Shop Manual

VENBM68001

PW148-11

MACHINE MODEL	SERIAL NUMBER
PW148-11	H55051 AND UP

- This shop manual may contain attachments and optional equipment that are not available in your area. Please consult your local Komatsu distributor for those items you may require.
- Materials and specifications are subject to change without notice.
- PW148-11 mount the SAA4D107E-3 engine.
- For details of the engine, see the 107 Series Engine Shop Manual.

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KOMATSU

Category	Code	Part No.	Quantity	Container	Main applications, features
Gasket sealant	LG-4	790-129-9020	200 g	Tube	• Features: Resistance to water, oil • Used as sealant for flange surface, thread. • Also possible to use as sealant for flanges with large clearance. • Used as sealant for mating surfaces of final drive case, transmission case.
	LG-5	790-129-9080	1 kg	Polyethylene container	• Used as sealant for various threads, pipe joints, flanges. • Used as sealant for tapered plugs, elbows, nipples of hydraulic piping.
	LG-6	09940-00011	250 g	Tube	• Features: Silicon based, resistant to heat, cold. • Used as sealant for flange surface, thread. • Used as sealant for oil pan, final drive case, etc.
	LG-7	09920-00150	150 g	Tube	• Features: Silicon based, quick hardening type. • Used as sealant for flywheel housing, intake manifold, oil pan, thermostat housing, etc.
	Three bond 1211	790-129-9090	100 g	Tube	• Used as heat-resisting sealant for repairing engines.
Molybdenum disulphide lubricant	LM-G	09940-00051	60 g	Can	• Used as lubricant for sliding parts (to prevent squeaking).
	LM-P	09940-00040	200 g	Tube	• Used to prevent seizure or scuffing of the thread when press fitting or shrink fitting. • Used as lubricant for linkage, bearings, etc.
Grease	G2-LI	SYG2-400LI SYG2-350LI SYG2-400LI-A SYG2-160LI SYGA160CNLI	Various	Various	• General purpose type
	G2-CA	SYG2-400CA SYG2-350CA SYG2-400CA-A SYG2-160CA SYG2-160CNCA	Various	Various	• Used for normal temperature, light load bearing at places in contact with water or steam.
	Molybdenum disulphide lubricant	SYG2-400M	400 g (10 per case)	Belows type	• Used for places with heavy load.

Temperature

Fahrenheit Centigrade Conversion; a simple way to convert a Fahrenheit temperature reading into a Centigrade temperature reading or vise versa 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	-7.2	19	66.2	12.2	54	129.2	31.7	89	192.2
-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	30	86.0	18.3	65	149.0	37.8	100	212.0
-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	175	347.0

Weight table

This weight table is for use when handling components or when transporting the machine.

Unit: kg

Machine model		**PW148-11**
Serial Number		**H55051 and up**
Engine assembly		436
Hydraulic pump		100
Radiator oil cooler assembly		175
Hydraulic tank, filter assembly (excluding hydraulic oil)		188
Fuel tank (excluding fuel)		130
Revolving frame		1218
Operator's cab		687
Operator's seat	Mechanical	45
	Air Suspension	48
Counterweight		2443
Swing machinery		107
Control valve 1 PB / 2 PB		138/138
Travel motor		67
centre swivel joint		130

Abbreviation	Actual word spelled out	Purpose of use (major applicable machine (*1), or component/system)	Explanation
NO	Normally Open	Electrical system, Hydraul- ic system	Characteristics of electrical or hydraulic circuits. Circuit is normally open if it is not actuated, and it closes when it is actuated.
OLSS	Open-center Load Sensing System	Hydraulic system	Hydraulic system that can operate multiple actuators at the same time, regardless of the load.
PC	Pressure Compensation	Hydraulic system	A function used to correct oil pressure.
PCCS	Palm command control system	Steering (D)	System in which a controller instantly analyses data from each lever, pedal, and dial, and per- forms optimum electronic control of the engine and transmission.
PCV	Pre-stroke Control Valve	Engine	This valve is installed at inlet port of pump and it adjusts fuel intake amount in order to control fuel discharged volume of supply pump.
PPC	Proportional Pressure Control	Hydraulic system	This system is used for controlling proportional pressure. It moves actuators in proportion to the oil pressure.
PPM	Piston Pump and Motor	Hydraulic system (D, PC, etc)	Piston type hydraulic pump and motor.
PTO	Power Take Off	Power train system	Power take-off mechanism.
PTP	Power Tilt and power Pitch dozer	Work equipment (D)	This function performs hydraulic control of the tilt and pitch of the bulldozer blade.
ROPS	Roll-Over Protective Structure	Cab and canopy	If a machine tips over, this structure protects the operator wearing a seatbelt from being crushed. (Operator Protective structure when tipping) This performance is standardized as ISO 3471.
SCR	Selective Catalytic Reduction	Urea SCR system	It is exhaust gas purifier using urea water converts nitrogen oxides (NO_x) to harmless nitrogen and water by oxidation-reduction reaction. It may also be mentioned as exhaust gas purification catalyst or part of the name of related devices.
SI	Le Systeme International d' Unites (International unit system)	Unit	Abbreviation for "Le Systeme International d' Unites". It is the universal unit system and "a single unit for a single quantity" is the basic principle applied.
SOL	Solenoid	Electrical system	It refers to an actuator consisting of a solenoid and an iron core that is moved by the magnetic force when the solenoid is energized.
TWV	2-Way Valve	Hydraulic system	Solenoid valve that switches over direction of flow.
VGT	Variable Geometry Turbocharger	Engine	The turbocharger on which the cross-section area of the exhaust passage is made variable.

*1: Code for applicable machine model

D: Bulldozer

HD: Dump truck

HM: Articulate dump truck

PC: Hydraulic excavator

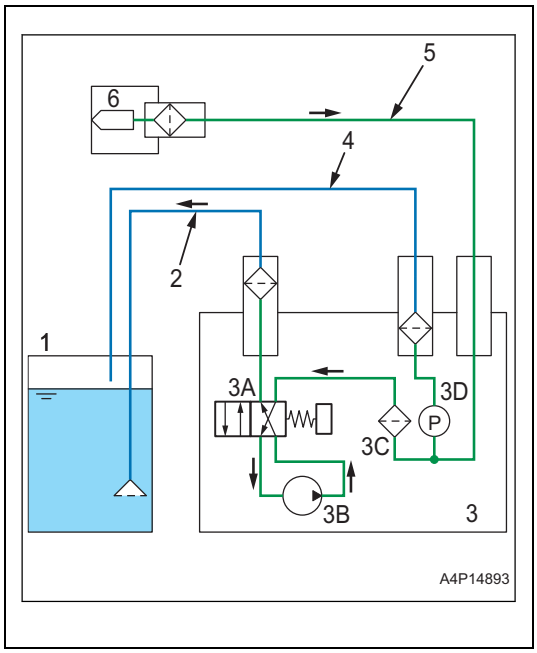
WA: Wheel loader

AdBlue/DEF purge function

- This is a function that purges remaining AdBlue/DEF in AdBlue/DEF system automatically after engine is stopped
- It purges AdBlue/DEF from inside of injector or pump in order to prevent blocking or sticking by deposited urea in AdBlue/DEF, or malfunction of equipment caused by frozen AdBlue/DEF in cold weather.
  For this reason, the system operates for few minutes even after engine is stopped, but this is not an abnormality

NOTICE

Do not turn off the battery disconnect switch while purging AdBlue/DEF.



Function of AdBlue/DEF thawing and preventing from freezing

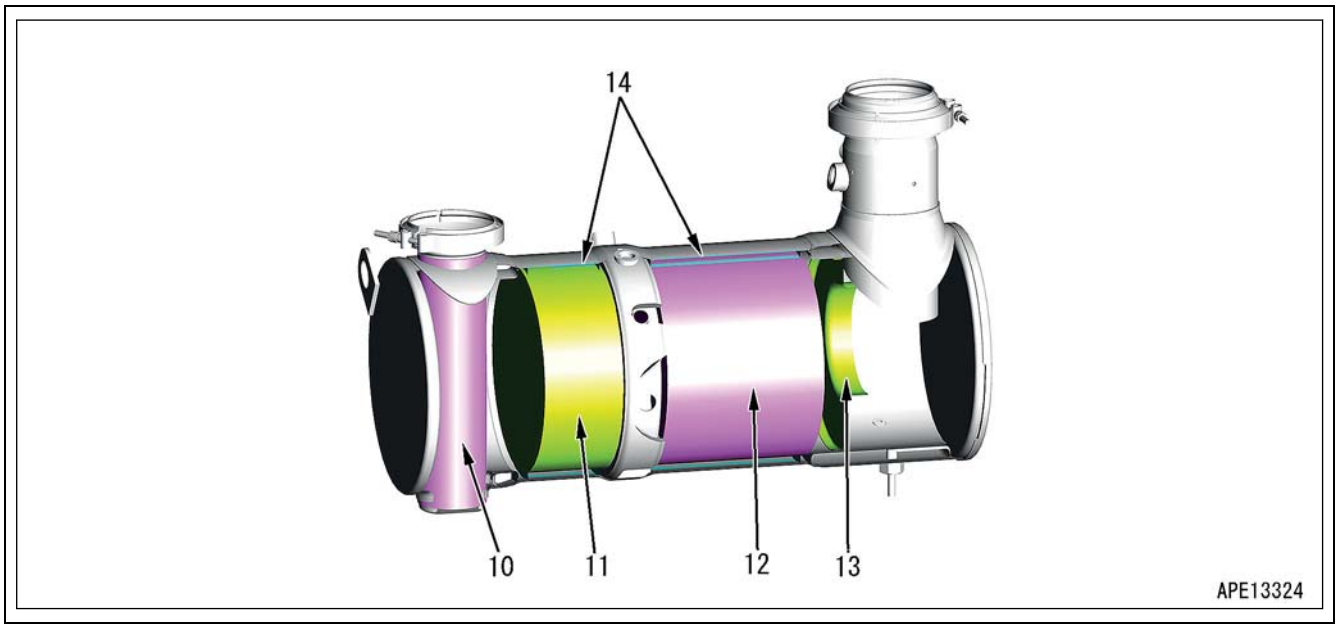
- This function has the thawing mode and freeze prevention mode.
- Thawing mode is the function to thaw the frozen AdBlue/DEF.
  - After starting engine, if the engine controller judges that AdBlue/DEF must be thawed, this function au- tomatically heats the system.
  - At this time, pressure control of AdBlue/DEF pump and injection of AdBlue/DEF are not performed until the thawing is completed.
- Freeze prevention mode is the function to keep AdBlue/DEF warm to prevent it from freezing.
  - This function automatically heats the system to prevent it from freezing while operating the machine, if engine controller judges that AdBlue/DEF could be frozen.
  - This function stops the pressure control of AdBlue/DEF pump and injection of AdBlue/DEF if it judges that AdBlue/DEF is frozen while operating the machine.
- Thawing and freeze prevention mode are controlled by sensor and the sensors vary by devices which AdBlue/DEF system consists of. The following table shows the relationship among the object devices, heating system and the sensors for each mode.

*2: These failure codes are displayed on “Current Abnormality” in the operator mode, or “Abnormality Record” in the service mode. For the failure codes, see TROUBLESHOOTING, “TROUBLESHOOTING POINTS FOR UREA SCR SYSTEM”.

*3: These percentages show a torque reduction ratio from the full torque curve, and a speed reduction ratio from the rated speed.

*4: Construction equipment with crawler

*5: Construction equipment with wheel



10. Rectifier tube
11. Upstream SCR catalyst
12. Downstream SCR catalyst and ammonia oxidation catalyst (integrated type)
13. Water dam
14. Catalyzer hold mat

SCR assembly consists of rectifier tube (10) equalizing the distribution of flow speed by leading exhaust gas, upstream SCR catalyst (11), downstream SCR catalyst, ammonia oxidation catalyst (integrated type) (12), and water dam (13) which prevents rain water from entering into downstream SCR catalyst and ammonia oxidation catalyst (integrated type) (12) while exhausting gas.

Ammonia oxidation catalyst (a part of 12) oxidizes ammonia to water and nitrogen with ammonia oxidation catalyst (a part of 12) to prevent ammonia which is supplied to SCR assembly from being released out be- cause SCR catalyst (a part of 12, 11) cannot completely consume it.

SCR assembly has SCR temperature sensor (2), SCR outlet temperature sensor (5), and SCR outlet NOx sensor (3) (1 piece each). These sensors monitor the function of SCR catalyst. These sensors are used for various troubleshooting.

Rectifying tube (10) equalizes the distribution of exhaust gas flow speed.

SCR catalyst (a part of 12, 11) uses the ceramic honeycomb

The catalyzer holding mat (9) is made of a specific fiber and protects the ceramic catalyst against vibrations by the engine and the machine body. It also protects the outer periphery of SCR assembly against a heat transfer of the ceramics during operation.

Water dam (13) is located at the upstream side of the outlet and prevents rainwater from entering into downstream SCR catalyst unit and ammonia oxidation catalyst (integrated type) (12).

Water baffle (4) is located at the downstream side of the outlet and prevents rainwater at outlet from splashing over the detection part of NOx sensor.

NOTICE

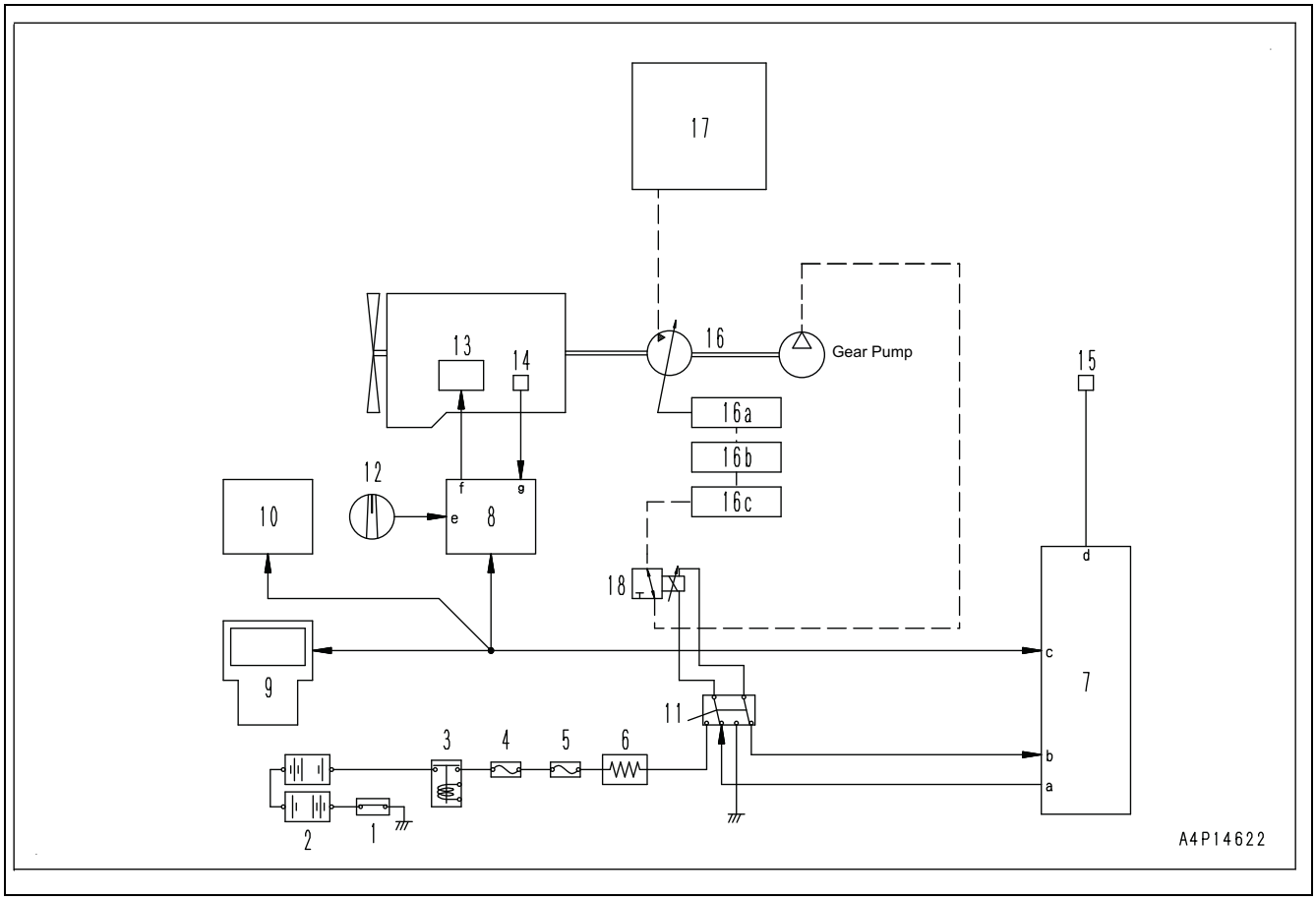
- **Do not turn battery disconnect switch (1) to OFF position while the system operating lamp is lit. If battery disconnect switch (1) is turned to OFF position while the system operating lamp is lit, the data in the controller may be lost and the controller may be damaged seriously.**
- **Do not turn battery disconnect switch (1) to OFF position while the engine is running or immediately after the engine is stopped. If battery disconnect switch (1) is turned to OFF position while the alternator is generating power, the generated current has nowhere to go, leading to overvoltage in the electrical system of the machine, which may cause serious damage to the electrical system, including the electric devices and controllers.**

REMARK

- The system operating lamp lights up while the controller is in operation or AdBlue/DEF pump is in operation. It lights up when KOMTRAX is performing communication, even if the starting switch is set to OFF position.
- If battery disconnect switch (1) has been at OFF position for a long period, the machine monitor and the clock of the radio may be initialized. In this case, re-setting is required.

Overheat prevention system

Overheat prevention system diagram

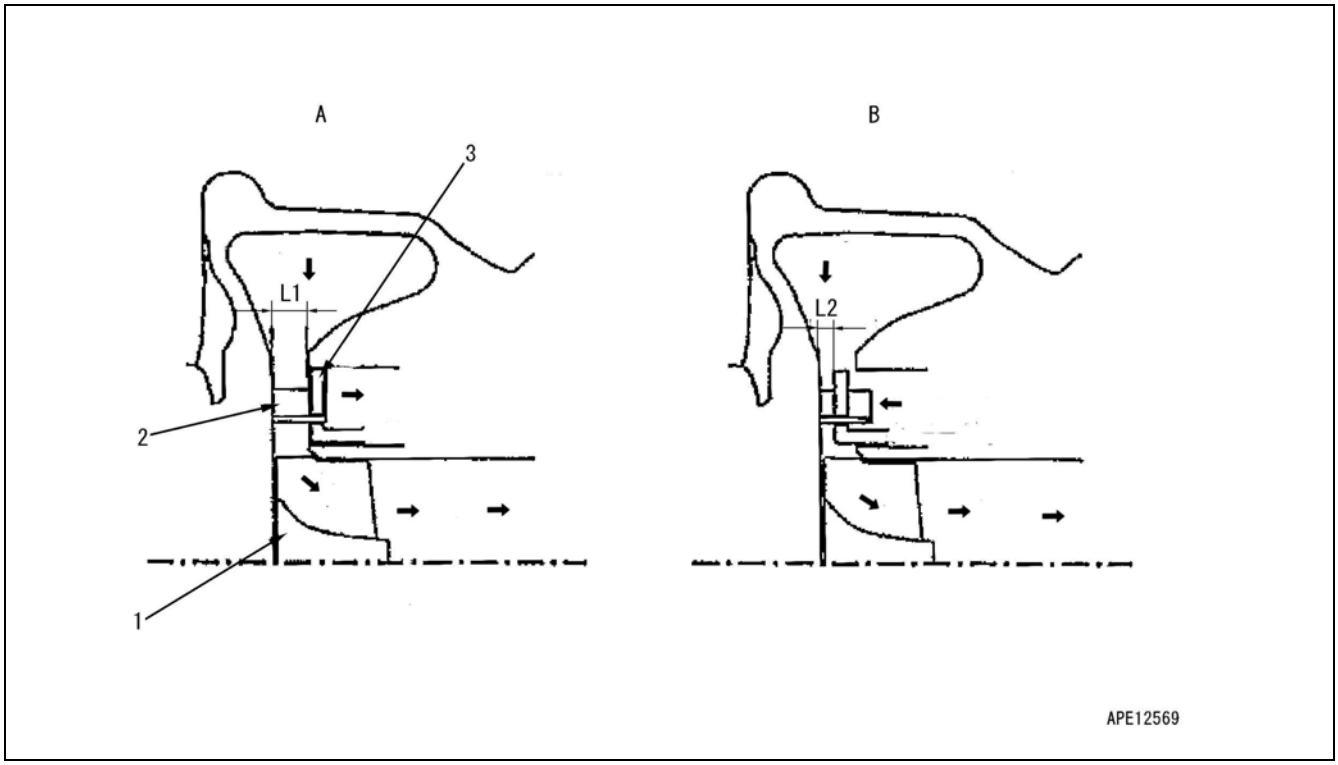


A. PC-EPC valve drive signal
B. Solenoid valve GND
C. CAN signal
1. Battery disconnect switch
2. Battery
3. Battery relay
4. Fusible link
5. Fuse box
6. Resistor for PC-EPC valve
7. Pump controller
8. Engine controller
9. Machine monitor
10. Air conditioner unit
11. Pump secondary drive switch
D. Hydraulic oil temperature signal
E. 1st throttle signal
F. Fuel supply pump control signal
G. Various sensor signals
12. Fuel control dial
13 Fuel supply pump
14 Various sensors
15 Hydraulic oil temperature sensor
16 Main pump
16a Servo
16b LS valve
16c PC valve
17 Control valve
18 PC-EPC valve

Operation of VGT

REMARK

Four cylinder engine is shown in the figure.



A. Moving shroud is open.
B Moving shroud is close.
1 Turbine rotor
2 Fixed vane
3

- (L1) and (L2) shows the flow rate range of exhaust gas.
- Turbo pressure is controlled by the exhaust gas whose passage is controlled by the moving shroud (3) being moved.
- The position of the moving shroud (3) is determined by the actuator which is driven by the command from the engine controller.

- Crankcase pressure may increases and oil leakage may occur if filter (6) of KCCV ventilator is clogged. Thus, crankcase pressure sensor detects the clogging of filter (6).
- Keep KCCV ventilator warm with warmed-up engine coolant, to prevent the blowby gas passage from being clogged.
- Relief valve (4) is inside case (1), and it operates to bypass the blowby gas and protect both KCCV ventilator and the engine when filter (6) is blocked.

Operation of KCCV ventilator

1. When blowby gas enters blowby gas inlet (A) and passes through the hole of impactor (5) in filter (6), large particles in the oil mist are separated.
2. Small particles in the oil mist are separated by filter (6).
3. The separated oil oozes out from the bottom of the filter (6), and flows to oil drain port (C), and then flows to the engine oil pan.
4. The crankcase pressure sensor (3) senses the crankcase pressure (blowby gas pressure). If the engine controller detects filter clogging by detected value of crankcase pressure sensor (3), it displays failure code CA555. If the pressure increases further, it displays failure code CA556.
5 . Relief valve (4) is installed in case (1) and operates when filter (6) is blocked.
6 . When the crankcase pressure becomes negative, CDR valve (2) operates for it not to become excessively negative.

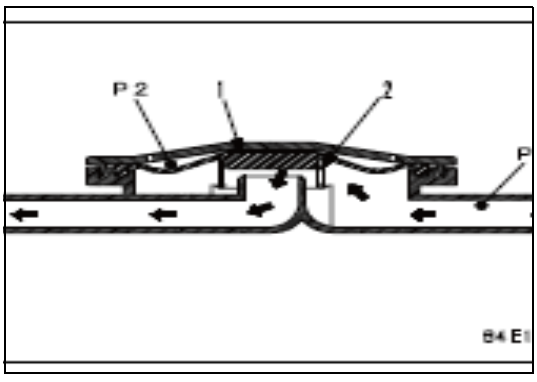
CDR valve

CDR

Abbreviation for Crankcase Depression Regulator

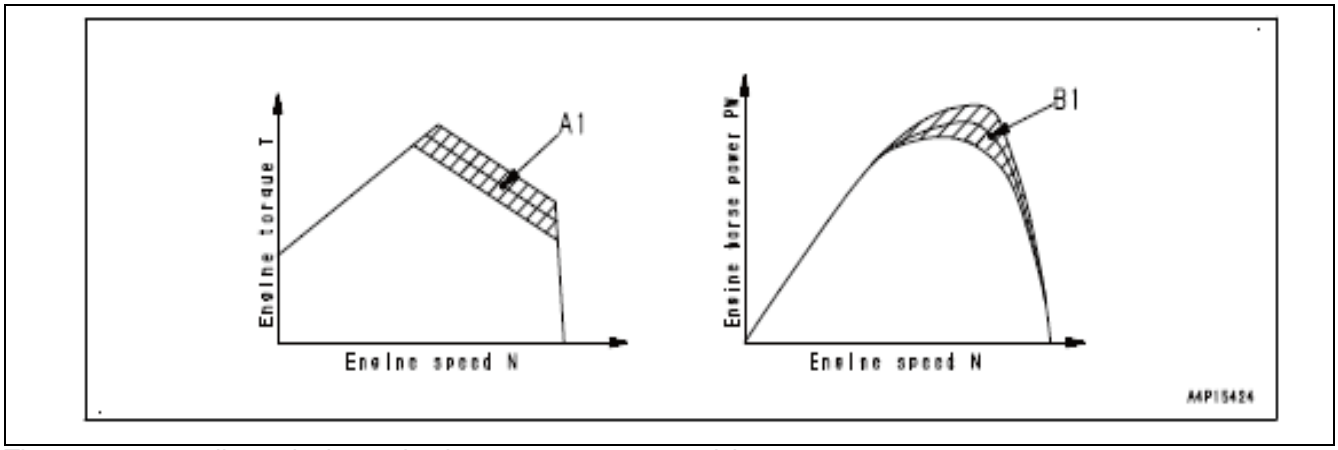
Operation of CDR valve

1. Spring (2) normally pushes up diaphragm (1), and the blowby gas flows from crankcase side (A) into turbocharger side (air intake side) (B).
2. As the intake air at turbochaeger side (air intake side) (B) increases, pressure on crankcase side (P1) decreases.
3. The reaction force of spring (2) is overwhelmed by ambient pressure (P2). Diaphragm (1) shuts the passage and temporarily blocks the flow.
4. When the blowby gas accumulates in the crankcase, pressure (P1) on the crankcase side increases, and it pushes up diaphragm (1) again and blowby gas starts to flow.



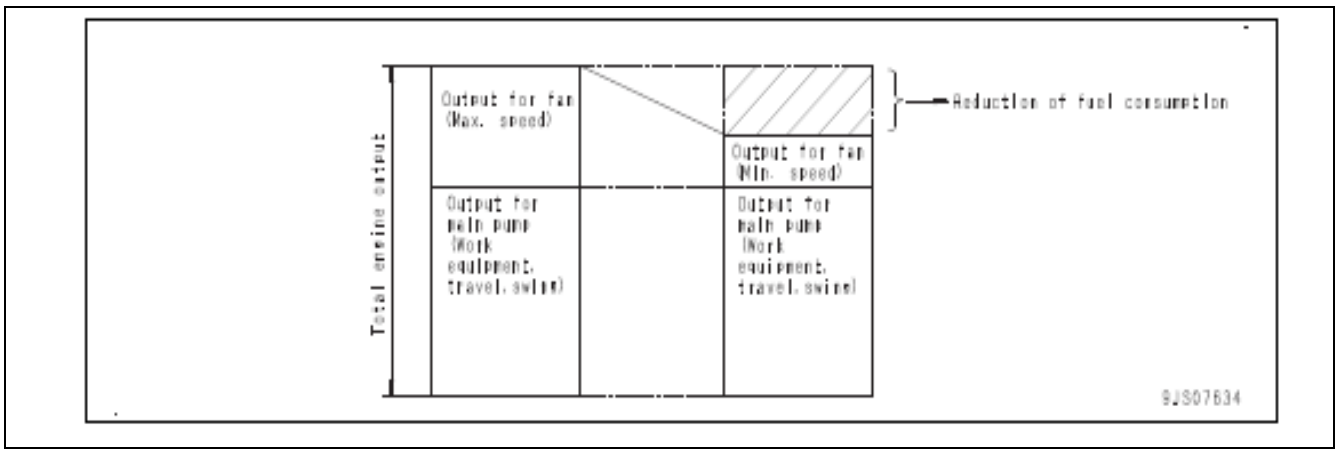
Function of engine output control system of fan clutch

At normal operation



The pump controller calculates the horsepower consumed by the fan, and controls engine output curves (A1) and (82) with the fan speed to reduce unnecessary fuel consumption.

Image of engine output (when fan speed varies)



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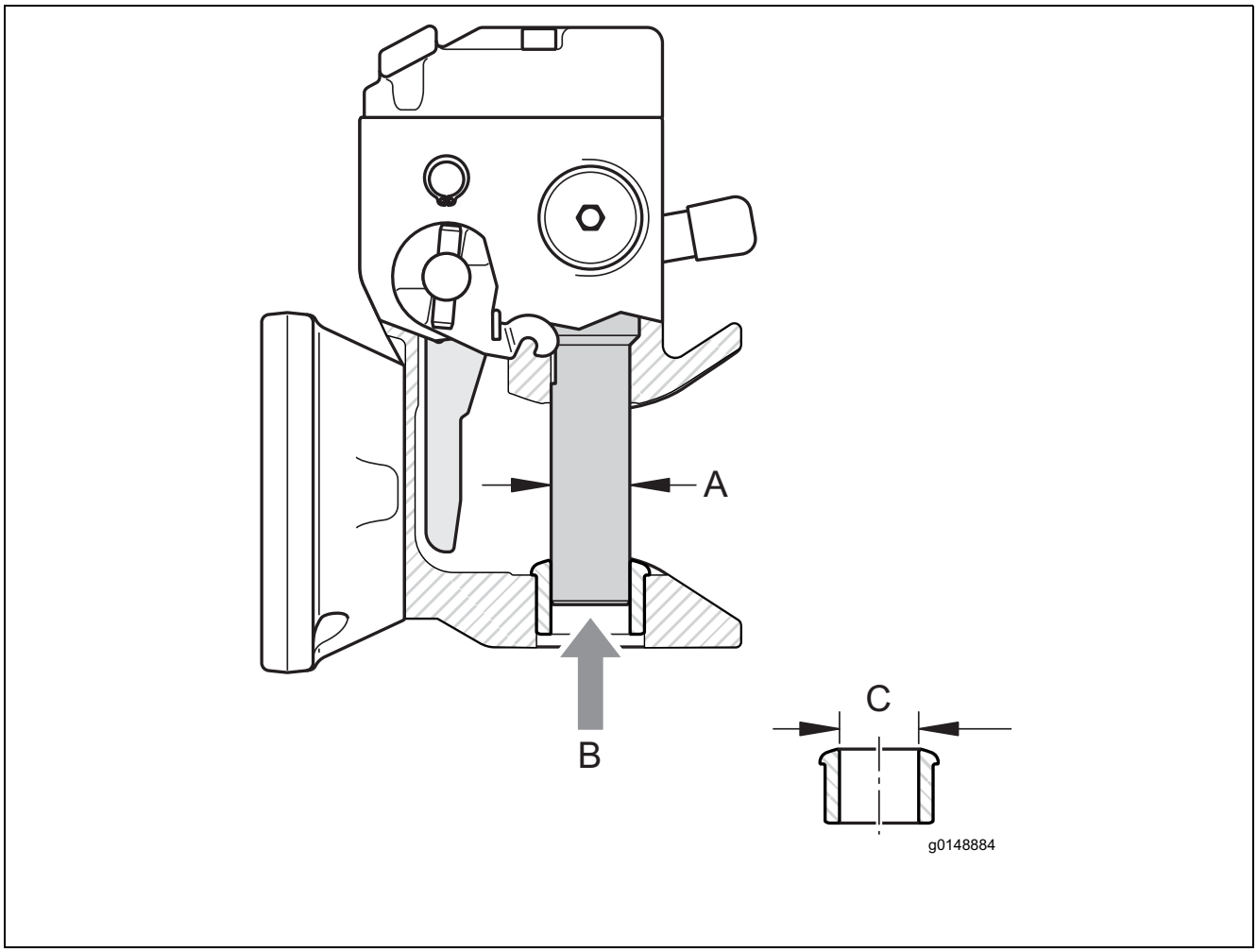
Wear limits

1. Coupling pin, bushing



Wear dimensions around the coupling pin

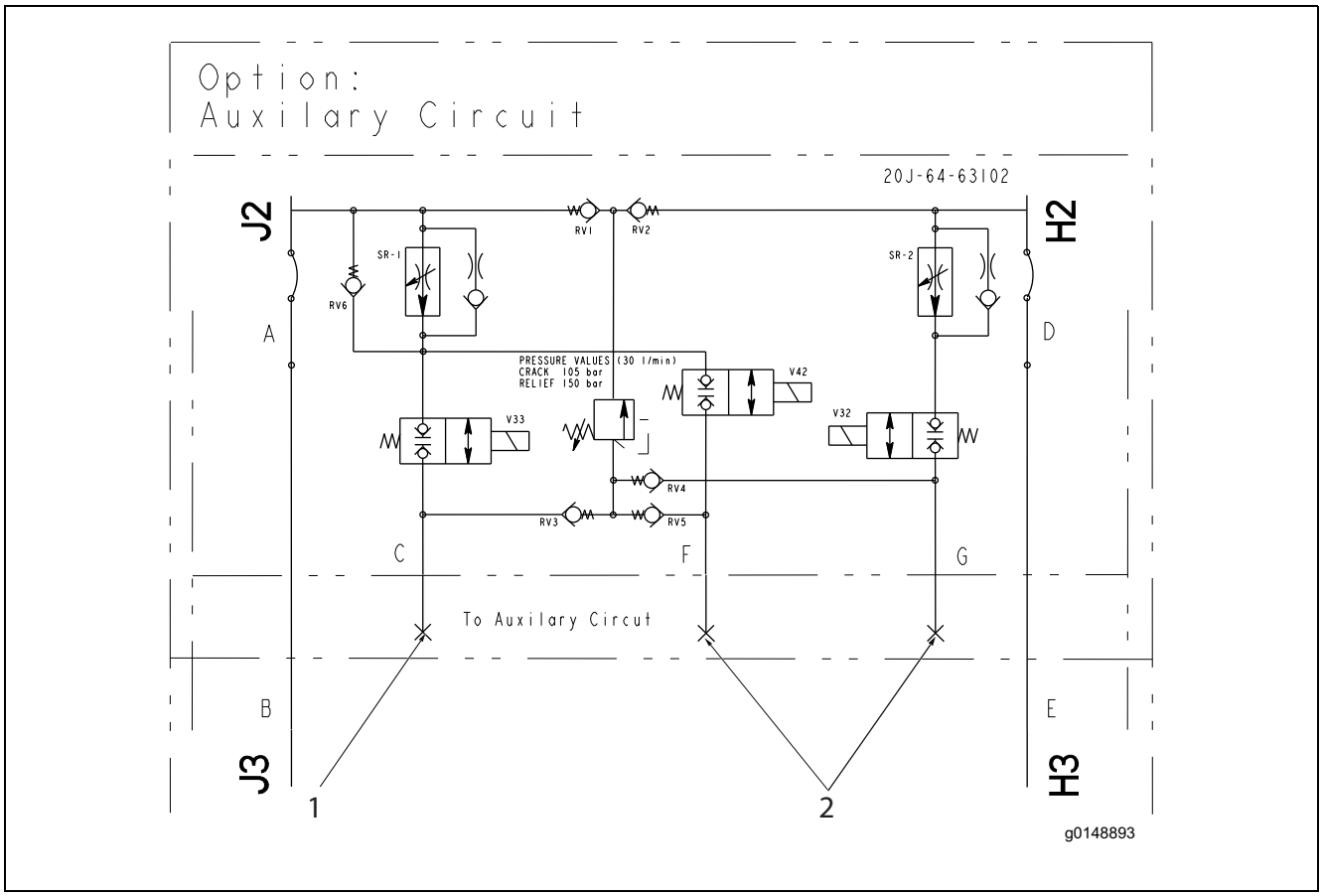
Measure	Measuring equipment	Designation	Type	Wear limit (mm)
A	Vernier caliper	Coupling pin Ø 38 mm	860	Ø 36
B	Depth gauge	Coupling pin Height clearance	-	2.5
C	Vernier caliper	Bottom socket	860	Ø 24.5

Specifications

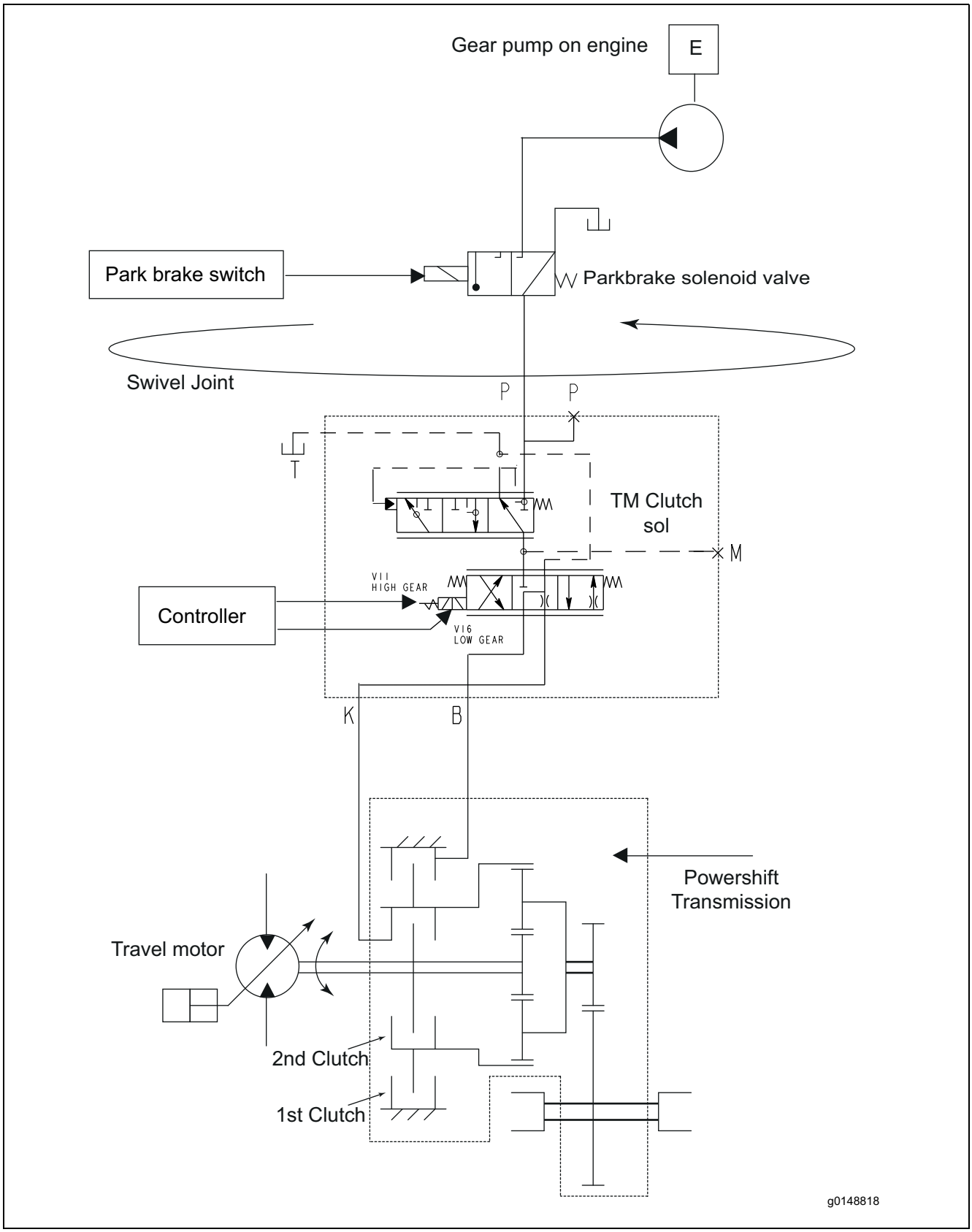
	Auxiliary circuit 1	Auxiliary circuit 2
Function	**single-acting**	**double-acting**
Max. pressure (bar)	150	30
Max. volume flow L/min	30	30

PW148-11: Schematic of auxiliary circuit

The hydraulic diagram shows the auxiliary circuit.



Clutch control circuit



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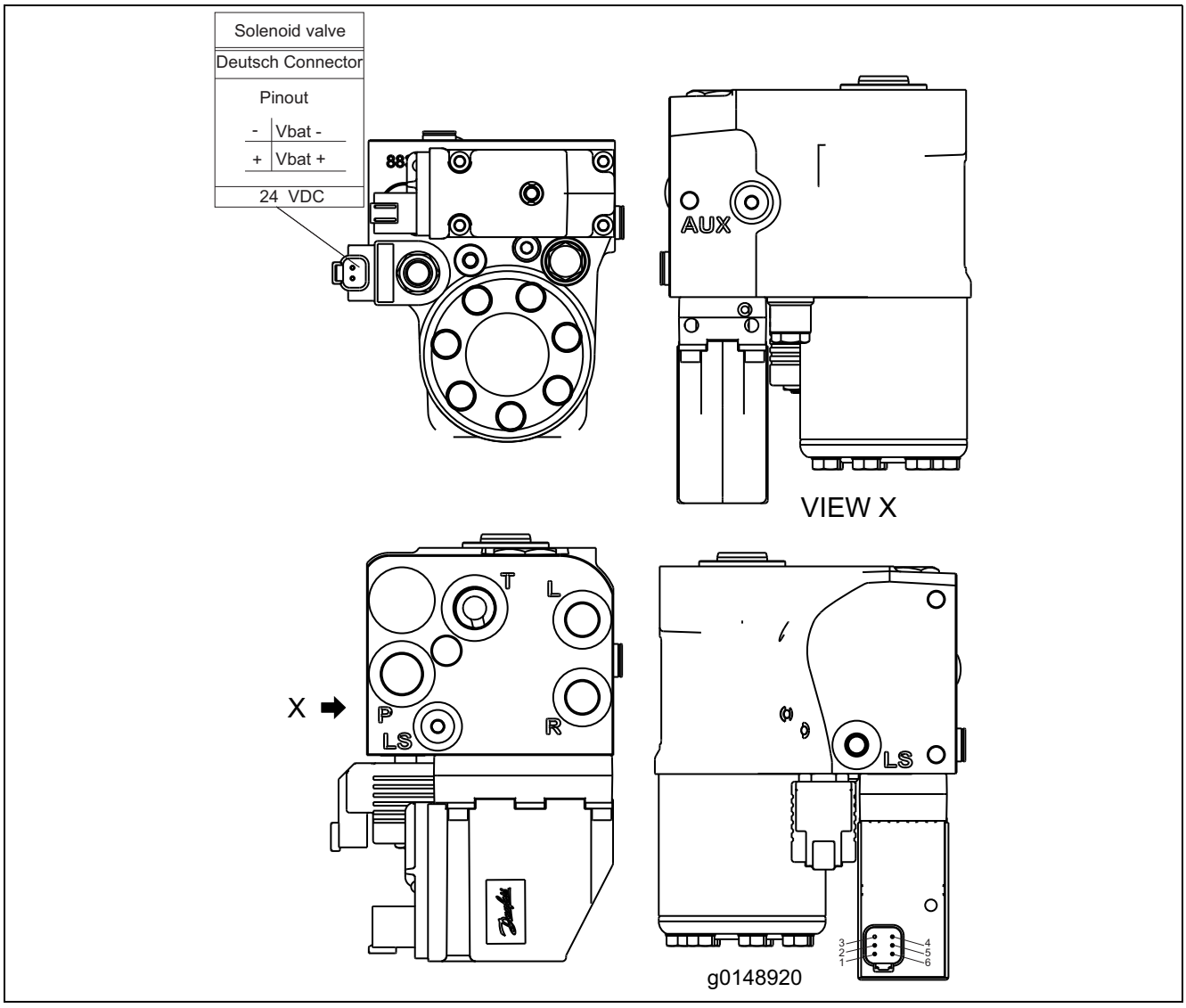
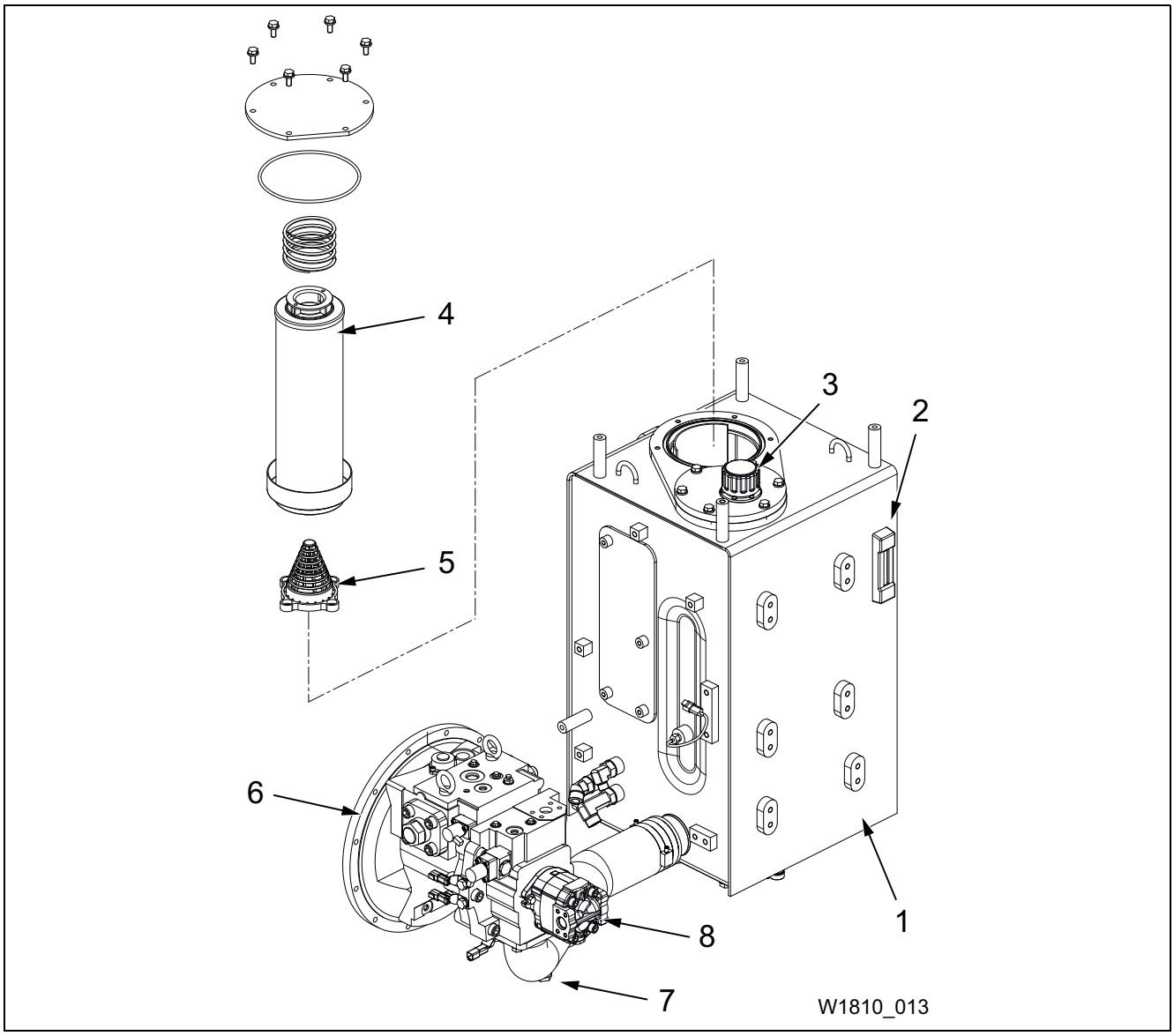


Specifications

Nominal displacement (normal operation)	160 cc/rev
Nominal displacement (emergency operation)	80cc/rev
Relief valve setting	190-200 bar

P	Pressure port (from priority valve)
T	Tank port
L	left turn port
R	Right turn port
LS	Load sensing port (to priority valve)

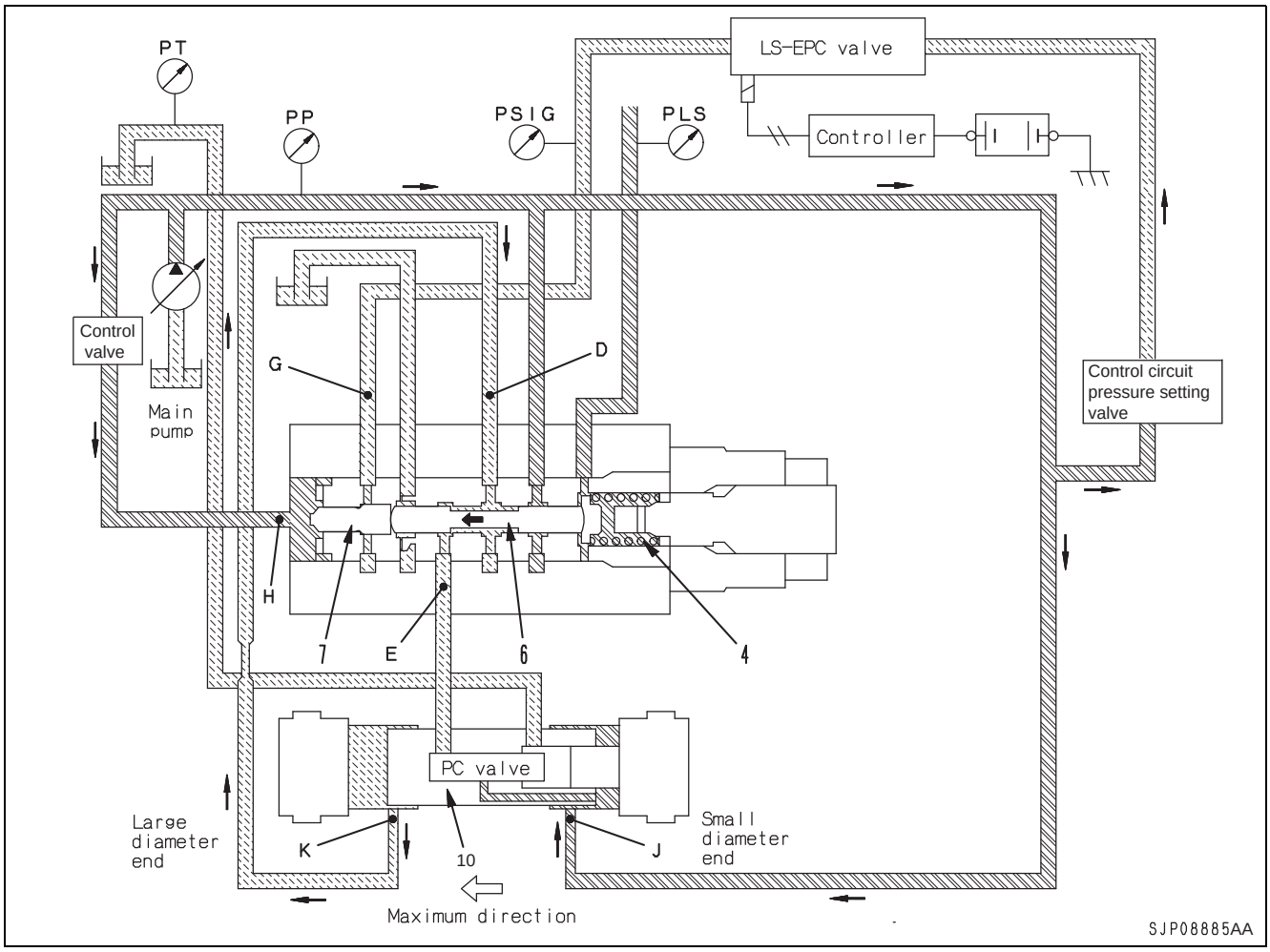
Hydraulic tank



1. Hydraulic tank
2. Oil level gauge
3. Tank breather
4. Filter element
5. Suction strainer
6. Main pump
7. Drain plug
8. Gear pump

Specifications

Tank dry volume		169 Litres
Tank oil capacity	gauge centre	125 Litres
	gauge HI	128 Litres
	gauge LO	123 Litres
Pressure valve (included in oil filler breather)		
Cracking pressure		0.2 bar
Release pressure		0.0 bar



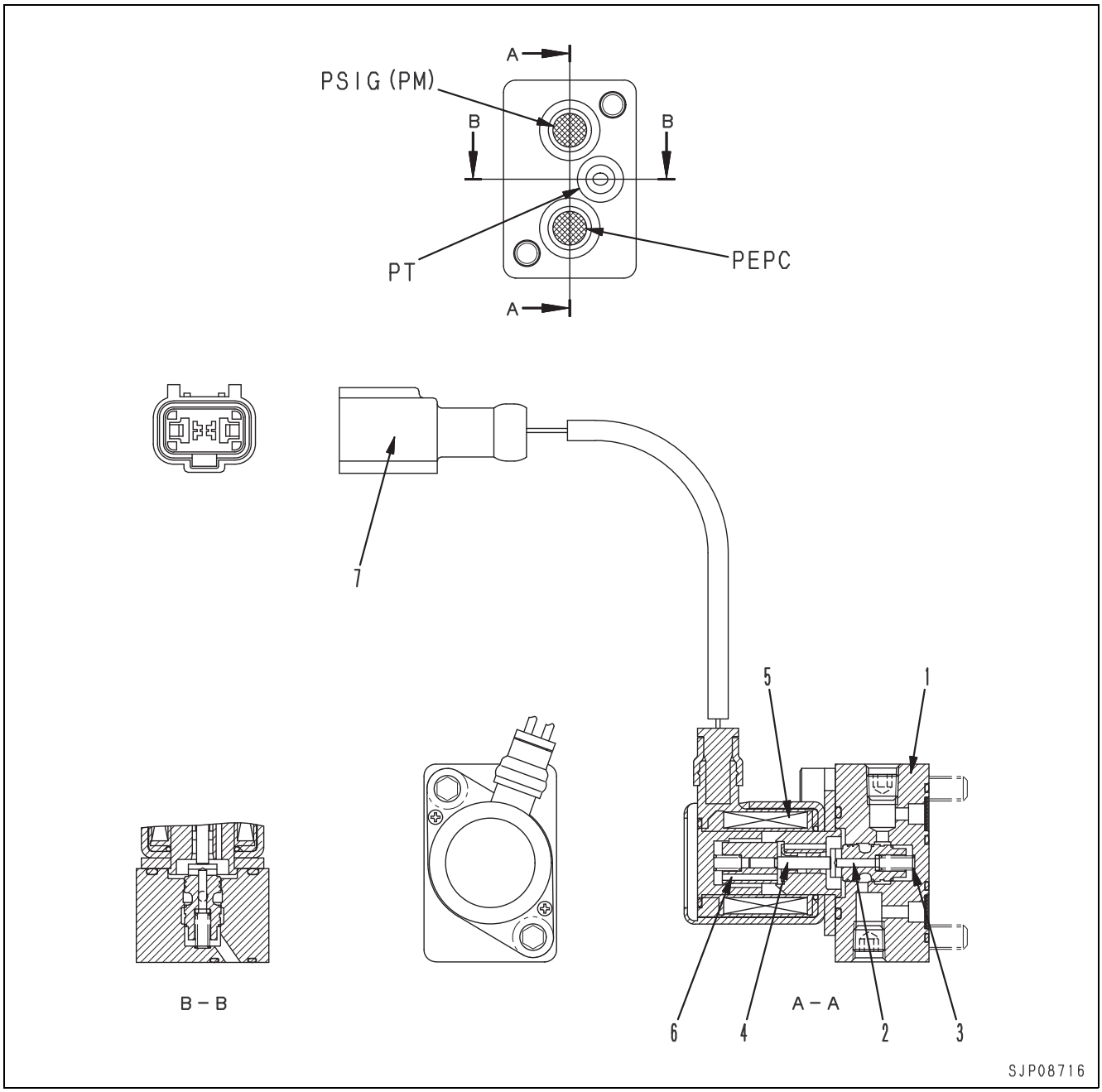
1.2 Operation in increase direction for pump discharge amount

- When the difference between the main pump pressure **PP** and LS pressure **PLS**, in other words, LS differential pressure ∆**PLS**, becomes smaller (for example, when the area of opening of the control valve becomes larger and pump **PP** drops), spool (6) is pushed to the left by the combined force of LS pressure **PLS** and the force of spring (4).

- When spool (6) moves, port **D** and port **E** are joined and connected to the PC valve. When this happens, the PC valve is connected to the drain port, so circuit **D - K** becomes drain pressure **PT**. (The operation of the PC valve is explained later).

- For this reason, the pressure at the large diameter end of servo piston (10) becomes drain pressure **PT**, and pump pressure **PP** enters port **J** at the small diameter end, so servo piston (10) is pushed to the left. Therefore, the swash plate moves in the direction to make the discharge amount larger. If the output pressure of the EPC valve for the LS valve enters port **G**, this pressure creates a force to move piston (7) to the right. If piston (7) is pushed to the right, it acts to make the set pressure of spring (4) weaker, and the difference between **PLS** and **PP** changes when ports **D** and **E** of spool (6) are connected.

LS(PC)-EPC valve



g

1. Body
2. Spool
3. Spring
4. Rod
5. Coil
6. Plunger
7. Connector

PSIG(PM): To LS(PC) valve

PT: To tank

PEPC: PPC pressure from solenoid block valve

1. Spool (Swing)
2. Spool (Boom)
3. Spool (Travel)
4. Spool (Stabilizer)
5. Spool (2PBoom)
6. Spool (Arm)
7. Spool (Bucket)
8. Spool (Service)
9. Spool (Service)
10. 2-stage main relief valve

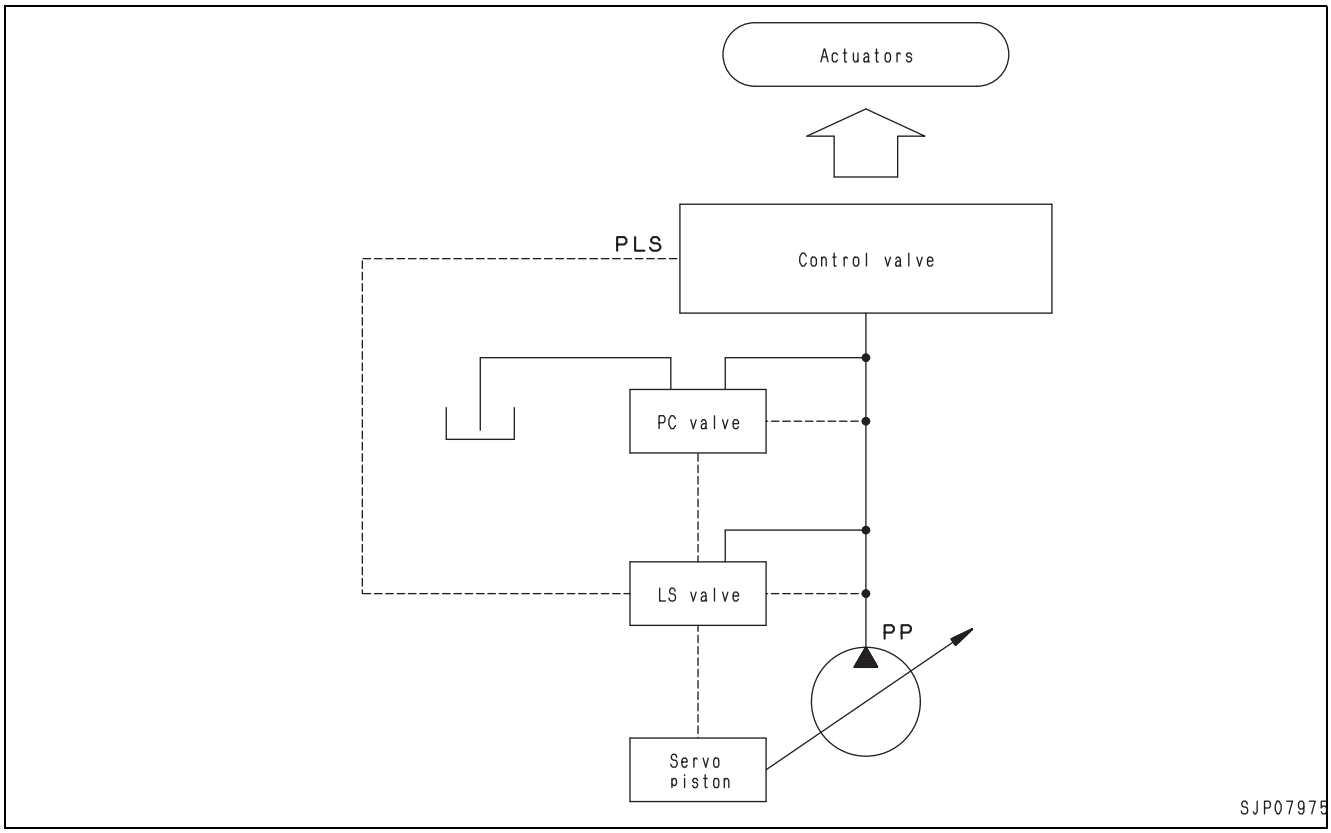
CLSS

Outline of CLSS

Features

CLSS is an abbreviation for Closed centre Load Sensing System, and has the following features.

- Fine control not influenced by load
- Control enabling digging even with fine control
- Ease of compound operation ensured by flow divider function using area of opening of spool during compound operations
- Energy saving using variable pump control



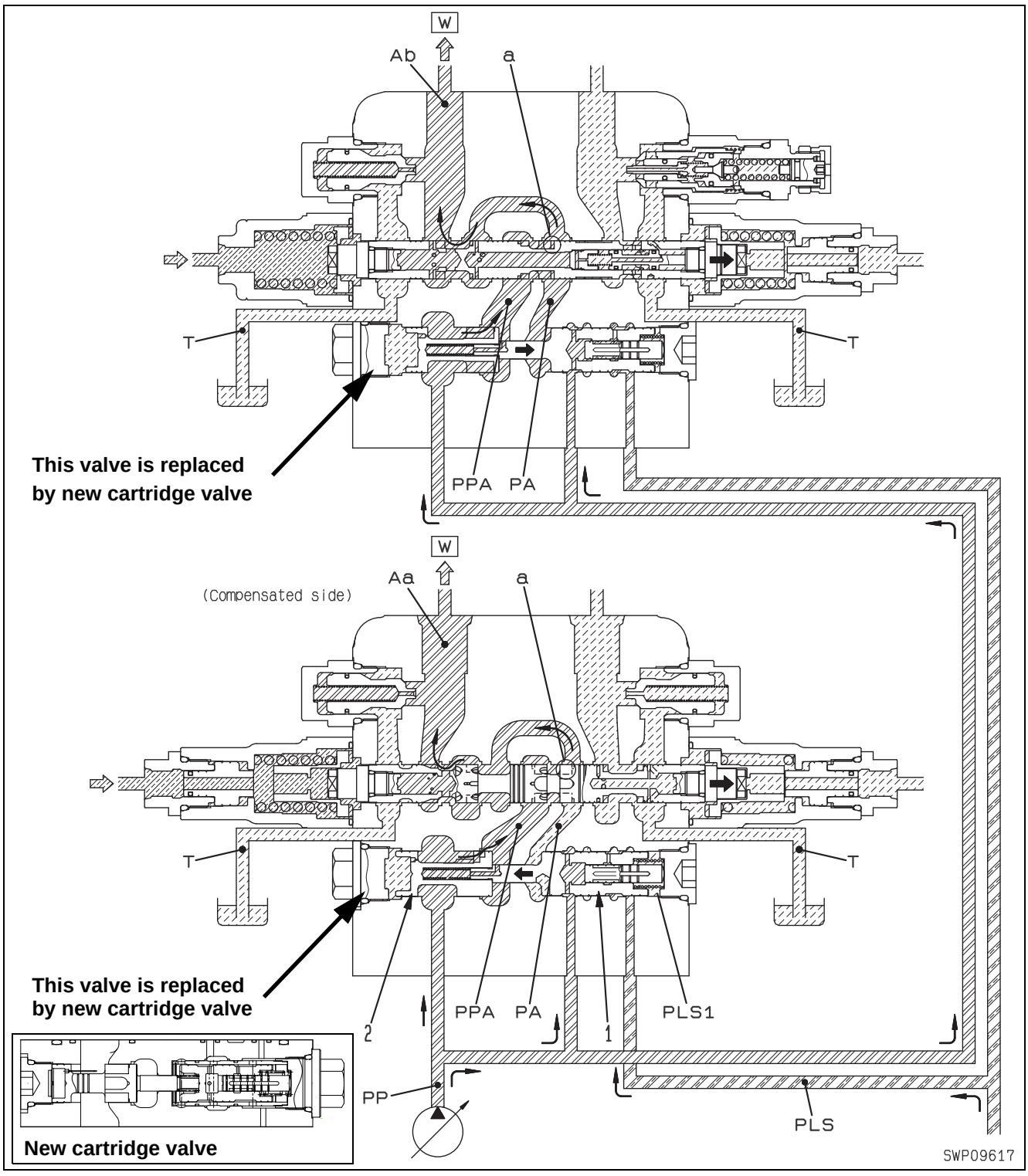
Structure

- The CLSS consists of a main pump, control valve, and actuators for the work equipment.
- The main pump body consists of the pump itself, the PC valve and LS valve.

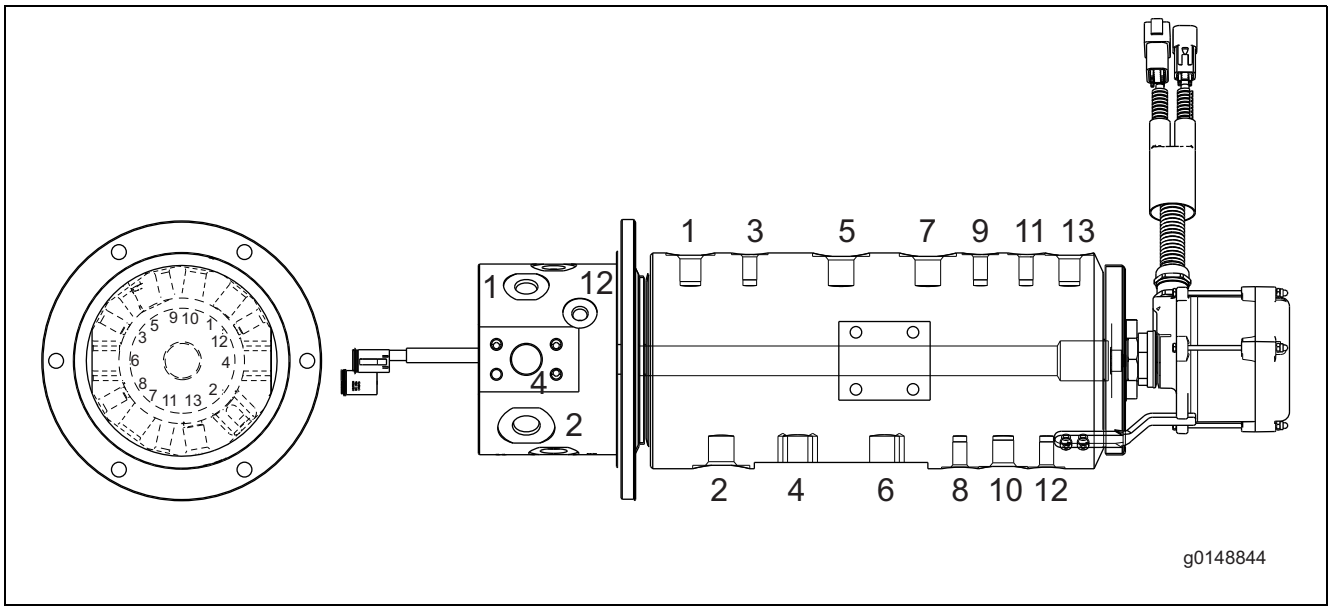
4. Pressure compensation valve

Function

- When the load pressure becomes lower than another actuator and the flow is going to increase during a compound operation, this valve compensates the load pressure. (At the time, the load pressure of another actuator under compound operation (the upper side) is higher than that of the actuator on this side (the lower side).



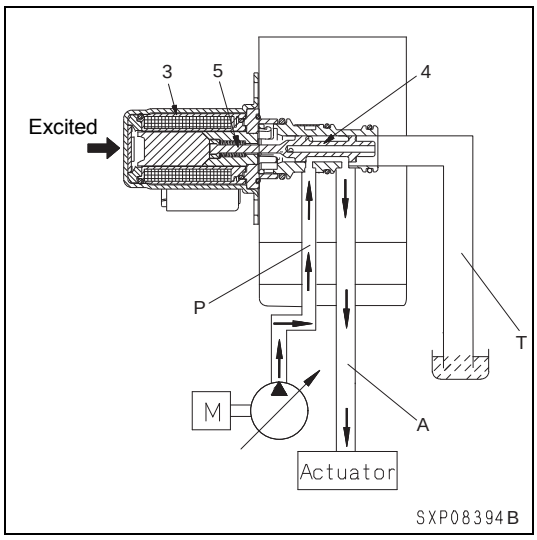
Centre swivel joint



1. Steering left
2. Drain Motor
3. Motor volume pilot (travel creep)
4. Travel forward
5. Stabilizer UP
6. Travel reverse
7. Stabilizer DOWN
8. Service brake-1
9. Service brake-2
10. Steering right
11. P clutch
12. Suspension lock
13. Drain Clutch

When solenoid is excited

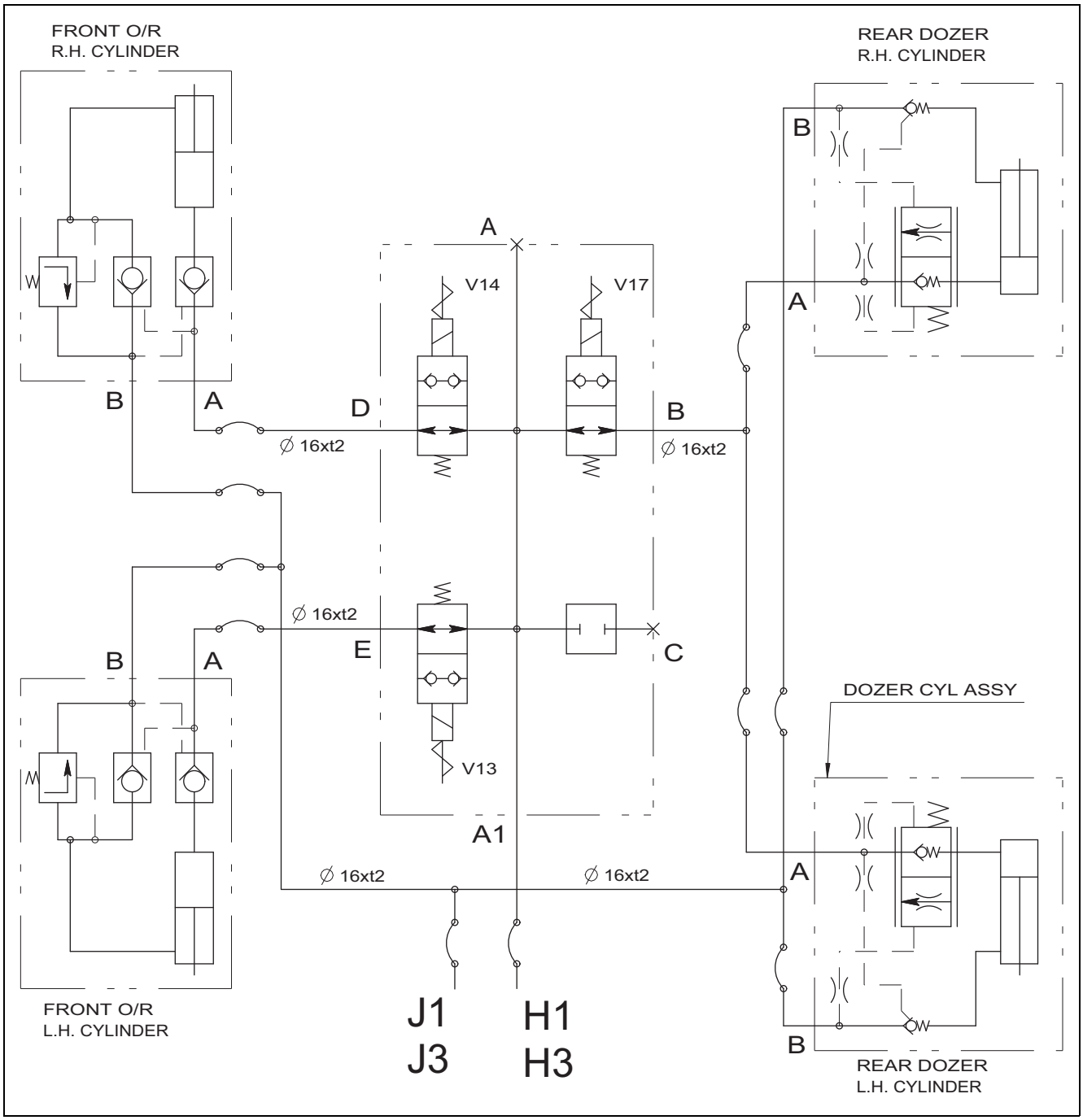
- The signal current flows from the controller to coil (3), and the latter is excited.
  Accordingly, spool (4) is pushed to the right side.
  By this operation, the hydraulic oil from the control circuit flows through port **P** and spool (4) to port **A** then flows into the actuator.
  At this time, port **T** is closed and the oil does not flow into the tank.



Undercarriage attachment schematic

The undercarriage attachment hydraulic diagram shows the combination front outriggers and rear blade.

Each hydraulic cylinder is connected to the control valve attachment spool ports (H) and (J) when the solenoid valve is not energized.



4. Logic: Activation of function

1) Activation of function

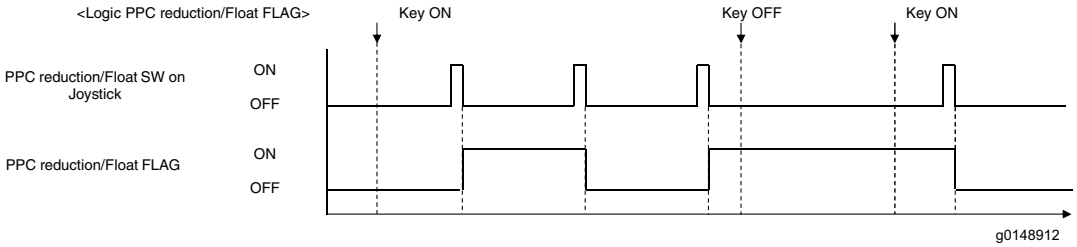
Default at first installation: PPC reduction/Float FLAG: OFF
Default at Key: ON: Memory of status before Key: OFF

PPC reduction/Float FLAG: OFF

PPC reduction/Float SW on Joystick: ON (Push 1x,) → PPC reduction/Float FLAG: ON

PPC reduction/Float FLAG: ON

PPC reduction/Float SW on Joystick: ON (Push 1x,) → PPC reduction/Float FLAG: OFF

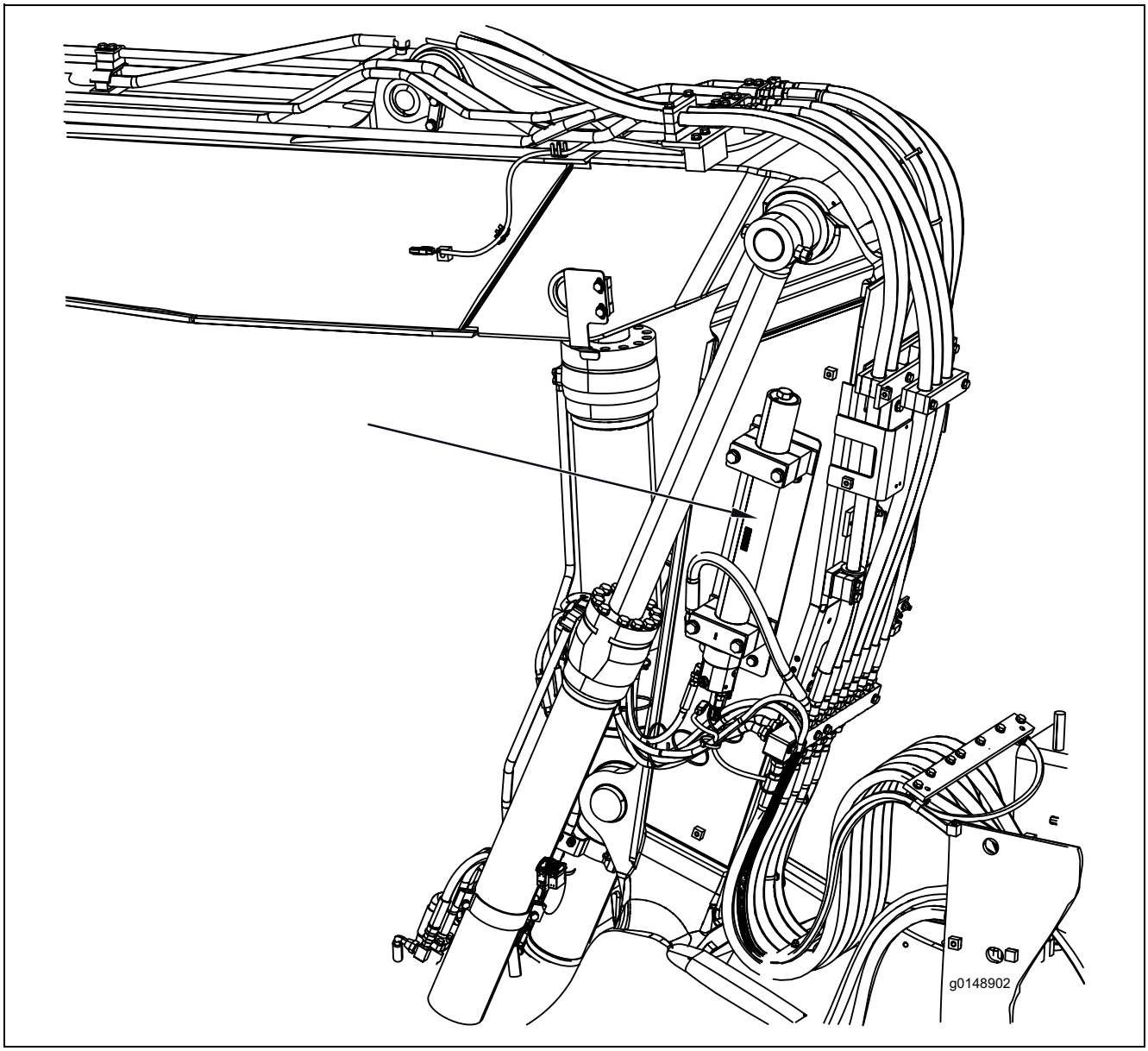


Work equipment

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size	Tolerance		Standard clearance	Clearance limit	
			Shaft	Hole			
1	Clearance between connecting pin and bushing of revolving frame and boom	70	-0.030 -0.060	+0.074 -0.000	0.014 ~ 0.044	1.0	Replace
2	Clearance between connecting pin and bushing of boom and arm	70	-0.030 -0.100	+0.1 -0.0	0 ~ 0.07	1.0	
3	Clearance between connecting pin and bushing of arm and link	60	-0.030 -0.080	+0.189 +0.139	0.059 ~ 0.159	1.0	
4	Clearance between connecting pin and bushing of arm and bucket	60	-0.030 -0.080	+0.216 +0.182	0.102 ~ 0.186	1.0	
5	Clearance between connecting pin and bushing of link and bucket	60	-0.030 -0.080	+0.186 +0.136	0.056 ~ 0.156	1.0	
6	Clearance between connecting pin and bushing of link and link	60	-0.030 -0.080	+0.184 +0.134	0.054 ~ 0.154	1.0	

ECSS Accumulator position



Specifications of air conditioner

Refrigerant: R134a

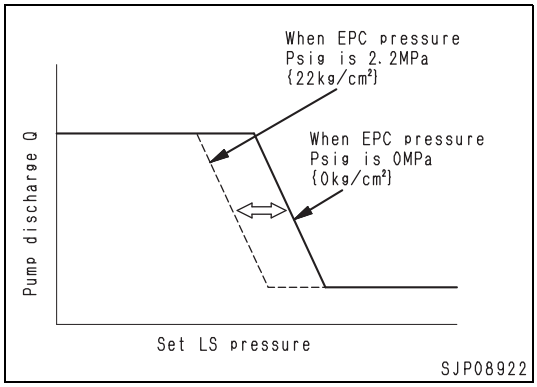
Refrigerant quantity: 960±50g

1. Digital or Digital/Analog Selectable Input

CH	Signal Name	PIN No	Input Logic
0	Key Switch(ACC Terminal)	80	ON/OFF Input (Hi)
1	Key Switch(C Terminal)	61	
2	CLS pump empty	42	
3		23	
4	Tilting Pod SW(PPC Lock SW; Lock Side)	79	
5	CLS pump failure	60	ON/OFF Input (Hi/Lo Select)
6	PPC LOCK SOL MONITORING SIGNAL	41	
7	PPC LOCK SOL EMERGENCY DRIVE SW MONITORING SIGNAL	22	
8	Tilting Pod SW(PPC Lock SW; Lock Cansel Side)	78	
9	Machine Select 1	59	ON/OFF Input (Lo)
10	Machine Select 2	40	
11	Machine Select 3	21	
12	Machine Select 4	77	
13	Wash/Wiper signal	58	
14	Swing Emergency SW	39	
15	Swing lock SW	20	
16	window limit SW	76	
17		57	ON/OFF Input(Lo) DC Pulse Encorder
18	Fan clutch speed	38	
19		19	
20	Knob SW (Pmax)	74	ON/OFF Input(Lo) or AD Input
21	ECSS SW	55	
22		36	
23	Wiper Lo Speed	17	
24	Wiper INT Speed	73	
25	Quick Coupler Pressure SW	54	
26	2nd Pieces Boom Press SW(Service Pressure SW)	35	
27	Overload Pressure Sensor	16	
28	Travel PPC Pressure Sensor	72	
29	LSC QC input 1	53	
30	LSC QC input 2	34	
31		15	
32		71	
33		52	
34		33	
35	Arm Dig Pressure Sensor	14	
36	Arm Dump Pressure Sensor	51	
37	Boom raise Pressure Sensor	32	
38	Boom down Pressure Sensor	13	
39	Bucket Dig Pressure Sensor	69	
40	Bucket Dump Pressure Sensor	50	
41	Swing left pressure Sensor	31	
42	Swing right pressure Sensor	12	

2.1 LS control function

- The change point (LS set differential pressure) of the pump discharge in the LS valve is changed by changing the output pressure from the LS-EPC valve to the LS valve according to the operating condition of the actuator.
- By this operation, the start-up time of the pump discharge is optimized and the composite operation and fine control performance is improved.



2.2 Cut-off function

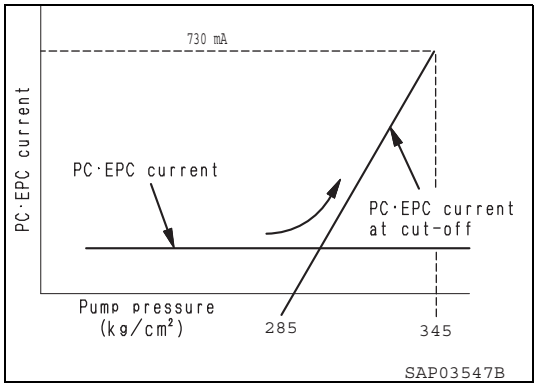
- When the cut-off function is turned on, the PC-EPC current is increased to near the maximum value.

  By this operation, the flow rate in the relief state is lowered to reduce fuel consumption.

- Operating condition for turning on cut-off function

Condition
• The value of the pressure sensors is above 27.9 MPa {285 kg/cm²} and the one-touch power maximizing function is not turned on

The cut-off function does not work, however, while the machine is travelling in mode A.



2.3 2-stage relief function

- The relief pressure in the normal work is 34.8 MPa {355 kg/cm²}. If the 2-stage relief function is turned on, however, the relief pressure rises to about 37.2 MPa {380 kg/cm²}.
- By this operation, the hydraulic force is increased further.
- Operating condition for turning on 2-stage relief function

Condition	Relief pressure
• During travel • When swing lock switch is turned on • When boom is lowered • When one-touch power maximising function is turned on • When L mode is operated	34.8 MPa {355 kg/cm²} ⇓ 37.2 MPa {380 kg/cm²}

6.1 Swing lock and swing holding brake functions

- The swing lock function (manual) is used to lock machine from swinging at any position. The swing holding brake function (automatic) is used to prevent hydraulic drift after the machine stops swinging.
- Swing lock switch and swing lock/holding brake
- Operation of swing holding brake release switch
- If the controller, etc. has a problem, the swing holding brake does not work normally, and the machine cannot swing, the swing lock can be reset with the swing holding brake release switch.

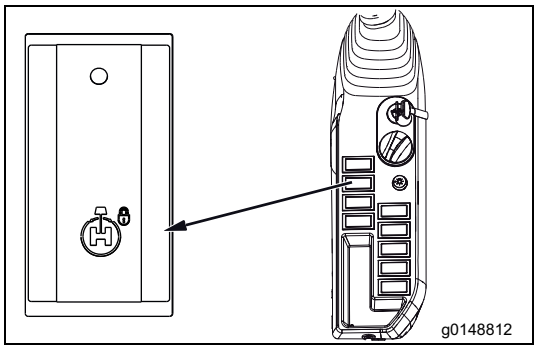
Lock switch	Lock lamp	Function	Operation
OFF	OFF	Swing holding brake	If swing lever is set in neutral, swing brake operates in about 5 sec. If swing lever is operated, brake is released and machine can swing freely.
ON	ON	Swing lock	Swing lock operates and machine is locked from swinging. Even if swing lever is operated, swing lock is not reset and machine does not swing.

Swing holding brake release switch	OFF (When controller is normal)		On (with PPC signal) (when controller is normal)		ON (When control has trouble)	
Swing lock switch	ON	OFF	On	Off	ON	OFF
Swing brake	Swing lock is turned on.	Swing holding brake is turned on.	Swing lock is turned on	Machine will swing	Swing lock is turned on.	Swing lock is cancelled.

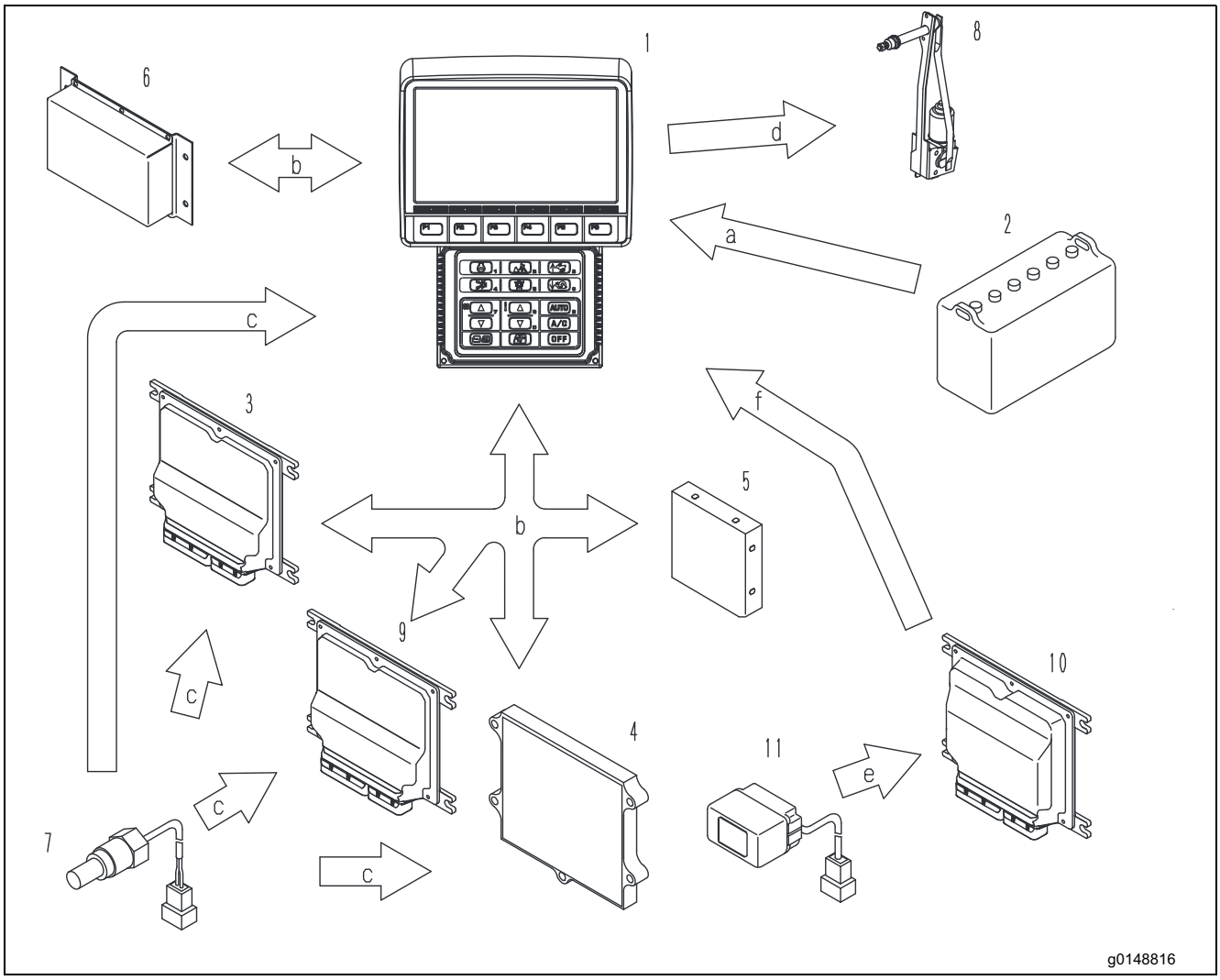
- Even if the swing holding brake release switch is turned on, if the swing lock switch is turned on, the swing brake is not released.
- If the swing lock is reset, swinging is stopped by only the hydraulic brake of the safety valve. Accordingly, if swinging is stopped on a slope, the upper structure may drift hydraulically.

6.2 Quick hydraulic oil warm-up function when swing lock switch is turned on

- If swing lock switch is turned on, the pump-cut function is cancelled and the relief pressure rises from 34.8 MPa {355 kg/cm²} to 37.2 MPa {380 kg/cm²}. If the work equipment is relieved under this condition, the hydraulic oil temperature rises quickly and the warm-up time can be shortened.



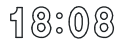
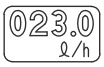
Machine monitor system



1. Machine monitor
2. Battery
3. Pump controller
4. Engine controller
5. Air conditioner controller
6. KOMTRAX terminal
7. Sensors and switches
8. Wiper motor and window washer motor
9. Monitor controller
10. KomVision controller
11. KomVision camera

Input and output signals

a. Power supply
b. CAN signal
c. Sensor and switch signals
d. Drive signal
e. Camera signal

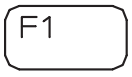
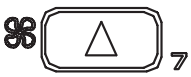
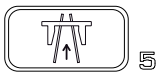
Gauge	Item displayed	Description	Remarks
 9JC01156	Service meter	00000.0 h to 99999.9 h	Indicates accumulated engine operating hours (alternator is generating). (Press F4 switch to change to clock display.)
 9JC01157	Clock	• 12-hour system display (AM/PM) • 24-hour system display	Displays time. (Press F4 switch to change to service meter display.)
 9JC01158	Fuel consumption gauge (*2)	• 1 Day • Split Time • None	Indicates average fuel consumption. (Display can be switched by selecting another item in ECO Guidance → Configurations → Average Fuel Consumption Display on user menu.)

*1: The gauge pointer disappears if the gauge signal is not available due to an open circuit in the CAN communication line.

*2: Display can be switched by selecting another item in ECO Guidance → Configurations on user menu.

Declaration of switch function on keypad

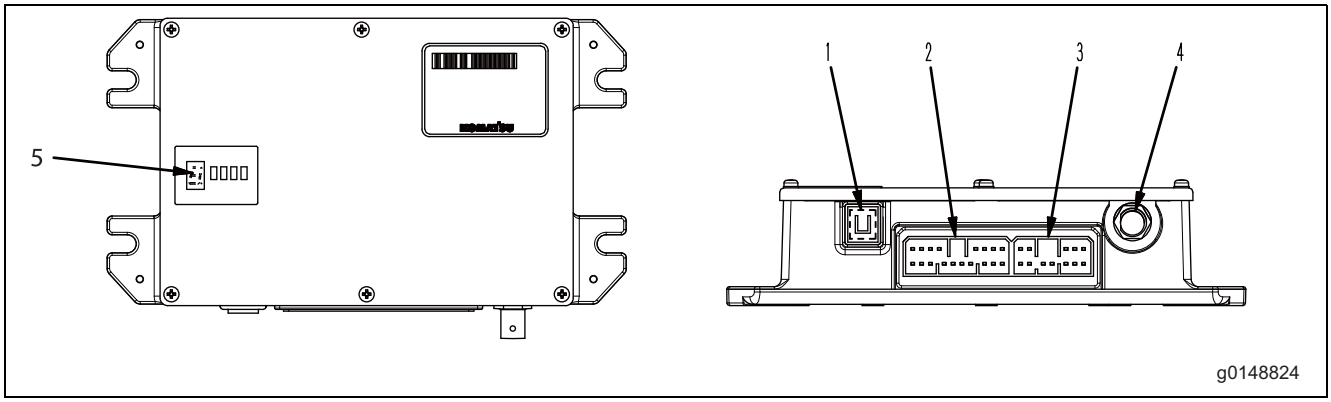
For more details refer to Operation and Maintenance Manual.

Item	Symbol	Name	Description
1.		Function switches (F1 to F6)	The function of switches on each screen can be confirmed by guidance icons displayed on top of each switch.
2.		RECIRC/FRESH selector switch (air conditioner)	This switch is used to switch the air source between recirculation of the air inside the cab and intake of air from the outside.
3.		Fan switch - min. (air conditioner)	This switch is used to adjust the air flow. Press the switch to reduce the air flow.
4.		Fan switch - max. (air conditioner) [figure 7]	This switch is used to adjust the air flow. Press the switch to increase the air flow [for figure input in service menu]
5.		Buzzer cancel switch [figure 4]	When this switch is pressed, the warning buzzer for the abnormal warning item stops. [for figure input in service menu]
6.		Auto-deceleration switch [figure 1]	If the control levers are at neutral, this switch automatically lowers the engine speed and turns on the function to reduce fuel consumption. [for figure input in service menu]
7.		Street mode switch [figure 5]	This switch is used to switch on the street mode. [for figure input in service menu]
8.		Working mode selector switch [figure 2]	This switch is used to set the movement or power of the work equipment. [for figure input in service menu]
9.		Travel speed selector switch [figure 3]	When the switch is pressed, the travel speed changes between 4 different travel speed mode (CR, LO, HI and AT) [for figure input in service menu]
10.		Travel Power Max. switch [figure 6]	This switch is used to set Travel Power Max. for more travel performance [for figure input in service menu]

KOMTRAX terminal

Structure of KOMTRAX terminal

Model: TC630/TC635



1. GPS antenna connection
2. Machine harness connection (070-18P)
3. Machine harness connection (070-12P)
4. Communication antenna connection
5: LED lamp display

Function of KOMTRAX terminal

- This terminal uses the communication technology of cell phone.
- This terminal is the wireless communication equipment which enables to transmit GPS locational information and various machine information which is received from network signal or input signal. It can transmit the information via communication antenna.
- The condition of KOMTRAX terminal can be checked on the “KOMTRAX Setting” screen in the service mode of the machine monitor.
- Use of KOMTRAX terminal must be limited for the countries in which such communication is allowed.
- The terminal has LED lamps and 7-segment lamp indicator used for testing and troubleshooting on its display section.

REMARK

The country in which T630 can be used is different from that of TC635.

Overload warning device

Outline

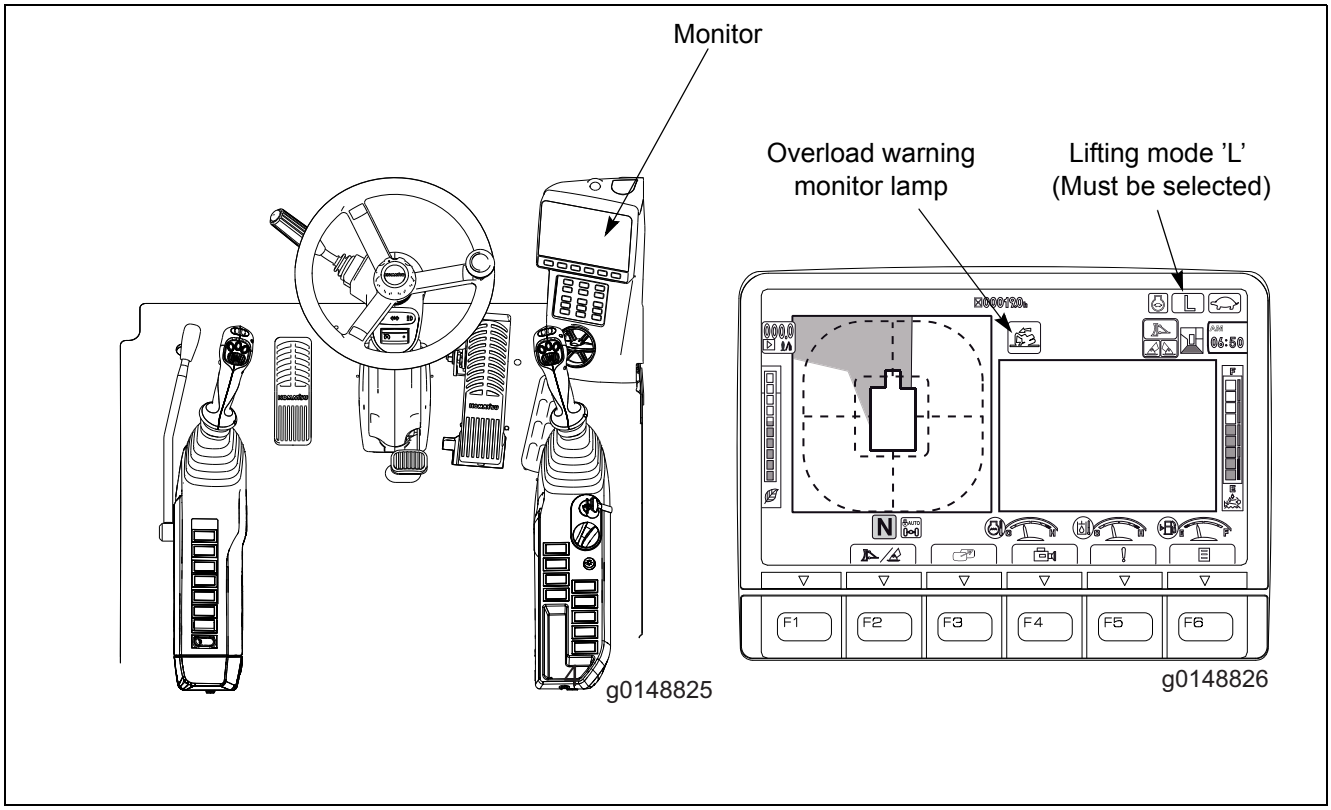
Function

- This device is installed to warn the operator when the machine lifts an excessive weight.

Structure

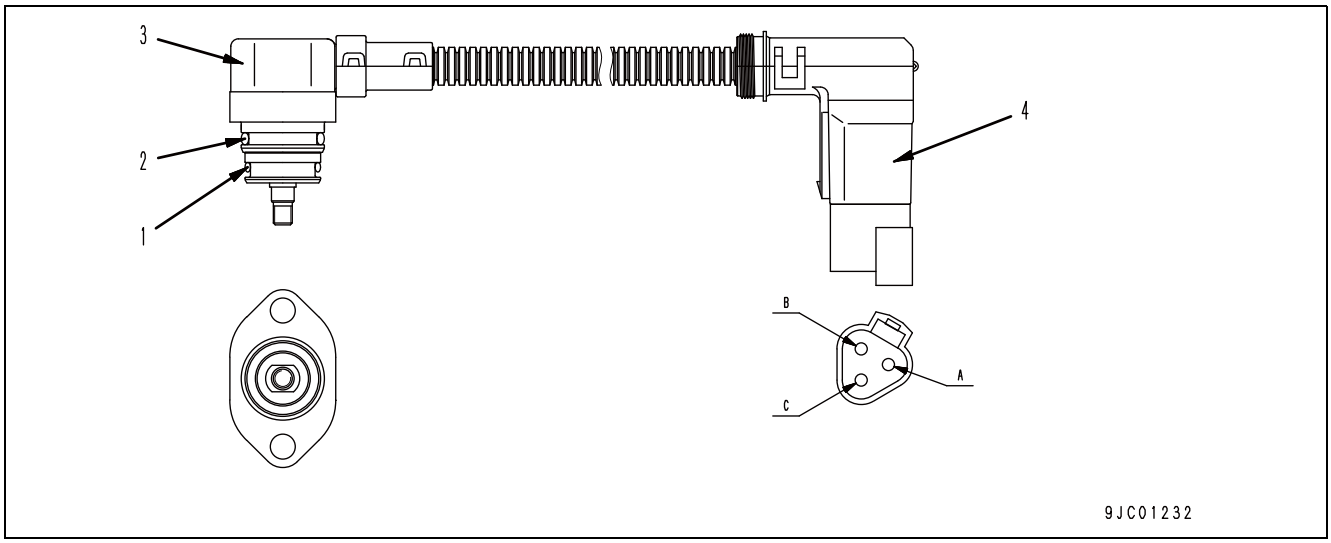
- When an excessive weight is lifted, the oil pressure increases at the bottom side of the boom cylinders. When this happens, a pressure switch is activated which lights the monitor lamp to warn the operator. When the monitor lamp lights, immediately lower the weight to the ground or bring the arm closer in the operator to prevent the machine from tipping over.

NOTE
The overload caution system can only be activated when the lifting mode (L) is activated on the monitor panel.



EGR valve lift sensor

EGR: Abbreviation for Exhaust Gas Recirculation



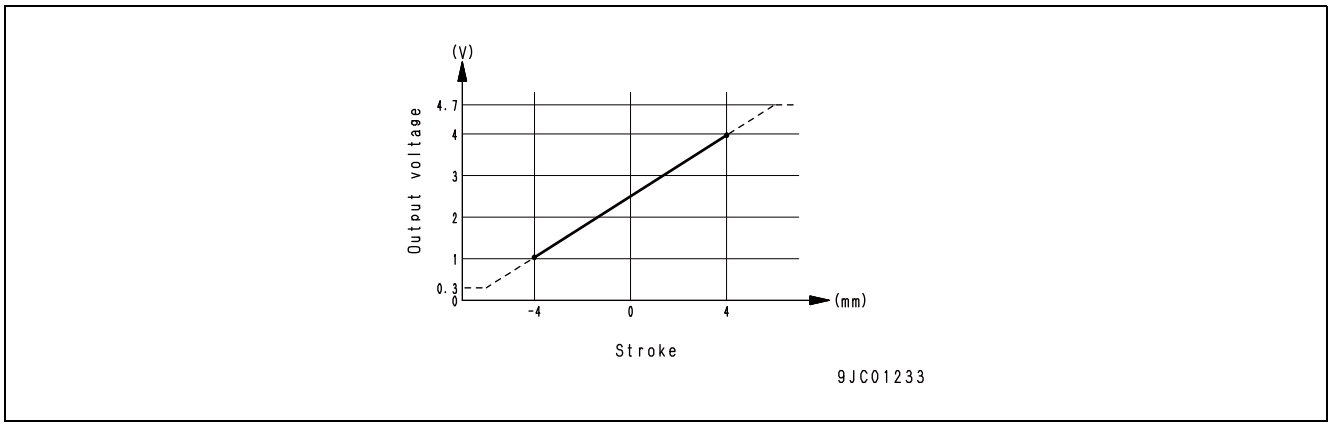
1. O-ring (small)
2. O-ring (large)
3. Sensor
4. Connector

Function

- This sensor, installed to EGR valve in the engine, detects the EGR valve opening to output the corresponding variable voltage.

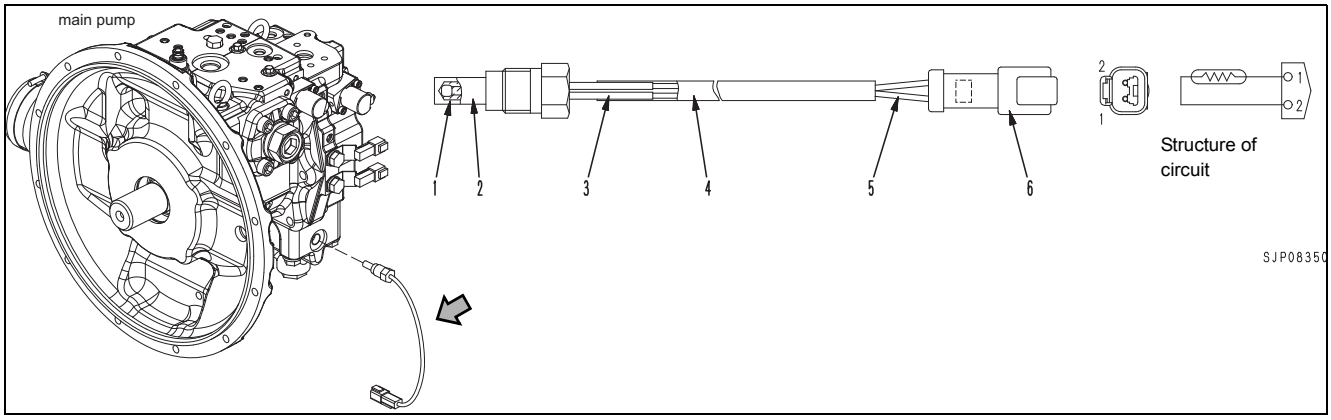
Output characteristics

- The relation between stroke and output voltage is as shown in the following graph.



Hydraulic oil temperature sensor

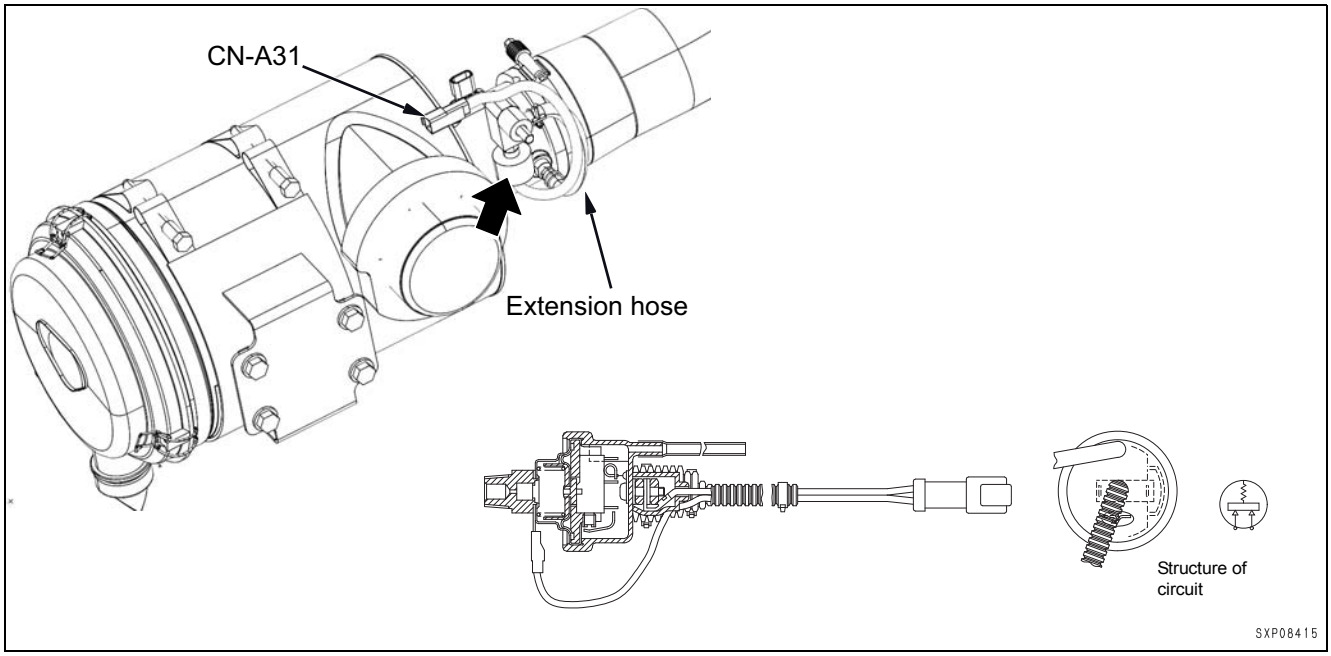
CN-A55



1. Thermistor
2. Body
3. Tube
4. Tube
5. Wire
6. Connector

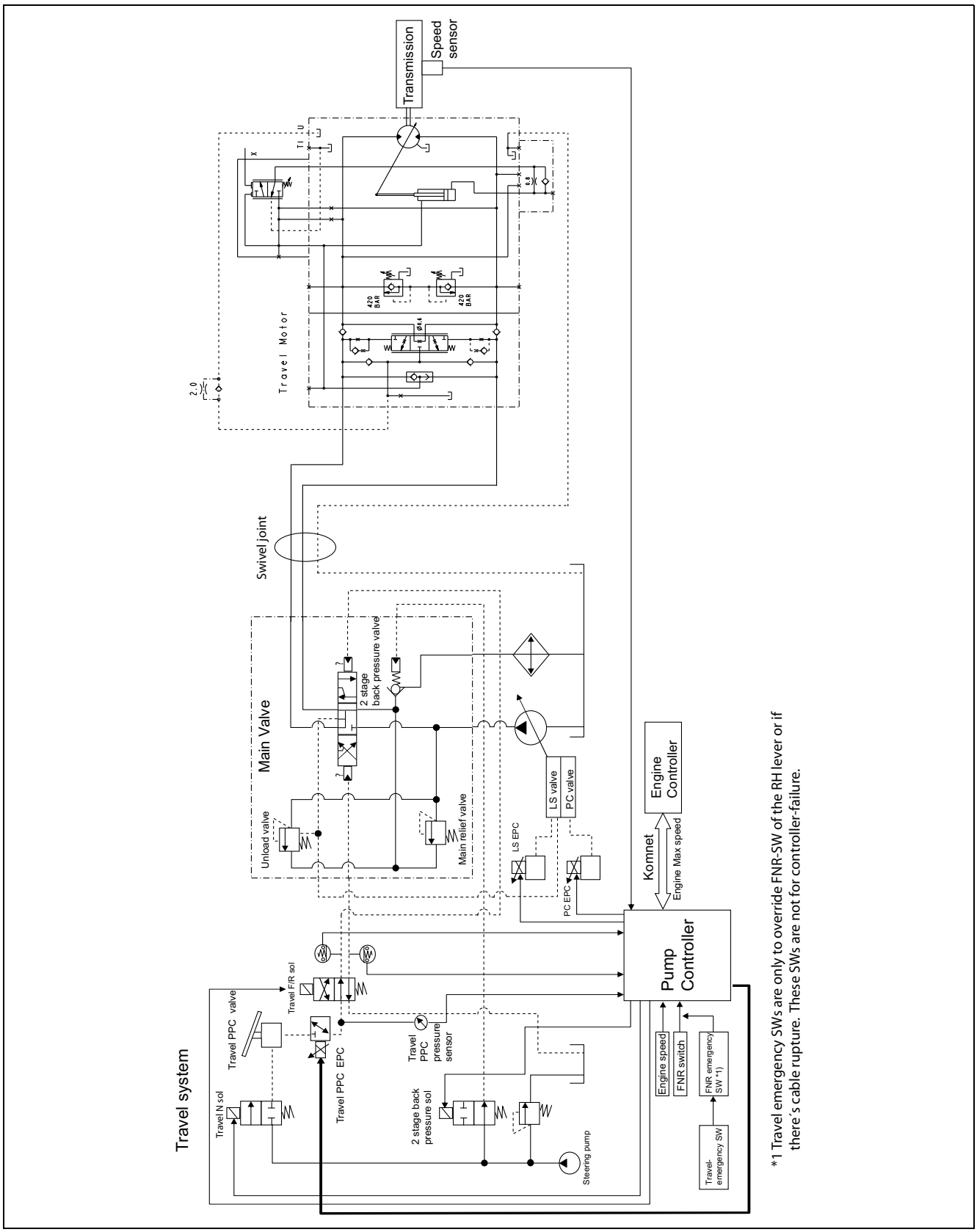
Air cleaner clogging sensor

CN-A31

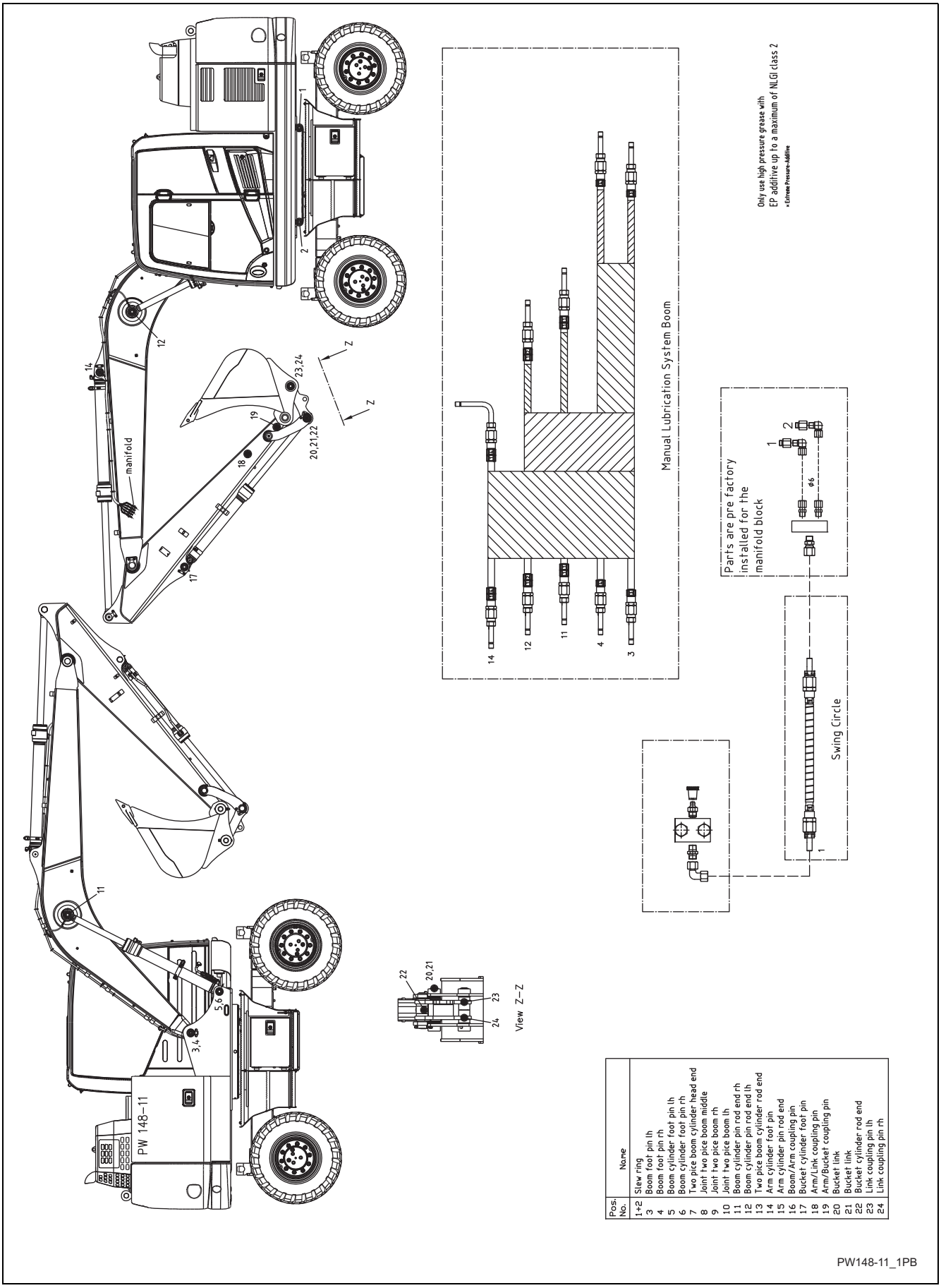


Travel system

Travel circuit



Manual system one-piece boom



Pos. No.	Name
1+2	Slew ring
3	Boom foot pin lh
4	Boom foot pin rh
5	Boom cylinder foot pin lh
6	Boom cylinder foot pin rh
7	Two pice boom cylinder head end
8	Joint two pice boom middle
9	Joint two pice boom rh
10	Joint two pice boom lh
11	Boom cylinder pin rod end rh
12	Boom cylinder pin rod end lh
13	Two pice boom cylinder rod end
14	Arm cylinder foot pin
15	Arm cylinder pin rod end
16	Boom/Arm coupling pin
17	Bucket cylinder foot pin
18	Arm/Link coupling pin
19	Arm/Bucket coupling pin
20	Bucket link
21	Bucket link
22	Bucket cylinder rod end
23	Link coupling pin lh
24	Link coupling pin rh

SCR related items

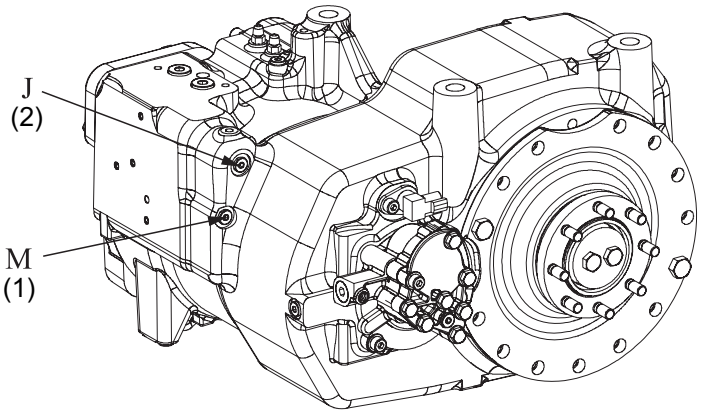
Machine model			PW148-11	
Engine			SAA4D107E–3	
Item	Measurement condition	Unit	Standard value for new machine	Repair limit
AdBlue/ DEF Pump Pressure Up Test	• Within approximately 200 seconds after starting AdBlue/DEF Pump Pressure Up Test	kPa	Min. 800	Min. 800
AdBlue/ DEF Injection Quantity Test	• Injection quantity after the AdBlue/DEF Injection Quantity Test is completed	ml	100 (+7/-26)	100 (+7/-26)
AdBlue/ DEF Line Heater Relay 1 Test	• Within approximately 900 seconds after starting AdBlue/DEF Line Heater Relay 1 Test	V	24.5±1.5	24.5±1.5
AdBlue/ DEF Line Heater Relay 2 Test	• Within approximately 900 seconds after starting AdBlue/DEF Line Heater Relay 2 Test	V	24.5±1.5	24.5±1.5
AdBlue/ DEF Pump Heater Relay Test	• Within approximately 900 seconds after starting AdBlue/DEF Pump Heater Relay Test	V	24.5±1.5	24.5±1.5
AdBlue/ DEF Tank heater valve test	• Within approximately 900 seconds after starting AdBlue/DEF Tank Heater Valve Test	V	24.5±1.5	24.5±1.5
SCR Denitration Efficiency Test	• Machine monitor display after SCR Denitration Efficiency Test is completed — AdBlue/ DEF Injection Test Result	-	1 (Normal)	1 (Normal)
	• Machine monitor display after SCR Denitration Efficiency Test is completed — SCR Efficiency Test Result		1 (Normal)	1 (Normal)

Applicable model					PW148-11	
Category	Item		Measurement Condition	Unit	Standard value	Permissible value
Work equipment	Time lag	Arm	 • Hydraulic oil temperature: Within operation range • Engine running at low idling • Working mode: P mode • Operate full arm curl from dumping stroke end to full retraction. Measure delay when arm pauses midway through operation	sec	max. 1.0	max. 1.2
		Bucket	 • Hydraulic oil temperature: Within operation range • Engine running at low idling • Working mode: P mode • Operate full bucket curl from dumping stroke end to full retraction. Measure delay when bucket pauses midway through operation		max. 1.0	max. 1.2
	Internal leakage	Cylinders	• Hydraulic oil temperature: Within operation range • Engine running at high idling • Leakage amount for one minute with cylinder or travel to be measured in relief condition	cc/ min	5.0	20.0
		centre swivel joint			10.0	50.0

9. Transmission clutch pressure

Connect gauges (M10x1) to ports J and M (1st and 2nd gear clutch pressure port). Depress the brake pedal and switch to forward travel direction. Then depress the travel pedal fully.

No.	Check item	Checking condition		Unit	Standard value	Measured value
1	Small clutch pressure (LO speed)	•P mode •high idle •auto deceleration •swing brake switch: off •parking brake switch: off •HI speed range selected	When forward is selected, the small clutch is pressurized (open)	bar	30.0 +5	
2	Large clutch pressure (HI speed)		When the travel pedal is depressed, the large clutch is pressurized (open)	bar	30.0 +5	

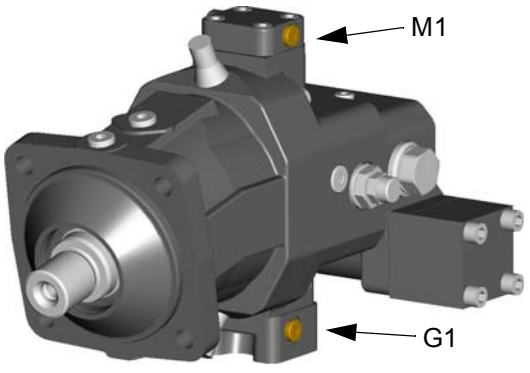


g0148964

10. Travel motor displacement change pressure

Install check nipples (M14x1.5) to ports M1 (servo piston pressure) and G1 (travel motor pressure) and connect gauges. Raise the wheels off the ground and select forward HI speed. Depress the brake pedal gently and watch the gauge. Record the pressure at port G1 when pressure on port M1 increases and when both pressure are the same.

No.	Check item	Checking condition	Unit	Standard value	Measured value
1	Start of displacement change	•P mode •high idle •auto deceleration •swing brake switch: off •parking brake switch: off	bar	approx. 310	
2	End of displacement change		bar	343	



TEST AND ADJUST VALVE CLEARANCE

Tools for testing and adjusting the valve clearance

Symbol	Part No.	Part name	Q'ty	Remarks
A	795-799-1131	Gear	1	
B	Commercially available	Feeler gauge	1	

- **Place the machine on a level ground, lower the work equipment completely to the ground in a stable posture, set the lock lever to LOCK position, and then stop the engine.**
- **Check that the system operating lamp is not lit, turn the battery disconnect switch to OFF position.**
-

⚠ Immediately after the engine is stopped, its parts and oil are still very hot and may cause burn injury. Wait for the temperature to go down, and then start the work.

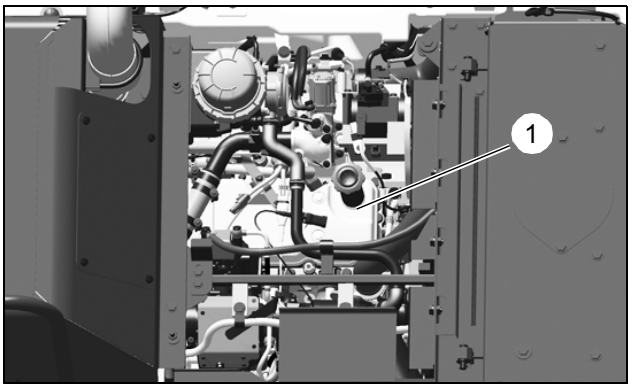
Check and adjust this item under the following conditions.

Engine coolant temperature: Normal temperature

For testing of valve clearance to perform troubleshooting, refer to this section.

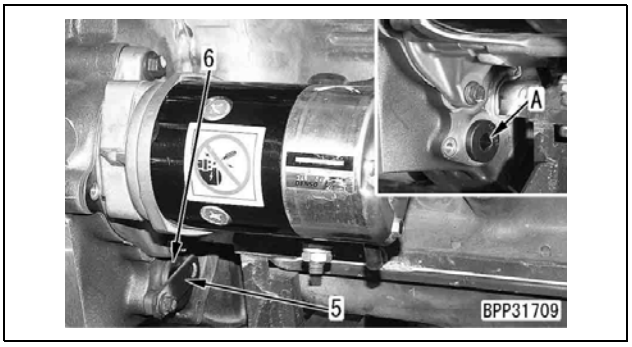
METHOD FOR TESTING VALVE CLEARANCE

1. Remove the cylinder head cover (1). See DISASSEMBLY AND ASSEMBLY, "REMOVE AND INSTALL INJECTOR ASSEMBLY".



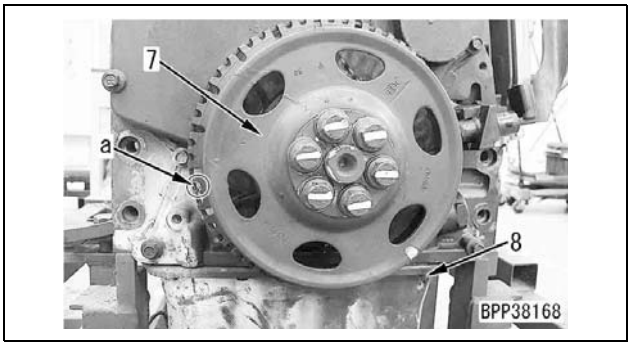
2. Remove the undercovers (2).

3. Remove the plate (5) and plug (6) under the starting motor, and insert the gear A into the position shown in the figure.



4. Check that there are painted mark at (a) part of the crankshaft pulley (7) and mounting bolt (8) of the engine oil pan.

NOTE
If there is no painted mark, paint (a) part of the crankshaft pulley (7) and mounting bolt (8) of the engine oil pan.



5. Rotate the crankshaft forward with gear A, and align the yellow paint (line) of the crankshaft pulley (7) with engine oil pan mounting bolt (8) so that their positions become straight line.

NOTE
The tip of the engine oil pan mounting bolt (8) is paint ed with yellow paint.

This alignment is not an alignment to obtain the com

the measurement while rotating the engine by us ing the starting motor. But do not crank the engine for more than 20 seconds continuously to protect the starting motor.

For standard values, see STANDARD VALUE TABLE, “STANDARD VALUE TABLE FOR ENGINE”.

After finishing the test, remove the testing tools and restore the machine.

Joint bolt (2): 19.6 to 29.4 Nm {2 to 3 kgm}.

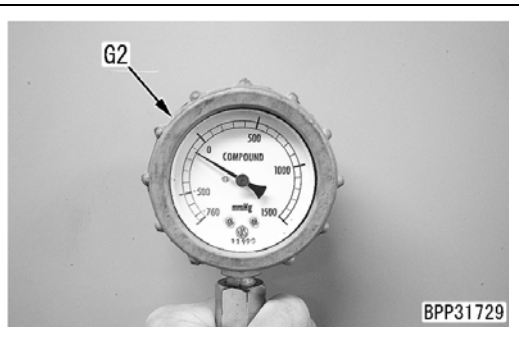
Testing of negative pressure circuit

1. Remove the joint bolt (3) of the fuel supply hose between the fuel prefilter and supply pump.

2. Install the screw F and nipple G1 of the boost gauge kit G instead of the joint bolt (3), and connect it to the gauge G2.

NOTE
When installing the screw F, be sure to install the seal washer.

Screw F: 25.4 to 34.3 Nm {2.59 to 3.5 kgm}.



3. Start the engine, set fuel control dial at MAX (High idle) position, and test the fuel negative pressure circuit pressure.

   For standard values, see STANDARD VALUE TABLE, “STANDARD VALUE TABLE FOR ENGINE”.

4. After finishing the test, remove the testing tools and restore the machine.

   Joint bolt (3): 25.4 to 34.3 Nm {2.59 to 3.5 kgm}.

TEST FUEL DISCHARGE, RETURN AND LEAKAGE

Tools for testing fuel discharge, return and leakage

Symbol	Part No.	Part name	Q'ty	Remarks
A	795-790-4700	Tester kit	1	
B	6164-81-5790	Joint	1	
C	07206-30812	Joint bolt	1	
D	6745-71-1130	Seal washer	1	
E	Commercially available	Stopwatch	1	
F	Commercially available	Hose	1	Inside diameter: 14 mm (approximate val ue)
G	Commercially available	Measuring cylinder	1	
H	Commercially available	Hose	1	Inside diameter: 8 mm (approximate val ue)

- **Place the machine on a level ground, and lower the work equipment to the ground.**

⚠ **Wait for the remaining pressure in the fuel circuit to be released for at least 30 seconds after stopping the engine. Then, perform removing or installing the testing tools. (Do not start the work immediately after the engine is stopped since remaining pressure is still in the circuit.**

NOTE
Prepare a container of approximately 20 ℓ to receive the fuel flows out during test.

Parameter list of test state

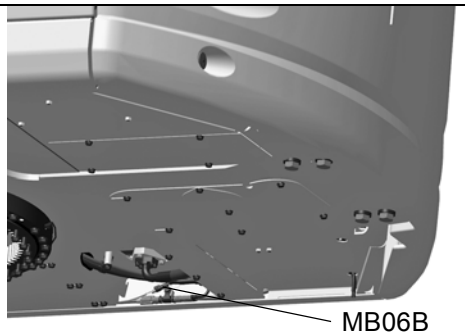
Test state	Content	Details	Required action
0	Wait for the start (de fault)	Regeneration disable state of aftertreatment devices by machine monitor	Press the start test switch to start the test.
1	AdBlue/DEF pump pressure is being in creased.	“Test State” is changing to “10”	Wait until “Test State” changes to “10”.
10	Being tested	It is on the following state depending on the contents. • Being pressure-fed by AdBlue/DEF pump • AdBlue/DEF is being injected. • The operation of energization cycle at a fixed time after specific time passes. • “SCR Denitration Efficiency Test” is being performed	• Check the items to be performed during the test. • In case of “SCR Denitration Efficieny-Test”, wait until the test is finished.
5	Pressure drop of AdBlue/DEF pump is detected (failure code [CA3574] is dis played)	Pressure drops (only when AdBlue/DEF pump is pressure-fed) while the display of “Test State” is “10”.	Perform the troubleshooting for the failure code [CA3574]. See “TROUBLESHOOTING”.
20	Test has been finished.	• AdBlue/DEF is being purged. • Heater energizing has been completed.	• If “Please turn the key off.” is displayed, turn the starting switch to OFF position and shut down the engine controller. (*1) • If “STOP” is displayed, press the corresponding switch to return the test to initial state. Other than the above, the state automatically returns to initial state.
11	Purging (energizing temporarily stops) or test cannot be per formed.	• AdBlue/DEF is being purged. • A particular error message is displayed.	• Turn the starting switch to OFF position, and perform the test again after shutting down the engine controller. (*1) • If a specific error message is displayed, see "TROUBLESHOOTING" and perform troubleshooting for the failure code.
12	AdBlue/DEF tank or AdBlue/DEF pump is at high temperature (energizing temporarily stops)	AdBlue/DEF tank temperature exceeds 70 °C or AdBlue/DEF pump temperature exceeds upper limit.	Wait for AdBlue/DEF tank temperature or AdBlue/DEF pump temperature to be lowered. After the display of “Test State” changes to “10”, the test restarts automatically.
14	SCR temperature is out of specified range	SCR temperature is 450 °C or above or 250 °C or below (temperature range is set by each test level)	The test state is displayed when step is switched during “SCR Denitration Efficiency Test”. Wait for several minutes. After “Test State” becomes “10”, test restarts automatically.
15	Mass air flow is out of specified range	Mass air flow is above 0.65 kg/sec or below 0.02 kg/sec.	Under the condition described on the left, “SCR Denitration Efficiency Test” can not be performed. Perform the troubleshooting for the failure code. See “TROUBLESHOOTING”.
16	NOx value at turbo charger outlet is out of specified range	• Turbo outlet NOx concentration: Max. 100 ppm • NOx sensor at turbocharger outlet is unmeasurable	Under the condition described on the left, “SCR Denitration Efficiency Test” does not finish successfully. Perform the troubleshooting for the failure code. See “TROUBLESHOOTING”.
17	Injection of AdBlue/ DEF is prohibited	The failure code is displayed.	Perform the troubleshooting for the failure code. See “TROUBLESHOOTING”.

"AdBlue/DEF Line Heater 2 Relay Test" function can actuate AdBlue/DEF line heater 2 at any timing, and can check electrical action.

For testing of AdBlue/DEF pressure circuit relay to perform troubleshooting or others, refer to this section.

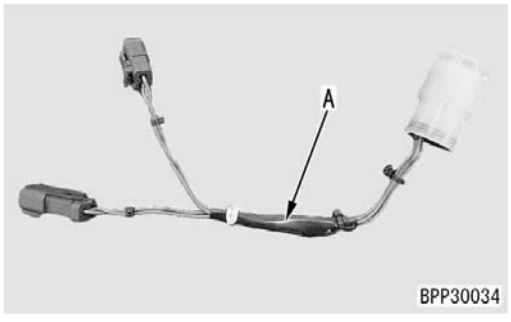
METHOD FOR TESTING AdBlue/DEF LINE HEATER RELAY 2

1. Check that the system operating lamp is not lit, turn the battery disconnect switch to OFF position, and remove the key.
2. Open the cover on the right side of the machine.
3. Disconnect the connector (MB06B).



4. Connect the T-adapter A and T-adapter box B, and prepare the multimeter C.

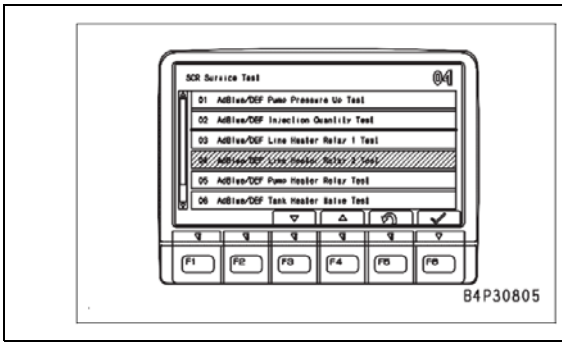
NOTE
Measure the voltage between pin 1 and pin 2.



5. Check that the system operating lamp is not lit, and turn the battery disconnect switch to ON position.
6. Turn the starting switch to ON position.

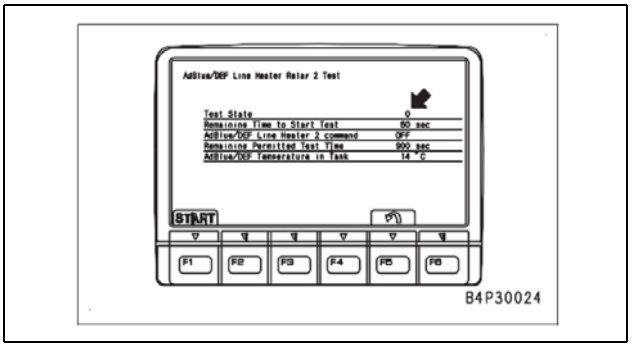
   For the safety reasons, this test cannot be performed while the engine is running.

7. See "METHOD FOR SETTING WITH TESTING MENU (SCR SERVICE TEST)" of "SETTING AND OPERATION OF MACHINE MONITOR", and select "AdBlue/DEF Line Heater Relay 2 Test".



8. Check that "0" in the "Test State" column is flashing.

NOTE
Flashing of "0" indicates "Ready for the start (default)", and the test can be performed. When the display is other than "0", perform the required action according to the "Parameter list of test state".

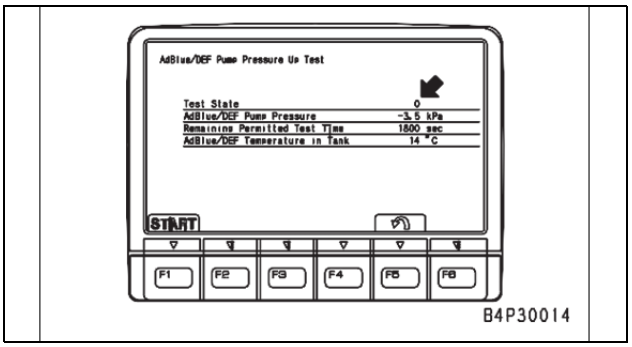


9. Press F1 to start "AdBlue/DEF Line Heater Relay 2 Test".

   F1: Starts "AdBlue/DEF Line Heater Relay 2 Test".

   F2: Stops "AdBlue/DEF Line Heater Relay 2 Test". (When "STOP" is displayed.)

   F5: Returns to the "SCR Service Test" screen.



6. Press F1 to start “AdBlue/DEF Pump Pressure Up Test”.

   F1: Starts “AdBlue/DEF Pump Pressure Up Test”.

   F2: Stops “AdBlue/DEF Pump Pressure Up Test”. (When “STOP” is displayed.)

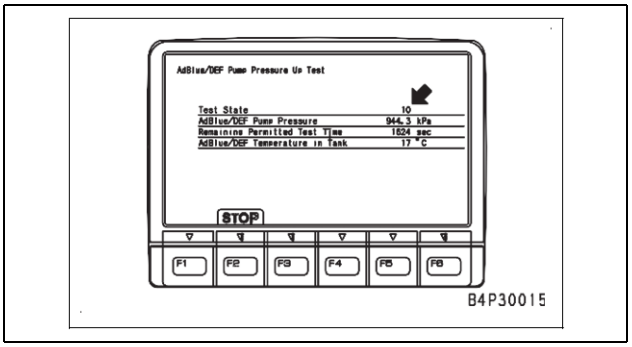
   F5: Screen returns to the “SCR Service Test” screen.

NOTE
AdBlue/DEF pump operates.

7. When the value of “AdBlue/DEF Pump Pressure” exceeds “800 kPa”, press F2.

NOTE
When the value of “AdBlue/DEF Pump Pressure” increases to “800 kPa” or higher, the display of “Test State” changes to flashing of “10”.

The 1st “AdBlue/DEF Pump Pressure Up Test” iscompleted. Perform the test 3 times in total.

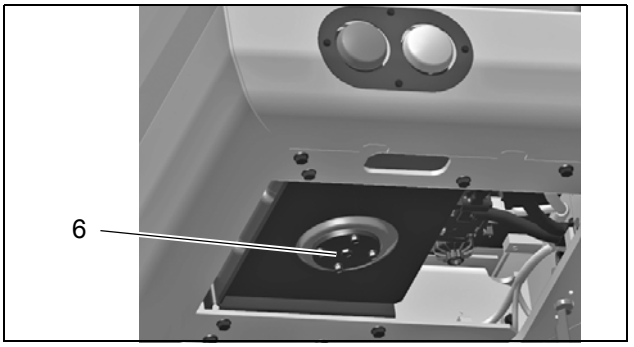


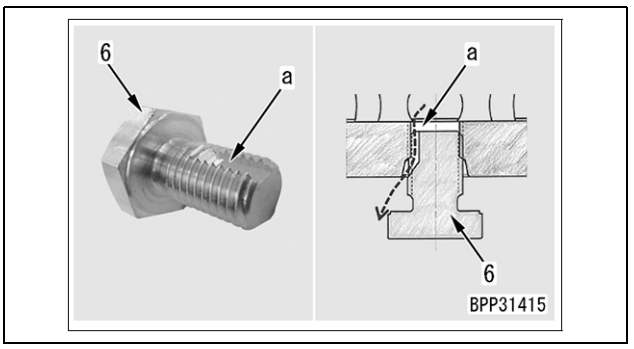
8. Repeat above steps 5 to 7 for 2 times.

9. Close the valve B1 of remote breather hose B securely.

10. Loosen the drain plug (6) by 6 turns and drain AdBlue/DEF into oil container A.

NOTE
There is the slit (a) at threaded part of the drain plug (6) and it prevents large amount of AdBlue/DEF to drain and splash.





11.)It is almost drained in approximately 2 minutes, remove the drain plug (6).

12. Fully open the valve B1 of remote breather hose B.

13. When the container A is almost filled up, close the valve B1 of the remote breather hose B securely.

14. It is almost drained in approximately 15 seconds, change the oil container A.

15. Repeat steps 12) to 14). When AdBlue/DEF tank becomes empty, install the drain plug securely.

Procedure 4: clean AdBlue/DEF tank according to the following procedure.

Inspection and adjustment of pump PC (valve inlet) control oil pressure

- Pump PC control circuit oil pressure inspection and adjustment tools

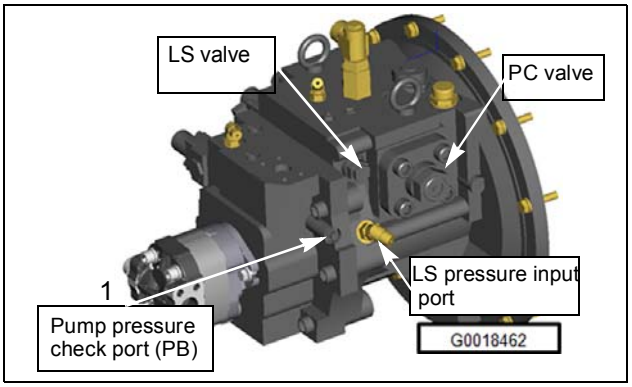
Mark		Part No.	Part Name	No. Off
J	1	799-101-5002	Hydraulic Tester	2
		790-261-1203	Digital Type Hydraulic Tester	2
	2	799-101-5220	Grease Fitting (10 x 1.25 mm)	2
		07002-11023	O-ring	2

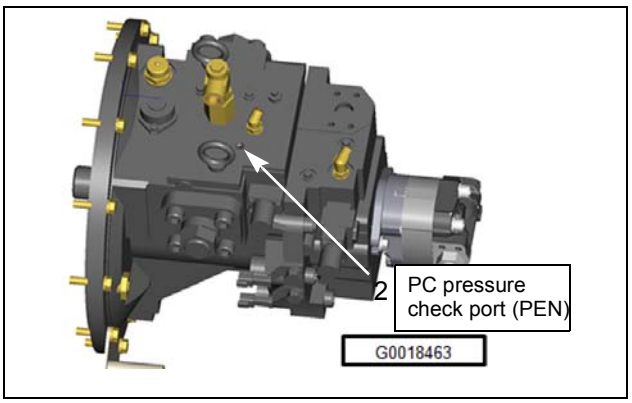
Measurement

- Implement measuring the pump PC control circuit oil pressure after confirming that the work equipment, swing and travel circuit oil pressure as well as the control circuit original oil pressure are normal.

Lower the work equipment to the ground and stop the engine. After the engine is stopped, (but with the ignition switch in the ON position and safety lever still ENGAGED), operated the control levers several times to release the remaining pressure in the hydraulic system. Then loosen the oil filler cap to release any pressure in the hydraulic tank.

1. Measurement of PC valve output pressure (servo piston inlet pressure)
   - Measure PC valve output pressure (servo piston inlet pressure) and pump delivery pressure together, and compare the two pressures.
   a. Remove oil pressure measurement plugs (1) and (2).
      - Plug (1): For measuring the pump delivery pressure
      - Plug (2): For measuring the pump PC valve delivery pressure





   b. Fit tool J2 to each port (1 and 2), connect each tool to oil pressure gauge of hydraulic tester J1.
      - Use an oil pressure gauge with the capacity of 58.8 MPa{600 kg/cm²}

Measuring and adjusting quick coupler control valve output pressure

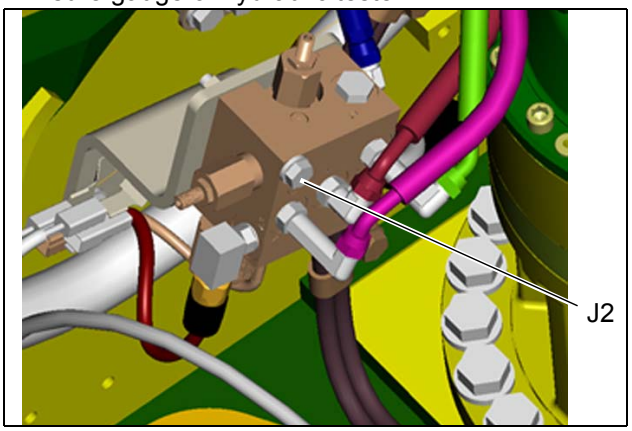
★ Measuring and adjusting tools for oil pressure in quick coupler circuit.

Symbol		Part No.	Part name
J	1	799-101-5002	Hydraulic tester
		790-261-1204	Digital hydraulic tester
	2	799-101-5220	Nipple (10 × 1.25 mm)
		07002-11023	O-ring

Stop the machine on a level ground and lower the work equipment to the ground. Then, release the residual pressure from the hydraulic circuit. For details, see "Releasing residual pressure from hydraulic circuit".

Measuring

- Measure quick coupler control valve output pressure after checking that work equipment, swing and travel circuit pressures are normal.
- Fit nipple J2 to port B2 and connect it to oil pressure gauge of hydraulic tester.



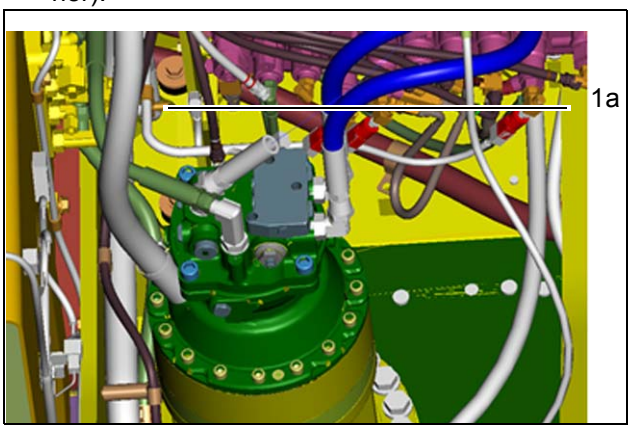
- Use an oil pressure gauge with the capacity of 59MPa (600kg/cm²)
- Start the engine. In order to raise the pressure to the set pressure of the pressure regulating valve it will be necessary to operate one of the main control circuits. Set the swing lock to ON and operate the swing lever.

NOTE
When delivered from the factory the regulated pressure is set to 4MPa (41kg/cm²).

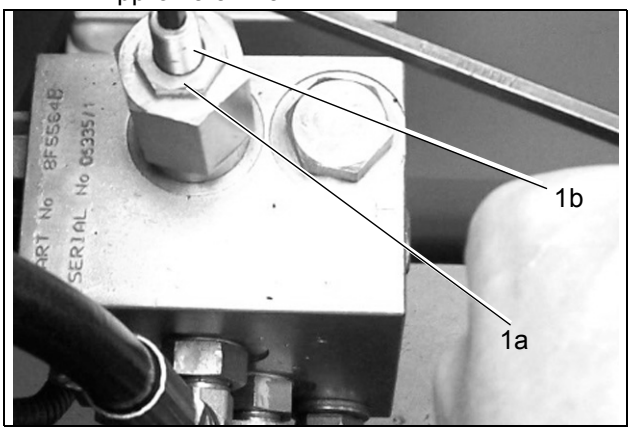
Adjustment

If the regulated pressure is not suitable for the quick coupler to be installed adjust the pressure of the regulating valve as follows:

1. Loosen the locknut (1a). (using a 17mm spanner).



2. Turn the adjustment screw (1b) to adjust the pressure. (Using a 5mm hexagon key).
   - If the screw is turned to the right the pressure increases.
   - If the screw is turned to the left the pressure reduces.
   - Quantity of adjustment per turn of the screw: Approx 5.5MPa.

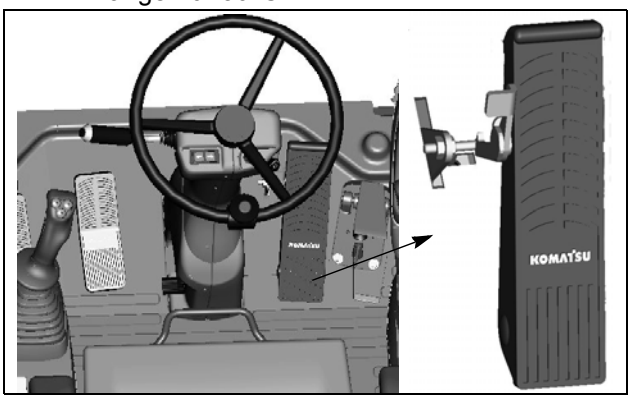


After required pressure is achieved, hold adjustment screw (1b) and tighten the lock nut (1a). (Torque of lock nut (1a) 12+/-2Nm)

d. After finishing the measurement, make sure that the machine is back to normal condition.

5. Measuring leakage from travel motor

a. With the safety lock lever in the ENGAGED position the PPC switch in the OFF position, the engine running at high idle and the service brake locked in the ON position. Raise the hydraulic oil temperature to be in the range 40~50°C.

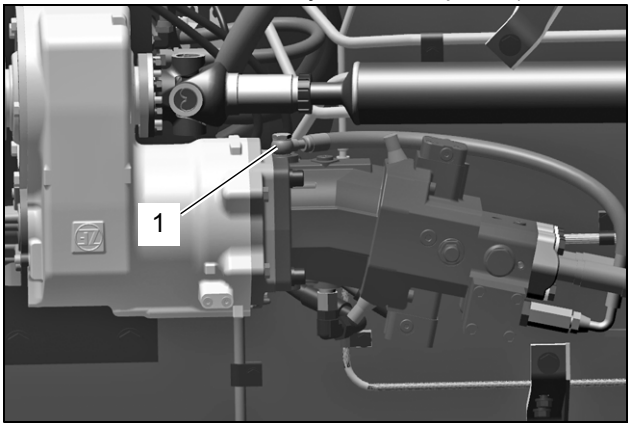


b. Disconnect flushing hose (1) of the travel motor and fit a blind plug in the hose end.

c. Using the travel pedal, put the travel circuit into relief.

d. Port A or B are set under pressure above the setting of relief valves (i.e. 380 bar)

- Since any incorrect operation of the controls may lead to a serious accident. Only do this test in a secure area marked with adequate warning signs.
- Start measuring the oil leakage 30 seconds after the travel motor circuit is relieved and measure for 1 minute.
- Measure the oil leakage several times, moving the motor little by little (changing the positions of the valve plate, cylinder, those of the cylinder and piston).



e. After the measurement, make sure that the machine is back to normal conditon.

Leakage - 4 ~ 6 litres / min Normal
Leakage > 10 litres / min Abnormal

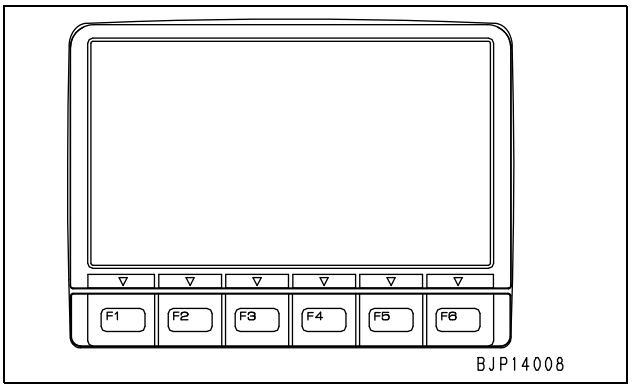
Repair or replace travel if motor is found to have an abnormal level of oil leakage.

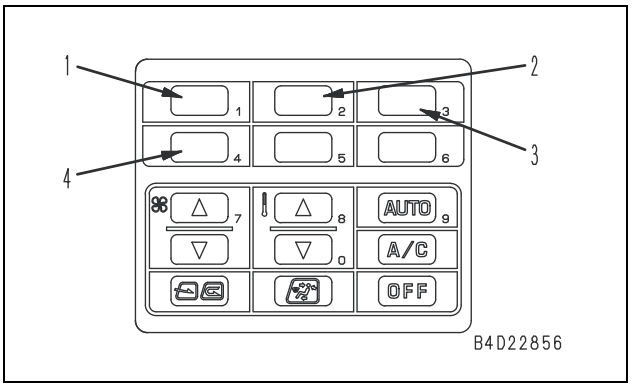
Checking function by LCD (Liquid Crystal Display)

While the standard screen is displayed, if the numeral input switches or function switches are operated in the following manner, the entire LCD screen turns white.

Switch operations (simultaneously): 4 + F2

- When finishing the operation of the switches, release F2 first.
- If there is a display error in the LCD, only that part is indicated in black.
- To return to the former screen, press any one of the function switches.





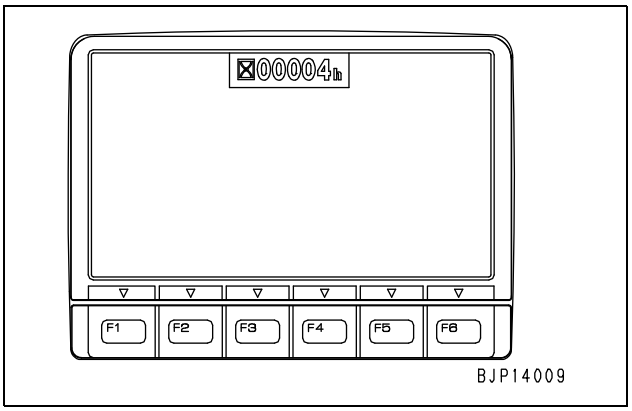
Checking function of service meter

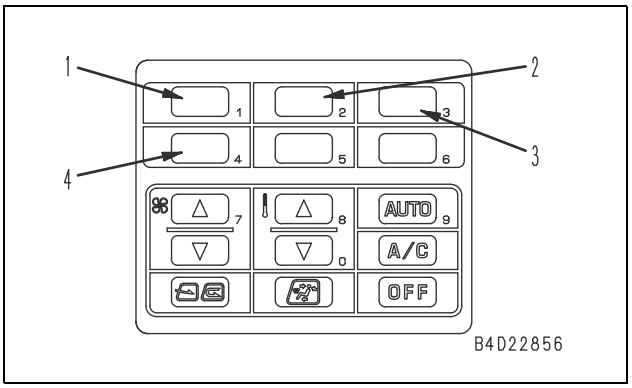
When checking the service meter with the starting switch in OFF position, operate the numeral input switches as follows to display only the service meter section.

Operate the switches (simultaneously): 4 + 1

REMARK

- There is some time lag in start of the LCD, so hold down the switches until the service meter is displayed.
- If you release one of the switches, the monitor goes off.





Pre-defined Monitoring (05/35) Intake&Exhaust.

No	ID	Item	Unit (SI)	Applicable component
1	01002	Engine Speed	kPa	ENG
2	37400	Ambient Pressure	kPa	ENG
3	36500	Charge Pressure	kPa	ENG
4	48300	Exhaust Manifold Pressure	r/min	ENG
5	48100	Turbo Speed Turbocharger Speed	kg/min	ENG
6	48200	MAF	kPa	ENG

Pre-defined Monitoring (06/35) After treatment

No	ID	Item	Unit (SI)	Applicable component
1	47300	KDOC 1 Inlet Temperature	°C	ENG
2	47400	KDOC 1 Outlet Temperature	°C	ENG
3	19300	SCR Temperature	°C	ENG
4	36400	Rail Pressure	MPa	ENG
5	47500	Dosing Instant Fuel Consumption	l/h	ENG
6	19200	Exhaust Gas Flow Rate	kL/h	ENG

Pre-defined Monitoring (07/35) Engine related items (1)

No	ID	Item	Unit (SI)	Applicable component
1	01002	Engine Speed	r/min	ENG
2	47300	KDOC 1 Inlet Temperature	°C	ENG
3	47400	KDOC 1 Outlet Temperature	°C	ENG
4	04107	Coolant Temperature	°C	ENG

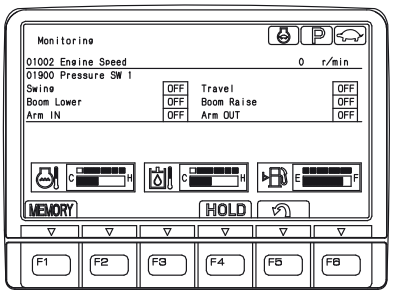
Pre-defined Monitoring (08/35) Engine related items (2)

No	ID	Item	Unit (SI)	Applicable component
1	01002	Engine Speed	r/min	ENG
2	37212	Engine Oil Pressure SW	-	ENG
3	48400	Crankcase Pressure	kPa	ENG
4	47300	KDOC 1 Inlet Temperature	°C	ENG
5	36500	Charge Pressure	kPa	ENG
6	48100	Turbo Speed Turbocharger Speed	r/min	ENG

4. On the “Monitoring” screen, perform the necessary operation of the machine and check the self-define monitoring information.

   REMARK

   - Monitoring information is indicated by value, ON/OFF, or special display.
   - The display unit can be set to “SI”, “Metric”, or “Imperial” as required.

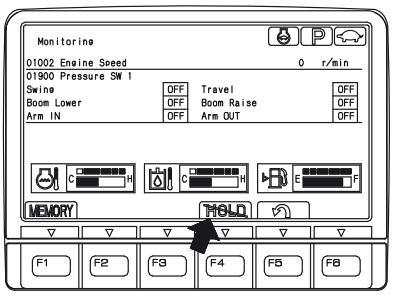


RKA56820

5. You can hold and release holding of the monitoring information by using the function switches.

   F4: Selects HOLD or releasing HOLD. (When HOLD is selected, “HOLD” part is hatched.)

   F5: Returns to the “Monitoring Selection Menu” screen

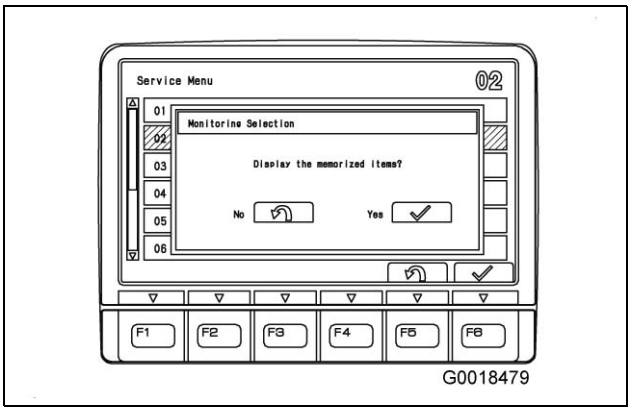


RKA56830

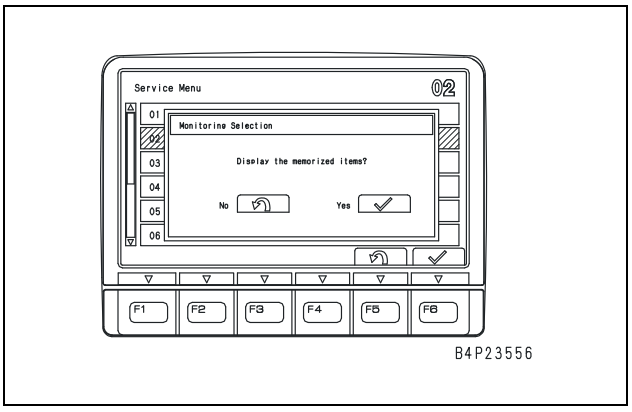
6. To change the setting of the working mode, travel speed, or auto-deceleration during monitoring, operate the corresponding switch under the current condition, and the corresponding mode is selected.

   REMARK

   - If the setting is changed during monitoring, the new setting is held even after the screen returns to the normal screen after monitoring is finished.
   - When the working mode is changed to B (“Breaker Mode”), the screen to confirm the change of the setting is displayed as in changing the working mode on the standard screen.



G0018479

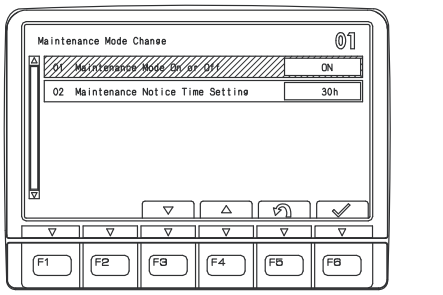


B4P23556

Monitoring code	Self-define Monitoring items (screen display)	Unit			Applicable component	Remarks
		SI	Metric	Imperial		
04300	Battery Charge Voltage	V	V	V	MON	
04200	Fuel Level Sensor Voltage	V	V	V	MON	
04500	Monitor Input 1					
	Key SW	ON/OFF	ON/OFF	ON/OFF	MON	
	Start	ON/OFF	ON/OFF	ON/OFF	MON	
	Preheat	ON/OFF	ON/OFF	ON/OFF	MON	
	Light	ON/OFF	ON/OFF	ON/OFF	MON	
04501	Monitor Input 2					
	Air Cleaner	ON/OFF	ON/OFF	ON/OFF	MON	
	Engine Oil Level	ON/OFF	ON/OFF	ON/OFF	MON	
	Battery Charge Voltage	ON/OFF	ON/OFF	ON/OFF	MON	
	Quick Coupler	ON/OFF	ON/OFF	ON/OFF	MON	
04502	Monitor Input 3					
	Swing Parking Brake SW	ON/OFF	ON/OFF	ON/OFF	MON	
	Engine Shutdown 2nd SW	ON/OFF	ON/OFF	ON/OFF	MON	
	Seat Belt SW	ON/OFF	ON/OFF	ON/OFF	MON	
04503	Monitor Function SW					
	F1	ON/OFF	ON/OFF	ON/OFF	MON	
	F2	ON/OFF	ON/OFF	ON/OFF	MON	
	F3	ON/OFF	ON/OFF	ON/OFF	MON	
	F4	ON/OFF	ON/OFF	ON/OFF	MON	
	F5	ON/OFF	ON/OFF	ON/OFF	MON	
	F6	ON/OFF	ON/OFF	ON/OFF	MON	
04504	Monitor 1st & 2nd Row SW					
	SW 1	ON/OFF	ON/OFF	ON/OFF	MON	
	SW 2	ON/OFF	ON/OFF	ON/OFF	MON	
	SW 3	ON/OFF	ON/OFF	ON/OFF	MON	
	SW 4	ON/OFF	ON/OFF	ON/OFF	MON	
	SW 5	ON/OFF	ON/OFF	ON/OFF	MON	
	SW 6	ON/OFF	ON/OFF	ON/OFF	MON	

REMARK

Even if ON/OFF of each item has been set, if the above setting is changed, it overrides the individual setting.



4. Select “Maintenance Notice Time Setting”. When “Maintenance Notice Time Setting” is displayed, set the notice time with the function switches.

   Default value: Maintenance notice time set on the machine monitor (Recommended by the manufacturer and not changeable).

   Set value: Maintenance notice time can be arbitrarily set. Maintenance reminder function works according to this set time in operator mode (the time can be increased or decreased in 10-hour unit).

   F3: Decreases the set value

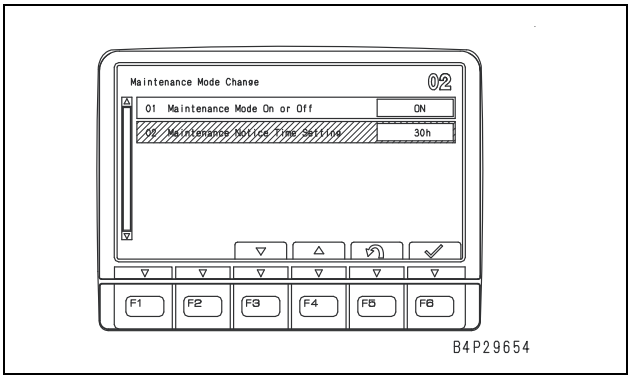
   F4: Increases the set value

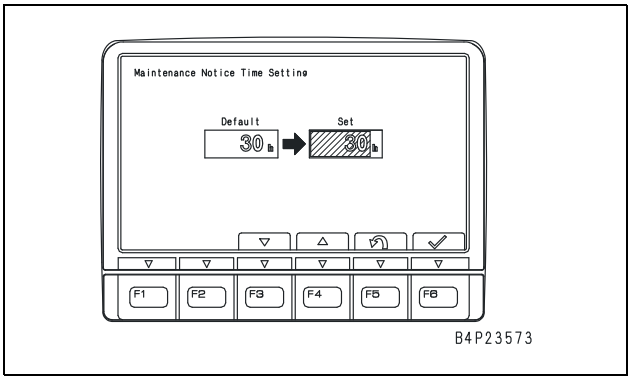
   F5: Cancels the set value and returns to the “Maintenance Mode Setting” screen

   F6: Enters the set value, and returns to the “Maintenance Mode Setting” screen

   REMARK

   - Press F6 and confirm the setting. When the setting is enabled, the screen returns to the “Maintenance Mode Setting”.
   - If the setting item is changed when the maintenance mode setting is turned “ON” after running the machine more than an hour from the setup, the change is recognized as a reset operation.





5. Select one of the Maintenance Items. When the particular maintenance item screen is displayed, select “On or Off Setting”.

   F3: Moves the selected item down by one item

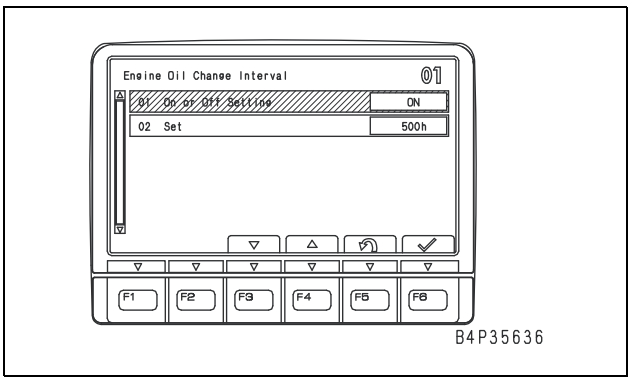
   F4: Moves the selected item up by one item

   F5: Cancels the selection and returns to “Maintenance Mode Change” screen

   F6: Enters the selected item, and moves the screen to the “ON” or “OFF” screen

   REMARK

   - The image is a setup example of “Engine Oil Change Interval”.



Method for setting with default setting menu (chassis attachment)

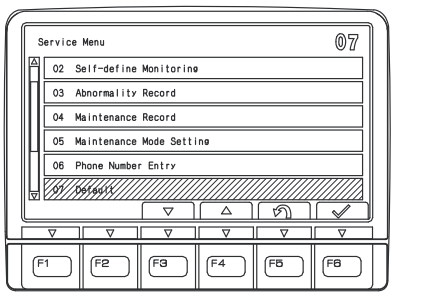
Use the menu of "Default" to check or change various settings of the machine monitor and machine.

Use the Chassis of attachment setting to configure attachment setting when a blade or outrigger is installed or removed.

1. Select “Default” on “Service Menu” screen.

   REMARK

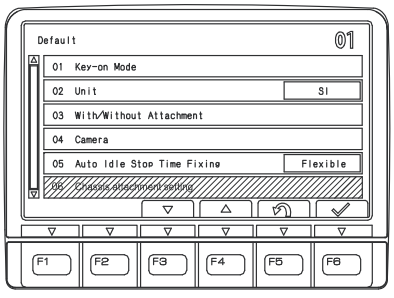
   For selecting method, see “METHOD FOR OPERATING SERVICE MODE” in “SERVICE MODE”.



2. Select “Chassis attachment setting” with the function switches or numeral input switches on “Default” screen.

   REMARK

   Selecting method is the same as on “Service Menu” screen.



3. Selecting display setting
   After the "Chassis Attachment Setting" screen is displayed, select a setting by using the function switch.

   Front Setting

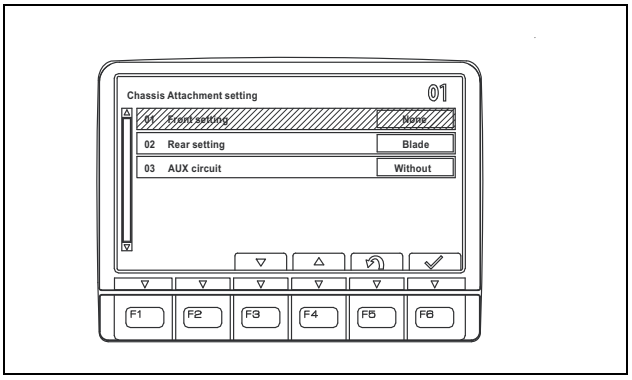
   Rear Setting

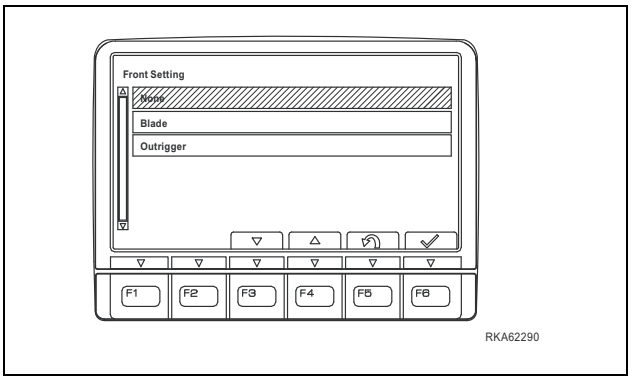
   F3: Moves selection downward

   F4: Moves selection upward

   F5: Cancels contents of setting before entry and returns to "Default" screen

   F6: Enters selection and returns the display to Default screen





Method for operating testing menu (KDPF Memory Reset)

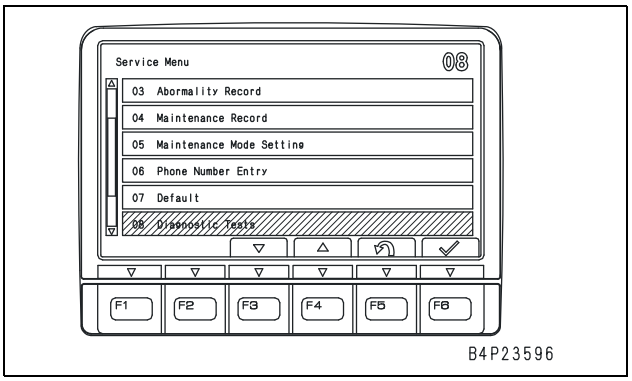
Testing menu checks the machine or resets the settings of the machine monitor.

“KDPF Memory Reset” resets KDOC information saved in the machine. Refer to this section and reset KDOC information after cleaning or replacing KDOC.

1. Select “Diagnostic Tests” from the “Service Menu” screen.

   REMARK

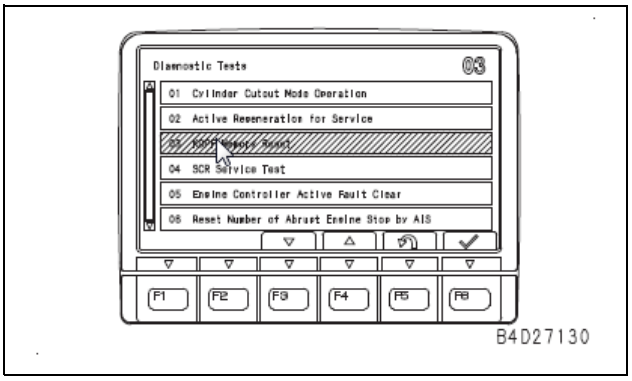
   For selecting method, see “Operating method of service mode” in “SERVICE MODE”.



2. On the “Diagnostic Tests” screen, select “KDPF Memory Reset” with function switches or numeral input switches.

   REMARK

   For selecting method, see “Operating method of service mode” in “SERVICE MODE”.



3. On “KDPF Memory Reset” screen, select an item to be reset.

   F3: Moves the selected item down by one item

   F4: Moves the selected item up by one item

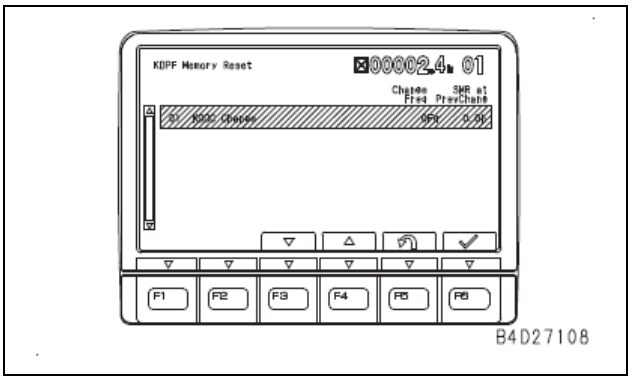
   F5: Returns to the “Diagnostic Tests” screen

   F6: Enters the selected item

   After cleaning or replacing KDOC, perform “KDOC Change”.

   REMARK

   Perform the applicable operation. See TROUBLESHOOTING, “PRECAUTIONS FOR CLEANING AND REPLACING KDOC”.

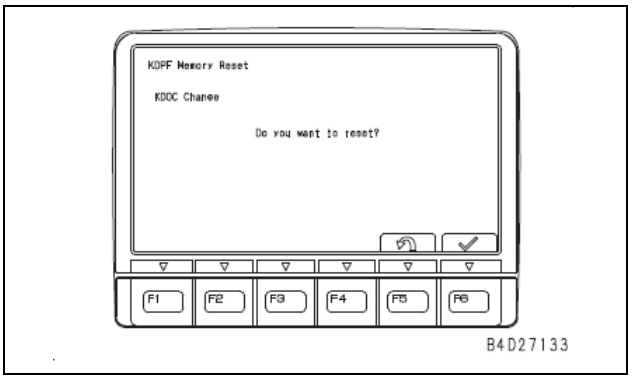


4. After “Do you want to reset?” is displayed, enter the reset with the function switch.

   F5: Returns the screen to previous screen

   F6: Executes resetting

   When the memory has been reset successfully, “Reset completed.” appears on the screen. If an error occurs while resetting the memory, “Reset failed.” appears on the screen.



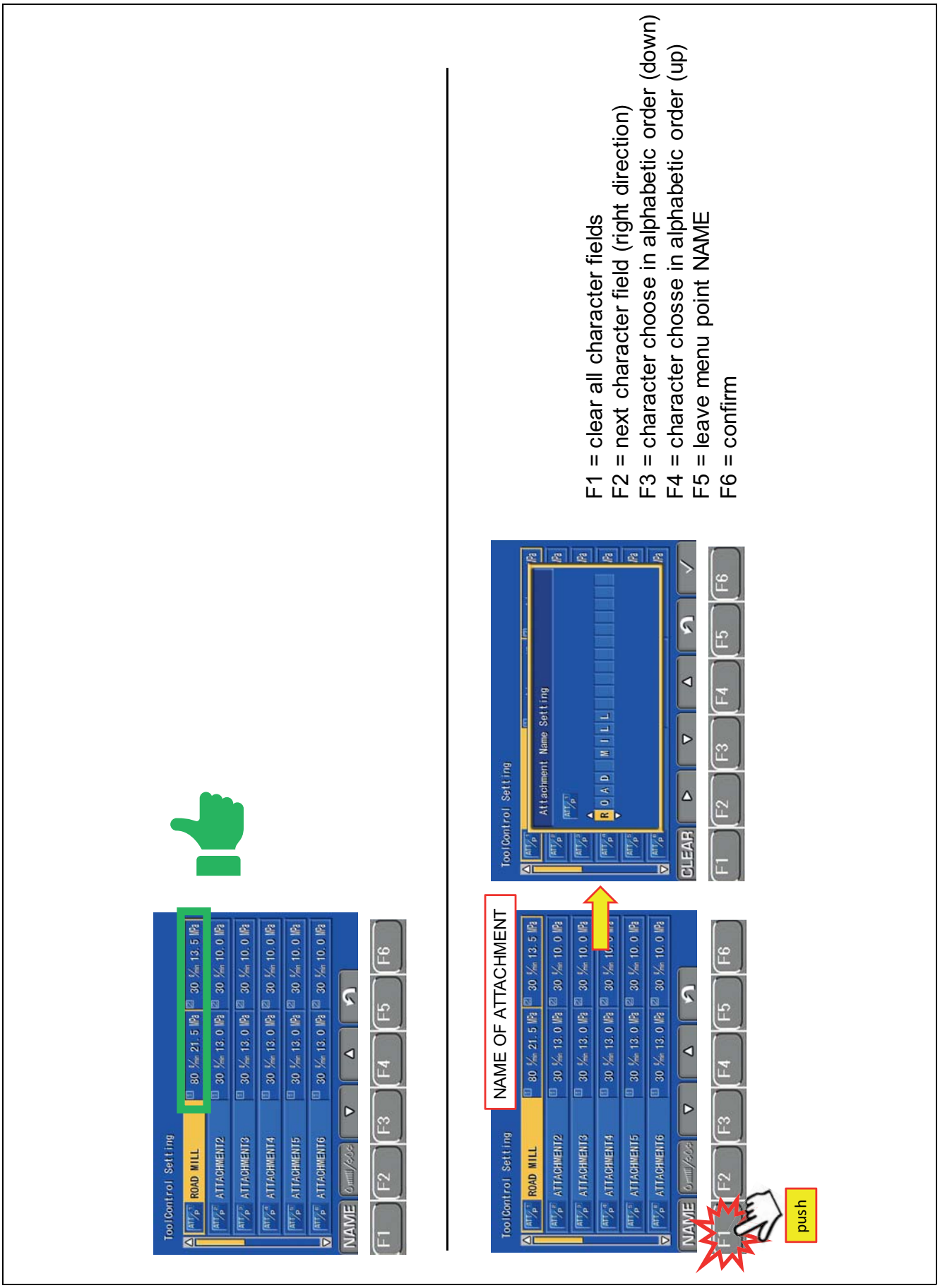
Relationship between set value and EPC current

05 Attachment EPC1 06 Attachment EPC2 07 Attachment EPC3 08 Attachment EPC4 09 Attachment Press EPC1 adjustment 10 Attachment Press EPC2 adjustment	
Code	Set Value (mA)
000	-100
001	-90
002	-80
003	-70
004	-60
005	-50
006	-40
007	-30
008	-20
009	-10
010 (default)	0
011	+10
012	+20
013	+30
014	+40
015	+50
016	+60
017	+70
018	+80
019	+90
020	+100

Troubleshooting when the failure occurs

Phenomenon	Cause	Required action
GPS does not become OK.	Something on the cab blocks off GPS satellites acquisition.	Remove the obstacle on the cab.
	GPS antenna cable is not connected to the machine monitor, or they are loose.	Check for the connection. If the connection is loose, secure it.
Modem does not become OK.	The mobile phone is out of communication range.	Check for state of in/out communication range with your mobile phone. If it is out of communication range, move into communication reception range and perform inspection.
	Communication antenna cable is not connected to the KOMTRAX terminal, or they are loose.	Check for the connection. If the connection is loose, secure it.
	KOMTRAX terminal is not connected to machine side wiring harness, or they are loose.	Check for the connection. If the connection is loose, secure it.

4. After troubleshooting, perform 1) in step 2 again.


F1 = clear all character fields
F2 = next character field (right direction)
F3 = character choose in alphabetic order (down)
F4 = character chosse in alphabetic order (up)
F5 = leave menu point NAME
F6 = confirm
NAME OF ATTACHMENT
push
Tool Control Setting
Attachment Name Setting
ROAD MILL
ATTACHMENT2
ATTACHMENT3
ATTACHMENT4
ATTACHMENT5
ATTACHMENT6
NAME
CLEAR
F1
F2
F3
F4
F5
F6

Setting of KomVision (main setting)

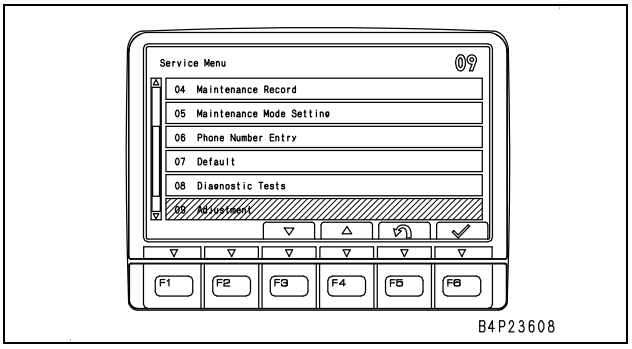
Check and select the model name and the machine specifications.

Method for setting KomVision (main setting)

1. Select the “Adjustment” on the “Service Menu” screen.

   REMARK

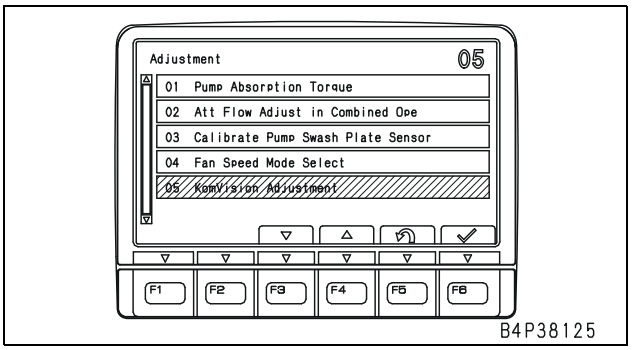
   For selecting method, see “Operating method of service mode” in “SERVICE MODE”.



2. Select the “KomVision Adjustment” with the function switches or numeral input switches on the “Adjustment” screen.

   REMARK

   For selecting method, see “Operating method of service mode” in “SERVICE MODE”.



3. Select the “Main Setting” with the function switches on the “KomVision Adjustment Menu” screen.

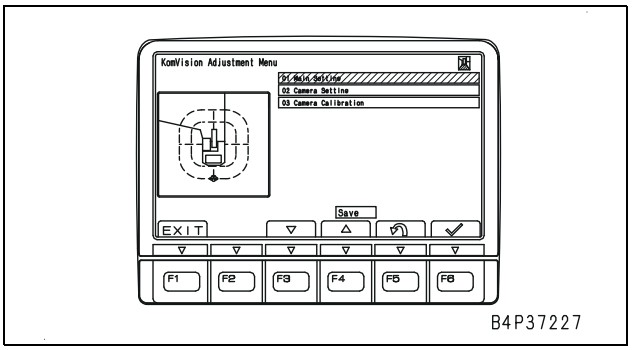
   F1: Screen returns to the “Service Menu” screen.

   F3: Moves the selection downward

   F4: Moves the selection upward

   F5: Cancels the selection. Screen returns to the “Adjustment” screen.

   F6: Enters the selected item



4. Select the “01 Machine Model” with the function switches on the “Main Setting” screen.

   F1: Screen returns to the “Service Menu” screen without saving the setting.

   F3: Moves the selection downward

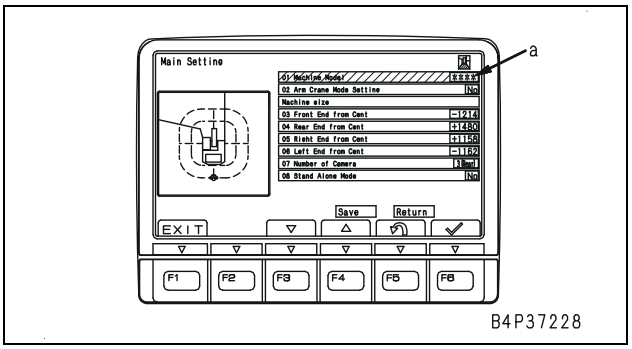
   F4: Moves the selection upward

   F5: Screen returns to the “KomVision Adjustment Menu” screen without saving the setting.

   F6: Enters the selected item

   REMARK

   When the selected item is entered, the back ground color of icon (a) turns yellow.



11. Align the marker of the target camera and the lateral position of the calibration marker B for position setting with the function switches.

    z: Marker of target camera

    B: Position setting calibration marker B

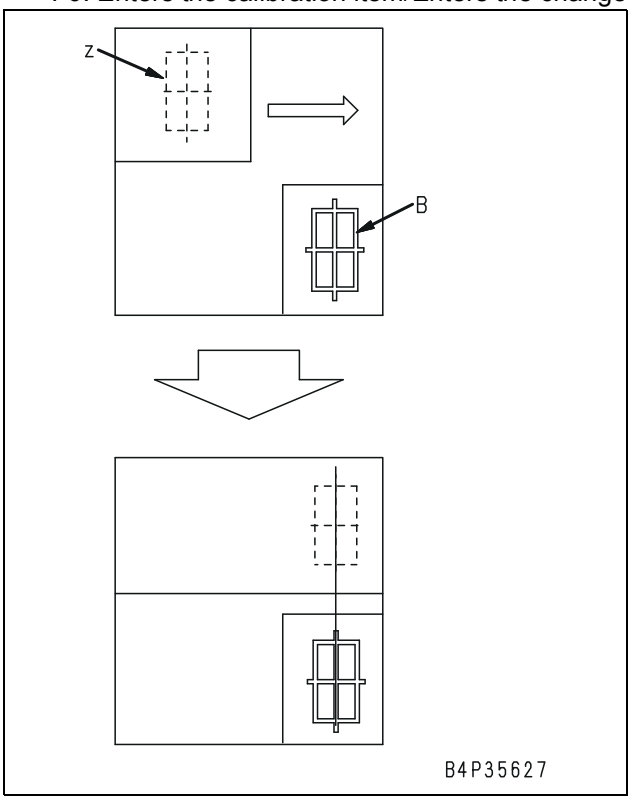
    F1: Screen returns to the “Service Menu” screen.

    F3: Camera image is moved to the left.

    F4: Camera image is moved to the right.

    F5: Cancels the calibration item/Cancels the changed item. Screen returns to the “Position Calibration Camera Select” screen.

    F6: Enters the calibration item/Enters the change



12. Select and enter the “Camera Longitude Posit” with the function switches.

    F1: Screen returns to the “Service Menu” screen.

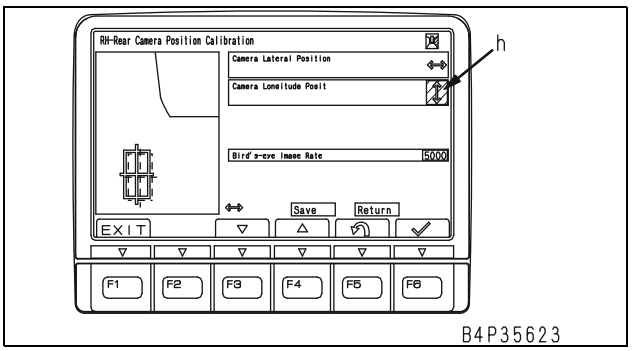
    F3: Moves the selection downward

    F4: Moves the selection upward

    F5: Cancels the selection. Screen returns to the “Camera Calibration” screen.

    F6: Enters the selected item

    When the selected item is entered, the back ground color of icon (h) turns yellow.



CA3235	SCR Outlet Temperature High Error - Non Regeneration	L03
CA3239	AdBlue/DEF Line Heater 2 Voltage High Error	L01
CA324	Injector #3 (L#3) Open Circuit Error or Short Circuit Error	L03
CA3241	AdBlue/DEF Line Heater 2 Voltage Low Error	L01
CA3242	AdBlue/DEF Tank Heating Error	L01
CA3251	KDOC Inlet Temperature High Error	L03
CA331	Injector #2 (L#2) Open Circuit Error or Short Circuit Error	L03
CA3313	KDOC Inlet Temperature Sensor Low Error	L03
CA3314	KDOC Inlet Temperature Sensor High Error	L03
CA3315	KDOC Inlet Temperature Sensor In Range Error	L03
CA332	Injector #4 (L#4) Open Circuit Error or Short Circuit Error	L03
CA3419	MAF Sensor Supply Voltage High Error	L03
CA3421	MAF Sensor Supply Voltage Low Error	L03
CA343	Engine Controller Internal Failure	L04
CA3497	AdBlue/DEF Level Low Error 1	-
CA3498	AdBlue/DEF Level Low Error 2	-
CA351	Injectors Drive Circuit Error	L03
CA352	Sensor 1 Supply Voltage Low Error	L03
CA3545	SCR Outlet NOx Sensor Unstable Error	L01
CA3547	AdBlue/DEF Level Low Error 4	L04
CA3558	AdBlue/DEF Pump Voltage High Error	L01
CA3559	AdBlue/DEF Pump Voltage Low Error	L01
CA356	MAF Sensor High Error	L03

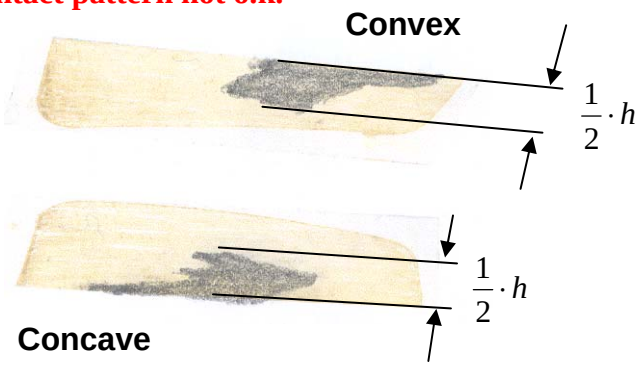
DV00KA	Buzzer Output Open Circuit(KomVision)	L01
DV00KB	Buzzer Output Short Circuit(KomVision)	L01
DV20KB	Travel Alarm Short Circuit	L01
DW44KA	Travel FR Sol Open Circuit	L04
DW44KB	Travel FR Sol Short Circuit	L04
DW44KY	Travel FR Sol Hot Short Circuit	L04
DW45KA	Swing Parking Brake Solenoid Open Circuit	L03
DW45KB	Swing Parking Brake Solenoid Short Circuit	L03
DW45KY	Swing Parking Brake Solenoid Hot Short Circuit	L03
DW4AKA	SUSLock Sol Open Circuit	L04
DW4AKB	SUSLock Sol Short Circuit	L04
DW4AKY	SUSLock Sol Hot Short Circuit	L04
DW4CKY	PPC Lock Solenoid Hot Short Circuit	L03
DW4MKA	Creep Sol Open Circuit	L03
DW4MKB	Creep Sol Short Circuit	L03
DW4MKY	Creep Sol Hot Short Circuit	L03
DW4UKA	Travel Return Bypass Sol Open Circuit	L03
DW4UKB	Travel Return Bypass Sol Short Circuit	L03
DW4UKY	Travel Return Bypass Sol Hot Short Circuit	L03
DW4YKA	High Gear Sol Open Circuit	L03
DW4YKB	High Gear Sol Short Circuit	L03
DW4YKY	High Gear Sol Hot Short Circuit	L03
DW4ZKA	Low Gear Sol Open Circuit	L03

Circuit diagram for outrigger solenoid

See wiring diagram 5-0

EXAMPLE 1: Dedendum tooth position

Contact pattern not o.k.

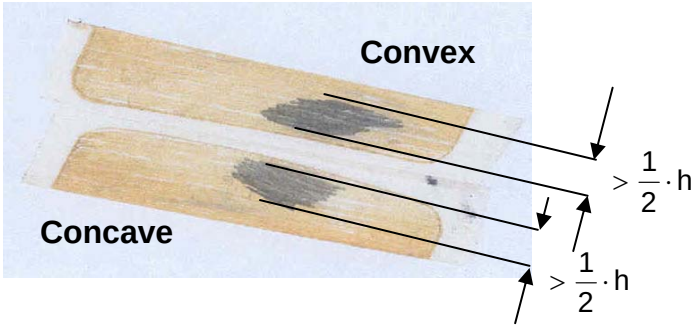


The contact pattern on the convex and concave flank is too far in the root, although more than 50% of the flank in h-direction is covered.
An adjustment is necessary!

Feature: On the convex flank the contact pattern has an impression at the toe / root and on the concave flank on the heel/root.

Adjustment: **Add a smaller shim to the pinion!**

Contact pattern o.k.



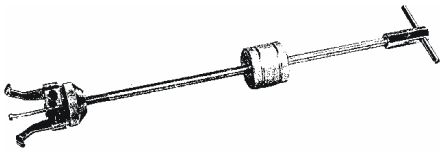
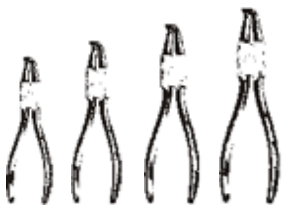
The contact pattern is in the flank without bridging and a minimum of 50% of the flank in h-direction is covered.
The contact pattern in the example is relatively small. However, the contact pattern has an impression on the middle of the tooth and would cover the flank optimally with a greater load (see sketch).

SPECIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

MS-E 3050 / 3060 / 3070 II
4472 097 200 / 4472 098 200 / 4472 099 201

Cons. No.	Figure	Designation Order no.	Qty.	Chapter/ Figure
21		**Grab sleeve** **5873 001 037**	1	3/10
22		**Grab sleeve** **5873 011 019**	1	4/2
23		**Basic tool** **5873 001 000**	1	4/2 4/11
24		**Pressure piece** **5870 100 009**	1	4/2
25		**Grab sleeve** **5873 001 034**	1	4/11

COMMERCIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

Cons. No.	Figure	Designation Order no.	Qty.	Chapter/Fig
10		**Lifting chain** **5870 281 047**	1	Universal
11		**Pry bar** **5870 345 071**	1	Universal
12		**Striker** **5870 650 004**	1	Universal
13		**Set of internal pliers** I1-I2-I3-I4 **5870 900 013**	1	Universal
14		**Set of internal pliers** I11-I21-I31-I41 90° **5870 900 014**	1	Universal

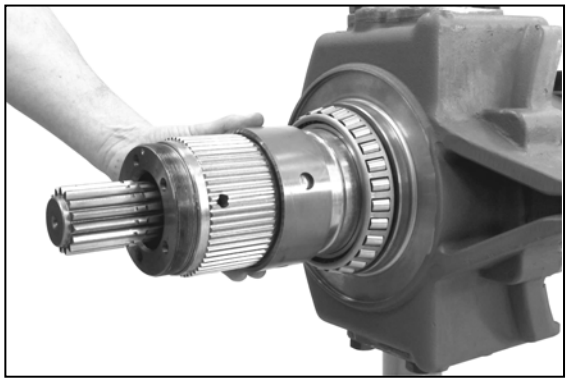


Figure 17

Operation (Figure 17) is only applicable for axle type MS-E 3060

Remove spacer bush.

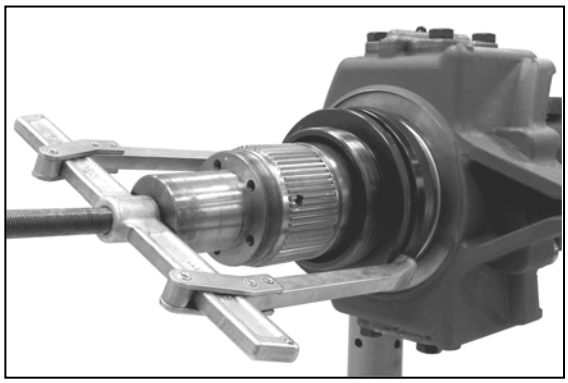


Figure 18

Pull tapered roller bearing from joint housing.

MS-E 3050	
(S) Grab sleeve	5873 003 022
(S) Pressure piece	5870 100 067
MS-E 3060	
(S) Grab sleeve	5873 004 026
(S) Pressure piece	5870 100 067
MS-E 3070	
(S) Grab sleeve	5873 004 022
(S) Pressure piece	5870 100 067

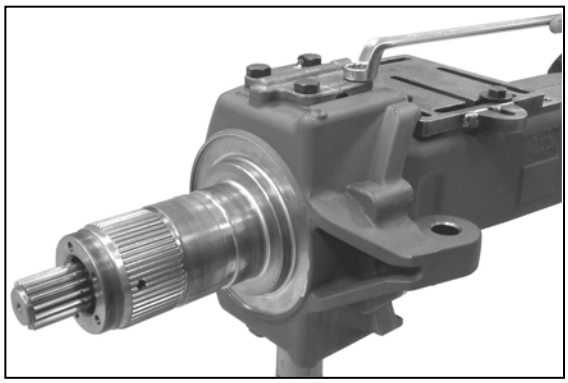


Figure 19

2.4 Disassembly knuckle housing

Loosen threaded joint and remove upper bearing pin.

Pay attention to releasing O-ring!

Remove lower bearing pin only after securing the knuckle housing (see figure below)!

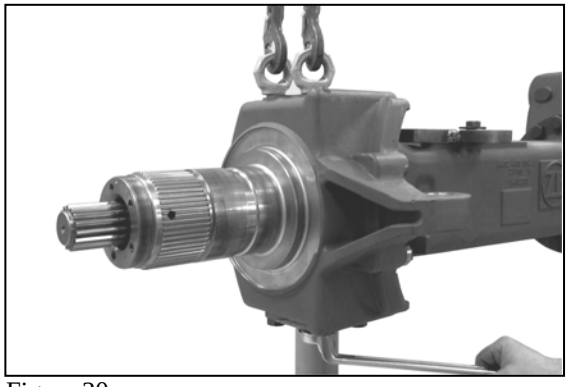


Figure 20

Secure knuckle housing by means of lifting tackle.

Then loosen threaded joint and remove lower bearing pin.

MS-E 3050	
(S) Eyebolts (M 16)	0636 804 001
MS-E 3060	
(S) Eyebolts (M 18)	5870 204 085
MS-E 3070	
(S) Eyebolts (M 20)	0636 804 003

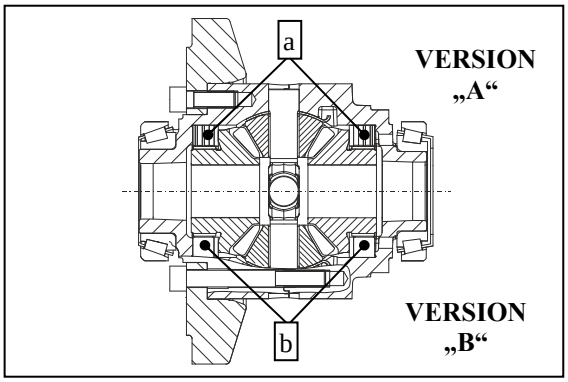


Figure 10

4.2 DZ-750 und D-750

VERSION "A" = multi-disk differential lock DZ-750:
(e.g. with 25 % locking value)
a = disk packages (outer disks, thickness = optional)

VERSION "B" = differential D-750:
(without disks / no locking value)
b = shim rings


Figure 11

Pull both tapered roller bearings off the differential carrier.

(S) Grab sleeve	5873 001 034
(S) Basic tool	5873 001 000

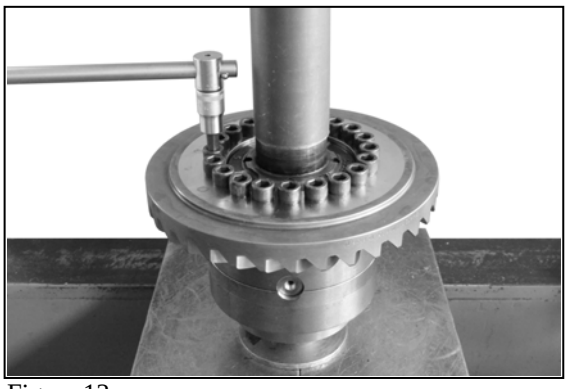


Figure 12

Fix differential by means of a press and loosen threaded connection of crown wheel /differential carrier.


Figure 13

Separate differential carrier halves.

6. Reassembly input

6.1 Install input pinion

☞ **The following measuring procedures must be carried out with utmost accuracy!**
Inaccurate measurements lead to an incorrect contact pattern and another disassembly and reassembly of the input pinion is required!

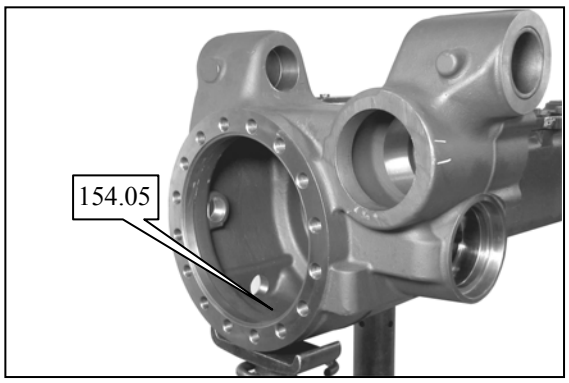


Figure 1

6.1.1 Determine thickness of the shim to obtain a correct contact pattern

Read dimension I from the axle drive housing.

Dimension I e.g. . . . . 154.05 mm

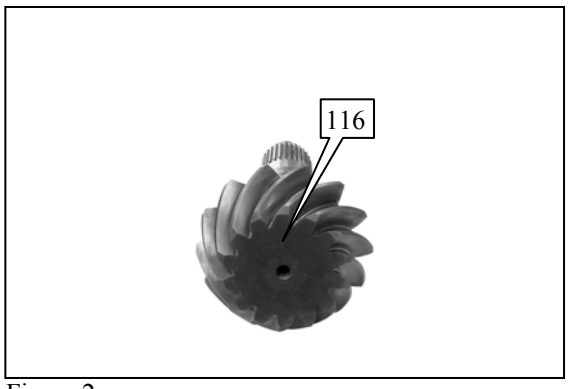


Figure 2

Read dimension II (pinion dimension).

Dimension II e.g. . . . . 116.00 mm

In case of a + or – deviation of the pinion dimension for production reasons the relevant value is marked by hand on the pinion.

Pinion dimension (without + or – deviation) = 116.0 mm
Pinion dimension with an indicated + 0.1 deviation = 116.1 mm
Pinion dimension with an indicated – 0.1 deviation = 115.9 mm

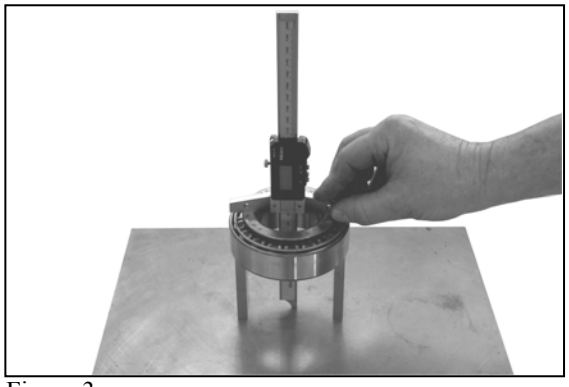


Figure 3

Determine dimension III (bearing width).

☞ **Make sure that the rollers are located without any play (rotate bearing g inner ring several times in both directions – roller setting)!**

Since the installed roller bearing is subject to a pre-load in installation position, consider an experience deduction of
- 0.1 mm !

Dimension III, e.g. 36.60 mm – 0.1 mm . . . . . = 36.50 mm

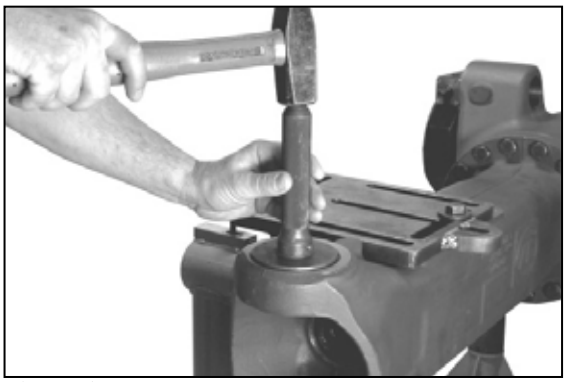


Figure 5

Insert both bearing outer rings into the pivot bearing holes of the axle housing.

MS-E 3050	
(S) Driver tool	5870 058 058
(S) Handle	5870 260 002
MS-E 3060	
(S) Driver tool	5870 058 022
(S) Handle	5870 260 002
MS-E 3070	
(S) Driver tool	5870 058 078
(S) Handle	5870 260 002

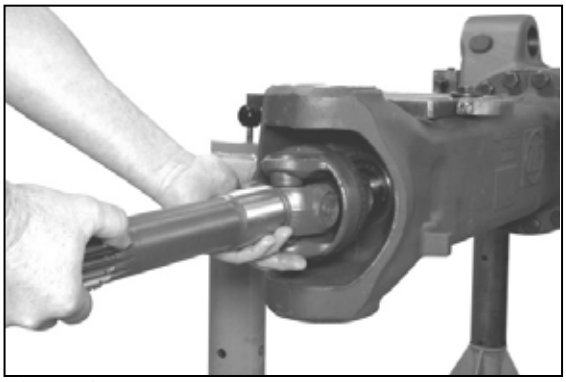


Figure 6

Install the u-joint shaft – by inserting the u-joint shaft into the axle bevel gear teeth.

⚠ **Pay attention to shaft seal ring in the axle housing – risk of damage!**

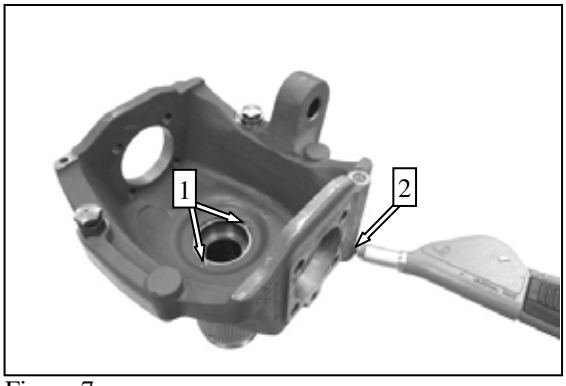


Figure 7

7.2 Reassembly knuckle housing (Pivot bearing-SET-RIGHT)

Seal machining openings of oil supply holes – position 1 (MS-E 3050/3060/3070) and 2 (only version MS-E 3060) with plugs.

(S) Lever riveting tongs	5870 320 016

☞ **Operation is only required when using a new knuckle housing!**


Figure 8

Insert bushing into the hole of the knuckle housing – considering the installation dimension „B“ and installation position „Y“ (see also sketch 9 and 11).

MS-E 3050	
(S) Driver tool (MS-E 3050)	5870 055 081
S) Handle	5870 260 002
MS-E 3060/3070	
(S) Driver tool (MS-E 3060/3070)	5870 055 090
(S) Handle	5870 260 002

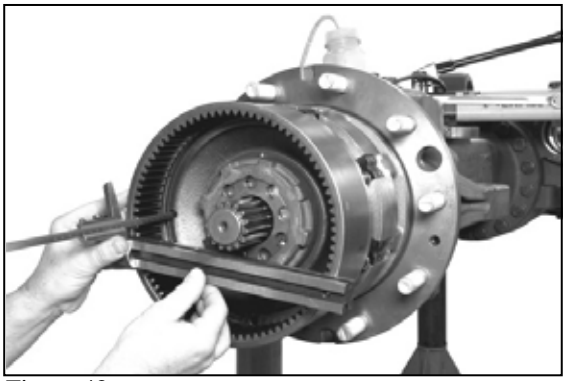


Figure 42

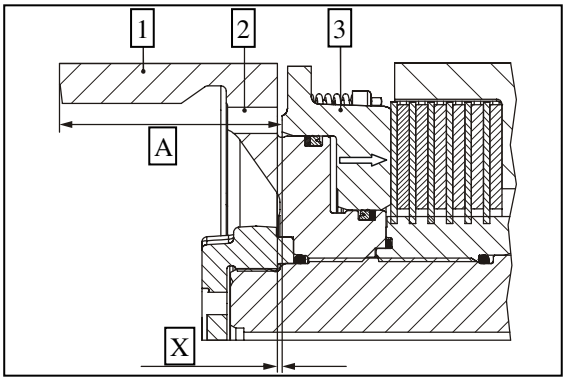


Figure 43

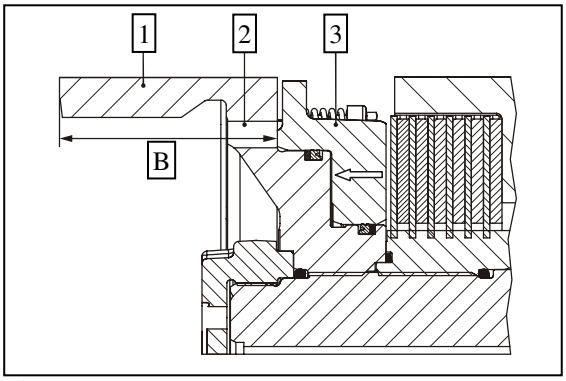


Figure 44

7.4.2 Adjust and check piston stroke

Piston stroke / disk clearance = 0.7 ..... 1.3 mm

Build up braking pressure (100 bar) and close locking valve of the HP pump.

Determine dimension „A“, from face of the ring gear (1) through measuring hole (see also sketch 43) to the face of the piston (3).

Dimension „A“ e.g. . . . . 83.10 mm

☞ **Breathe brake completely before starting the measuring operation!**

Then open locking valve of the HP pump and release pressure from brake (reset piston through compression springs).

Determine dimension „B“, from the face of the ring gear (1) through the measuring hole (see also sketch 44) to the face of the piston (3).

Dimension „B“ e.g. . . . . 82.10 mm

CALCULATION EXAMPLE:

Dimension „A“ e.g. . . . . 83.10 mm
Dimension „B“ e.g. . . . . - 82.10 mm
Difference = Piston stroke = 1.00 mm

☞ **If the required piston stroke (0.7 ... 1.3 mm) is not achieved, correct it with the corresponding inner clutch disk(s) – refer to corresponding spare parts list.**

Then remove HP pump (S), breather bottle (S) and threaded coupling (S).

Comment on sketch 43 and 44:
1 = Ring gear
2 = Measuring hole
3 = Piston
X = Piston stroke / disk clearance

(S) Straightedge 5870 200 022

8.3 Track setting and checking

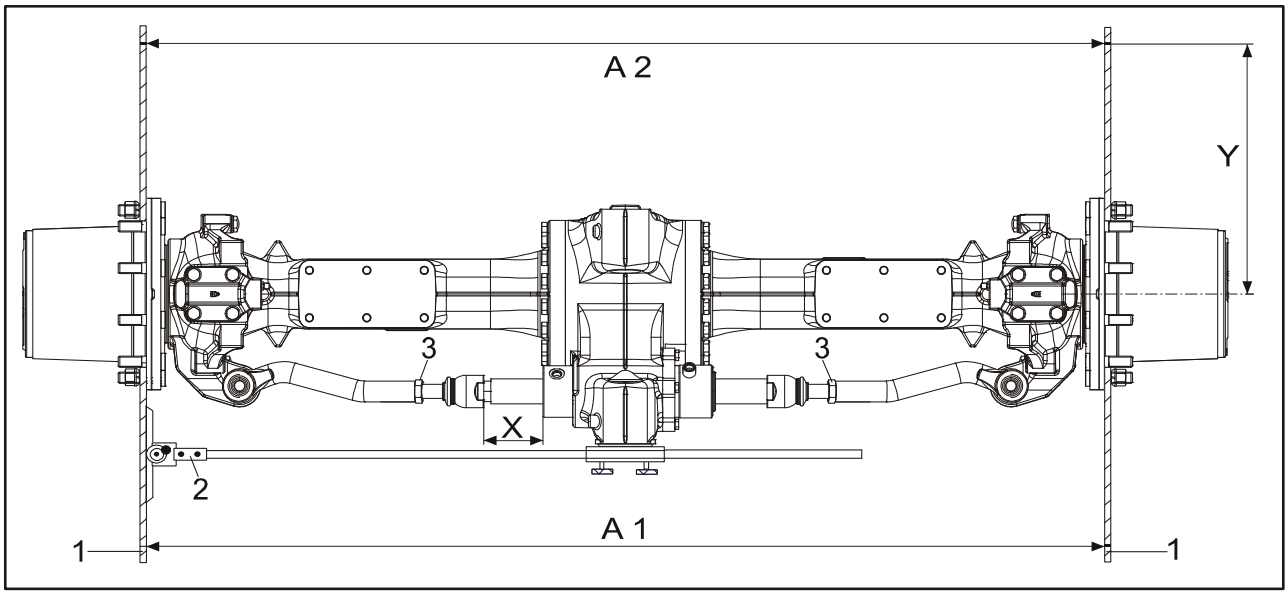


Figure 19

1 = (S) Straightedge 5870 200 029
2 = (S) Measuring device 5870 200 033
3 = Hexagon nut
X = Installation dimension (central position – piston rod)
Y = Distance – wheel center to rim flange

Basic track setting

Bring piston rod in central position.
MS-E 3050/3060
Dimension X = 119 mm (measured from front face/steering cylinder to contact face/axial joint).
MS-E 3070
Dimension X = 124 mm (measured from front face/steering cylinder to front face / axial joint).

Do not change axial position of piston rod any more during track setting!

Mount straightedge (1) in horizontal and central axis position.
Fix measuring device (2) to yoke.
Loosen hexagon nut (3) and set length of tie rod (axial joint) until the measuring device (2) indicates **„ 0° “** (corresponds to a track setting of „zero““ mm).

For a toe-in and toe-out setting, which might be required, stick to the vehicle manufacturer’s specification!

Make setting on both output sides!

Check track setting (0°):

Determine dimension A1.
Rotate both outputs by 180° – dimension A2 must equal dimension A1.
Dimension „Y“ = distance between rim center and rim flange.

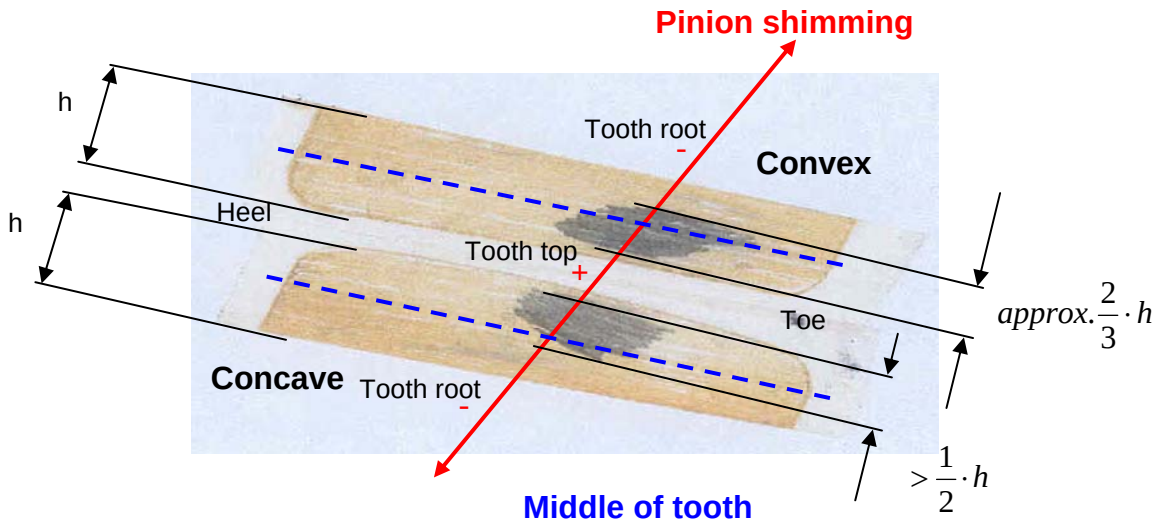
Then fix both tie rods (axial joint) by means of hexagon nut (3).

MS-E 3050/3060/3070 II
Tightening torque . . . . . M_A = 400 - 450 Nm

Examples of contact patterns for the Gleason gear tooth system

Application: The examples of contact patterns are applicable for all bevel gear sets in MT and MS axles which have a ratio between **1.5 < i < 6**.
Also, the examples are only valid for ground bevel gear sets.
(The examples are only partly applicable for lapped contact patterns).

Ideal contact pattern:



Contact pattern setting:
The contact patterns are viewed on the crown wheel flanks.
The contact pattern must be tangent to the center of tooth flank (middle of tooth), otherwise it is too far on the tooth top or on the tooth root.
The contact pattern should have a size of minimum 50% at the flank in h-direction (inspection criterion).

General:
By changing the pinion distance the contact pattern position is relocated in the direction of the tooth depth.

Shimming in + :	= reduce pinion shim thickness (contact pattern moves to the top)
Shimming in - :	= increase pinion shim thickness (contact pattern moves to the root)

Flank glossary:

Convex flank	= Drive side
Concave flank	= Coast side
Toe	= Crown wheel inner side
Heel	= Crown wheel outer side

Note:
The following pages (0/5 … 7) describe three different examples of contact patterns!

SPECIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

MT-E 3050 / 3060 / 3070 II
4472 047 200 / 4472 048 200 – 202 / 4472 049 201

Cons. No.	Figure	Designation Order no.	Qty.	Chapter/ Figure
16		**Grab sleeve** **5873 011 019**	1	3/2
17		**Basic tool** **5873 001 000**	1	3/2 3/11
18		**Pressure piece** **5870 100 009**	1	3/2 3/11
19		**Grab sleeve** **5873 001 034**	1	3/11
20		**Adjusting screws** M12x1.5 **5870 204 027**	1	4/11

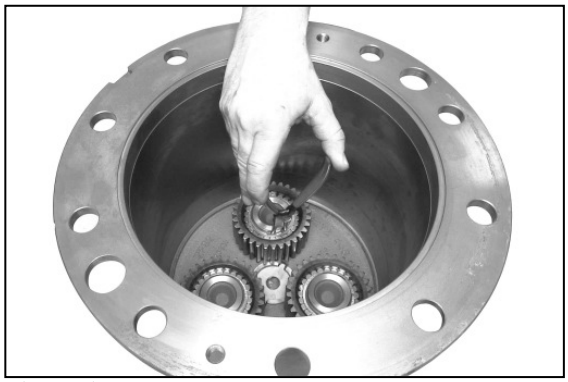


Figure 5

Snap out retaining ring.

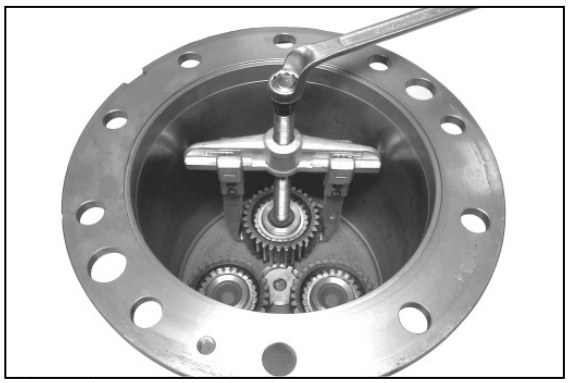


Figure 6

Pull off planetary gear together with cylindrical roller bearing.

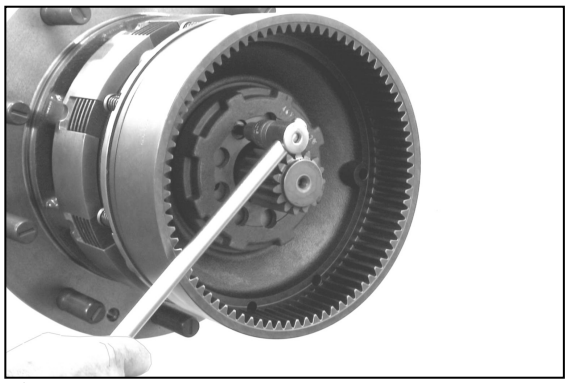


Figure 7

1.2 Disassembly of brake

Loosen cylindrical screw (slotted nut fixing).

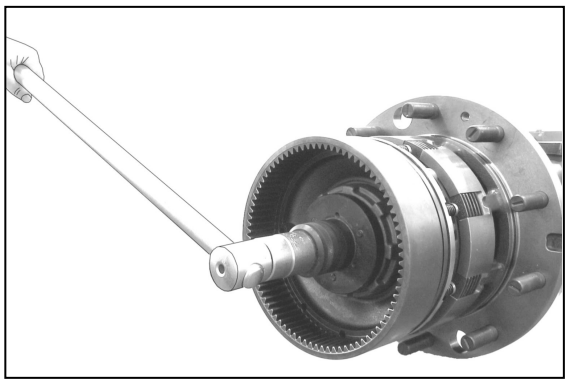


Figure 8

Loosen slotted nut.

(S) Socket wrench 5870 656 097

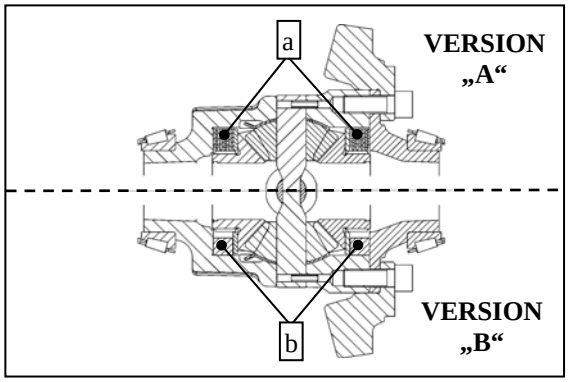


Figure 1

3. Disassembly differential

3.1 DZ-500 and D-500

VERSION "A" = DZ-500:
DZ-500 = limited slip differential
(e.g. with 45 % locking value)
a = Disk package (outer disks, s = optional)

VERSION "B" = D-500:
D-500 = Standard differential
(without disks / no locking value)
b = Constant spacers


Figure 2

Pull both tapered roller bearings from differential carrier.

(S) Grab sleeve	5873 011 019
(S) Basic tool	5873 001 000
(S) Pressure piece	5870 100 009

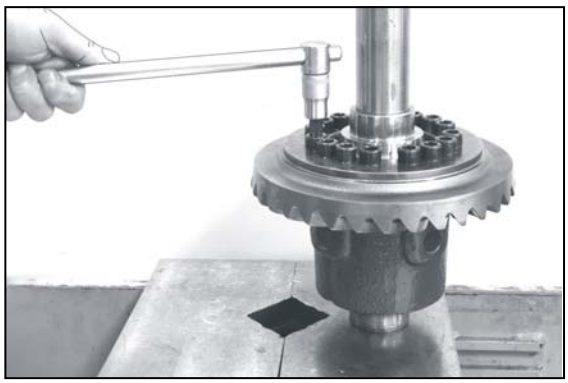


Figure 3

Use press to fix differential and loosen threaded joint crown wheel / differential carrier.

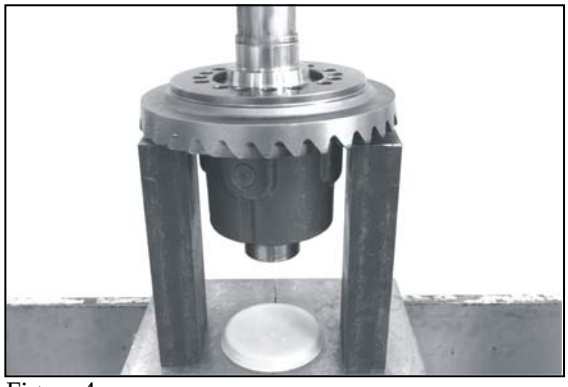


Figure 4

Press crown wheel from differential.

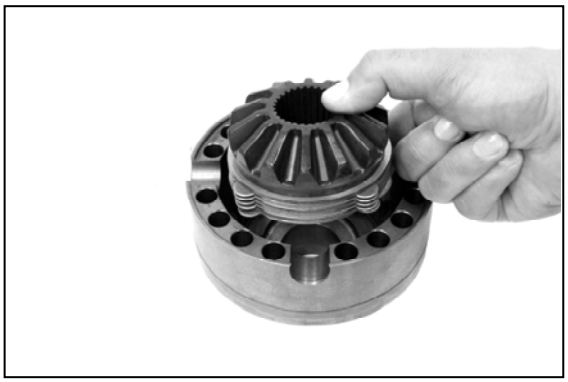


Figure 19

Insert preassembled axle bevel gear into the differential carrier half.

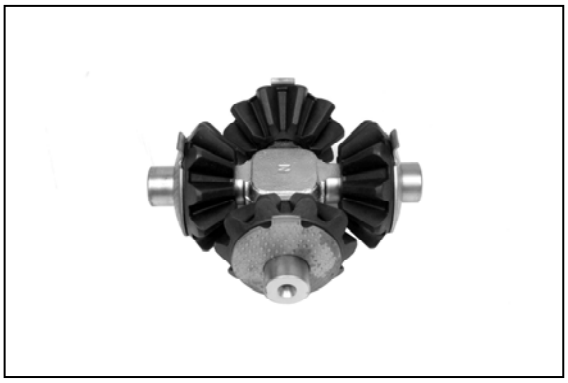


Figure 20

Preassemble differential spider with spider gears and thrust washers.

Figure 21

Place preassembled differential spider into the differential carrier.

☞ **Observe radial installation position of thrust washers (tabs to show vertically upwards)!**

Figure 22

DZ-750
Preassemble second axle bevel gear with pressure plate and disk package and position it.

⚠ **Thickness and arrangement of disk package must be identical on both sides of the differential assy!**

D-750
Preassemble second axle bevel gear with pressure plate and shim ring (also see figure 18) and position it.

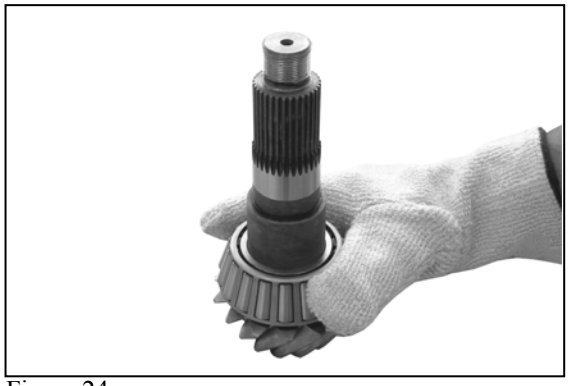


Figure 24

Adjustment of the rolling torque of input pinion bearing 1.0 ... 3.0 Nm (without shaft seal ring)

Heat up roller bearing and install it until contact is obtained.

Adjust bearing after cooling-down!

Use protective gloves!

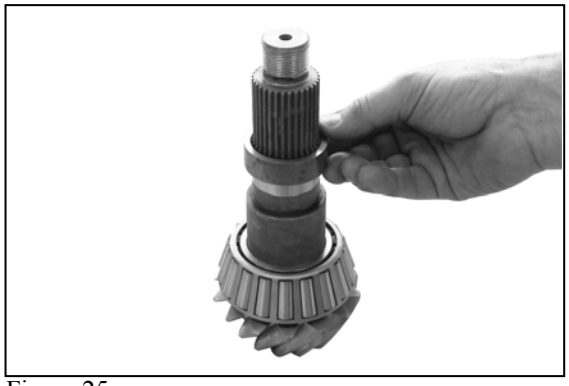


Figure 25

Mount spacer ring (e.g. thickness = 16.96 mm).

According to our experience, the necessary rolling torque is obtained when reusing the spacer ring which has been removed during disassembly (e.g. thickness = 16.96 mm)! A later check of the rolling torque, however, is absolutely necessary!

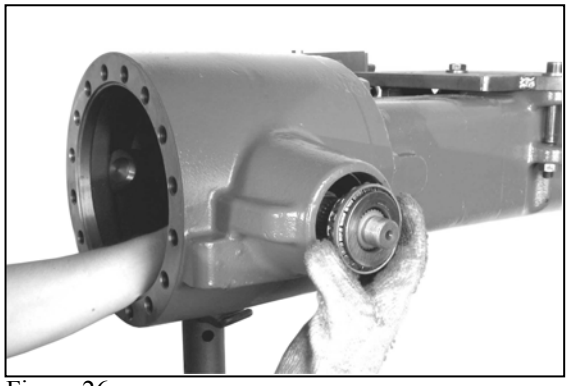


Figure 26

Place the preassembled input pinion into the axle housing and mount the heated roller bearing until contact is obtained.

Use protective gloves!

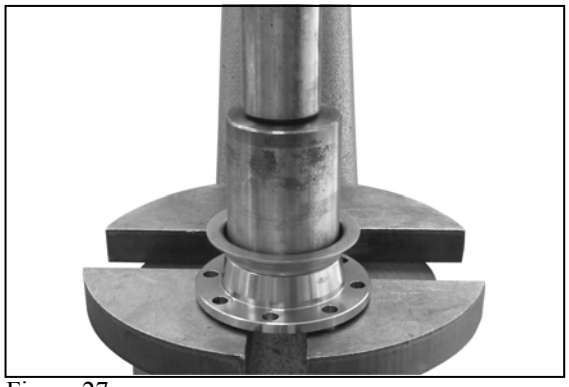


Figure 27

Press screen sheet (see arrow) onto the input flange until contact is obtained.

Wet front face (contact face bearing inner ring) and profile (teeth) with anti-corrosive agent Weicon Anti Size (ZF-order no.: 0671 090 357)!

Figure 17

Oil grooved and back-up rings and insert them into the annular grooves of the ring gear.

☞ **Observe installation position, see sketch below!**

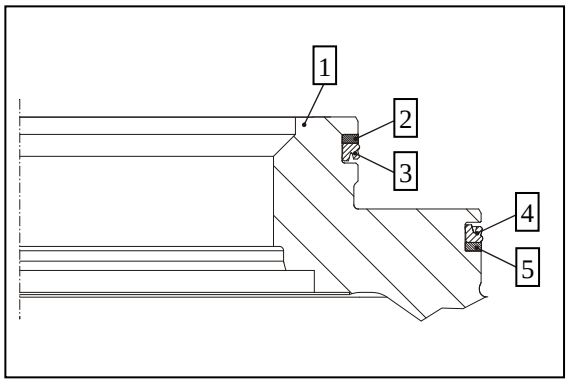


Figure 18

Legend to sketch:
1 = Ring gear
2 = Back-up ring
3 = Grooved ring
4 = Grooved ring
5 = Back-up ring

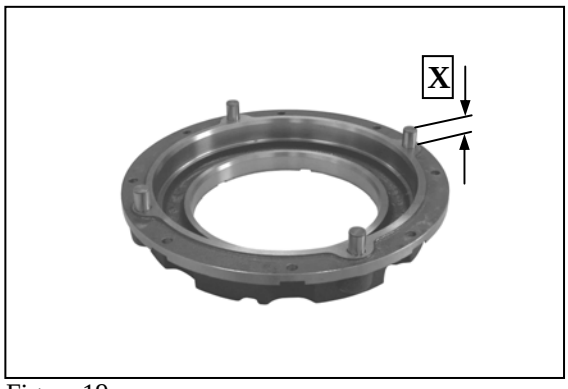


Figure 19

Fit cylindrical pins into the piston, considering the installation dimension „X“.

X = Installation dimension

MT-E 3050	**18.00 mm**
MT-E 3060/3070	**16.00 mm**

Figure 20

Mount piston onto ring gear.

PREFACE

This documentation has been developed for the skilled Serviceman, trained by the ZF Friedrichshafen for the Repair and Maintenance operations on ZF-Units.

This manual describes a ZF series product with a design level valid at the date of edition.

Due to the continuous technical upgrading of the product, however, the repair of the unit at your disposal may require both deviating work steps and different setting and testing data.

We would therefore recommend you to entrust masters and servicemen with the work on your ZF product whose practical and theoretical training is constantly updated in our training school.

The Service Stations established by ZF Friedrichshafen all over the world offer you:

1. Permanently trained staff

2. Specified equipment, e.g. special tools

3. State-of-the-art genuine ZF spare parts

All work is done there with utmost care and reliability.

In addition, repair work carried out by ZF Service Stations is covered by the ZF warranty within the terms of the currently applicable contractual conditions.

Any damage resulting from work which is done in an improper and unprofessional manner by third parties and any consequential costs incurred shall be excluded from this contractual liability.
This shall also be applicable if other than genuine ZF spare parts are used.

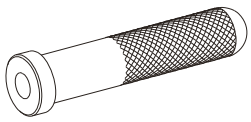
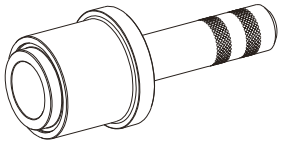
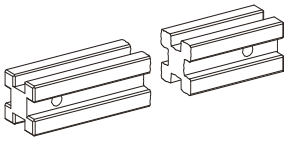
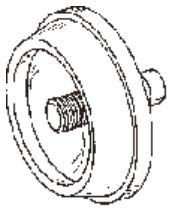
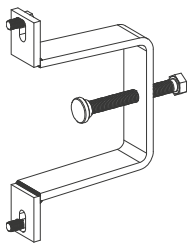
This manual is based on the state-of-the-art at the time of printing.
It was prepared with utmost care in order to avoid errors.
However, we shall not be liable for any errors in figures or descriptions.

ZF Friedrichshafen AG

Service Department

SPECIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

2 HL-250/270/290/ 4143 020 095/106

Cons. No.	Figure	Designation Order No.	Qty	Chapter/Fig
21		**Handle** **5870 260 002**	1	4/3 4/14 5/1 5/2
22		**Driver tool** **5870 048 281**	1	4/7
23		**Straightedge** **5870 200 108**	1	4/10 4/13 4/36 4/41 4/42
24		**Driver tool** **5870 058 078**	1	4/14
25		**Clamping bar** **5870 654 049**	1	4/22 5/11

1. Separate HL-TRANSMISSION from AXLE HOUSING

(only for version „Axle attachment“)

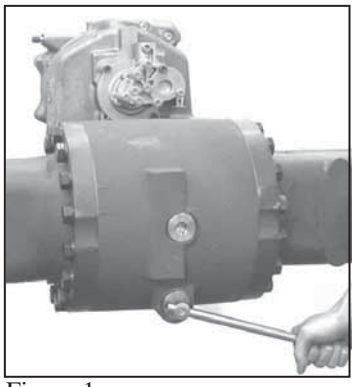


Figure 1

Drain oil from axle housing – use a suitable oil reservoir.

(S) Assembly truck	5870 350 000
(S) Clamping fork	5870 350 106

Waste oil to be disposed of ecologically!

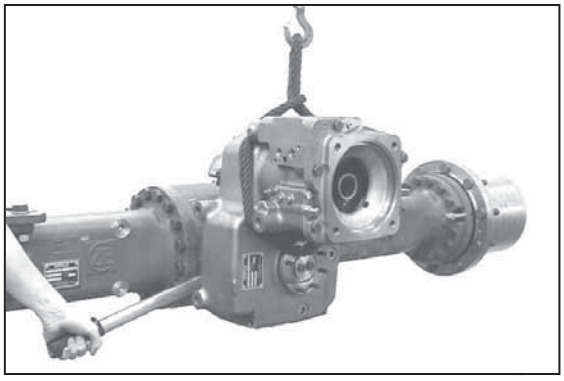


Figure 2

Pick-up HL-Transmission by means of lifting tackle, loosen threaded joint and separate complete HL-Transmission from axle housing.

(S) Lifting strap	5870 281 026

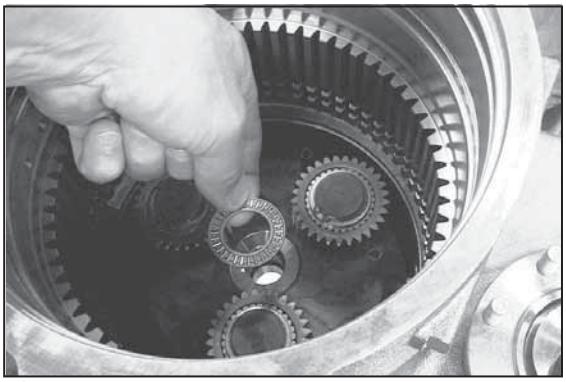


Figure 34

2.6 Planetary carrier

Remove axial needle cage.

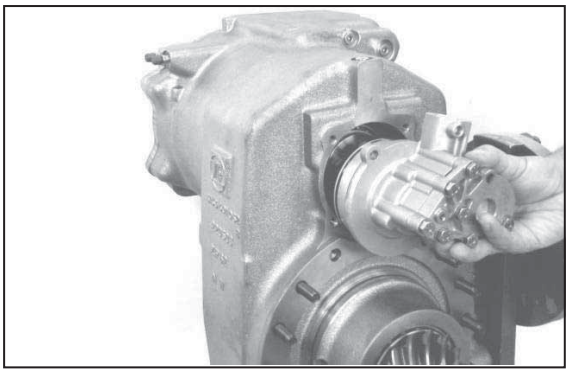


Figure 35

If not yet disassembled previously – remove lubrication pump or shift interlock (depending on version).
(Illustration shows version - „Lubrication pump“).

☞ **Cpl. disassembly of lubrication pump and shift interlock – see Chapter 6!**

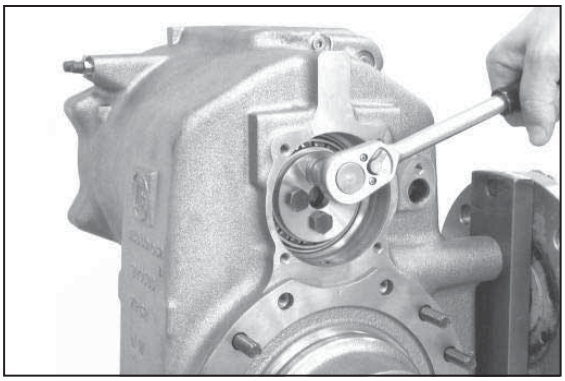


Figure 36

Loosen threaded joint and remove disk – fasten output flange by means of clamping fork.

(S) Clamping fork 5870 240 025

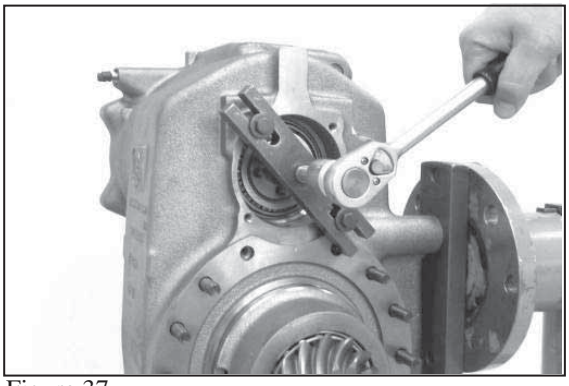


Figure 37

Press cpl. planetary carrier out of roller bearing.

(S) Extractor 5870 000 017

☞ **Pay attention to releasing planetary carrier and bearing inner ring!**

4. REASSEMBLY - OUTPUT

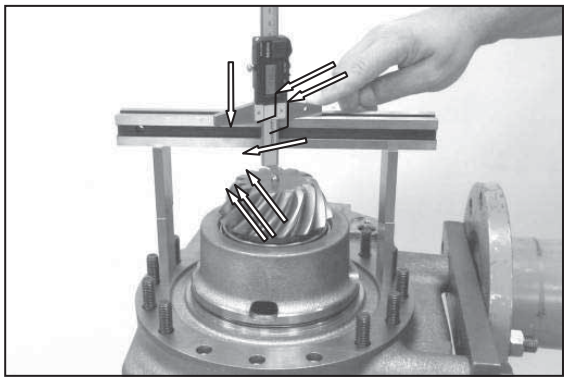


Figure 1

Seal finished holes (8x) of oil supply holes with screw plugs.

(S) Lever riveting tongs 5870 320 016

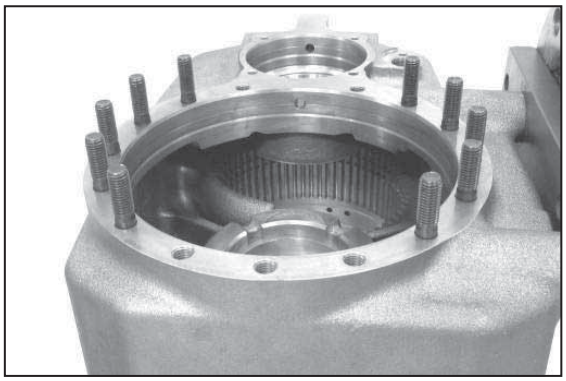


Figure 2

4.1 Version „Axle attachment“

Install stud bolts.

Tightening torque M_A = 27 Nm

☞ **Pay attention to installation position – see Figure no. 2!**

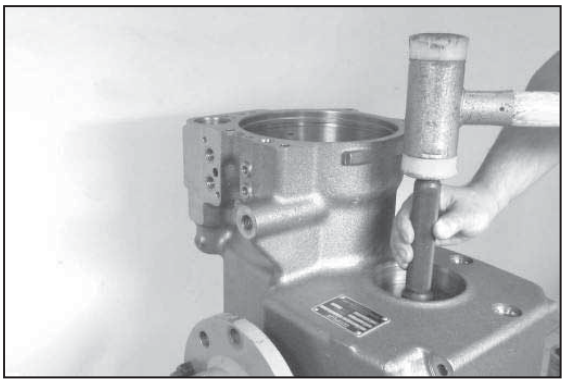


Figure 3

Install bearing outer ring until contact is obtained.

(S) Driver tool 5870 058 073
(S) Handle 5870 260 002

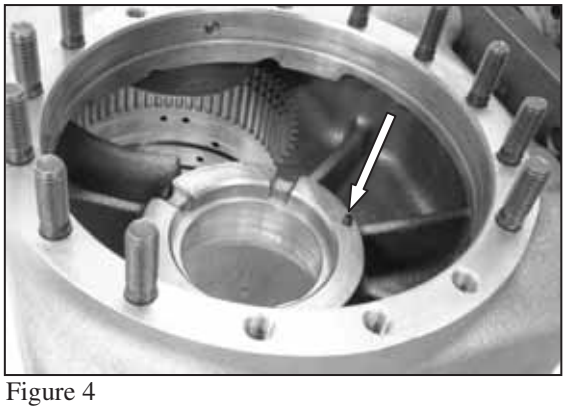


Figure 4

Insert slotted pin (see arrow) to the bottom.

4.2 Version „Separate installation“

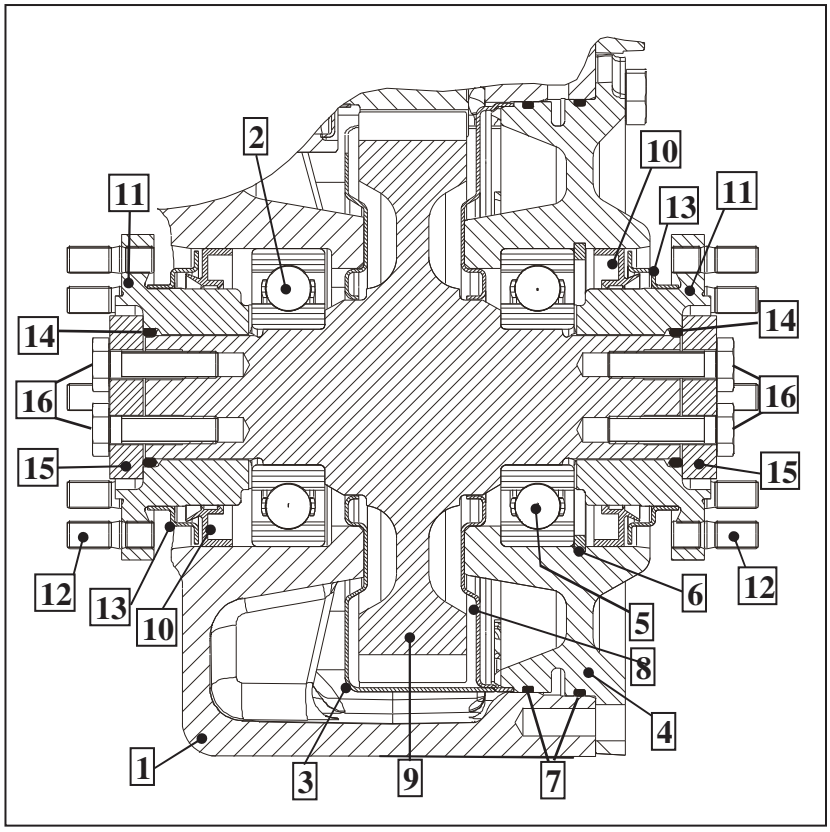


Figure 36

Legend to sketch no. 37 …. 55:

1 = Transmission housing
2 = Ball bearing
3 = Screen sheet
4 = Bearing cover
5 = Ball bearing
6 = Retaining ring
7 = O-ring
8 = Oil screen sheet
9 = Output gear
10 = Shaft seal
11 = Output flange
12 = Stud bolt
13 = Metal sheet
14 = O-ring
15 = Disk
16 = Hexagon screw

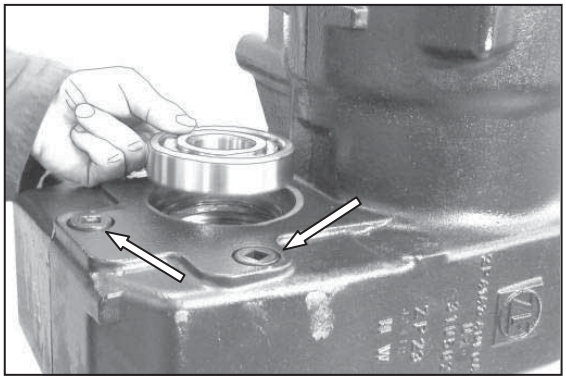


Figure 37

Provide screw plugs (see arrows) with new O-ring and install it.

Tightening torque M_A = 80 Nm

Then insert ball bearing (2) until contact is obtained.

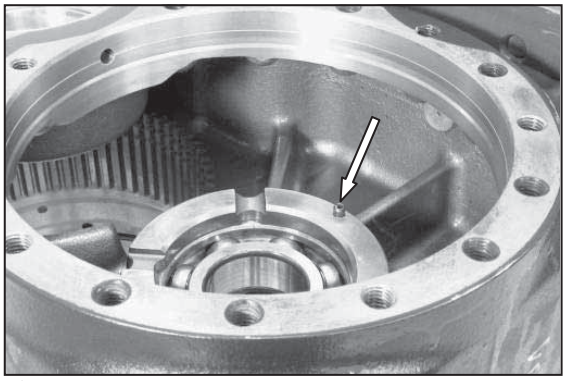


Figure 38

Rotate transmission by 180°.

Insert slotted pin (see arrow) to the bottom.

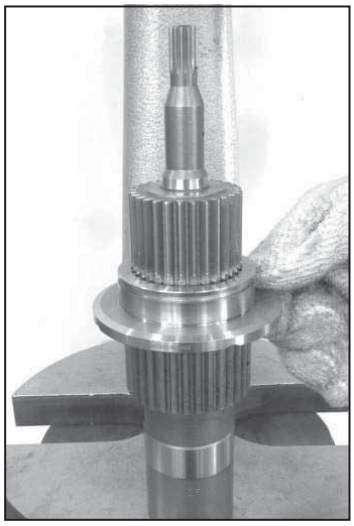


Figure 16

5.2 Brake and clutch

Mount heated centering disk and press it until contact is obtained.

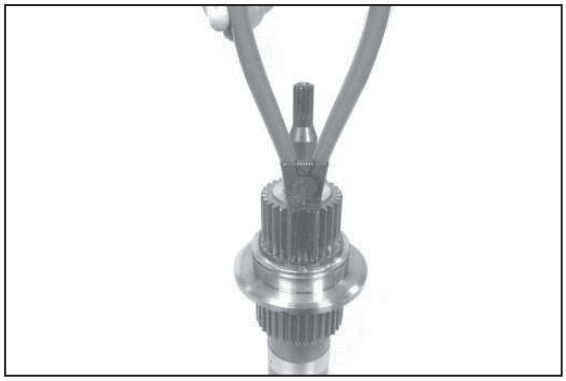


Figure 17

Fix centering disk by engaging retaining ring into annular groove of input shaft.

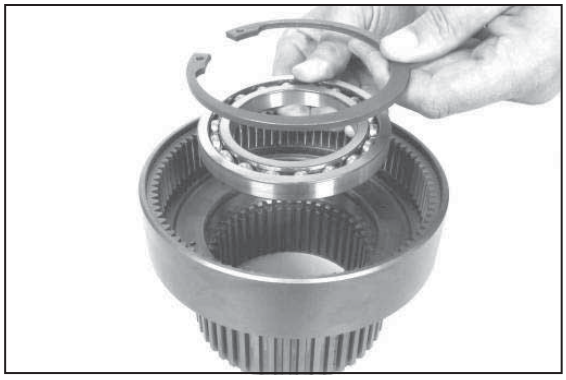


Figure 18

Insert ball bearing into ring gear and fasten it by engaging retaining ring into annular groove of ring gear.

(S) Clamping pliers 5870 900 021


Figure 19

Heat bearing inner ring of ball bearing.

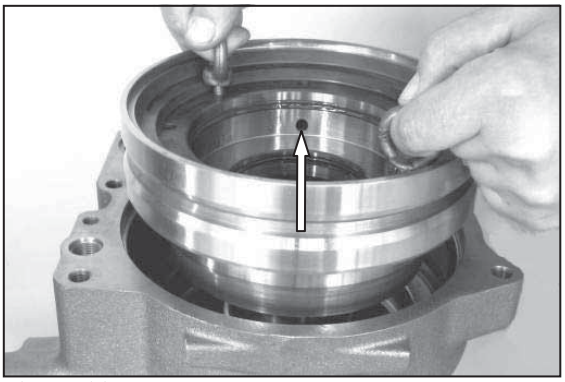


Figure 55

Insert preassembled piston/brake until contact is obtained.

☞ **Position piston in such a way that oil supply hole (see arrow) – with HL-Transmission installed into vehicle – is at 12.00 o'clock position!**
Observe version as to transmission installation position „HORIZONTAL – VERTICAL" !

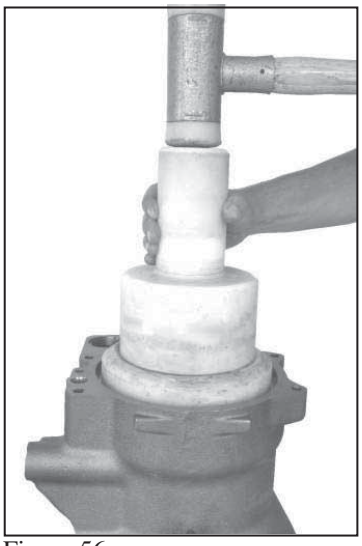


Figure 56

Use driver tool to bring piston into contact position.

(S) Driver tool 5870 506 161

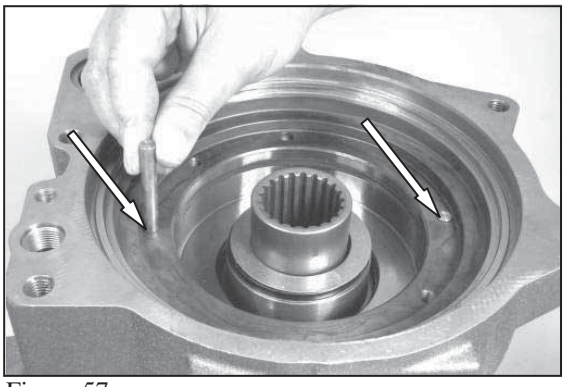


Figure 57

Insert both cyl. pins (arrow).

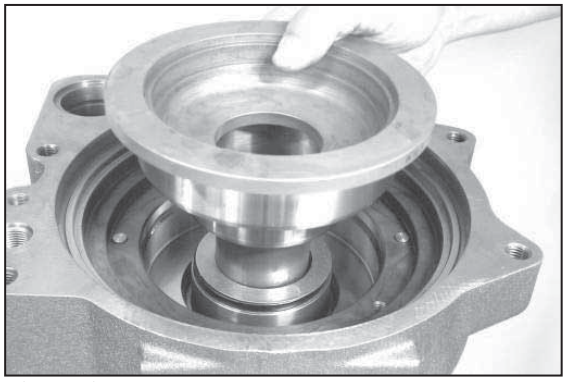


Figure 58

Insert piston/clutch until contact is obtained.

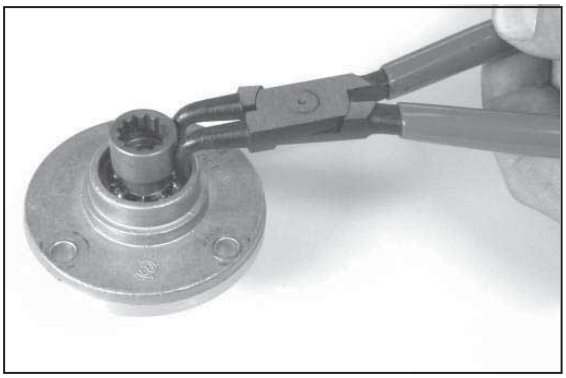


Figure 8

Unsnap retaining ring.

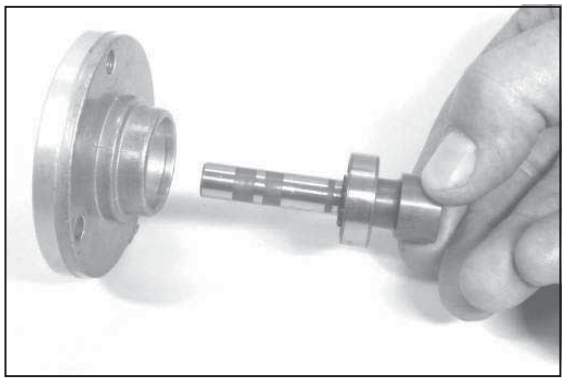


Figure 9

Pull cpl. pump shaft out of pump cover.

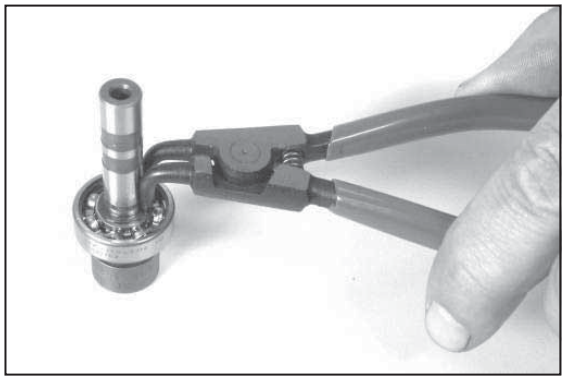


Figure 10

Unsnap retaining ring and press ball bearing from shaft.

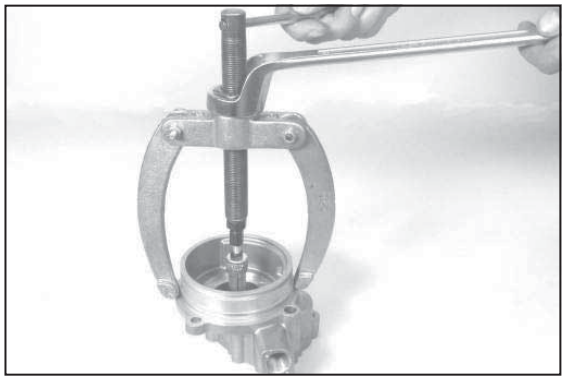


Figure 11

Pull needle sleeve out of housing hole.

(S) Inner extractor	5870 300 012
(S) Counter support	5870 300 011

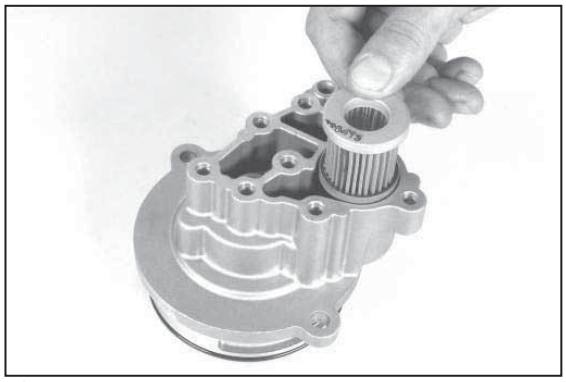


Figure 17

Insert filter.

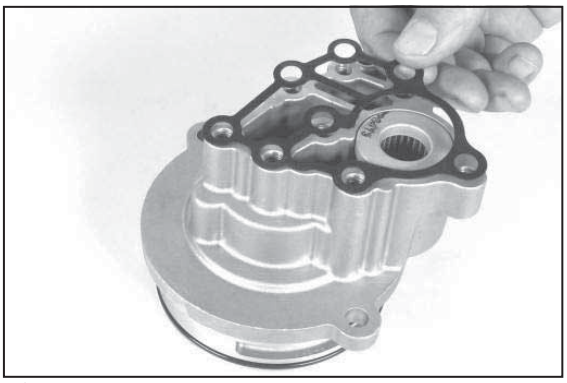


Figure 18

Place gasket.

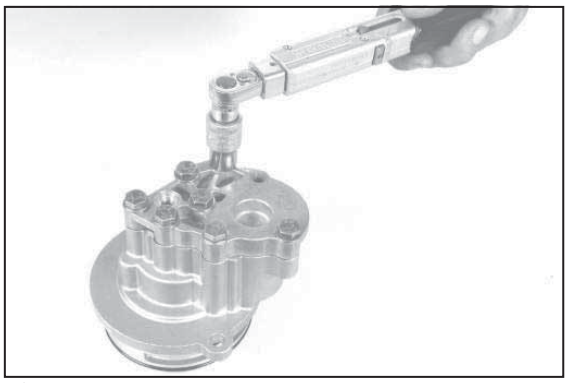


Figure 19

Place cover and fix it with hexagon screws and disks.

Tightening torque (M8/8.8) M_A = 23 Nm

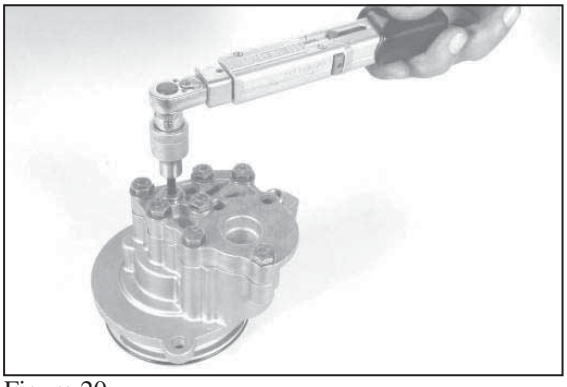


Figure 20

Insert screw plug with new O-ring.

Tightening torque (M10x1) M_A = 15 Nm

9. VALVE BLOCK (shifting low gear – high gear)

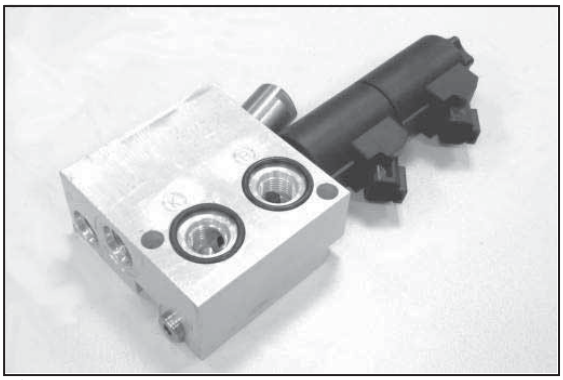


Figure 1

Insert O-rings (see arrows) into countersinks of valve block.

☞ **Use grease as assembly aid!**

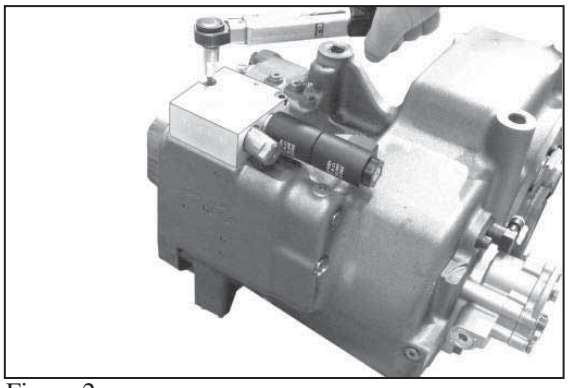


Figure 2

Fix cpl. valve block with cylindrical screws.

Tightening torque (M8/10.9) M_A = 23 Nm

ARM CYLINDER

SEE SHEET 1/3

E

B6

A6

P86

707-G1-X2970
ARM CYLINDER ASSY
(STD Ø115xØ75-1159 STROKE)

702-21-08870
ARM CYLINDER SAFETY VALVE
CRACKING PRESSURE 382 bar

ADJUST CYLINDER

SEE SHEET 1/3

F

P85

A5

B5

702-21-08331
ADJ CYLINDER SAFETY VALVE
CRACKING PRESSURE 382bar

Ø21.7x12.8

707-HI-X2990
ADJUST CYLINDER ASSY
(STD Ø140xØ75-555 STROKE)

OPTION:
1 ATT HCU (STD) CLAMSHELL AND BREAKER ONLY

B

B8

A8

SEE SHEET 1/3

6bar

0.5bar

0.5bar

V31

VALVE
20G-60-61111

K

OPTION: JOYSTICK STEERING

V63

V64

V64.2

V64.1

195bar

70 cc/rev

70 cc/rev

240+ 260bar

240+ 260bar

Orbitrol (OC-40-61130 /35S VALVE)

LH STEER

RH STEER

LS PORT MASTER PRIO

TANK LINE

ST PORT MASTER PRIO

N

SEE SHEET 1/3

BOOM CYLINDERS

SEE SHEET 1/3

702-21-18120
L.H. BOOM CYLINDER SAFETY VALVE
CRACKING PRESSURE 382bar

707-G1-X2950
BOOM CYLINDER ASSY
LEFT HAND (STD Ø105xØ70-902 STROKE)
2 PIECE BOOM

707-G1-X1890
BOOM CYLINDER ASSY
LEFT HAND (STD Ø105xØ70-902 STROKE)
MONO BOOM

(LEFT)

20G-60-31960

G

A2

B2

P82

G1/4

7861-93-1870
OVER LOAD CAUTION

707-G1-X2960
BOOM CYLINDER ASSY
RIGHT HAND (STD Ø105xØ70-902 STROKE)
2 PIECE BOOM

707-G1-X1900
BOOM CYLINDER ASSY
RIGHT HAND (STD Ø105xØ70-902 STROKE)
MONO BOOM

(RIGHT)

702-21-18110
R.H. BOOM CYLINDER SAFETY VALVE
CRACKING PRESSURE 382bar

BUCKET CYLINDER

D

A7

B7

Ø21.7x12.8

707-HI-X2980
Bucket Cyl. ASSY.
(STD Ø95xØ65-885 STROKE)

QUICK COUPLER PIPING

L

B

A

T

Ø16x12

TO QUICK COUPLER

OPTION

OPTION: 2 ATT HCU BREAKER RETURN

A

B9

A9

SEE SHEET 1/3

B

B8

A8

6bar

0.5bar

0.5bar

V31

VALVE
20G-60-61111

K

OPTION:
BOOM FLOATING

T1 SEE BOOM CYLINDERS

T2

T3

Pa2

T

V62

20J-60-61241

20J-70-61111

V66

Ø0.8

N2
STD PRESSURE
35bar

702-21-08331
ADJUST CYLINDER SAFETY VALVE
CRACKING PRESSURE 382bar

F

Pas

A5

B5

Ø21.7x12.8

707-HI-X2990
ADJUST CYLINDER ASSY
(STD Ø140xØ75-555)

V61

V65

PC

PP

U

SOLENOID PORT
SEE PAGE 1/3

20J-62-61381

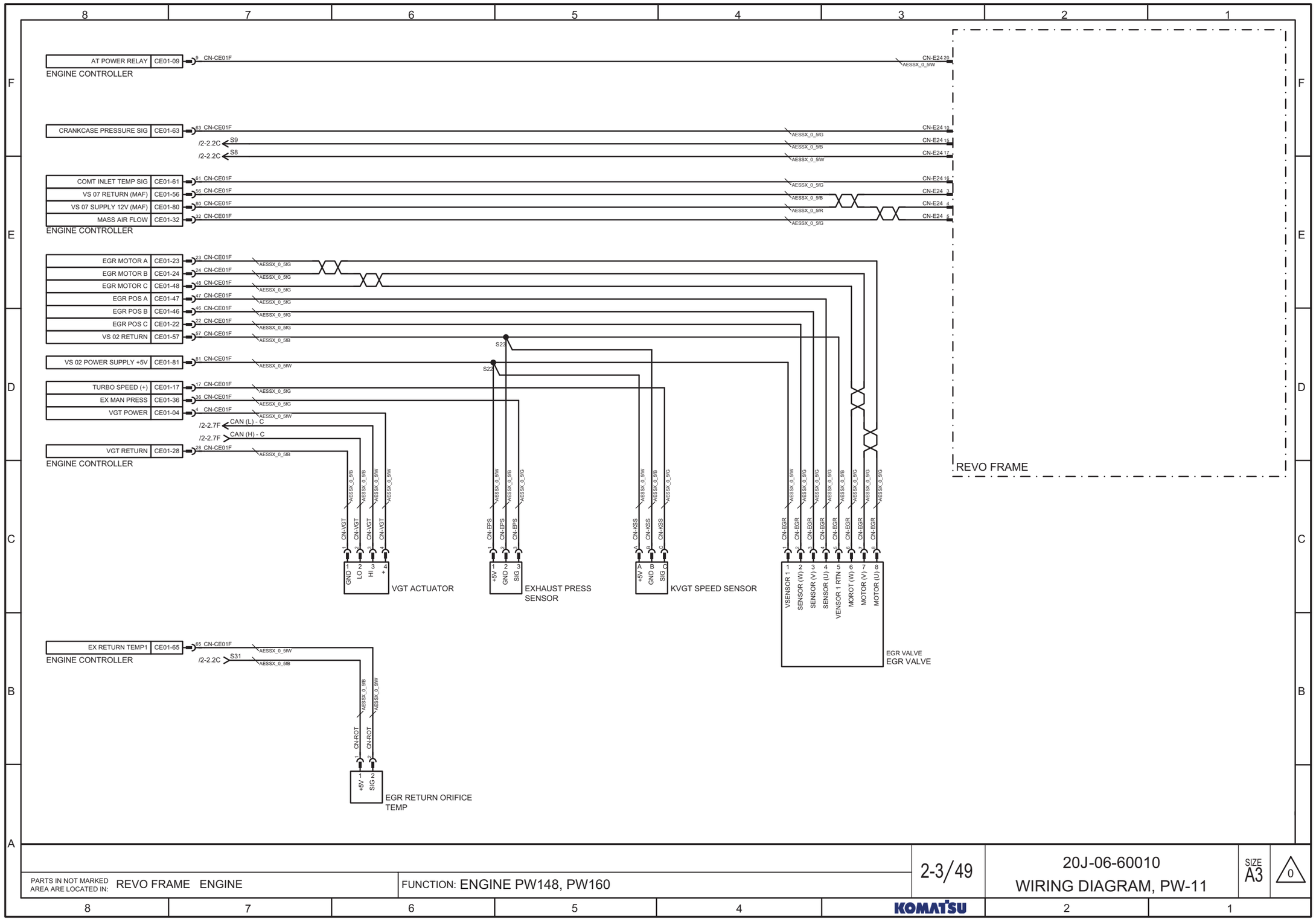
OPTION: ECSS

WORK EQUIPMENT
SUSPENSION SYSTEM

SEE SHEET 1/3

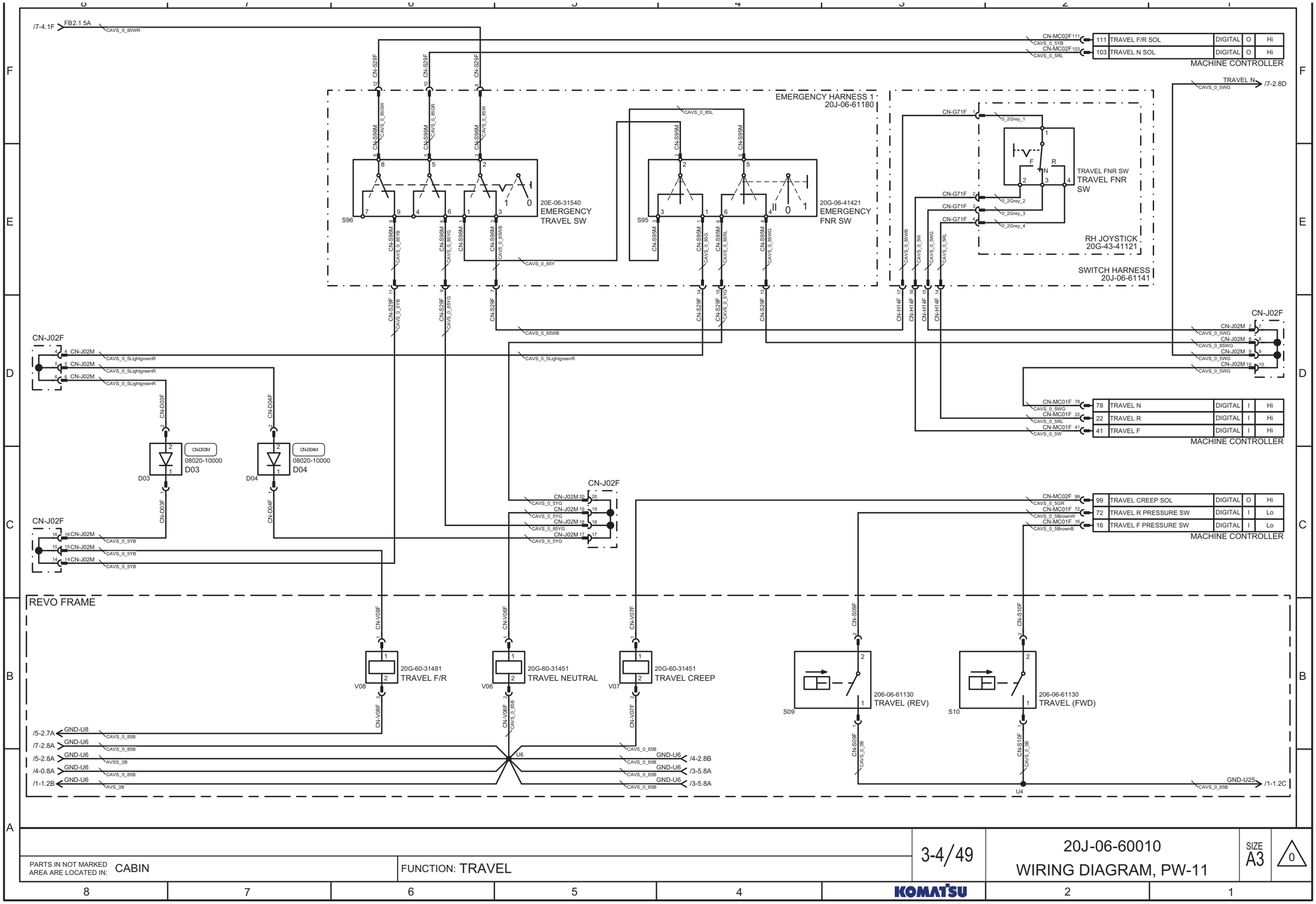
HYD.DIAGRAM, PW148-11 3/3

2-3 Engine PW48, PW160



PARTS IN NOT MARKED AREA ARE LOCATED IN: REVO FRAME ENGINE	FUNCTION: ENGINE PW148, PW160	2-3/49	20J-06-60010 WIRING DIAGRAM, PW-11 SIZE A3 0

3-4 TRAVEL



PARTS IN NOT MARKED AREA ARE LOCATED IN: CABIN	FUNCTION: TRAVEL	3-4/49	20J-06-60010 WIRING DIAGRAM, PW-11	SIZE A3 / 0