5003ZT

Compact Excavator

SERVICE MANUAL

PART #918178

Revision B - 04/09

Mustang Manufacturing Company, Inc.

Type decals and component numbers

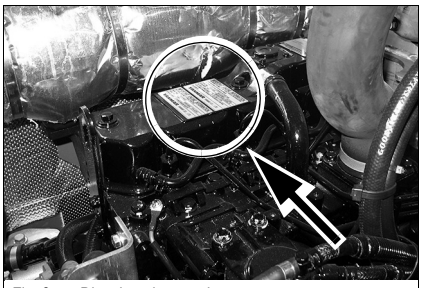


Fig. 3: Diesel engine number

Engine number

The type decal (arrow) is located on the cylinder-head cover (engine).

Example: Yanmar 46557

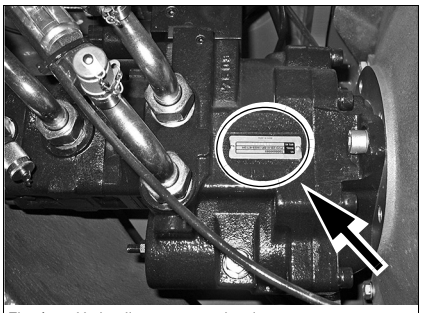


Fig. 4: Hydraulic pump type decal

Hydraulic pump number

The type decal (arrow) is located on the hydraulic pump housing.

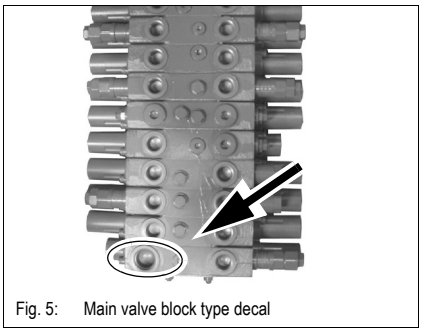


Fig. 5: Main valve block type decal

Main valve block number

The type decal (arrow) is located on the lower side of the main valve block.

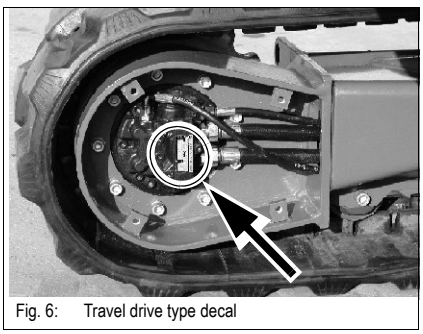


Fig. 6: Travel drive type decal

Travel drive number

The type decal (arrow) is located on the travel drive.

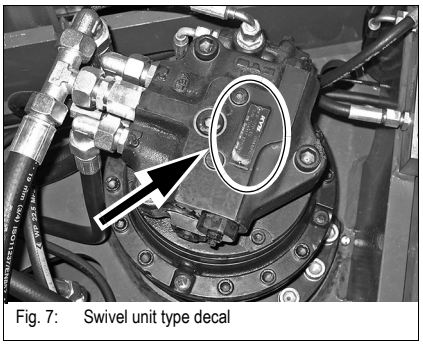
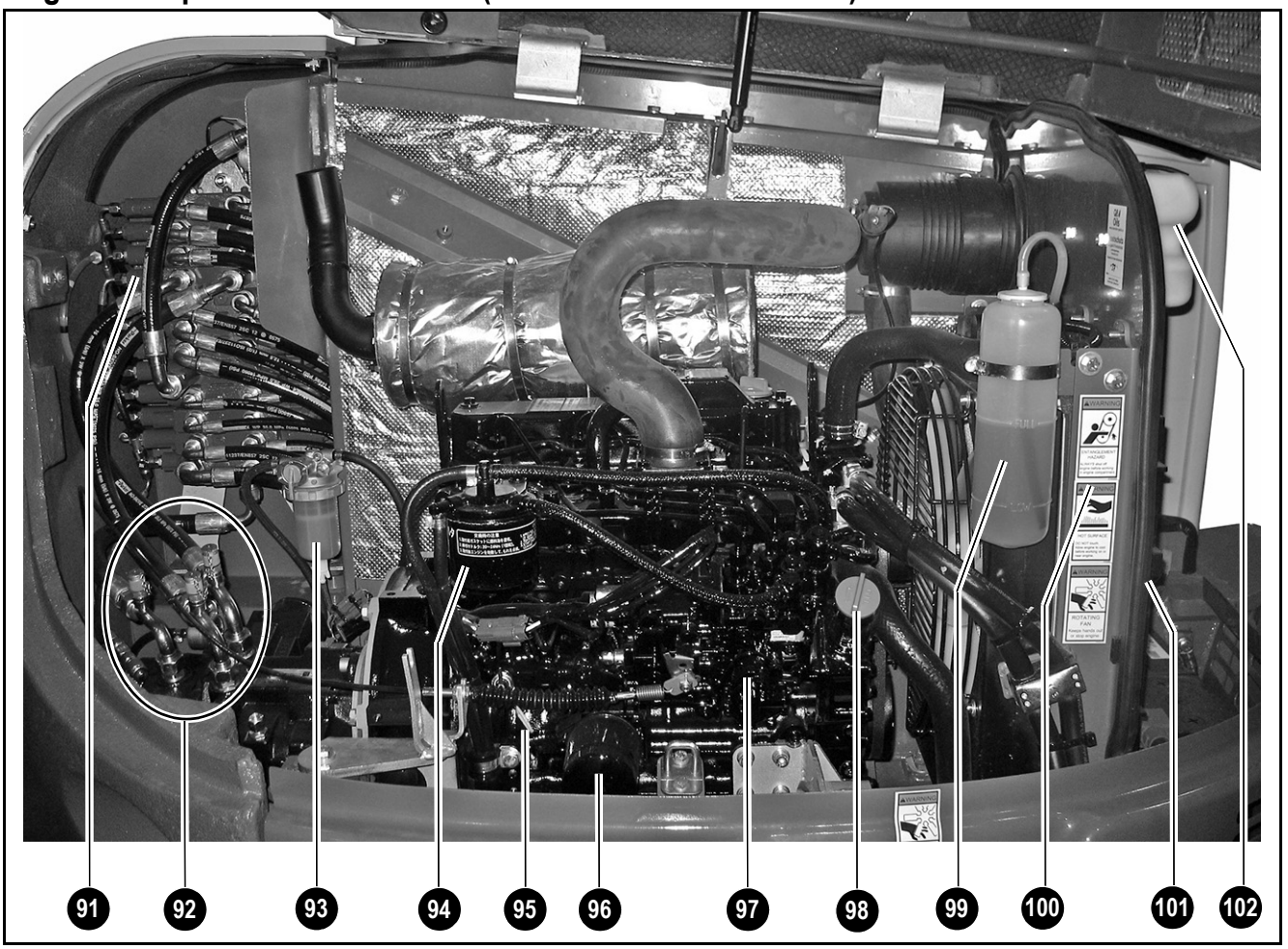


Fig. 7: Swivel unit type decal

Swivel unit number

The type decal (arrow) is located on the swivel unit.

Engine compartment: overview (SN AH00578 and before)



Ref. No.	Description
91	Main valve block
92	Hydraulic test ports
93	Fuel water separator
94	Fuel filter
95	Engine oil dipstick
96	Engine oil filter
97	Engine
98	Engine oil filler cap
99	Coolant tank
100	Engine coolant radiator
101	Hydraulic oil cooler
102	Washer system tank

Model-specific tightening torques

5003ZT - Hardware application	Size / Grade	lb-ft. (Nm)
Live ring	M14 10.9	133 (180)*
Track roller	M16 10.9	203 (275)*
Drive pinion	M14 10.9	133 (180)*
Travel drive	M14 10.9	133 (180)*
Gear motor	M16 10.9	203 (275)*
Angled engine bracket	M10 8.8	33 (45)
Engine mounting	M10 8.8	33 (45)
Pump mounting	M10 10.9	52 (70)
Pump	M12 10.9	81 (110)
Swivel joint	M10 10.9	47 (64)*
Counterweight	M20 8.8	214 (290)*

* All hardware with an * must have an appropriate thread-locking compound applied.

General tightening torques

Tightening torques for hydraulic screw connections (dry assembly)

Hose fittings for hydraulic applications (light application, DKOL)				
Nominal ø DN	Outer ø RA	Thread	Width across flats	Tightening torque (lb-ft.) Nm
05	6L	M12X1.5	W/F 14	11 (15)
06	8L	M14X1.5	W/F 17	15 (20)
08	10L	M16X1.5	W/F 19	30 (40)
10	12L	M18X1.5	W/F 22	37 (50)
12	15L	M22X1.5	W/F 27	55 (75)
16	18L	M26X1.5	W/F 32	63 (85)
20	22L	M30X2	W/F 36	74 (100)
25	28L	M36X2	W/F 41	133 (180)
32	35L	M45X2	W/F 55	162 (220)

Galvanised and dry surface (O-ring slightly oiled). Torque tolerance: -10%
Values determined empirically and to be applied as approximate figures.

Metric hose fittings for hydraulic applications (heavy application, DKOL)				
Nominal ø DN	Outer ø RA	Thread	Width across flats	Tightening torque (lb-ft.) Nm
05	8S	M16X1.5	W/F 19	30 (40)
06	10S	M18X1.5	W/F 22	37 (50)
08	12S	M20X1.5	W/F 24	44 (60)
10	14S	M22X1.5	W/F 27	55 (75)
12	16S	M24X1.5	W/F 30	66 (90)
16	20S	M30X2	W/F 36	74 (100)
20	25S	M36X2	W/F 41	133 (180)
25	30S	M42X2	W/F 50	199 (270)
32	38S	M52X2	W/F 60	295 (400)

Galvanized and dry surface (O-ring slightly oiled). Torque tolerance: -10%
Values determined empirically and to be applied as approximate figures.

Maintenance

Fluids and lubricants

Component/ application	Engine/machine fluid	Specification	Season/ temperature	Capacities[1]
Diesel engine	Engine oil	SAE 10W-40[2]; API: CD, CF, CF-4, CI-4; ACEA: E3, E4, E5; JASO: DH-1	-4°F (-20°C) 104°F (+40°C)	2.1 gal. (7.8 L)
Travel drive	Gearbox oil[3]	Q8 T 55, SAE 85W-90[4]	Year-round	About 0.3 gal. (1.3 L) each
		Q8 T 55, SAE 80W-90[5]		
		FINA PONTONIC GLS, SAE 85W-90		
Hydraulic oil tank	Hydraulic oil	HVLP46[6]	Year-round	21.1 gal. (80 L)
	Biodegradable oil[7]	PANOLIN HLP Synth 46		
		FINA BIOHYDRAN SE 46		
		BP BIOHYD SE-46		
Grease	Roller and friction bearings (live ring ball bearing race)	FINA Energrease L21M[8]	Year-round	As required
	Open gear (live ring gears)	BP Energrease MP-MG2[9]	Year-round	As required
Grease zerks	Multipurpose grease[10]	FINA Energrease L21 M[11]	Year-round	As required
Battery terminals	Acid-proof grease[12]	FINA Marson L2	Year-round	As required
Fuel tank	Diesel fuel	2-D, ASTM D975 - 94 (USA)		20.6 gal. (78 L)
		1-D, ASTM D975 - 94 (USA)		
		EN 590: 96 (EU)		
		ISO 8217 DMX (International)		
		BS 2869 - A1 (GB)	Summer or winter diesel depending on outside temp.	
		BS 2869 - A2 (GB)		
Radiator	Coolant	Soft or distilled water + antifreeze ASTM D4985	Year-round	1.8 gal. (7.0 L)
Air conditioning	Refrigerating agent	R134a[13]	Year-round	~2.1 lbs. (~950 g)
	Compressor oil	Sanden SP20 (SN AD07125 and below)	Year-round	7.45 cu. in. (122 cm³)
		Sanden SP20 (SN AH00579 and up)	Year-round	5.5 cu. in. (90 cm³)
Washer system	Cleaning agent	Water + antifreeze	Year-round	0.32 gal. (1.2 L)

1. The capacities indicated are approximated values; only use the oil level check to determine the correct oil level
2. According to DIN 51502
3. Hypoid gearbox oil based on basic mineral oil (SAE 85W-90 according to DIN 51502), (API GL-4, GL5)
4. The Q8 T55 SAE 85W-90 gearbox oil is no longer produced.
5. The Q8 T55 SAE 80W-90 gearbox oil is used from 10/2006 onwards. Do not mix both gearbox oils!
6. According to DIN 51524 section 3
7. Hydraulic ester oils (HEES)
8. KF2K-25 according to DIN 51502 multipurpose lithium grease with MoS^2 additive
9. KP2N-20 according to DIN 51502 EP multipurpose calcium sulphonate complex grease
10. KF2K-25 according to DIN 51502 multipurpose lithium grease with MoS^2 additive
11. KF2K-25 according to DIN 51502 multipurpose lithium grease with MoS^2 additive
12. Standard acid-proof grease
13. According to DIN 8960

Stationary fuel pumps

General

Only refuel from stationary fuel pumps. Fuel from barrels or canisters is usually contaminated.

Even the smallest particles of dirt can cause:

- Increased engine wear.
- Malfunctions in the fuel system.
- Reduced effectiveness of the fuel filters.

Diesel fuel specification

Only use high-grade fuels.

Grade	Cetane number	Use
• No. 2-D according to DIN 51601	**Min. 45**	For normal outside temperatures
• No. 1-D according to DIN 51601		For outside temperatures below 39 °F (4 °C) or for operation above 4921 ft. (1500 m) altitude

Bleeding the fuel system

DANGER!

If the fuel, as it drains, comes into contact with hot engine parts or the exhaust system, there is an increased -

Risk of burns.

☞ *Never bleed the fuel system if the engine is hot.*

Bleed the fuel system in the following cases:

- After removing and re-attaching the fuel filter, pre-filter, or the fuel lines.
- After running the fuel tank empty.
- After running the engine again, after a long period out of service.

☞ *Bleed the fuel system as follows:*

- Fill the fuel tank.
- Turn the ignition key to the first position.
- Wait about five minutes while the fuel system bleeds itself automatically.
- Start the engine.

If the engine runs smoothly for a while, and then stops; or if it does not run smoothly:

- Turn off the engine.
- Bleed the fuel system again as described above.
- Have this checked by authorized service technicians.

Replacing the filter

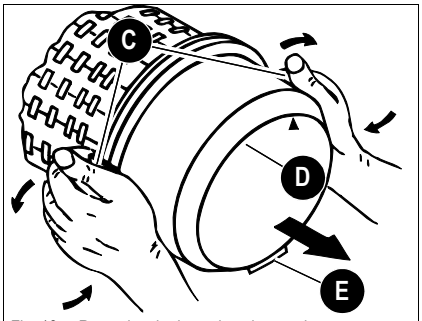


Fig. 18: Removing the lower housing section

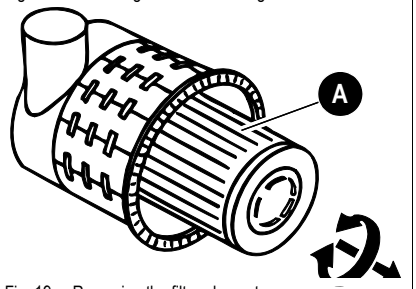


Fig. 19: Removing the filter element

- Replace outside filter **A** as follows:

☞ *Turn off the engine.*

☞ *Remove the key and keep it with you.*

☞ *Let the engine cool down.*

☞ *Open the engine cover.*

☞ *Remove dirt and dust from the air filter and the area around the air filter.*

☞ *Fold both bow clips **C** on cover section **D** to the outside.*

☞ *Remove cover section **D**.*

☞ *Carefully remove outside filter **A** with slight turning movements.*

☞ **Make sure** *all dirt (dust) inside the upper and lower housing sections, including the dust valve **E**, has been removed.*

☞ Clean the parts with a clean lint-free cloth, DO NOT use compressed air.

☞ *Check the air filter cartridges for damage, only install intact filters.*

☞ *Carefully insert new outside filter **A** in the upper housing section.*

☞ *Position cover section **D** (make sure it is properly seated).*

☞ *Close both bow clips **C**.*

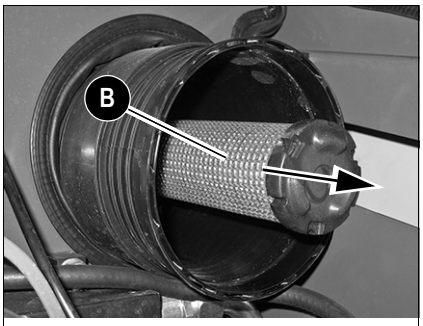


Fig. 20: Replacing the inside filter

- Replace inside filter **B** as follows:

☞ *Turn off the engine.*

☞ *Remove the key and keep it with you.*

☞ *Let the engine cool down.*

☞ *Open the engine cover.*

☞ *Remove dirt and dust from the air filter and the area around the air filter.*

☞ *Fold both bow clips **C** on cover section **D** to the outside.*

☞ *Remove cover section **D**.*

☞ *Carefully remove outside filter **A** with slight turning movements.*

☞ *Carefully remove inside filter **B**.*

☞ Cover the air supply at the end of the filter with a clean lint-free cloth to prevent dust from entering the engine.

☞ **Make sure** *all dirt (dust) inside the upper and lower housing sections, including the dust valve **E**, has been removed.*

☞ Clean the parts with a clean lint-free cloth, DO NOT use compressed air.

☞ Remove the cloth from the air supply.

☞ *Check the air filter cartridges for damage. Only install intact filters.*

☞ *Carefully insert outside filter **A** in the upper housing section.*

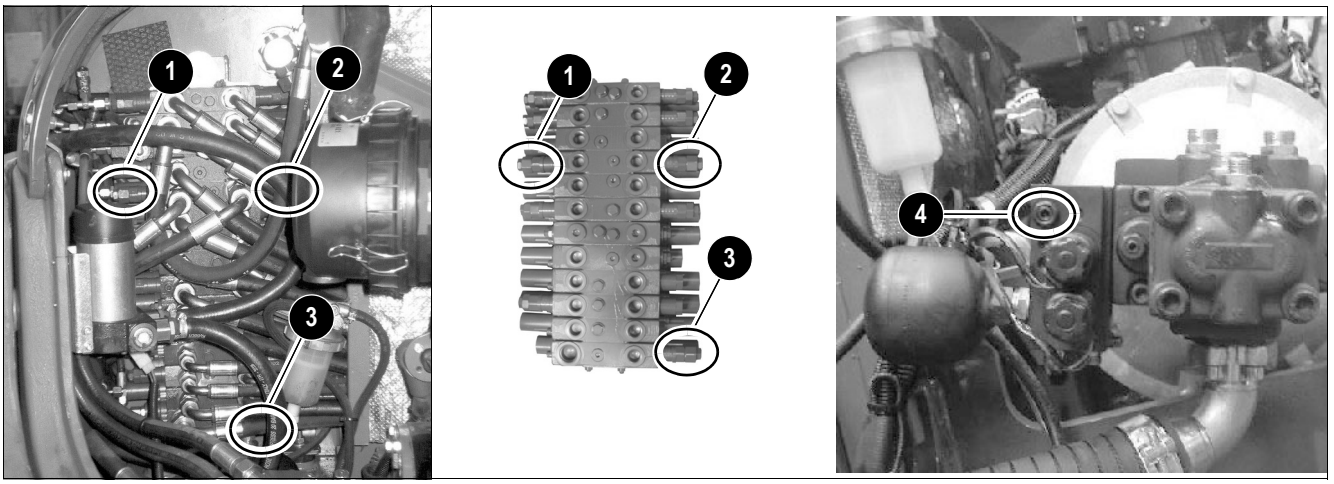
☞ *Position cover section **D** (make sure it is properly seated).*

☞ *Close both bow clips **C**.*

NOTE:

Make sure dust valve **E** points downward after it is installed.

Primary pressure limiting valves



Ref. No.	Description	
1	Pump primary pressure limiting valve 1	PPLV 1
2	Pump primary pressure limiting valve 2	PPLV 2
3	Pump primary pressure limiting valve 3	PPLV 3
4	Pressure limiting valve	PLV 4

Checking hydraulic pressure lines

Safety instructions

DANGER!

Use caution when checking hydraulic lines, especially when searching for leaks. Hydraulic oil escaping under high pressure can penetrate the skin and cause serious injuries.

Risk of personal injury.

☞ *Always consult a doctor immediately, even if the wound appears insignificant, to be sure that serious infections do not set in.*

☞ *Always follow these instructions:*

- Only tighten leaking screwed fittings and hose connections after you have released the system pressure.
- Never weld or solder damaged or leaking pressure lines and connections. Always replace damaged parts with new ones.
- Never search for leaks with your bare hands, always wear protective gloves.
- Only use paper or wood to check for minor leaks, never use an unprotected light or open flame.
- Only authorized dealers should replace damaged flexible lines.

- Leaking or damaged pressure lines must be immediately repaired or replaced by an authorized technician.
- Replace hydraulic hoses every six years from the date of manufacture, even if they do not appear to be damaged.

Observe all relevant safety regulations for hydraulic lines, as well as safety regulations regarding accident prevention and occupational health and safety and DIN20066, part 5.

The date of manufacture (month or quarter and year) is stated on the flexible line.

Example:

The indication "**1 Q/05**" means manufactured in the 1st quarter of 2005.

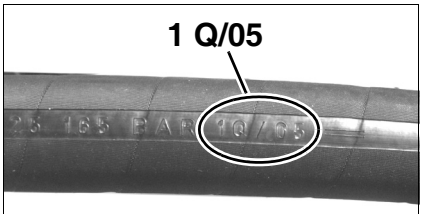


Fig. 7: Hydraulic hose manufacture date

Using a Booster Battery (Jump-Starting)

WARNING!

☞ *Keep arcs, sparks, flames and lighted tobacco away from batteries. When jump-starting from a booster battery, make final connection (negative) at engine frame away from battery. A discharged battery can create flammable gases. Sparks or open flames can cause this gas, and the battery, to explode.*

☞ DO NOT *jump-start or charge a frozen battery. Warm battery to 60° F (16° C) before connecting to a charger. Unplug charger before connecting or disconnecting cables to battery.*

IMPORTANT!

When jump-starting from another machine, be sure the second machine is not running while using the unstarted machine's glow plugs. High voltage spikes from a running machine can burn out the glow plugs.

IMPORTANT!

Damage to the alternator can occur if:

- *Engine is operated with battery cables disconnected.*
- *Battery cables are connected when using a fast charger or when welding on the machine. When welding on the machine, remove both cables from the battery and ground welder to machine frame near repair area.*
- *Extra battery cables (booster cables) are incorrectly connected.*

Be very careful when jump-starting the machine. Booster battery must be 12-volt.

Jump-starting procedure:

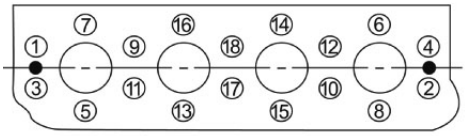
- Turn ignition key to the "OFF" position.
- Open the engine cover.
- Connect one end of the cable to the positive (+) terminal on the booster battery. Connect the other end of the same cable to the positive (+) terminal on the battery of the machine to be started.

NOTE:

If the machine is equipped with a battery disconnect switch, connect the other end of the cable connected to the positive (+) terminal of the booster battery to the positive (+) terminal on the battery disconnect switch of the machine to be started.

Removing/Tightening order for cylinder head bolts

☞ *Order for removing the cylinder-head bolts.*

Flywheel end  Fan end

NOTE:

Only complete work on the cylinder head if the engine is cold.

☞ *Mount the cylinder-head bolts:*

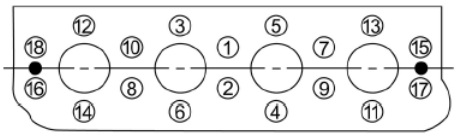
➥ Tightening torque:

- 1st pass 31.4 – 33.6 lb-ft. (42.6 – 45.5 Nm)
- 2nd pass 62.9 – 67.2 lb-ft. (85.3 – 91.1 Nm)

IMPORTANT!

Remember the order for tightening the cylinder-head bolts.

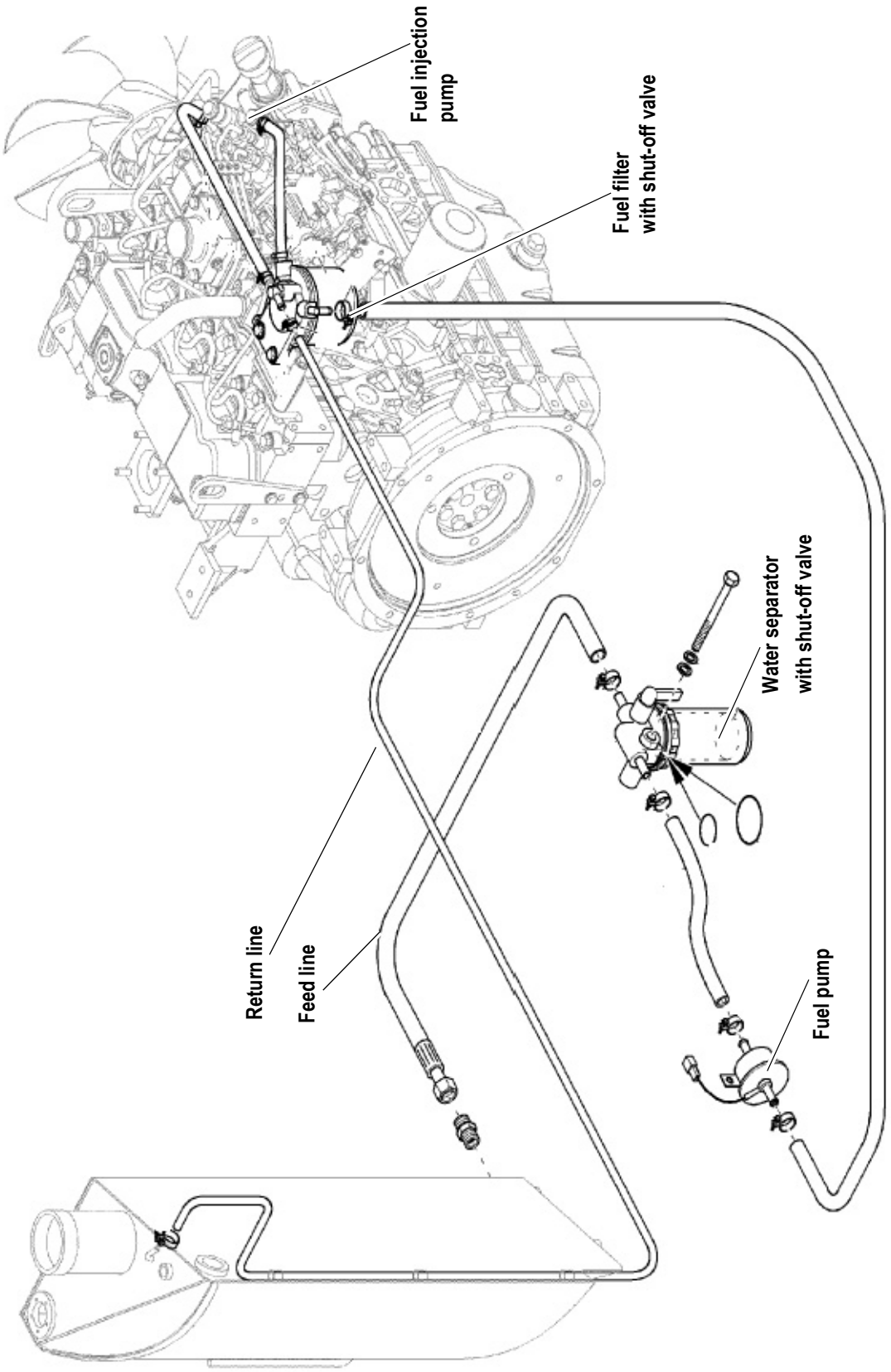
☞ *See figure below.*

Flywheel end  Fan end

NOTE:

Oil the threads and the contact surfaces of the cylinder-head bolts before mounting them.

Fuel system


Fuel injection pump
Fuel filter with shut-off valve
Water separator with shut-off valve
Return line
Feed line
Fuel pump

Engine Troubleshooting

Problem	Possible causes
Engine does not start or is not easy to start	No fuel
	Air in fuel system
	Wrong SAE grade of engine lubrication oil
	Fuel grade does not comply with specifications
	Defective or discharged battery
	Loose or oxidized cable connections in starter circuit
	Defective starter, or pinion does not engage
	Wrong valve clearance
	Defective fuel injector
	Defective starting relay
	Defective glow plug / intake air preheater
	Defective solenoid switch
	Cut-off solenoid does not attract
	Cut-off solenoid without current
	High pressure created immediately in the hydraulic system
Engine starts, but does not run smoothly	Fuel grade does not comply with specifications
	Wrong valve clearance
	Injection line leaks
	Defective fuel injector
	Air in fuel system
Engine overheats, temperature warning system responds	Oil level too low
	Damaged water pump
	Oil level too high
	Dirty air filter
	Dirty cooler fins
	Defective fan, torn or loose V-belt
	Defective thermostat
	Resistance in cooling system too high, flow capacity too low
	Defective fuel injector

Pump assignment

Hydraulic supply by pump 1

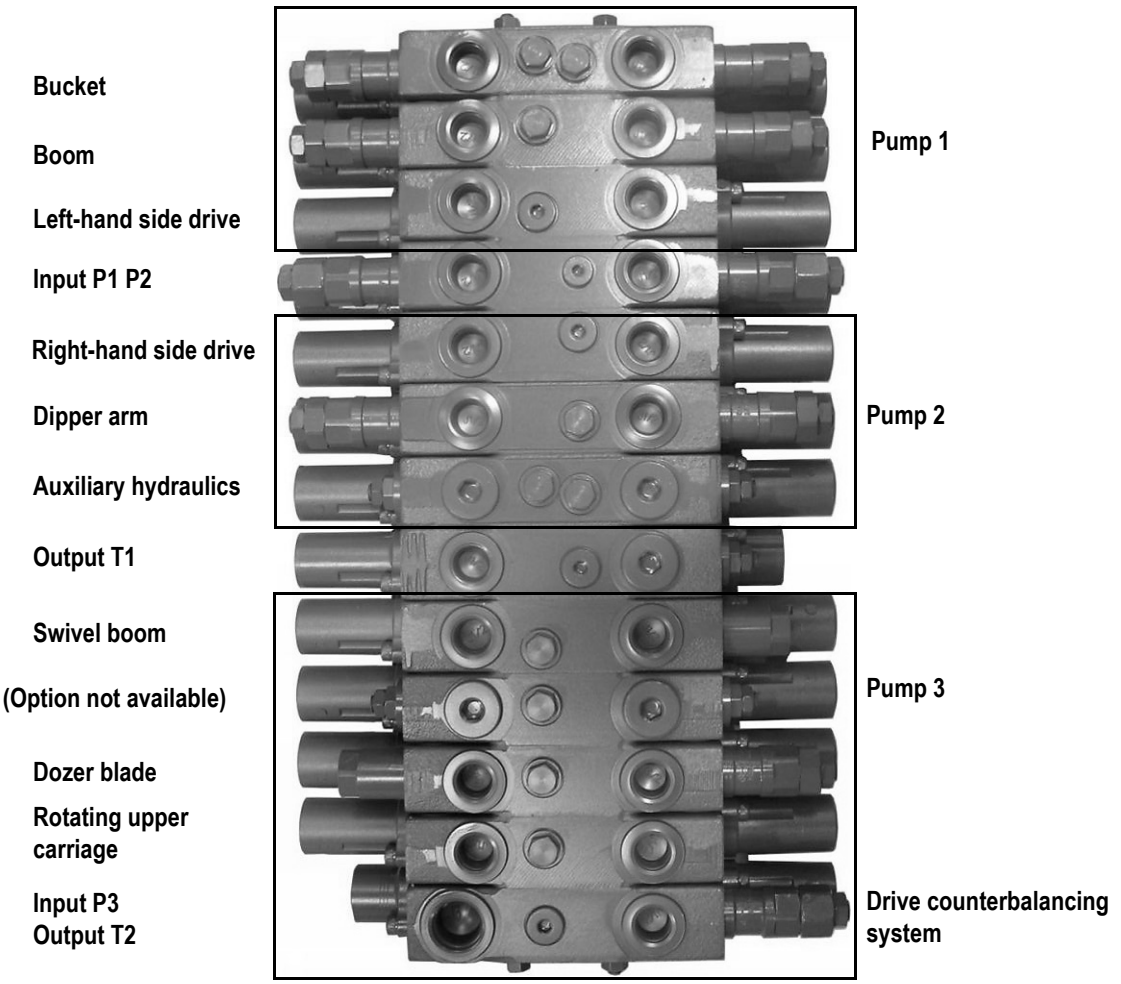
- Bucket section.
- Boom section.
- Left-hand side drive section.

Hydraulic supply by pump 2

- Right-hand side drive section.
- Dipper arm section.
- Auxiliary hydraulics section.

Hydraulic supply by pump 3

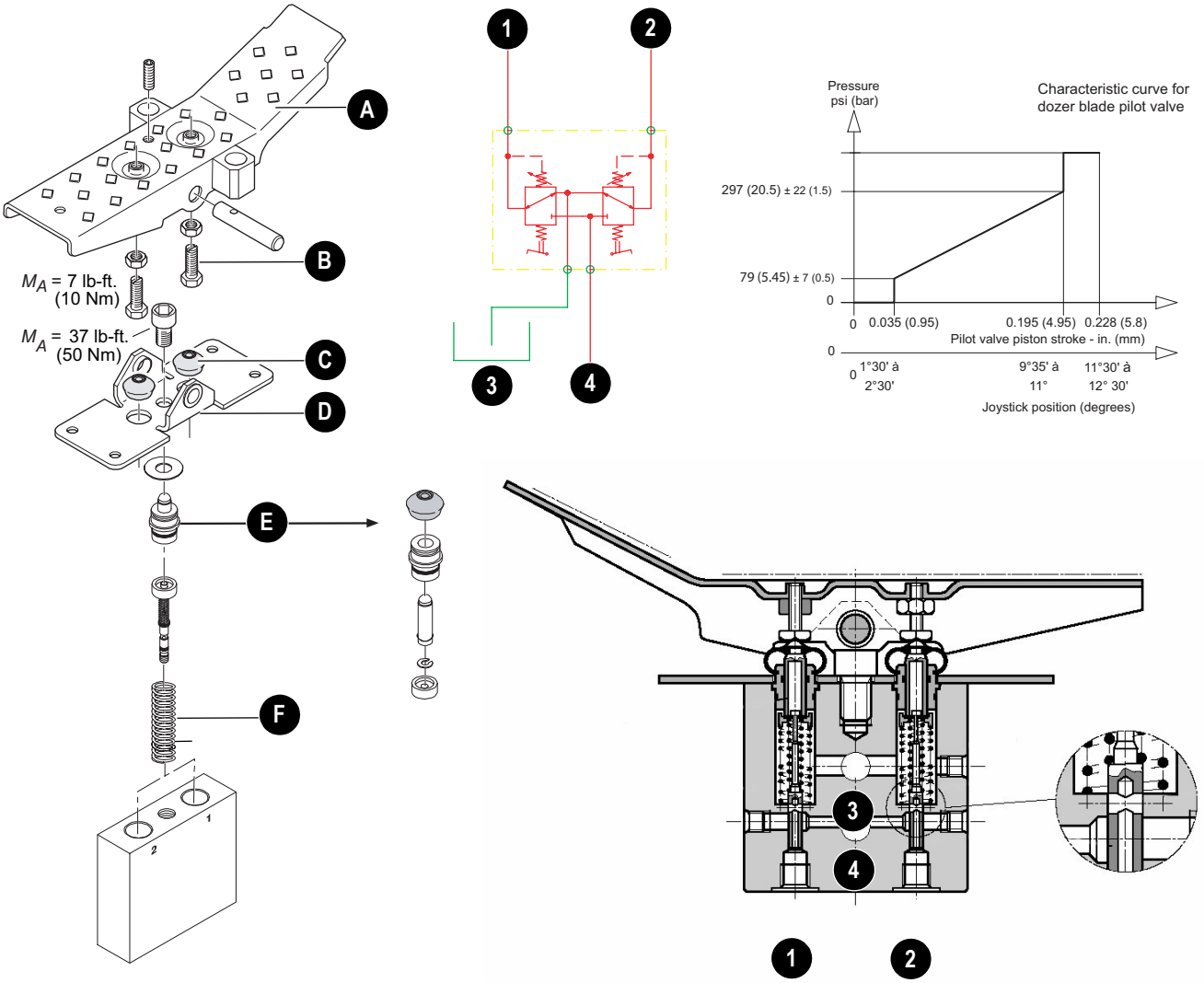
- Dozer blade section.
- Upper carriage rotation section.
- (Option not available).
- Boom swivel section.
- Drive counterbalancing system section.



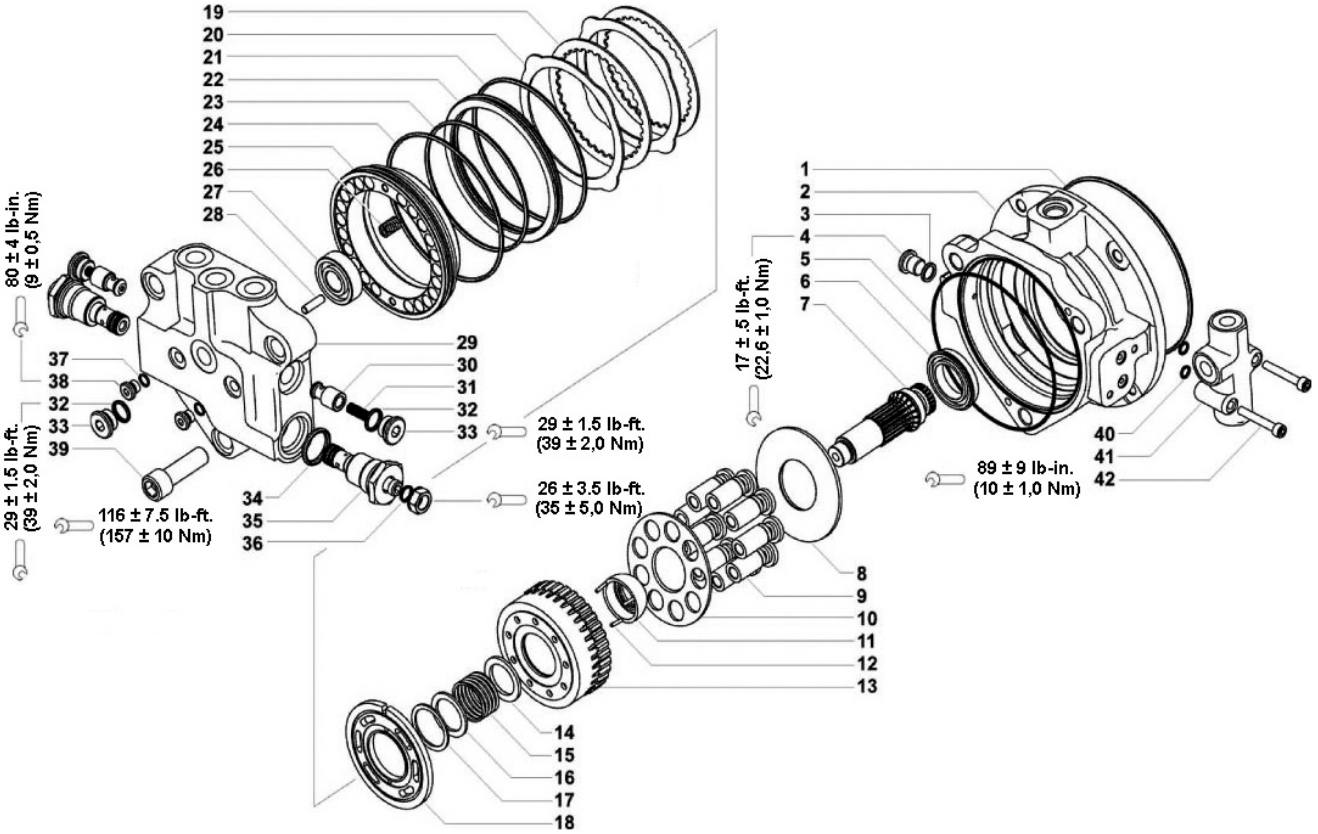
Pilot valve for dozer blade

- Pilot valve with pedals for remote control of directional valves.

Consists of a pedal and two pressure reducing valves.



Ref. No.	Description	Ref. No.	Description
A	Pedal	1	Dozer blade cylinder extension control
B	Adjusting screws	2	Dozer blade cylinder retraction control
C	Protective caps	3	Tank line
D	Mounting plate	4	Supply from pilot oil supply unit
E	Tappet		
F	Springs		



Ref. No.	Description	Ref. No.	Description
1	O-ring	22	Space washer
2	Motor housing	23	O-ring
3	O-ring	24	O-ring
4	Plug	25	Parking brake piston
5	O-ring	26	Brake piston spring
6	Bearing	27	Bearing
7	Motor shaft	28	Pin
8	Plate	29	Motor head
9	Piston	30	Anti-cavitation valve
10	Plate	31	Spring
11	Bush	32	O-ring
12	Pin	33	Plug
13	Cylinder block	34	O-ring
14	Plate	35	Shock valve
15	Spring	36	O-ring
16	Plate	37	O-ring
17	Circled	38	Plug
18	Control disc	39	Screw
19	Parking brake steel ring	40	O-ring
20	Brake disc	41	Brake release valve block
21	O-ring	42	Screw

Electrical system

Ohm's Law (defines current, voltage and resistance relationship)

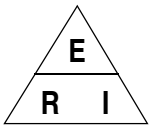
Ohm's law is a mathematical formula that is used to describe the relationship between voltage, current, and resistance.

Current "**I**" – Ampere (A)

Voltage "**E**" – Volt (V)

Resistance "**R**" – Ohm (Ω)

Mnemonic:



Output

Power "P" – Watt (W)

$P = E \times I = R \times I^2 = E^2/R$

Measuring equipment and methods

Multi-function measuring device

- Measurements of values (E, R, I, P).
- Continuity test.
- Diode test.

Calculate measuring range using known data (E, R, I, P) and set before measuring.

Follow AC/DC basic setting.

➥ AC = alternating current/voltage.

➥ DC = direct current/voltage.

Test device with acoustic and optical signal output

- Continuity test in de-energized machine electrical system and of wiring harnesses.

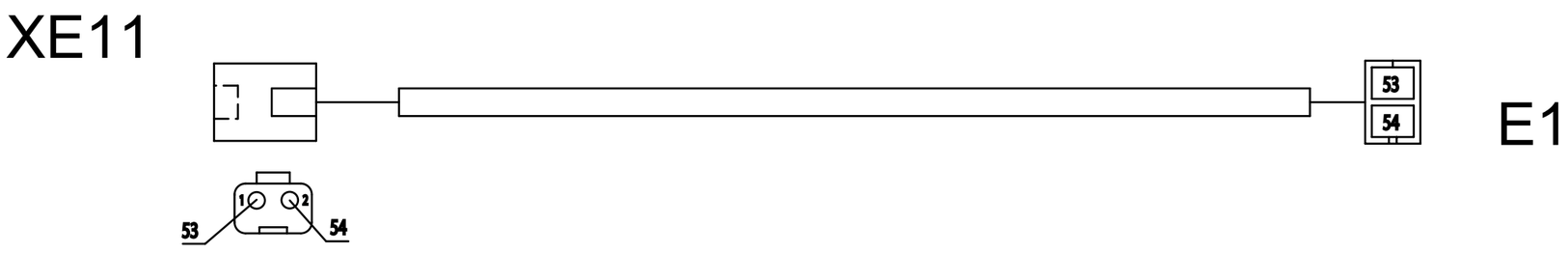
Wiring diagram legend (SN AC02889 and before)

No.	Description	Section	Loc.
A1	Radio	E14	Opt
B1	Fuel indicator	F6	
B2	Horn	D/E10	
B6	Engine oil temperature sensor	E6	
B11	Loudspeaker	E15	Opt
B12	Loudspeaker	E15	Opt
E7	Rear roof lights	F14	Opt
E9	Front roof light	F13	Opt
E10	Front roof light		Opt
E11	Boom light	F8/9	
E14	Interior light	E/F13	
E15	Socket (e.g., cigarette lighter)	A14	
F1	Main fuse: starter, preheating	E2	
F2	Main fuse	E1	
F3	Indicators, engine relay	A4	
F4	Boom working light	A7	
F5	Cab working lights	A8	
F6	Valves, horn	A9	
F7	Fan, air conditioning	A10	
F8	Wiper, interior light	A12	
F9	Rotating beacon, radio	A13	
F10	Socket (e.g., cigarette lighter)	A14	
G1	Alternator	F3	
G2	Battery	F1	
H2	Preheating indicator	B3	
H3	Engine temperature indicator	B3	
H4	Engine oil pressure indicator	B3	
H5	Alternator charge function indicator	B3	
H6	Air filter indicator	B3	
H7	Hydraulic oil filter indicator	B3	
H9	Not assigned	C3	Opt
H28	Rotating beacon	F13	Opt
H33	Spare indicator	B3	
H30	Spare indicator	C3	
K5	Preheating high current relay	E4	
K6	Preheating time lag relay	D5	
K7	Start high current relay	E2	
K8	Cutoff solenoid time lag relay	E3	
K9	Cutoff solenoid switching relay	E3	
M1	Starter	F2	
M2	Wiper motor	F13	Opt
M4	Fan	C12	Opt
M5	Washer pump	F8	Opt
M7	Not assigned	F1	Opt
M9	Fuel pump	F3	
P1	Hourmeter	B3	
P2	Fuel level indication	B3	
P3	Engine oil temperature gauge	A3	
R1	Intake air preheater	F5	
S1	Preheating start switch	A1	

No.	Description	Section	Loc.
S2	Engine oil pressure switch	F5	
S3	Engine temperature switch	E5	
S4	Air filter pressure switch	F6	
S5	Hydraulic oil pressure switch	F7	
S15	Ventilation switch	A10	
S16	Boom working light switch	A7	
S17	Cab working light switch	A8	Opt
S18	Rotating beacon switch	A/B 13	Opt
S20	Wiper/washer switch	A12	Opt
S21	High speed switch	A9	
S21.1	High-speed joystick button (prepared)	E9	Opt
S27	Additional hydraulics/swivel joystick button	D10	
S28	Safety switch	C12	
S30	Additional control circuit joystick button	D9	Opt
S31	Additional control circuit joystick button	D9	Opt
S41	Not assigned	E8	Opt
S42	Not assigned	A6	Opt
S48	Not assigned	C9	Opt
S51	Air conditioning switch	A11	Opt
S52	Air conditioning pressure switch	E12	Opt
S54	Air conditioning thermostat	D12	Opt
S55	Horn joystick button	C10	
V1	Recovery diode	E4	
X1	13-pole connection – engine/chassis	D4-6	
X2	11-pole connection – engine/chassis	D7-9	
X3	2-pole main connection	D0	
X4	9-pole connection – not assigned	C/D1	
X5	7-pole connection – armrest/chassis	D11/12	
X6	5-pole connection – armrest switch	C11/12	
X7	6-pole connection – joystick (right)	C/D 11	
X8	6-pole connection – joystick (left)	D11	
X10	15-pole connection – instrument panel	B/C3	
X11	Not assigned	B6	
X12	9-pole connection – cab	C13/14	
X13	5-pole connection – engine temperature	A3	
X14	2-pole connection – auto-idle setting	D3/4	
X15	1-pole connection – drive alarm	D1	
X16	3-pole connection – drive alarm	E2	
X19	1-pole connection – socket	F7	
XE11	2-pole connection – boom working light	E9	
XS41	Not assigned	E8	
Y1	Cutoff solenoid	F4	
Y3	High-speed solenoid valve	F9	
Y13	Solenoid valve for safety valve	F11	
Y14	Solenoid valve – not assigned	F9	Opt
Y15	Solenoid valve – auxiliary hydraulics/swivel	F10	
Y16	Solenoid valve – additional control circuit	F10	Opt
Y17	Solenoid valve – additional control circuit	F11	Opt
Y31	Solenoid valve – air conditioning	F12	Opt

Wiring diagram (legend)

Boom working light wiring harness



No.	Up to	To	Color
53	XE11/1 boom working light	E1 boom working light	grn/yel
54	XE11/2 boom working light	E1 boom working light	blk

Long dipper arm

Specifications

Long dipper arm	
Difference in length in relation to standard dipper arm	11.8” (300 mm)

NOTE:

Read the lift capacity table when using a long dipper arm.

Auxiliary hydraulics connections

NOTE:

Follow the Operator’s Manual of the attachment manufacturer for connecting the auxiliary hydraulics to the attachment.

Quick-couplers (cannot be joined under pressure)

Port	Function
T	Pressure line quick-coupler 12.5 1/2” (13 mm)
U	Return pressure line quick-coupler 12.5 1/2” (13 mm)
V	Unpressurized return-to-tank line quick-coupler 17 3/4” (19 mm)

Couplings according to ISO 16028

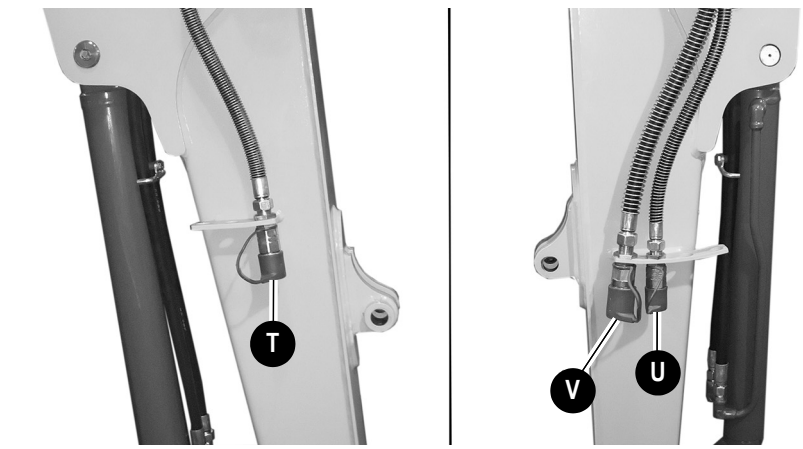


Fig. 4: Connections for auxiliary hydraulics