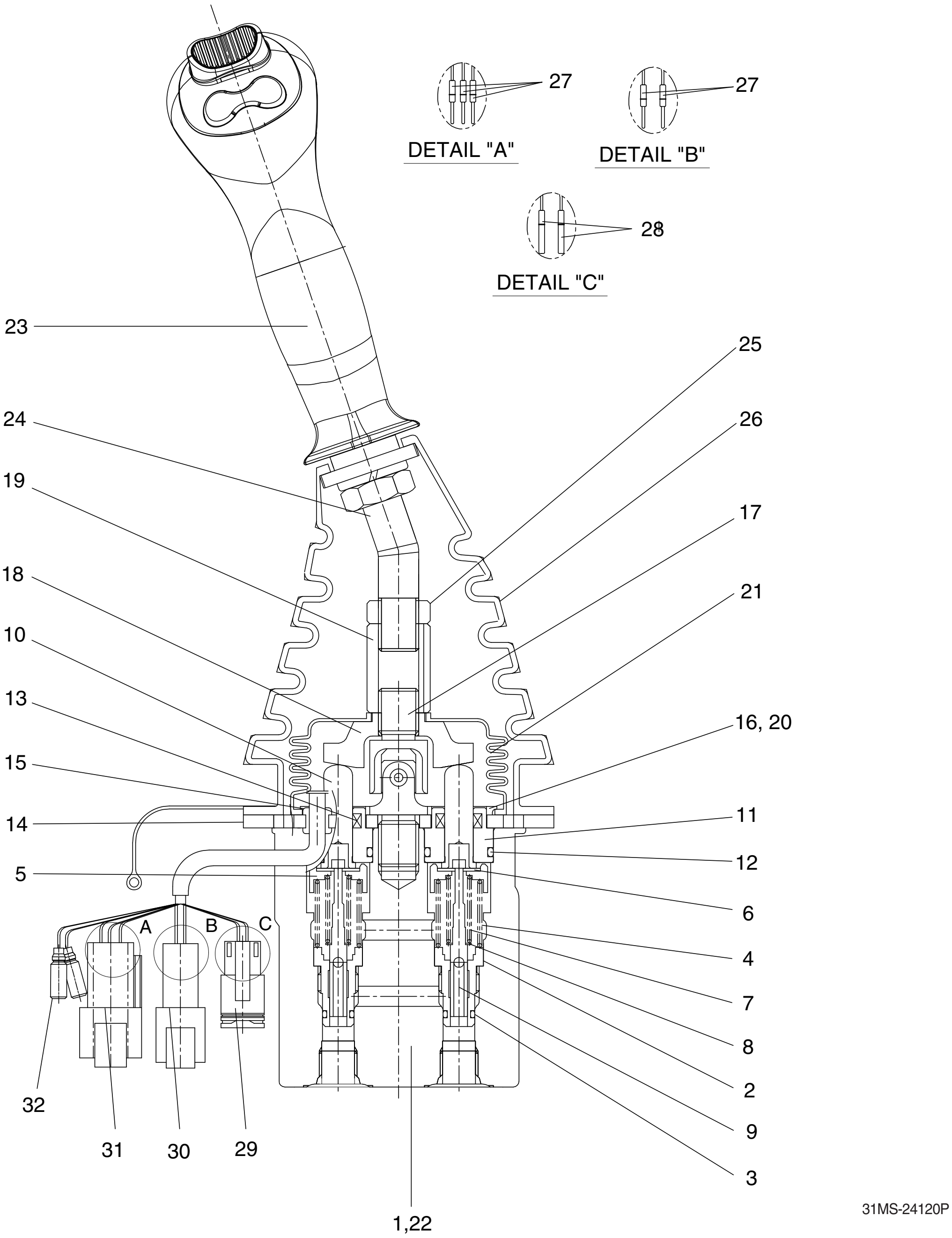
2. DISASSEMBLY AND ASSEMBLY

1) STRUCTURE (STD)



1	Body	12	O-ring	23	Handle assy (LH, RH)
2	Plug	13	Rod seal	24	Handle bar
3	O-ring	14	Plate (A)	25	Nut
4	Spring	15	Bushing	26	Boots
5	Spring seat	16	Machine screw	27	Switch 1
6	Stopper	17	Joint assy	28	Screw
7	Spring	18	Swash plate	29	Switch 2
8	Shim	19	Hex nut	30	Switch cover
9	Spool	20	Plate (B)	31	Connector assy
10	Push rod	21	Inner boots	32	Terminal
11	Plug	22	Plug	33	Guide
				34	Connector

STRUCTURE (PROPORTIONAL, OPT)



1	Body	12	O-ring	23	Handle assy (LH, RH)
2	Plug	13	Rod seal	24	Handle bar
3	O-ring	14	Plate (A)	25	Nut
4	Spring	15	Bushing	26	Boots
5	Spring seat	16	Machine screw	27	Connector pin male
6	Stopper	17	Joint assy	28	Connector pin female
7	Spring	18	Swash plate	29	Connector assy
8	Shim	19	Hex nut	30	Connector assy
9	Spool	20	Plate (B)	31	Connector assy
10	Push rod	21	Inner boots	32	Connector
11	Plug	22	Plug	33	Cap

2) TOOLS

Tool name	Information
Torque wrench	22 mm
Spanner	22 & 27 mm
Long nose plier	-
Screwdriver	-
Plastic hammer	-
L-wrench	M10

3) ASSEMBLY

(1) Prepare the body.
※ Secure the product on a flat table.


18AK7RCV03

(2) Insert greased plugs into the respective ports.
※ Insert the spring while making sure that it is as close to the center as possible.


18AK7RCV04

(3) Assemble plug.
※ 10 mm torque wrench, direction of assembly: clockwise
- Tightening torque : 3kgf·m (21.7 lbf·ft)

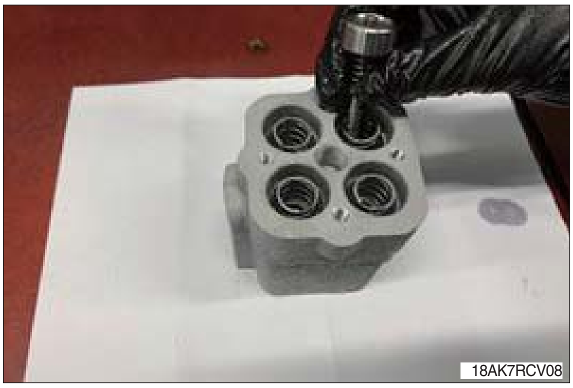

18AK7RCV05

(4) Insert the op spring into the respective ports.


18AK7RCV06

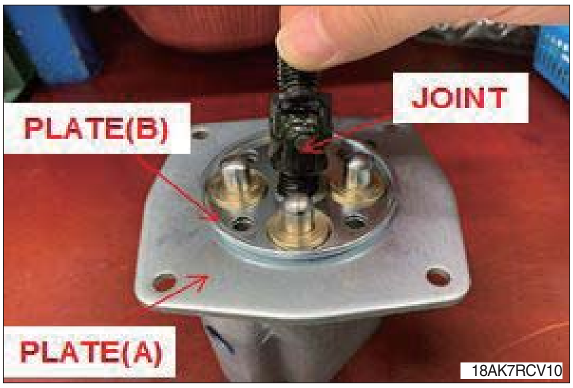
(5) Assemble the spool kit.
※ Assemble the spool, spring, spring seat, shim and stopper as shown in the photo.

(6) Assemble the spool kit to the respective ports.



(7) Place the plug kit over the spool kit.
※ Align the spool head part with the push rod hole.

(8) Place plate (B) over plate (A) and assemble the joint with the wire hole facing toward port P.
※ Assemble the joint clockwise while pressing the plate.



(9) Assemble the joint assy.
-Tightening torque : 3 kgf·m (21.7 lbf·ft)
※ Direction of assembly: clockwise
※ Lightly tap with a hammer in all four compass directions while making sure not to scratch the product, so that the plug can be inserted at the same time.

(10) Insert screws into the four holes.

(11) Fasten the screws with an electric driver. (Direction of assembly): clockwise

(12) Apply grease to the joint assy and push rod.
※ Grease spec: combi ep no.1 or equivalent

※ Apply grease to the rotating part of the joint and the upper surface of push rod.

(13) Assemble the swash plate.

※ Assemble the swash plate and push rod along the contact surface, and make sure that the push rod is not pressed.

※ Direction of assembly: clockwise.

(14) Assemble the hex nut.

※ Direction of assembly: clockwise.

(15) Assemble the hex nut with the torque wrench.

- Tightening torque : 8kgf·m (57.9 lbf·ft)

※ Direction of assembly of upper torque wrench: clockwise.

(16) Assemble the inner boots.

※ Insert the boots between the plate and body.

(17) Assemble the handle kit and fasten with a torque wrench.
-Tightening torque : 6kgf·m (43.4 lbf·ft)

※ When assembling, fasten according to the direction of the handle.

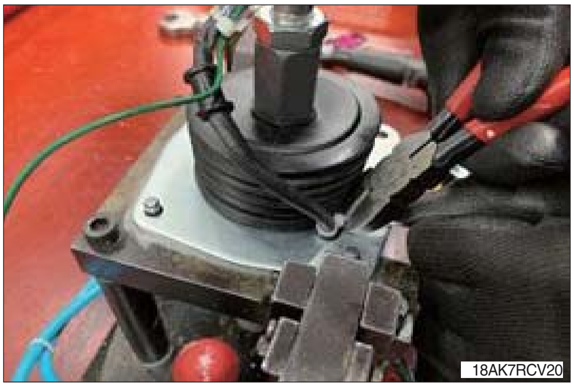
※ Assembly direction of the upper torque wrench: clockwise.

STD

PROPORTIONAL, OPT

(18) Insert wire into the bushing hole.

※ After inserting the wire, secure it with a cable tie.



(19) Insert the terminal into the respective wire.

STD

Insert the terminal into the respective wire.

SWITCH NUMBER	CONNECTOR SPECIFICATION	WIRE COLOR
1	DT06-2S-EP05	GRAY
2	DT04-2P-E005	BLACK
3	JIS D 5403 CB104	BLUE

(PUSH BUTTON SWITCH용)

SWITCH NUMBER	CONNECTOR SPECIFICATION	WIRE COLOR
4	DT04-3P-E004-1	RED
4	DT04-3P-E004-2	PURPLE
4	DT04-3P-E004-3	WHITE

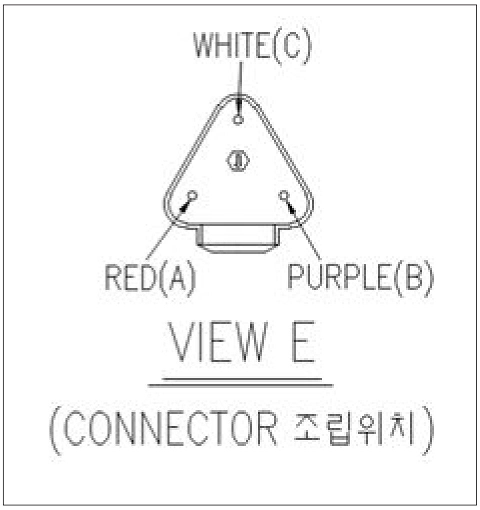
(PROPORTIONAL SWITCH용)

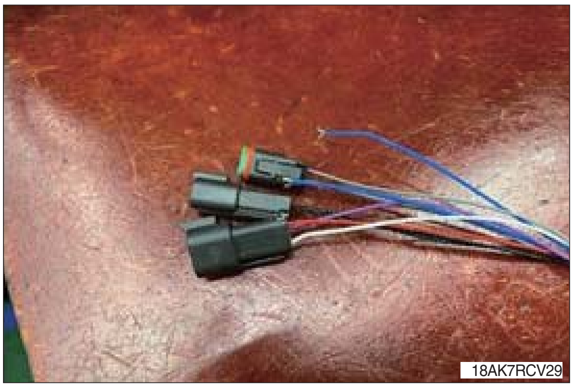
PROPORTIONAL, OPT

(20) Insert the female and male terminals.

STD

Insert the wire into the connector.





PROPORTIONAL, OPT

(21) Check the final status.

※ Check the exterior parts for irregularities as well as the connector specifications.

STD

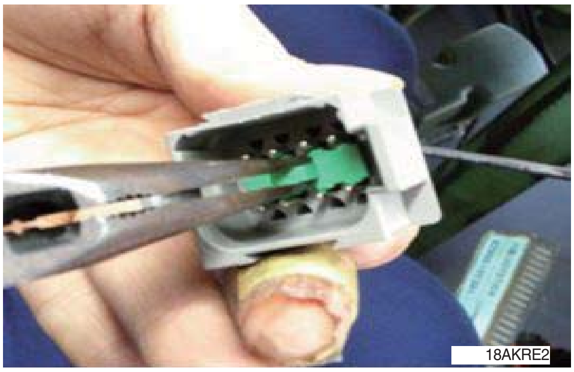
PROPORTIONAL, OPT

4) DISASSEMBLY

(1) 1. Prepare the joystick product.

※ Fix the product on a flat table.

(2) Dissemble the guide from the connector.



(3) Disassemble the wire from the connector.

※ Force the terminal holder to the opposite side and fix it.

(4) Pull out the terminal wire by moving the holder to the oppsite side.

(5) Pull out the wire from the bushing hole.

(6) Disassemble the handle kit from the hex nut.
※ Disassembly direction: counterclockwise.

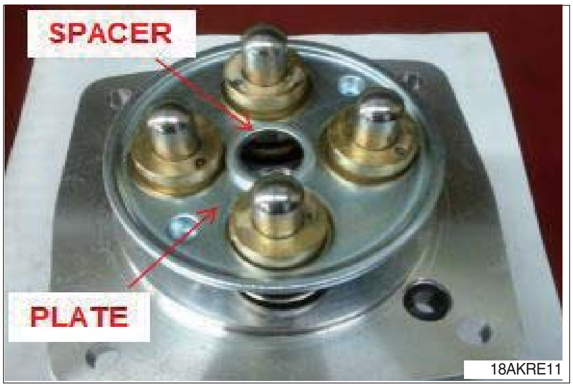
(7) Disassemble the inner boots.

(8) Disassemble the hex nut.
※ Disassembly direction: counterclockwise

(9) Disassemble the swash plate.
※ Disassembly direction: counterclockwise.

(10) Disassemble the joint assy.
※ Disassembly direction: counterclockwise.

(11) Disassemble the plate and spacer.



(12) Disassemble the plug kit from each port.

※ Fix the plug side using pliers and then force in the upper direction. take care not to damage the plug side.

(13) Disassemble the bushing.
※ Extract the bushing using a screwdriver.


18AKRE13

(14) Extract the spool kit from the body.


18AKRE14

(15) Extract the op spting from the body.


18AKRE15

(16) Check the final parts.


18AKRE16

GROUP 8 TURNING JOINT

1. REMOVAL AND INSTALL

1) REMOVAL

13031GE18

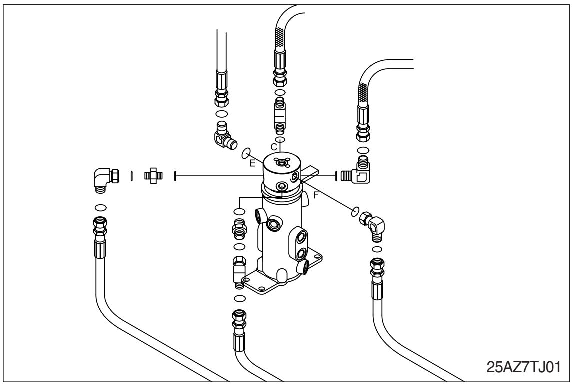
(1) Lower the work equipment to the ground and stop the engine.

(2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

(3) Loosen the breather slowly to release the pressure inside the hydraulic tank.

⚠ **Escaping fluid under pressure can penetrate the skin causing serious injury.**

※ When pipes and hoses are disconnected, the oil inside the piping will flow out, so catch it in oil pan.



25AZ7TJ01

(4) Disconnect all hoses.

(5) Sling the turning joint assembly (1) and remove the mounting bolt (2).

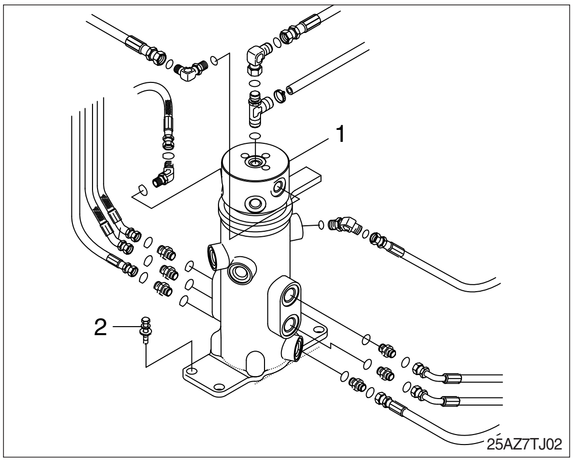
· Weight : 11 kg (24 lb)

· Tightening torque : 6.9±1.4 kgf · m
(49.9±10.1 lbf · ft)

(6) Remove the turning joint assembly.

※ When removing the turning joint, check that all the hoses have been disconnected.

2) INSTALL



25AZ7TJ02

(1) Carry out installation in the reverse order to removal.

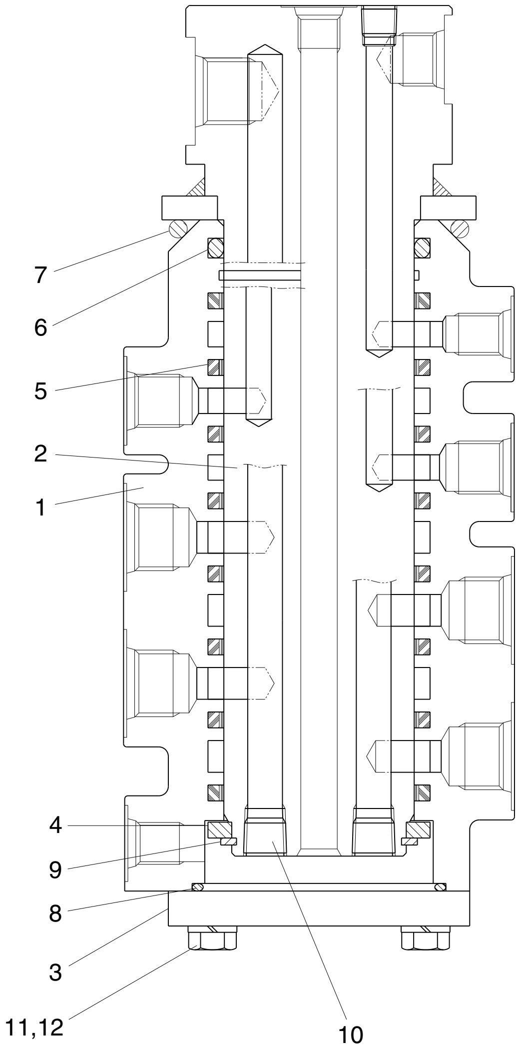
※ Take care of turning joint direction.

※ Assemble hoses to their original positions.

※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.

2. DISASSEMBLY AND ASSEMBLY

1) STRUCTURE



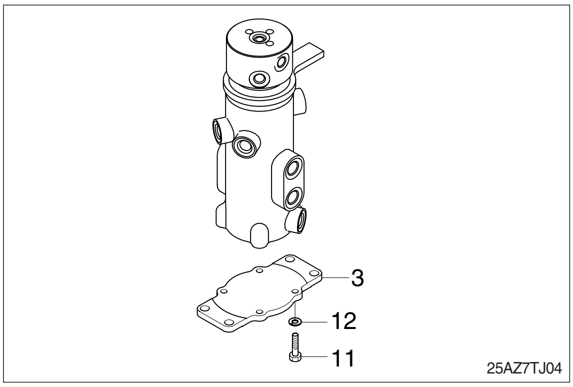
25AZ7TJ03

1	Hub	5	Slipper seal	9	Retainer ring
2	Shaft	6	O-ring	10	Plug
3	Cover	7	O-ring	11	Hexagon bolt
4	Spacer	8	O-ring	12	Spring washer

2) DISASSEMBLY

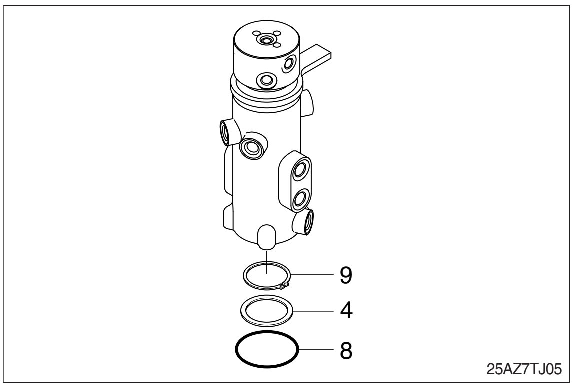
※ Before the disassembly, clean the turning joint.

(1) Remove bolts (11), washer (12) and cover (3).



(2) Remove O-ring (8).

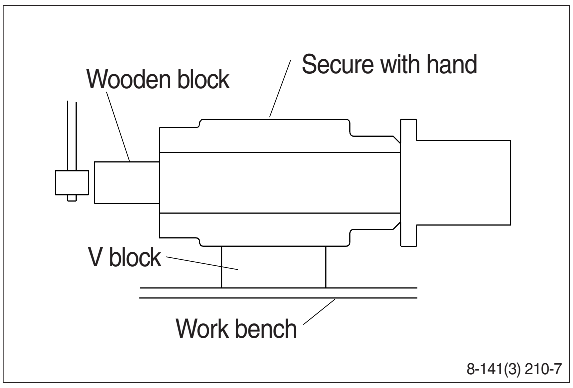
(3) Remove retainer ring (9) and spacer (4).



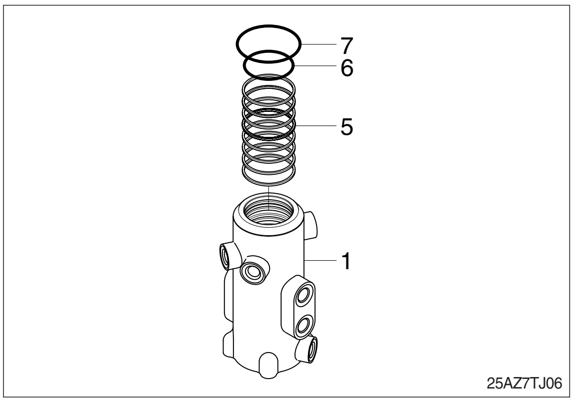
(4) Place hub (1) on a V-block and by using a wood buffer at the shaft end, hit out shaft (2) to about 1/2 from the body with a hammer.

※ Take care not to damage the shaft (2) when remove hub (1) or rest it sideway.

※ Put a fitting mark on hub (1) and shaft (2).



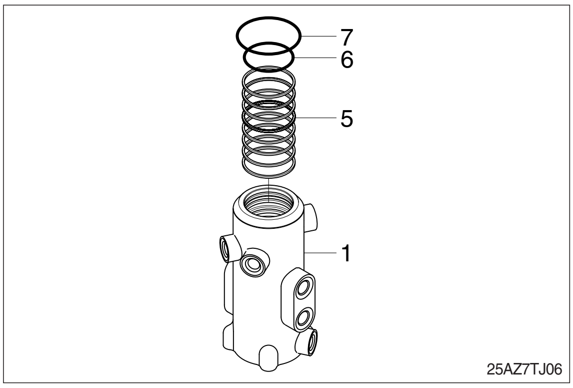
(5) Remove eight slipper seals (5) and O-ring (6, 7) from hub (1).



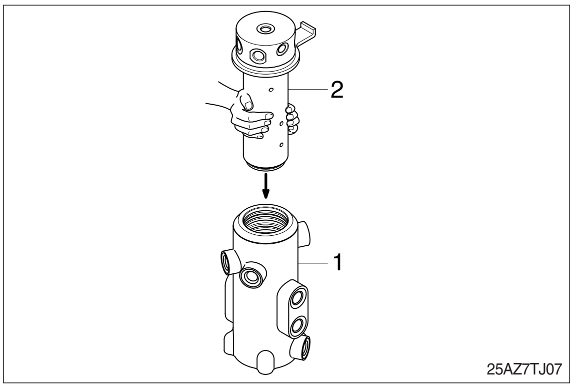
3) ASSEMBLY

※ Clean all parts.
※ As a general rule, replace oil seals and O-ring.
※ Coat the sliding surfaces of all parts with engine oil or grease before installing.

(1) Fix eight slipper seal (5) and O-ring (6, 7) to hub (1).

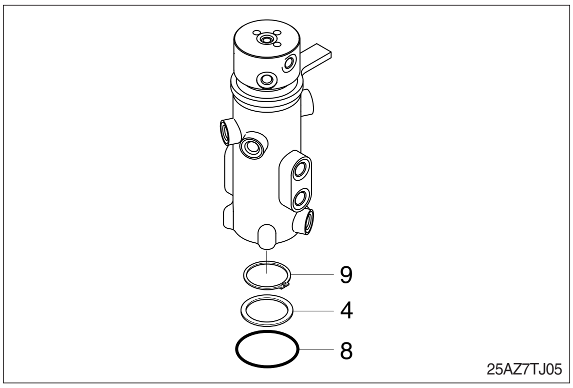


(2) Set hub (1) on block, install shaft (2) into hub (1) by hand.



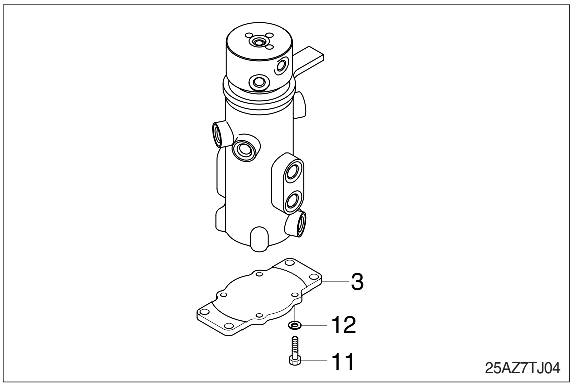
(3) Fit spacer (4) and retainer ring (9) to shaft (2).

(4) Fit O-ring (8) to hub (1).



(5) Install cover (3) to hub and tighten bolts (11).

· Tightening torque : 2.5~3.0 kgf·m (18.1~21.7 lbf·ft)



GROUP 9 BOOM, ARM AND BUCKET CYLINDERS

1. REMOVAL AND INSTALL

1) BUCKET CYLINDER

(1) Removal

※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.

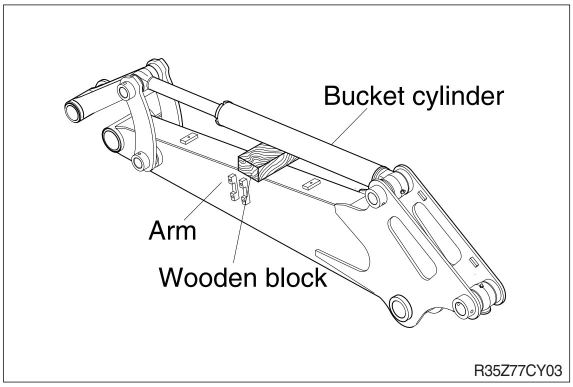
※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

13031GE18

⚠ Loosen the breather slowly to release the pressure inside the hydraulic tank. Escaping fluid under pressure can penetrate the skin causing serious injury.

※ Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.

① Set block between bucket cylinder and arm.

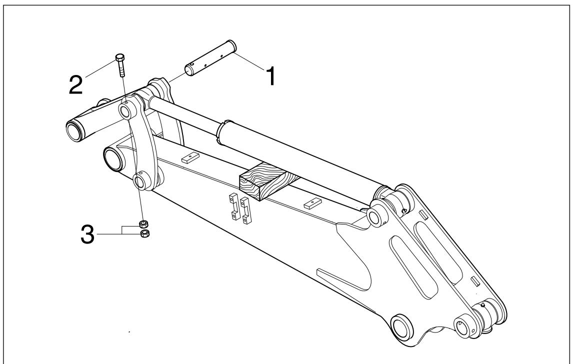


R35Z77CY03

② Remove bolt (2), nut (3) and pull out pin (1).

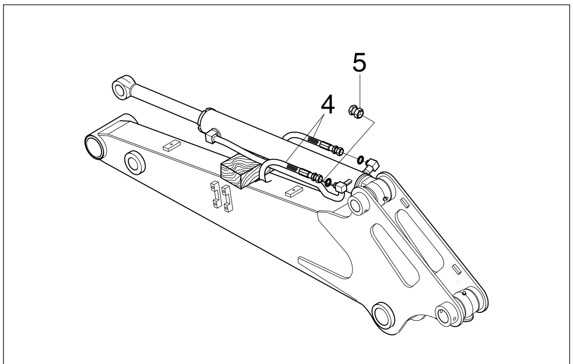
※ Tie the rod with wire to prevent it from coming out.

· Tightening torque : 6.9±1.4 kgf·m (49.9±10.1 lbf·ft)



R35Z77CY02

③ Disconnect bucket cylinder hoses (4) and put plugs (5) on cylinder pipe.



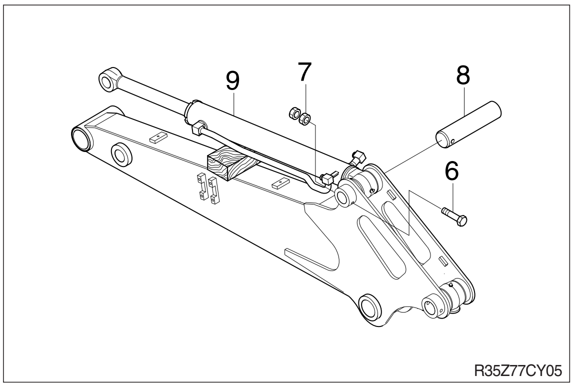
R35Z77CY04

④ Sling bucket cylinder assembly (9) and remove bolt (6) and nut (7) then pull out pin (8).

⑤ Remove bucket cylinder assembly (9).

· Weight : 15 kg (32 lb)

· Tightening torque : 6.9±1.4 kgf·m (49.9±10.1 lbf·ft)



(2) Install

① Carry out installation in the reverse order to removal.

▲ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.

※ Bleed the air from the bucket cylinder.

※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.

2) ARM CYLINDER

(1) Removal

※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.

※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

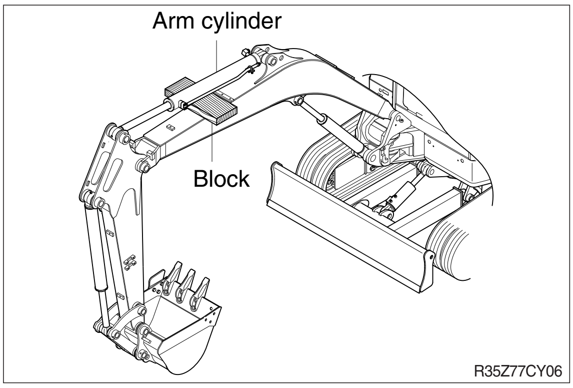
13031GE18

⚠ **Loosen the breather slowly to release the pressure inside the hydraulic tank.**

⚠ **Escaping fluid under pressure can penetrate the skin causing serious injury.**

※ Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.

① Set block between arm cylinder and boom.

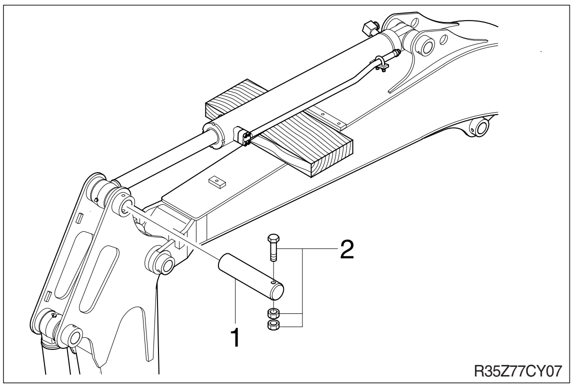


R35Z77CY06

② Remove bolt and nut (2) and pull out pin (1).

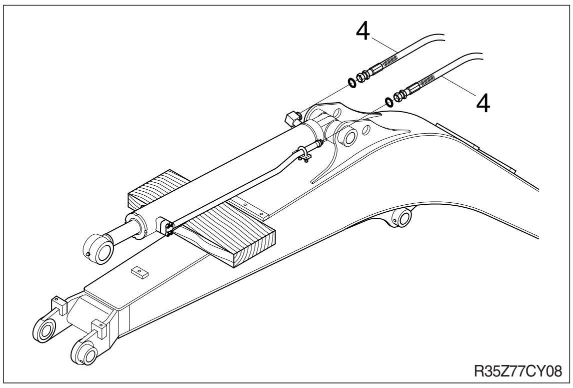
· Tightening torque : 6.9±1.4 kgf·m (49.9±10.1 lbf·ft)

※ Tie the rod with wire to prevent it from coming out.



R35Z77CY07

③ Disconnect arm cylinder hoses (4) and put plugs on cylinder pipe.



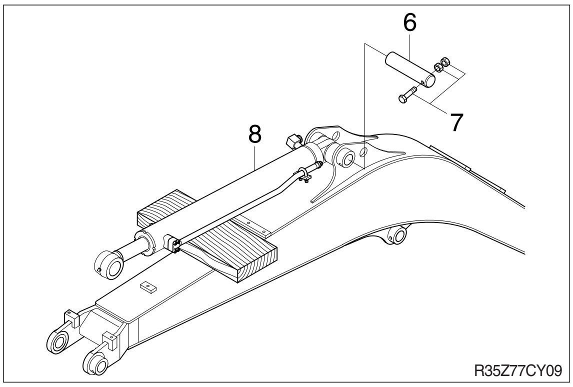
R35Z77CY08

④ Sling arm assembly (8) and remove bolt and nut (7) then pull out pin (6).

⑤ Remove arm cylinder assembly (8).

· Weight : 26 ㎏ (57 ℔)

· Tightening torque : 6.9±1.4 kgf·m (49.9±10.1 lbf·ft)



(2) Install

① Carry out installation in the reverse order to removal.

▲ **When aligning the mounting position of the pin, do not insert your fingers in the pin hole.**

※ Bleed the air from the arm cylinder.

※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.

3) BOOM CYLINDER

(1) Removal

※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.

※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

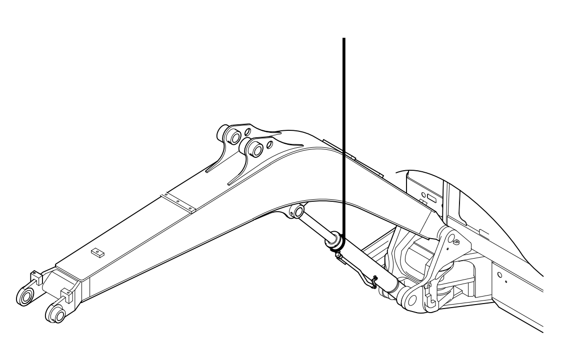
13031GE18

⚠ **Loosen the breather slowly to release the pressure inside the hydraulic tank.**

⚠ **Escaping fluid under pressure can penetrate the skin causing serious injury.**

※ Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.

① Sling boom cylinder assembly.

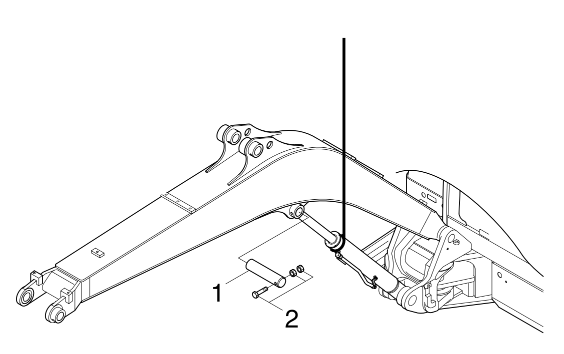


R35Z77CY10

② Remove bolt and nut (2) and pull out pin (1).

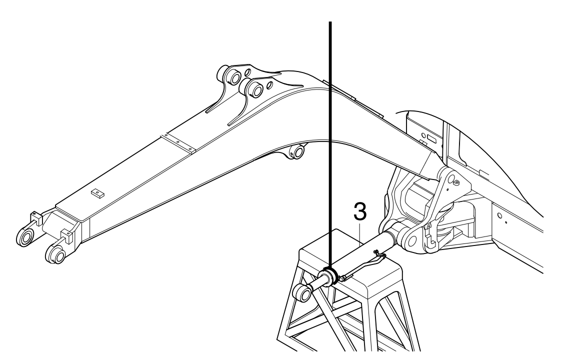
※ Tie the rod with wire to prevent it from coming out.

· Tightening torque : 6.9±1.4 kgf·m (49.9±10.1 lbf·ft)



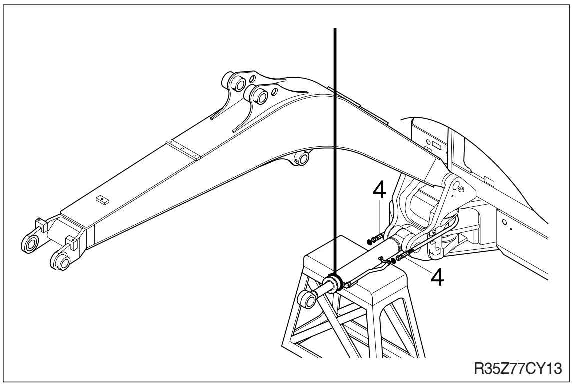
R35Z77CY11

③ Lower the boom cylinder assembly (3) on a stand.



R35Z77CY12

④ Disconnect boom cylinder hoses(4) and put plugs on cylinder pipe.

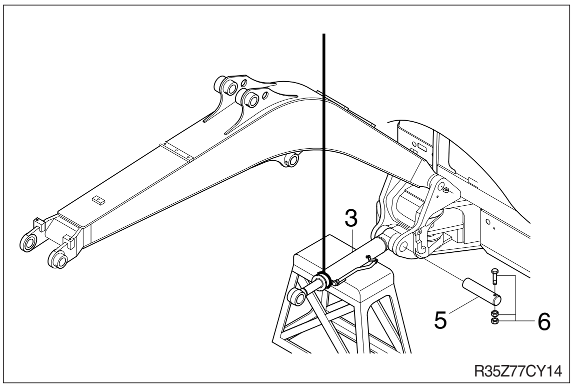


⑤ Remove bolt (6) and pull out pin (5).

⑥ Remove boom cylinder assembly (3).

· Weight : 29 kg (63 lb)

· Tightening torque : 12.8±3.0 kgf·m (92.6±21.7 lbf·ft)



(2) Install

① Carry out installation in the reverse order to removal.

⚠ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.

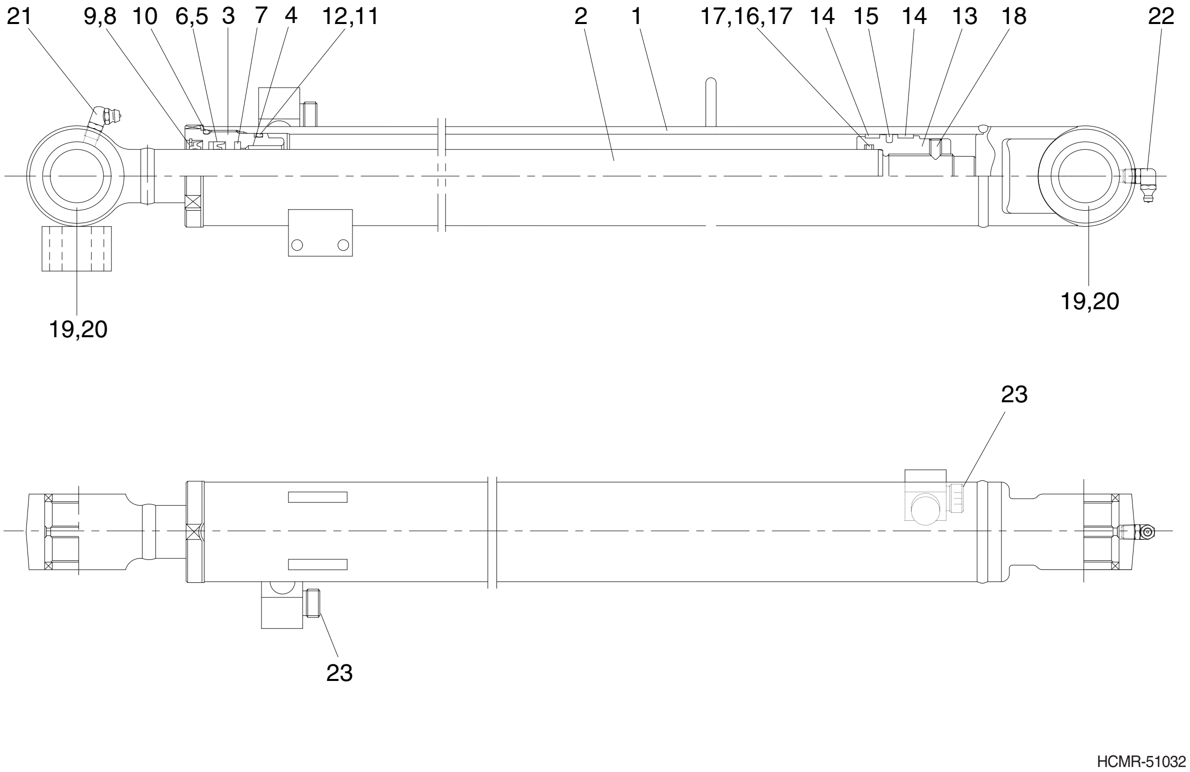
※ Bleed the air from the boom cylinder.

※ Conformed the hydraulic oil level and check the hydraulic oil leak or not.

2. DISASSEMBLY AND ASSEMBLY

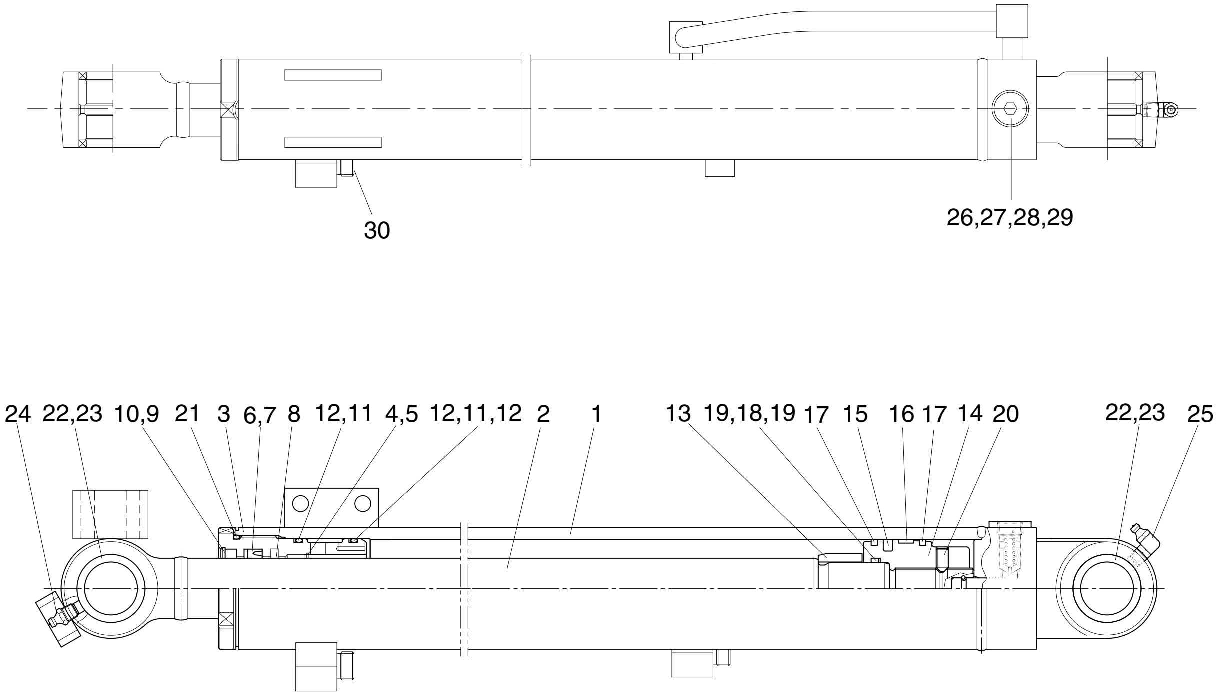
1) STRUCTURE

(1) Bucket cylinder



1	Tube assembly	9	Snap ring	17	Back up ring
2	Rod assembly	10	O-ring	18	Set screw
3	Gland	11	O-ring	19	Pin bushing
4	DU bushing	12	Back up ring	20	Dust seal
5	Rod seal	13	Piston	21	Grease nipple
6	Back up ring	14	Wear ring	22	Grease nipple
7	Buffer ring	15	Piston seal	23	O-ring
8	Dust wiper	16	O-ring		

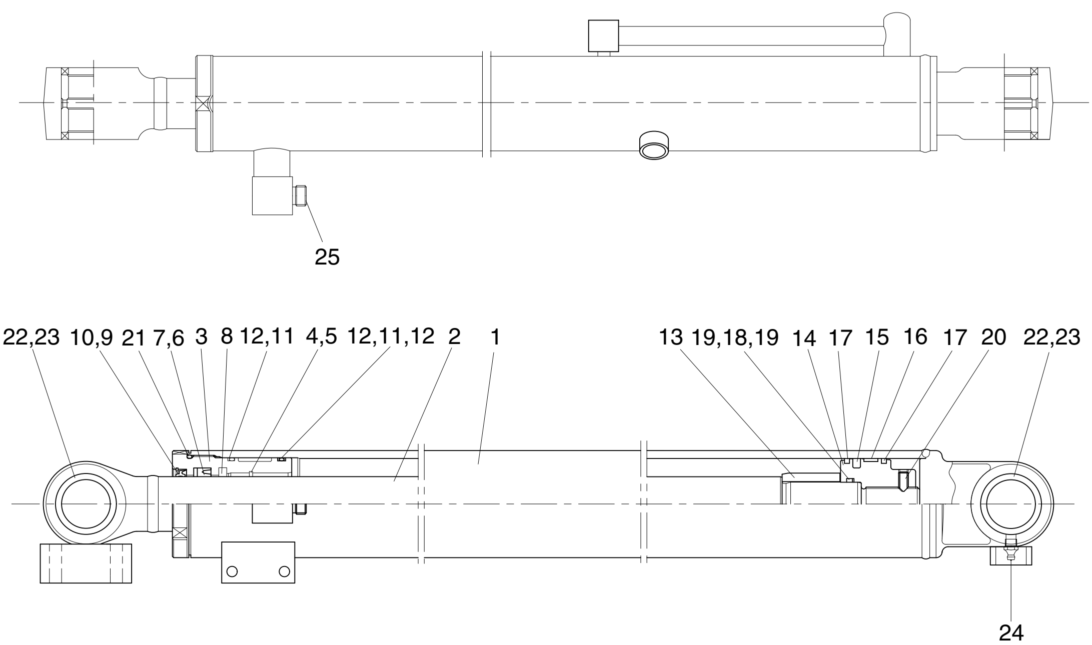
(2) Arm cylinder



HCMR-51022

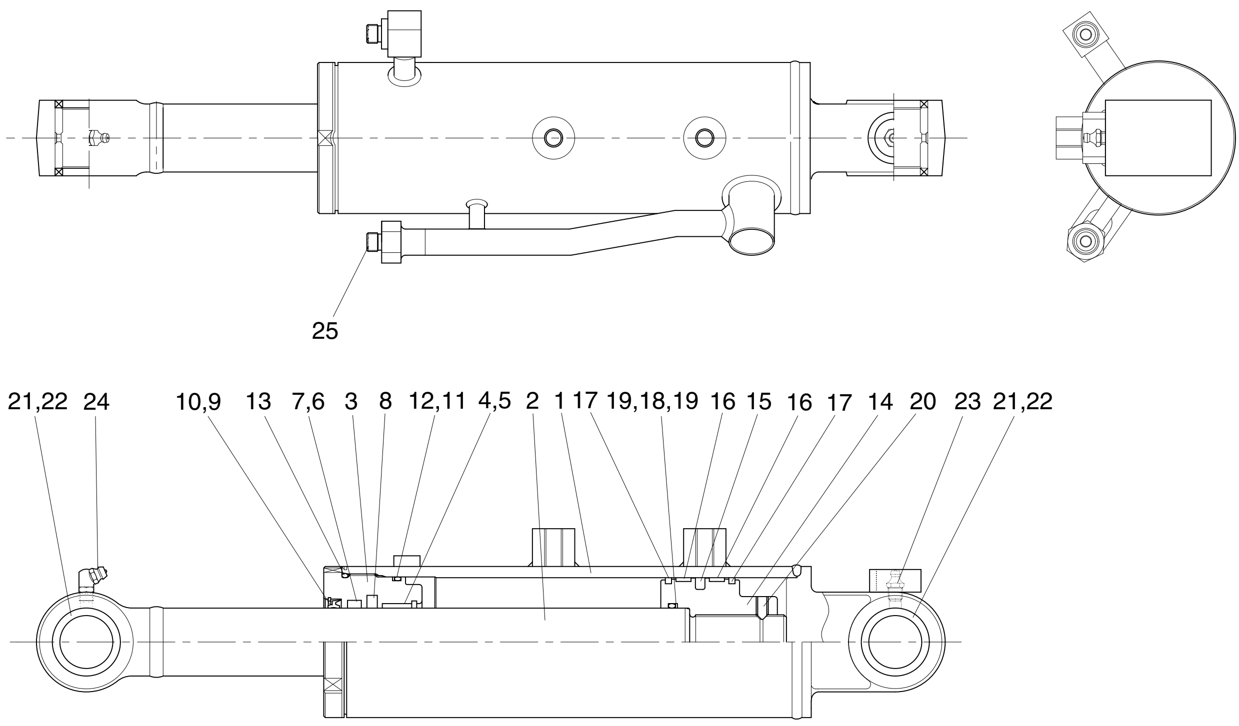
1	Tube assembly	11	O-ring	21	O-ring
2	Rod assembly	12	Back up ring	22	Dimple bushing
3	Gland	13	Cushion ring	23	Dust seal
4	DU bushing	14	Piston	24	Grease nipple
5	Snap ring	15	Piston seal	25	Grease nipple
6	Rod seal	16	Wear ring	26	Check valve
7	Back up ring	17	Dust ring	27	Coil spring
8	Buffer ring	18	O-ring	28	O-ring
9	Dust wiper	19	Back up ring	29	Socket plug
10	Snap ring	20	Set screw	30	O-ring

(3) Boom cylinder



1	Tube assembly	10	Snap ring	19	Back up ring
2	Rod assembly	11	O-ring	20	Set screw
3	Gland	12	Back up ring	21	O-ring
4	DU bushing	13	Cushion ring	22	Pin bushing
5	Snap ring	14	Piston	23	Dust seal
6	Rod seal	15	Piston seal	24	Grease nipple
7	Back up ring	16	Wear ring	25	O-ring
8	Buffer ring	17	Dust ring		
9	Dust wiper	18	O-ring		

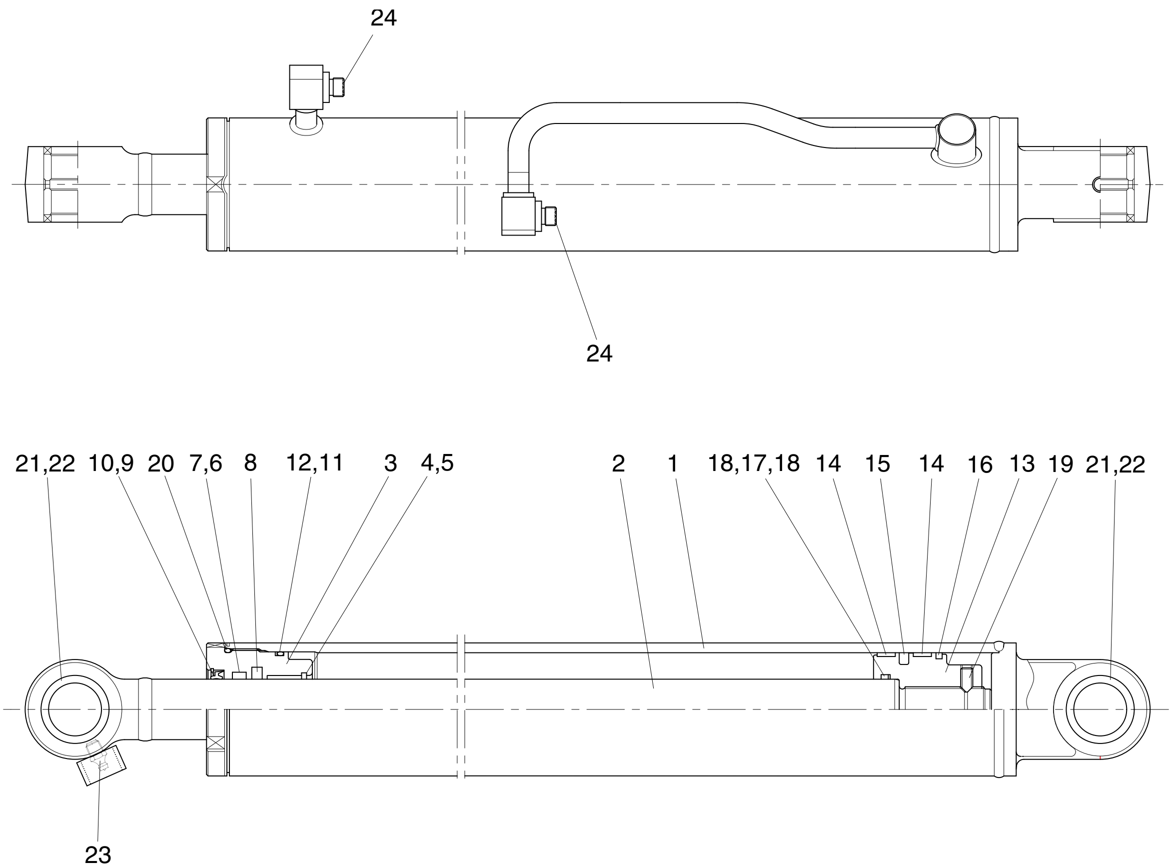
(4) Dozer cylinder



HCMR-40040

1	Tube assembly	10	Snap ring	19	Back up ring
2	Rod assembly	11	O-ring	20	Set screw
3	Gland	12	Back up ring	21	Pin bushing
4	DU bushing	13	O-ring	22	Dust seal
5	Snap ring	14	Piston	23	Grease nipple
6	Rod seal	15	Piston seal	24	Grease nipple
7	Back up ring	16	Wear ring	25	O-ring
8	Buffer ring	17	Dust ring		
9	Dust wiper	18	O-ring		

(5) Boom swing cylinder

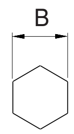


HCMR-10120

1	Tube assembly	10	Snap ring	18	Back up ring
2	Rod assembly	11	O-ring	19	Set screw
3	Gland	12	Back up ring	20	O-ring
4	DU bushing	13	Piston	21	Pin bushing
5	Snap ring	14	Wear ring	22	Dust seal
6	Rod seal	15	Piston seal	23	Grease nipple
7	Back up ring	16	Wear ring	24	O-ring
8	Buffer ring	17	O-ring		
9	Dust wiper				

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

Tool name	Remark	
Allen wrench	8	
	3	
Spanner	22	
Hook spanner	Suitable size (80~120 mm)	
(-) Driver	Small and large sizes	
Torque wrench	Capable of tightening with the specified torques	

(2) Tightening torque

Part name		Item	Size	Torque	
				kgf · m	lbf · ft
Gland	Boom cylinder	3	-	70±7.0	506±50.6
	Arm cylinder	3	-	70±7.0	506±50.6
	Bucket cylinder	3	-	70±7.0	506±50.6
	Dozer cylinder	3	-	70±7.0	506±50.6
	Boom swing cylinder	3	-	70±7.0	506±50.6
Piston	Boom cylinder	14	-	75±7.5	542±54.2
	Arm cylinder	14	-	50±5.0	362±36.2
	Bucket cylinder	13	-	50±5.0	362±36.2
	Dozer cylinder	14	-	75±7.5	542±54.2
	Boom swing cylinder	13	-	75±7.5	542±54.2
Set screw	Boom cylinder	20	M8	1.5±0.1	10.8±0.7
	Arm cylinder	20	M8	1.5±0.1	10.8±0.7
	Bucket cylinder	18	M8	1.5±0.1	10.8±0.7
	Dozer cylinder	20	-	1.5±0.1	10.8±0.7
	Boom swing cylinder	19	-	1.5±0.1	10.8±0.7

3) DISASSEMBLY

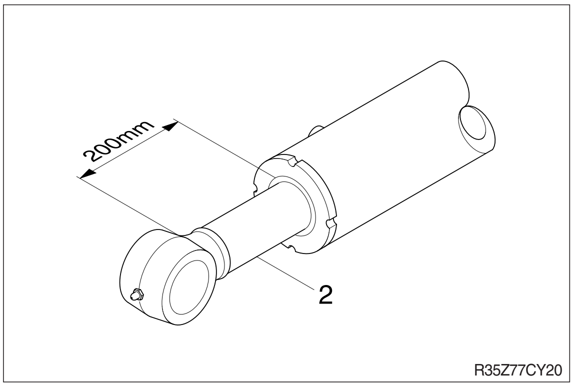
※ Procedures are based on the boom cylinder.

(1) Remove cylinder head and piston rod

① Hold the clevis section of the tube in a vise.

※ Use mouth pieces so as not to damage the machined surface of the cylinder tube. Do not make use of the outside piping as a locking means.

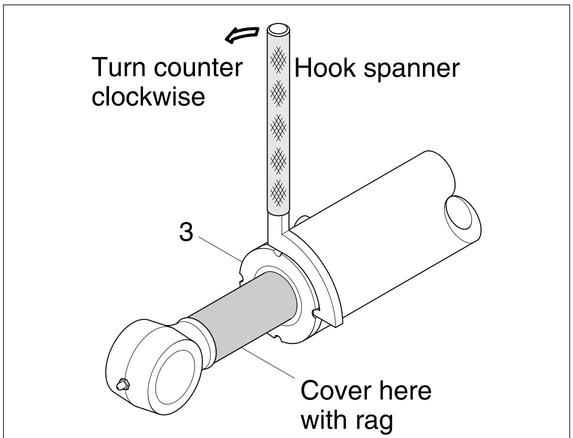
② Pull out rod assembly (2) about 200 mm (7.1 in). Because the rod assembly is rather heavy, finish extending it with air pressure after the oil draining operation.



R35Z77CY20

③ Loosen and remove the gland (3) by hook spanner.

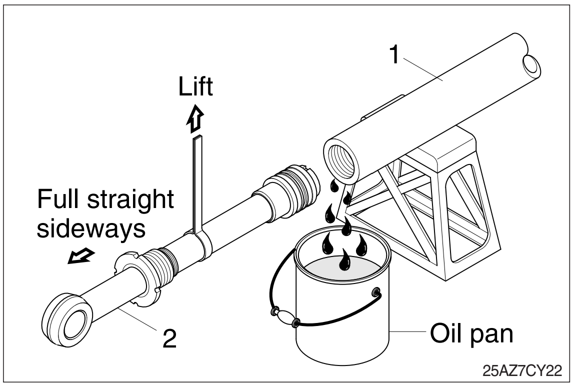
※ Cover the extracted rod assembly (2) with rag to prevent it from being accidentally damaged during operation.



25AZ7CY21

④ Draw out cylinder head and rod assembly together from tube assembly (1).

※ Since the rod assembly is heavy in this case, lift the tip of the rod assembly (2) with a crane or some means and draw it out. However, when rod assembly (2) has been drawn out to approximately two thirds of its length, lift it in its center to draw it completely.

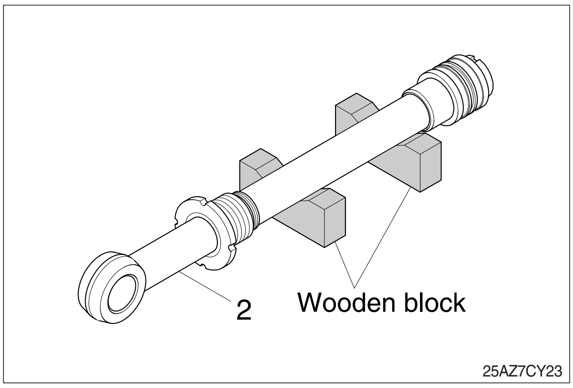


25AZ7CY22

※ Note that the plated surface of rod assembly (2) is to be lifted. For this reason, do not use a wire sling and others that may damage it, but use a strong cloth belt or a rope.

⑤ Place the removed rod assembly on a wooden V-block that is set level.

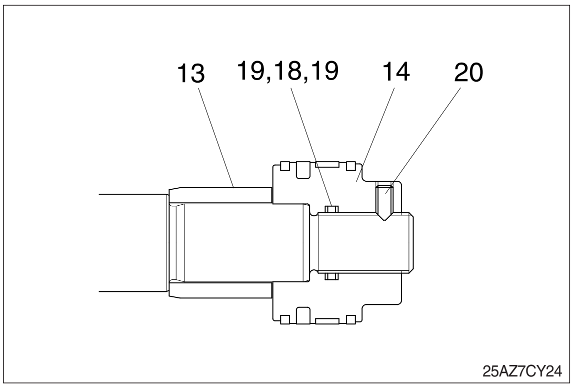
※ Cover a V-block with soft rag.



(2) Remove piston and gland

① Remove set screw (20).

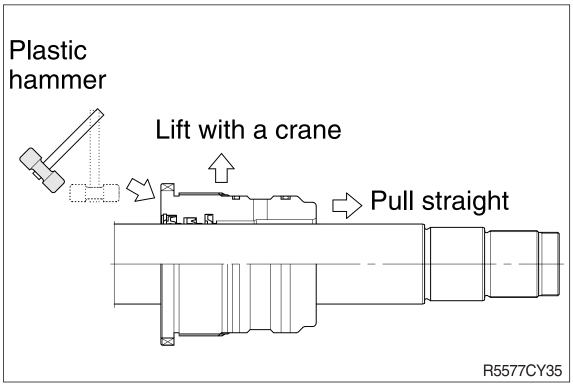
② Remove piston assembly (14), back up ring (19), O-ring (18) and cushion ring (13).



③ Remove the gland assembly from rod assembly (2).

※ If it is too heavy to move, move it by striking the flanged part of gland with a plastic hammer.

※ Pull it straight with gland assembly lifted with a crane.
Exercise care so as not to damage the lip of DU bushing (6) and packing (5, 6, 7, 8, 9, 10) by the threads of rod assembly (3).

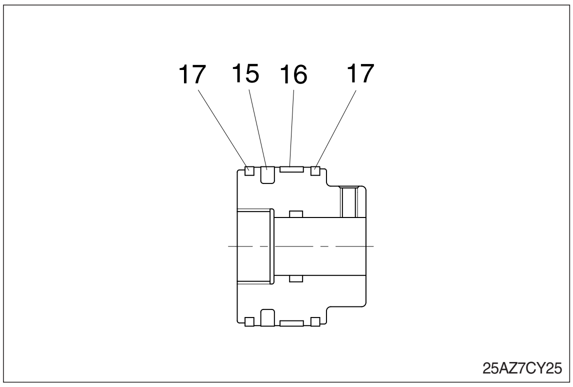


(3) Disassemble the piston assembly

① Remove wear ring (16).

② Remove dust rings (17) and piston seal (15).

※ Exercise care in this operation not to damage the grooves.



(4) Disassemble gland assembly

① Remove back up rings (12) and O-ring (11).

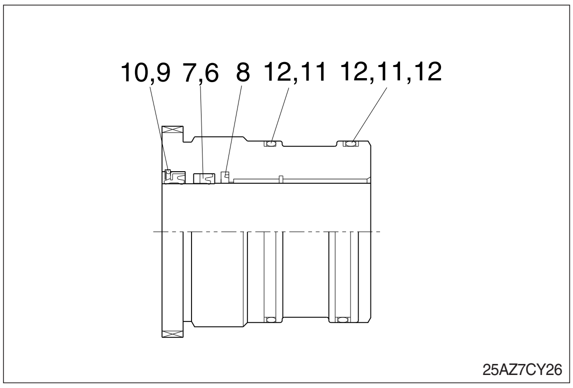
② Remove snap ring (10), dust wiper (9).

③ Remove buffer ring (8).

④ Remove the back up ring (7) and rod seal (6).

※ Exercise care in this operation not to damage the grooves.

※ Do not remove seal and ring, if does not damaged.

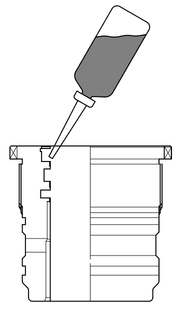


4) ASSEMBLY

(1) Assemble cylinder head assembly

※ Check for scratches or rough surfaces if found smooth with an oil stone.

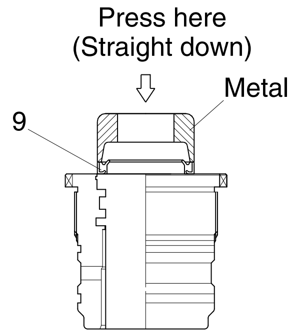
① Coat the inner face of gland (3) with hydraulic oil.



R5577CY38

② Coat dust wiper (9) with grease and fit dust wiper (9) to the bottom of the hole of dust seal.
At this time, press a pad metal to the metal ring of dust seal.

③ Fit back up ring (10) to the stop face.

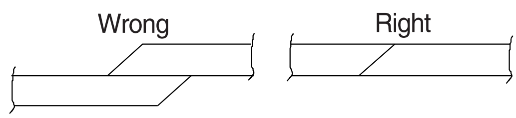


R27Z97CY29

④ Fit back up ring (7), rod seal (6) to corresponding grooves, in that order.

※ Coat each packing with hydraulic oil before fitting it.

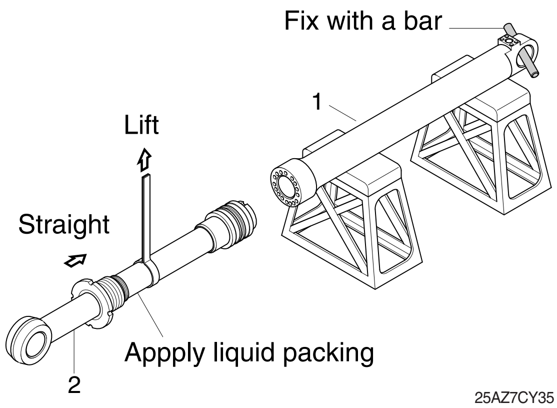
※ Insert the backup ring until one side of it is inserted into groove.



8-157(3) 210-7

※ Buffer ring (8) has its own fitting direction. Therefore, confirm it before fitting them.

※ Fitting buffer ring (8) upside down may damage its lip. Therefore check the correct direction that is shown in fig.

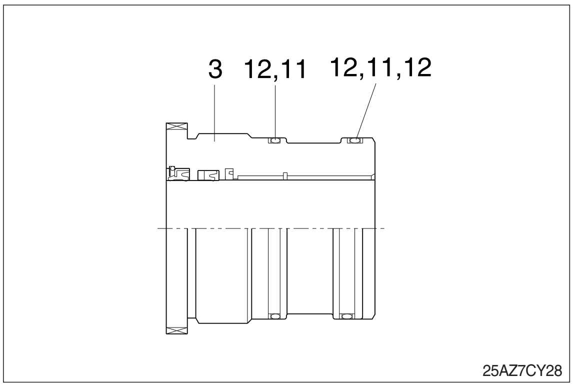


25AZ7CY35

⑤ Fit back up ring (12) to gland (3).

※ Put the back up ring in the warm water of 30~50°C .

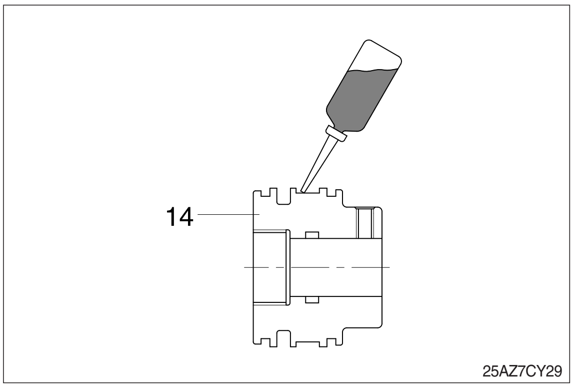
⑥ Fit O-ring (11) and back up ring (12) to gland (3).



(2) Assemble piston assembly

※ Check for scratches or rough surfaces. If found smooth with an oil stone.

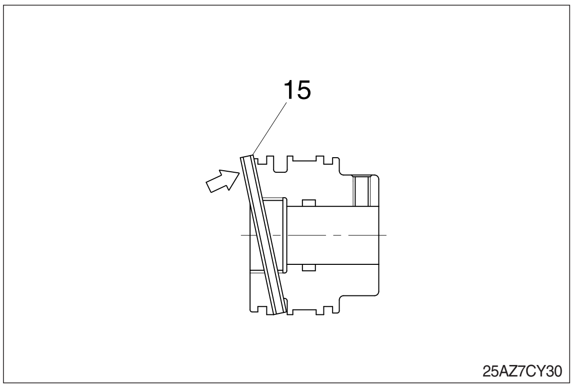
① Coat the outer face of piston (14) with hydraulic oil.



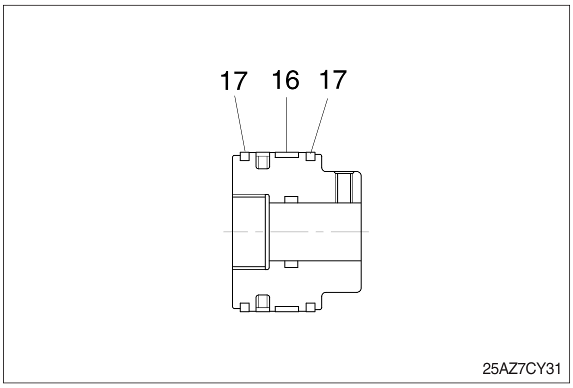
② Fit piston seal (15) to piston.

※ Put the piston seal in the warm water of 60~100°C for more than 5 minutes.

※ After assembling the piston seal, press its outer diameter to fit in.



③ Fit wear ring (16) and dust rings (17) to piston (14).

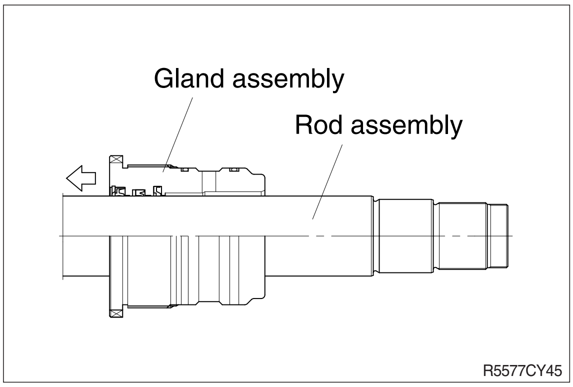


(3) Install piston and cylinder head

① Fix the rod assembly to the work bench.

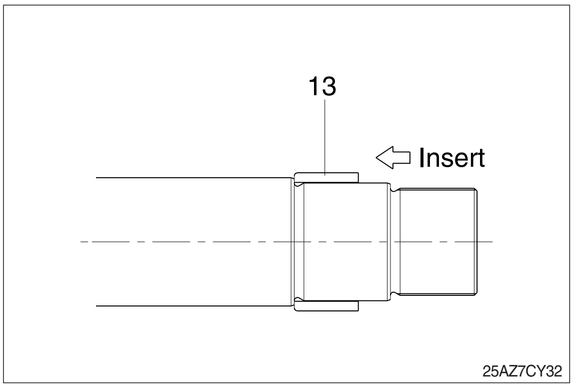
② Apply hydraulic oil to the outer surface of rod assembly (2), the inner surface of piston and gland.

③ Insert gland assembly to rod assembly.



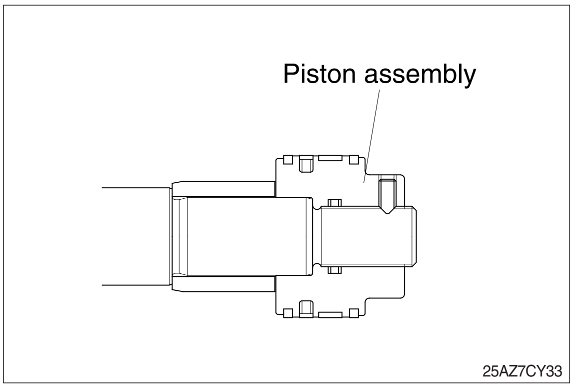
④ Insert cushion ring (13) to rod assembly.

※ Note that cushion ring (13) has a direction in which it should be fitted.



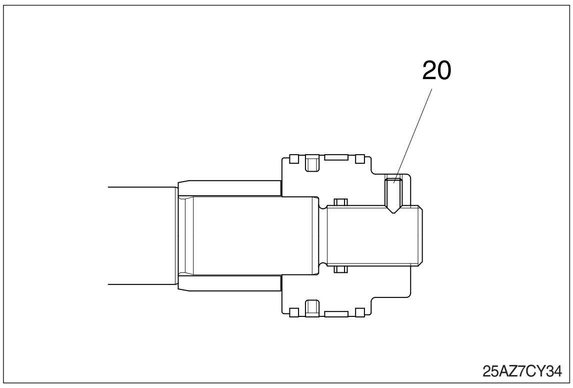
⑤ Fit piston assembly to rod assembly.

· Tightening torque : refer to page 7-122



⑥ Fit set screw (20).

· Tightening torque : refer to page 7-122

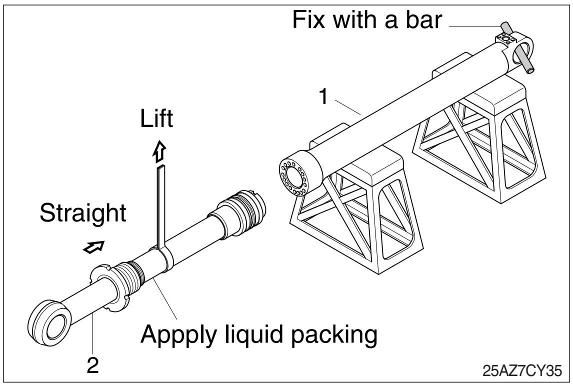


(4) Overall assemble

① Place a V-block on a rigid work bench. Mount the tube assembly (1) on it and fix the assembly by passing a bar through the clevis pin hole to lock the assembly.

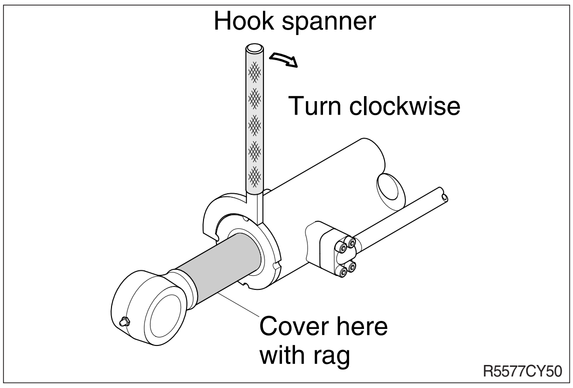
② Insert the rod assembly in to the tube assembly, while lifting and moving the rod assembly with a crane.

※ Be careful not to damage piston seal by thread of tube assembly.



③ Match the bolt holes in the cylinder head flange to the tapped holes in the tube assembly and tighten socket bolts to a specified torque.

※ Refer to the table of tightening torque.

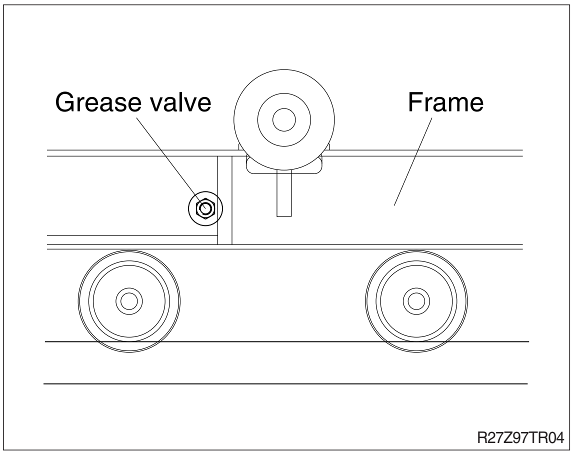


1. RUBBER TRACK

1) REMOVAL

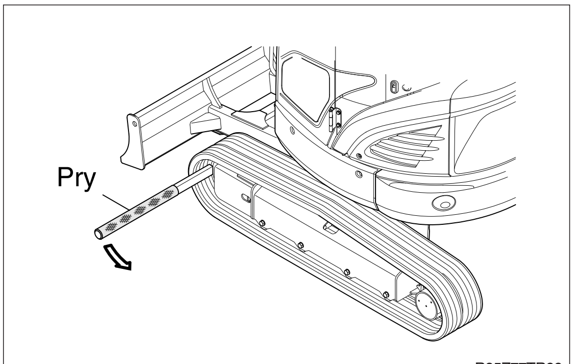
(1) Loosen tension of the rubber track.

※ If track tension is not relieved when the grease valve is loosened, move the machine backwards and forwards.



R27Z97TR04

(2) Remove the rubber track from lower frame using pry.

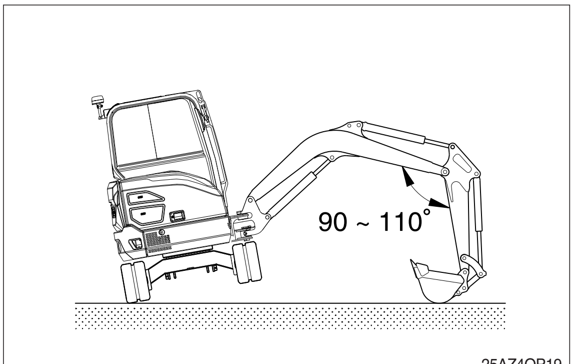


R35Z77TR22

2) INSTALL

(1) Carry out installation in the reverse order to removal.

※ Adjust the tension of the rubber track.



25AZ4OP19

2. TRACK LINK

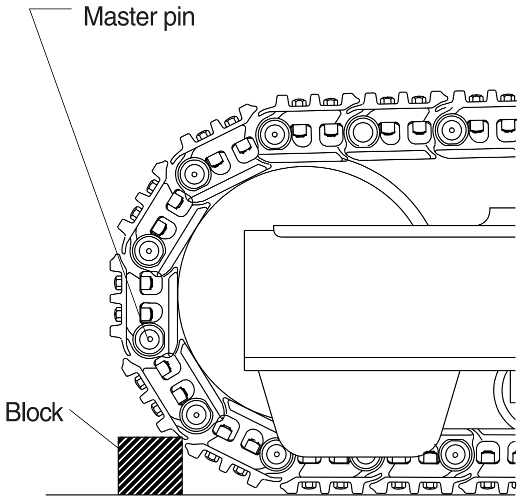
1) REMOVAL

(1) Move track link until master pin is over front idler in the position put wooden block as shown.

(2) Loosen tension of the track link.

※ If track tension is not relieved when the grease valve is loosened, move the machine backwards and forwards.

(3) Push out master pin by using a suitable tool.

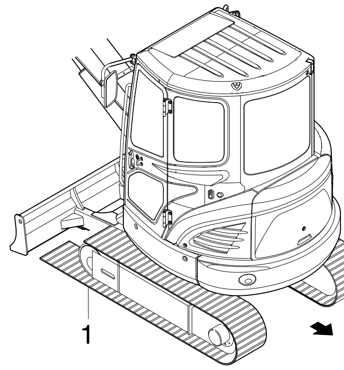


8-161(1) 140-7

(4) Move the machine slowly in reverse, and lay out track link assembly (1).

※ Jack up the machine and put wooden block under the machine.

※ Don't get close to the sprocket side as the track shoe plate may fall down on your feet.

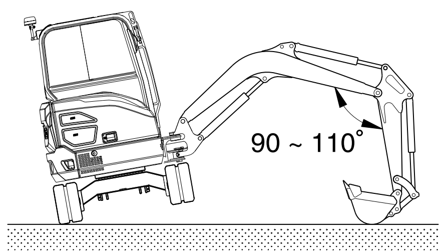


R35Z77TR01

2) INSTALL

(1) Carry out installation in the reverse order to removal.

※ Adjust the tension of the track link.

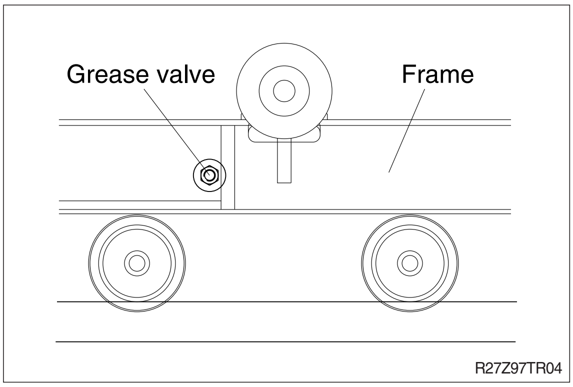


25AZ4OP19

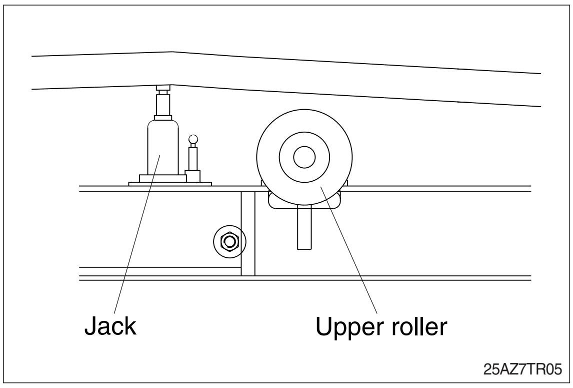
3. UPPER ROLLER

1) REMOVAL

(1) Loosen tension of the rubber track.

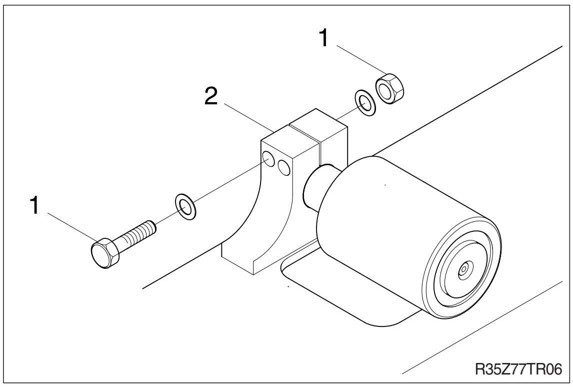


(2) Jack up the rubber track height enough to permit upper roller removal.



(3) Loosen the bolt and nut (1).
  · Tightening torque : 12.3±1.2 kgf · m
  (89±8.7 lbf · ft)

(4) Open bracket (2) with a screwdriver, push out from inside, and remove upper roller assembly.
  · Weight : 2.5 kg (5.5 lb)



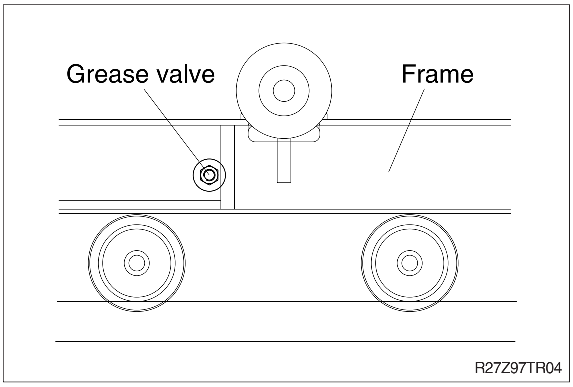
2) INSTALL

(1) Carry out installation in the reverse order to removal.

4. LOWER ROLLER

1) REMOVAL

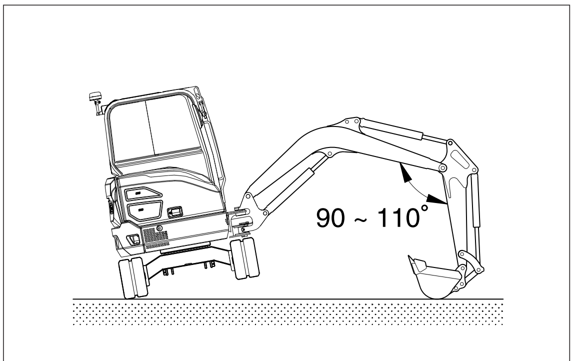
(1) Loosen tension of the rubber track.



R27Z97TR04

(2) Using the work equipment, push up track frame on side which is to be removed.

※ After jack up the machine, set a block under the unit.

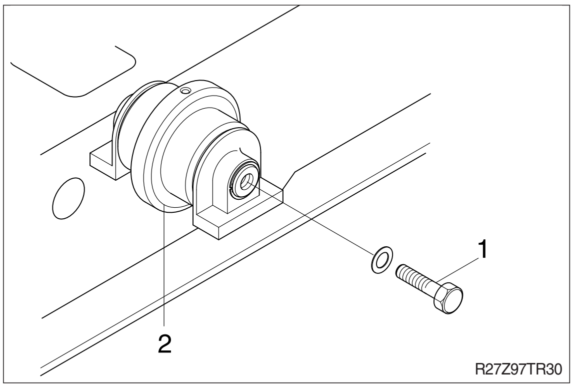


25AZ4OP19

(3) Remove the mounting bolt (1) and draw out the lower roller (2).

· Weight : 6.8 kg (15.0 lb)

· Tightening torque : 31.3±3.0 kgf · m
(226±21.7 lbf · ft)



R27Z97TR30

2) INSTALL

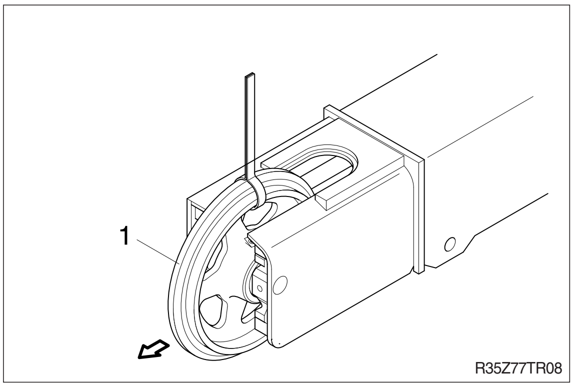
(1) Carry out installation in the reverse order to removal.

5. IDLER AND RECOIL SPRING

1) REMOVAL

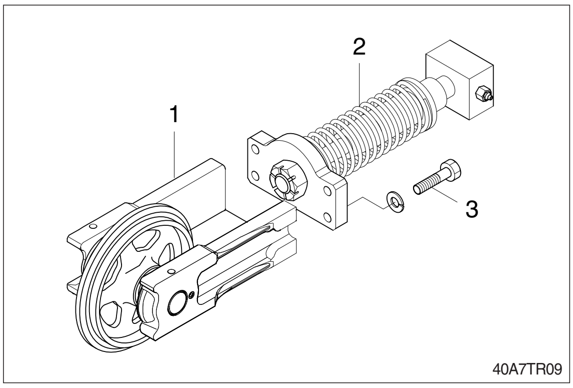
(1) Remove the track link.
For detail, see removal of track link.

(2) Sling the idler (1) and pull out idler and recoil spring assembly from track frame, using a pry.
· Weight : 33 kg (72.8 lb)



R35Z77TR08

(3) Loosen the hexagon bolt (3) and remove the idler (1) from the recoil spring assembly (3).
· Tightening torque : 6.5±0.7 kgf·m
(47.0±5.1 lbf·ft)

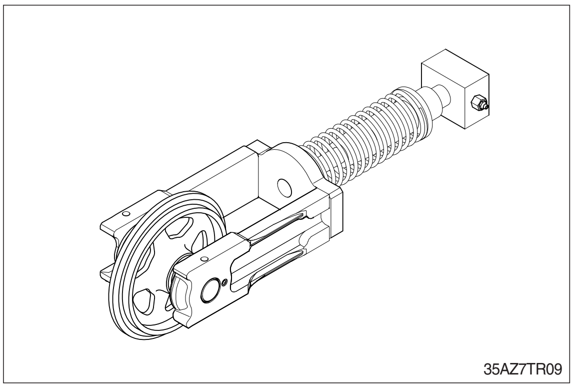


40A7TR09

2) INSTALL

(1) Carry out installation in the reverse order to removal.

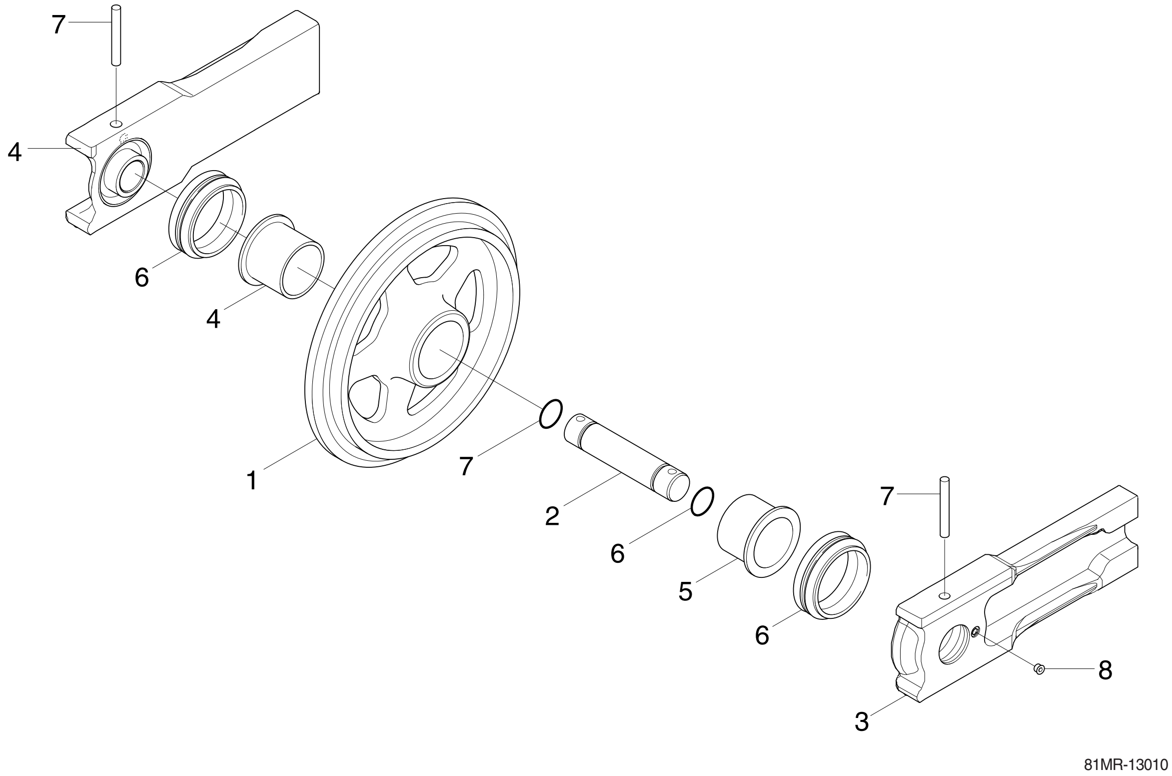
※ Make sure that the boss on the end face of the recoil cylinder rod is in the hole of the track frame.



35AZ7TR09

3) DISASSEMBLY AND ASSEMBLY OF IDLER

(1) Structure

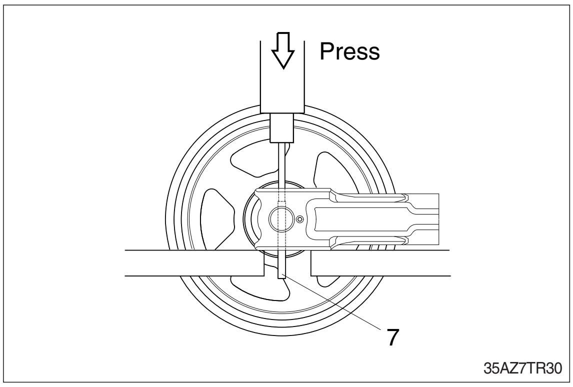


1	Shell	4	Bushing	7	Spring pin
2	Shaft	5	Seal assembly	8	Plug
3	Collar	6	O-ring		

(2) Disassembly

① Remove plug (8) and drain oil.

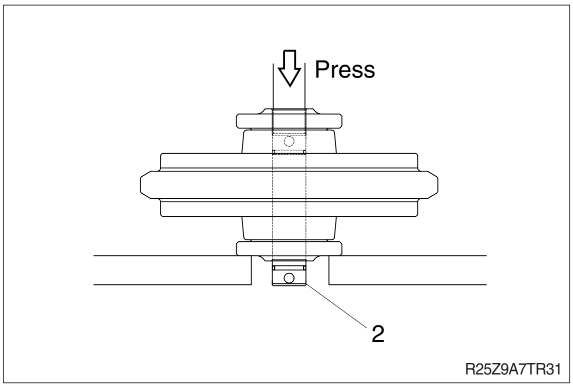
② Draw out the spring pin (7), using a press.



③ Pull out the shaft (2) with a press.

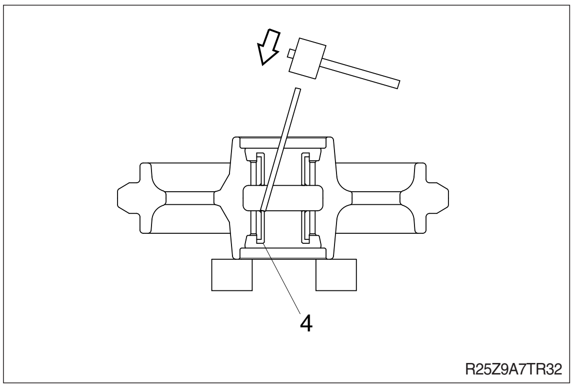
④ Remove seal (5) from idler (1) and collar (3).

⑤ Remove O-ring (6) from shaft.



⑥ Remove the bushing (4) from idler, using a special tool.

※ Only remove bushing if replacement is necessity.

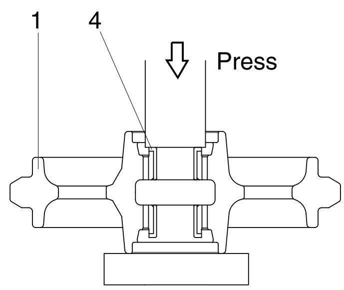


(3) Assembly

※ Before assembly, clean the parts.

※ Coat the sliding surfaces of all parts with oil.

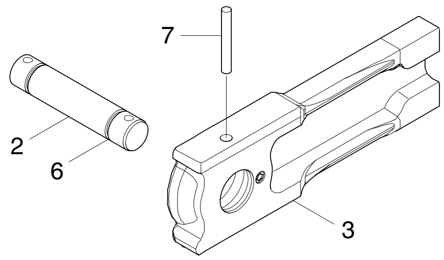
① Cool up bushing (4) fully by some dry ice and press it into shell (1).
Do not press it at the normal temperature, or not knock in with a hammer even after the cooling.



R25Z9A7TR33

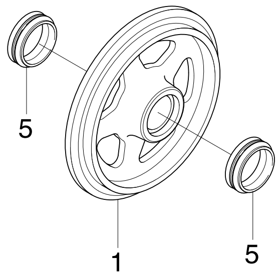
② Coat O-ring (6) with grease thinly, and install it to shaft (2).

③ Insert shaft (2) into collar (3) and drive in the spring pin (7).



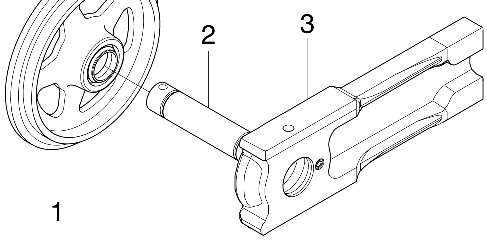
35AZ7TR34

④ Install seal (5) to shell (1) and collar (3).



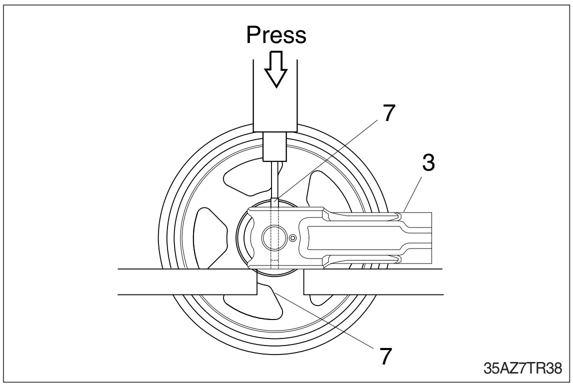
R25Z9A7TR35

⑤ Install shaft (2) and collar (3) to shell (1).

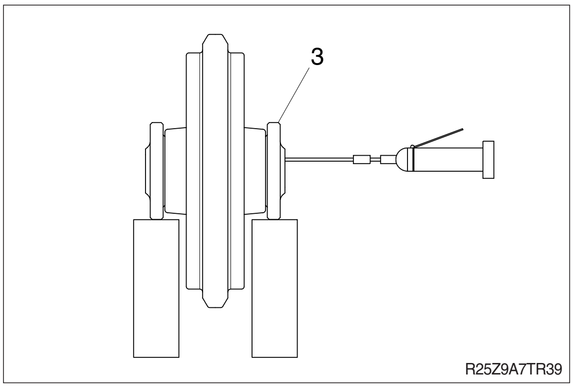


35AZ7TR36

⑥ Knock in the spring pin (7) with a hammer.

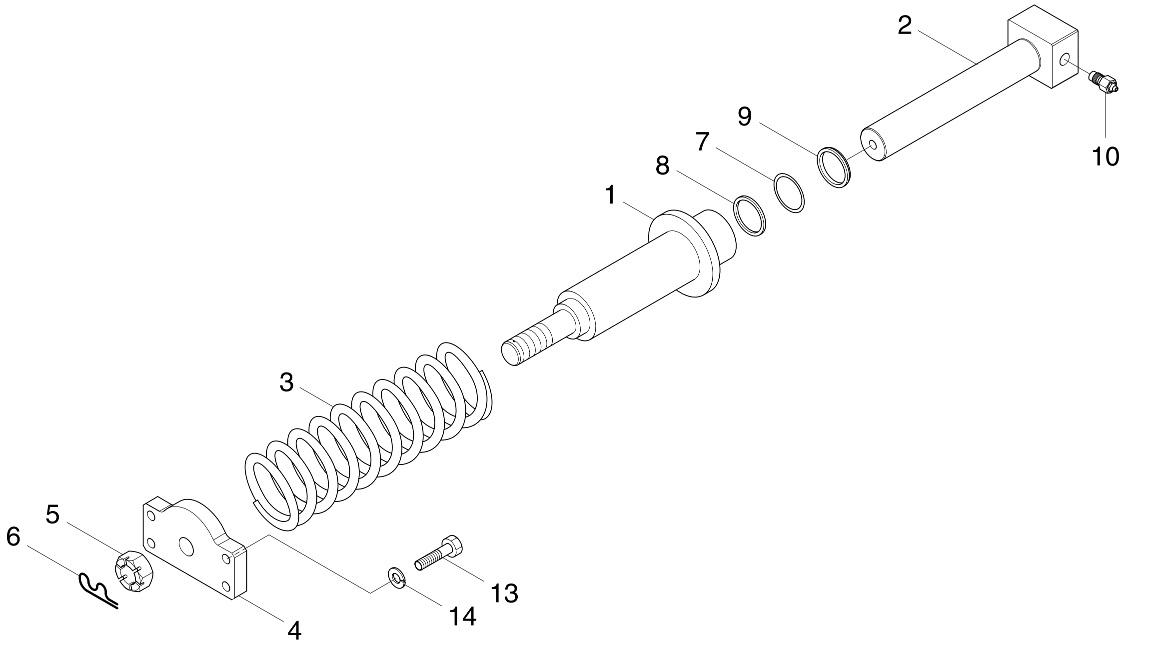


⑦ Lay collar (3) on its side.
Supply engine oil to the specified level, and tighten plug.



4) DISASSEMBLY AND ASSEMBLY OF RECOIL SPRING

(1) Structure



1	Tension cylinder	5	Castle nut	9	Dust seal
2	Piston	6	Split pin	10	Grease
3	Tension spring	7	Rod seal	13	Hexagon bolt
4	Yoke plate	8	Back up ring	14	Spring washer

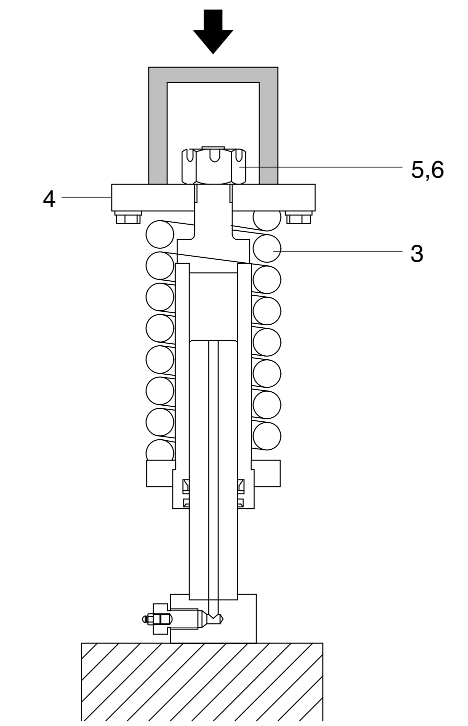
(2) Disassembly

① Apply pressure on yoke plate (4) with a press.

※ The spring is under a large installed load. This is dangerous, so be sure to set properly.

② Remove split pin (6) and castle nut (5). Take enough notice so that the press which pushes down the spring, should not be slipped out in its operation.

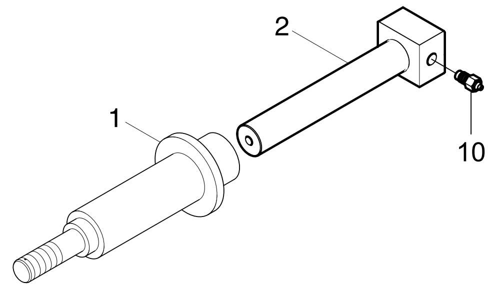
③ Lighten the press load slowly and remove yoke plate (4) and spring (3).



40A7TR13

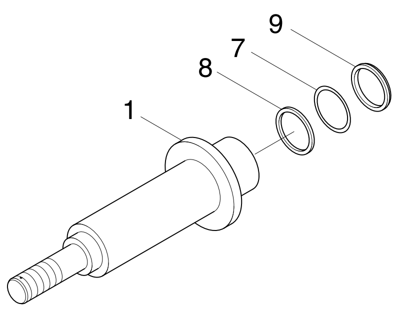
④ Remove piston (2) from tension cylinder (1).

⑤ Remove grease valve (10) from piston (2).



40A7TR14

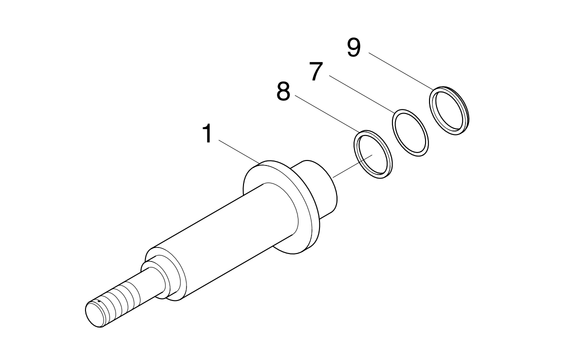
⑥ Remove dust seal (9), rod seal (8) and snap ring (7) from tension cylinder (1).



35AZ7TR15

(3) Assembly

① Install dust seal (9), rod seal (8) and snap ring (7) from tension cylinder (1).

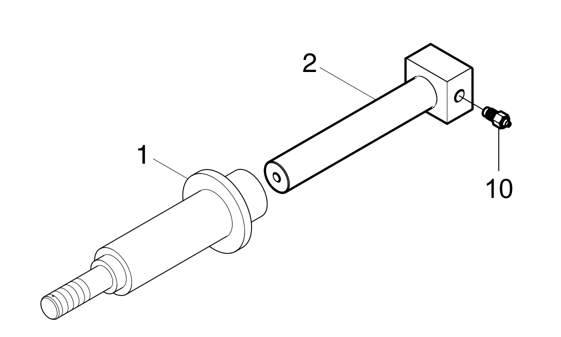


35AZ7TR15

② Pour grease into tension cylinder (1), then push in piston (2) by hand.
After take grease out of grease valve mounting hole, let air out.

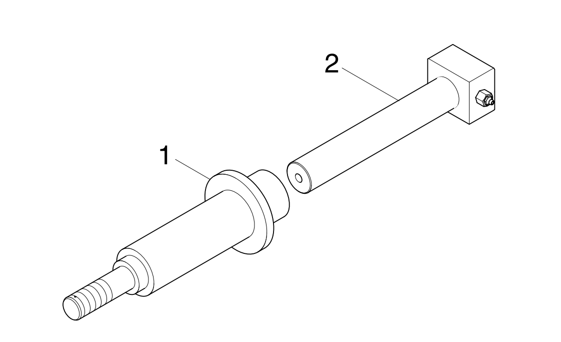
※ If air letting is not sufficient, it may be difficult to adjust the tension of crawler.

③ Fit grease valve (10) to piston (3).
· Tightening torque : 8 kgf · m (57.9 lbf · ft)



40A7TR14

④ Install piston (2) to tension cylinder (1).



40A7TR23

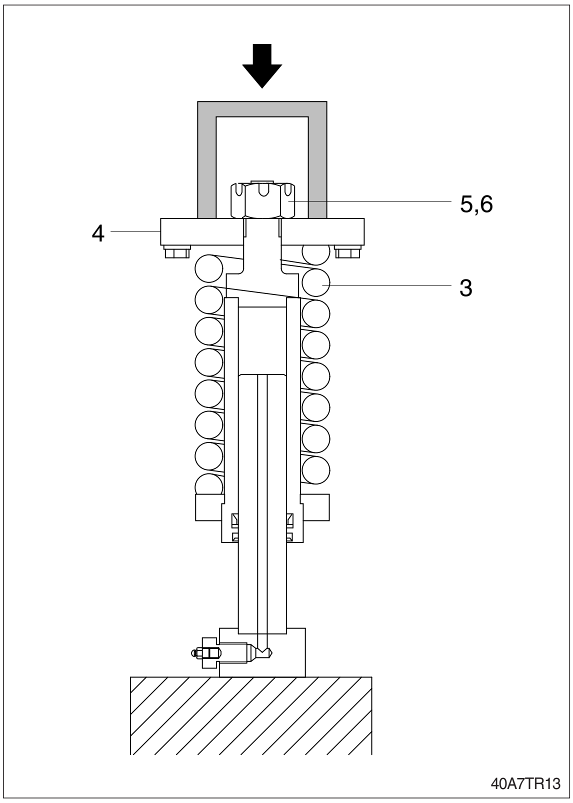
⑤ Install tension spring (3) and yoke plate (4) to tension cylinder (1).

⑥ Apply pressure to tension spring (3) with a press and tighten castle nut (5).

※ During the operation, pay attention specially to prevent the press from slipping out.

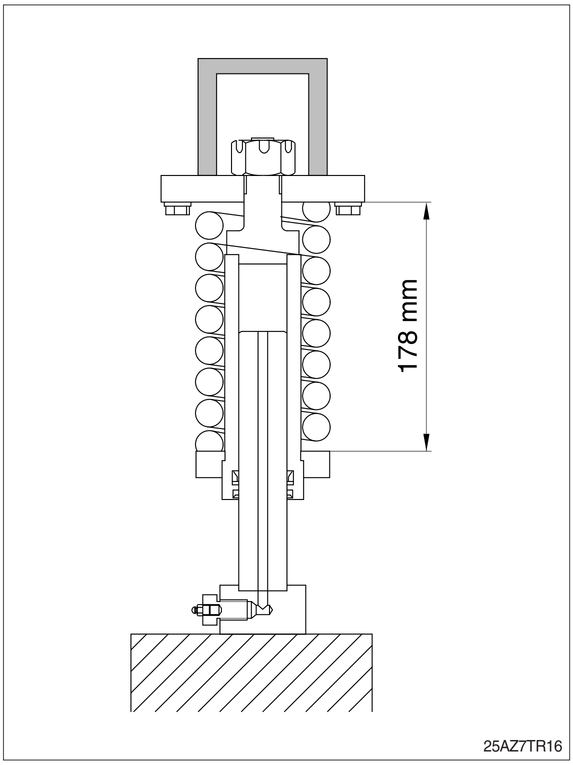
⑦ Tighten castle nut (5) and insert split pin (6).

· Tightening torque : 10.3±1.1 kgf·m (74.5±8.0 lbf·ft)



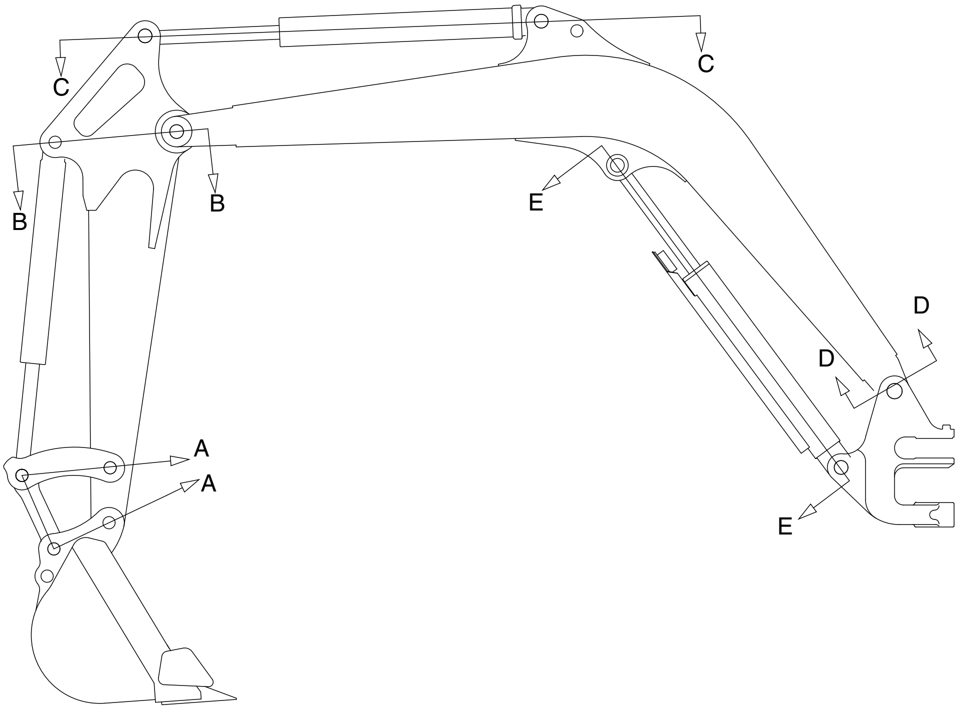
⑧ Lighten the press load and confirm the set length of tension spring (3).

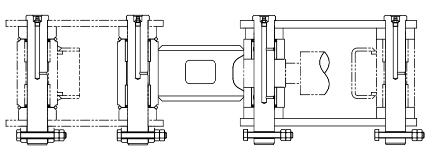
· Spring length : 178 mm



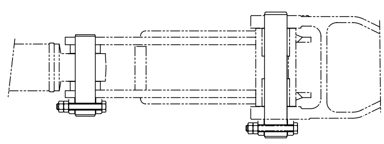
GROUP 11 WORK EQUIPMENT

1. STRUCTURE

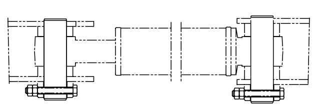




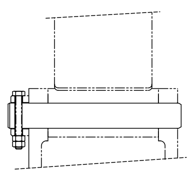
SECTION A-A



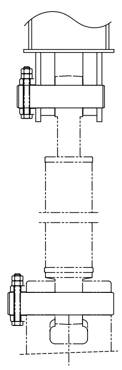
SECTION B-B



SECTION C-C



SECTION D-D



SECTION E-E

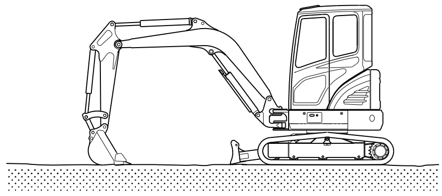
R27Z97AT01

2. REMOVAL AND INSTALL

1) BUCKET ASSEMBLY

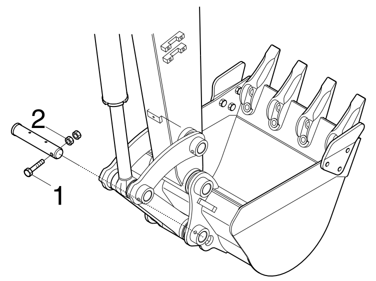
(1) Removal

① Lower the work equipment completely to ground with back of bucket facing down.



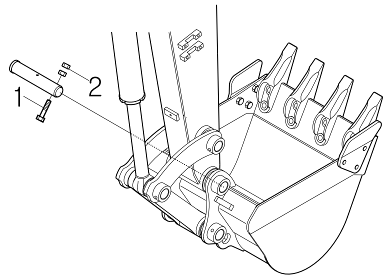
R27Z97AT02

② Remove nut (1), bolt (2) and draw out the pin (4).
  · Tightening torque : 12.8±3.0 kgf·m
                                (92.6±21.7 lbf·ft)



R35Z77AT03

③ Remove nut (1), bolt (2) and draw out the pin (3) then remove the bucket assembly.
  · Weight : 55 kg (120 lb)
  · Tightening torque : 12.8±3.0 kgf·m
                                (92.6±21.7 lbf·ft)



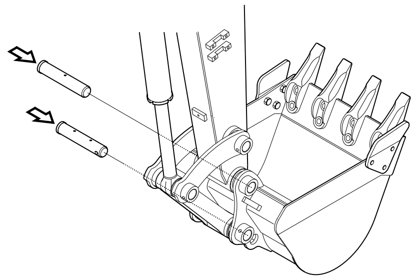
R35Z77AT04

(2) Install

① Carry out installation in the reverse order to removal.

⚠ **When aligning the mounting position of the pin, do not insert your fingers in the pin hole.**

※ Adjust the bucket clearance.
For detail, see operator's manual.



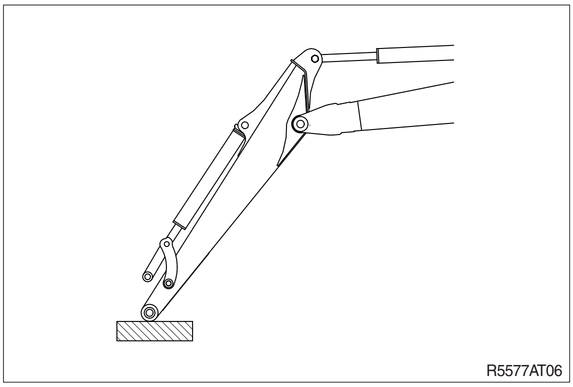
R35Z77AT05

2) ARM ASSEMBLY

(1) Removal

※ Loosen the breather slowly to release the pressure inside the hydraulic tank.

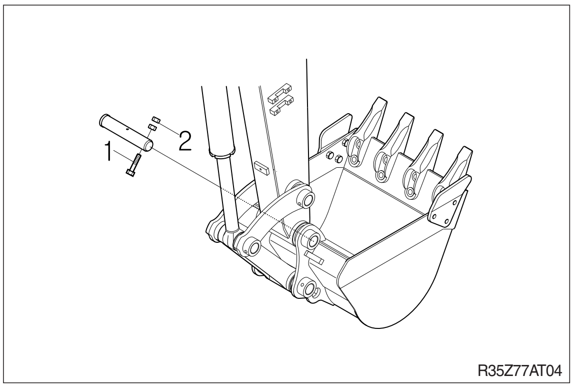
⚠ **Escaping fluid under pressure can penetrated the skin causing serious injury.**


R5577AT06

① Remove bucket assembly.
For details, see removal of bucket assembly.

② Disconnect bucket cylinder hose (4).

⚠ **Fit blind plugs (5) in the piping at the chassis end securely to prevent oil from spurting out when the engine is started.**



R35Z77AT04

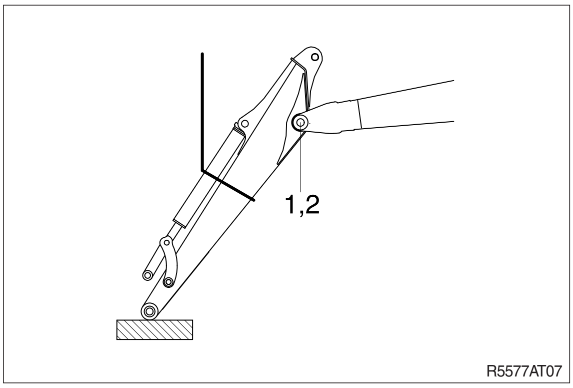
③ Sling arm cylinder assembly, remove spring, pin stopper and pull out pin.

※ Tie the rod with wire to prevent it from coming out.

④ For details, see removal of arm cylinder assembly.
Place a wooden block under the cylinder and bring the cylinder down to it.

⑤ Remove bolt (1) and pull out the pin (2) then remove the arm assembly.
- Weight (1.12 m arm) : 46 kg (100 lb)
- Tightening torque : 12.8±3.0 kgf·m (92.6±21.7 lbf·ft)

※ When lifting the arm assembly, always lift the center of gravity.



R5577AT07

(2) Install

① Carry out installation in the reverse order to removal.

⚠ **When lifting the arm assembly, always lift the center of gravity.**

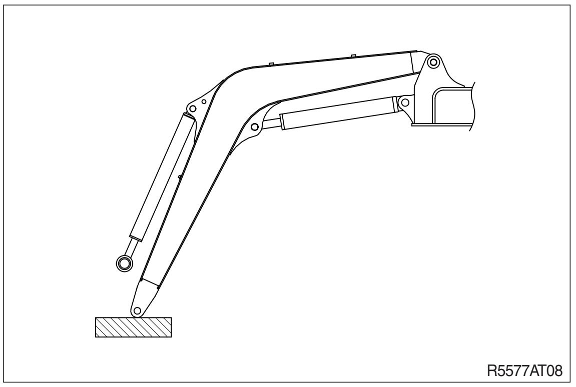
※ Bleed the air from the cylinder.

3) BOOM CYLINDER

(1) Removal

① Remove arm and bucket assembly.
For details, see removal of arm and bucket assembly.

② Remove boom cylinder assembly from boom.
For details, see removal of arm cylinder assembly.



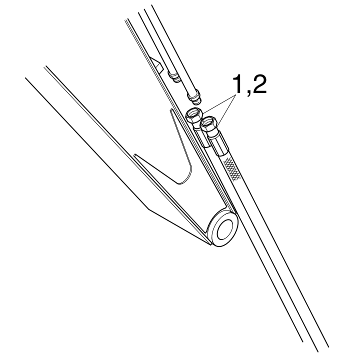
R5577AT08

③ Disconnect head lamp wiring.

④ Disconnect bucket cylinder hose (2) and arm cylinder hose (1).

※ When the hose are disconnected, oil may spurt out.

⑤ Sling boom assembly (3).



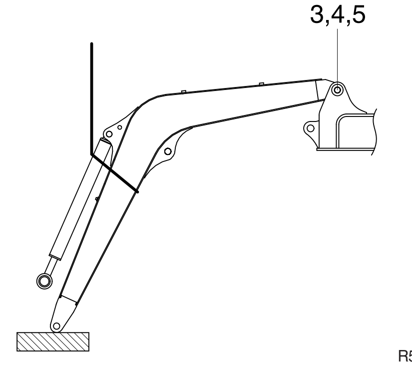
R5577AT10

⑥ Remove bolt (3), nut (4) and pull out the pin (5) then remove boom assembly.

· Weight : 101 kg (220 lb)

· Tightening torque : 12.8±3.0 kgf·m (92.6±21.7 lbf·ft)

※ When lifting the boom assembly always lift the center of gravity.



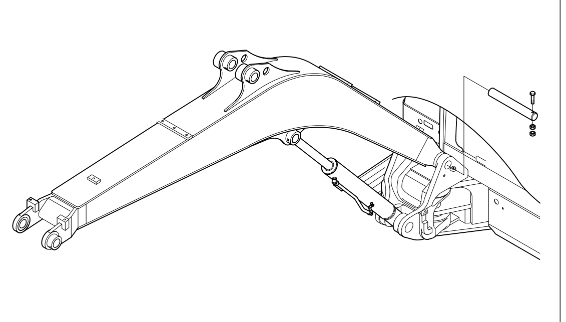
R5577AT09

(2) Install

① Carry out installation in the reverse order to removal.

⚠ **When lifting the arm assembly, always lift the center of gravity.**

※ Bleed the air from the cylinder.



R35Z77AT06