Service manual

Track excavators

ET18/ET20/ ET24



Machine models	**E12-02, 03, 04**
Edition	**2.3**
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Language	**en**

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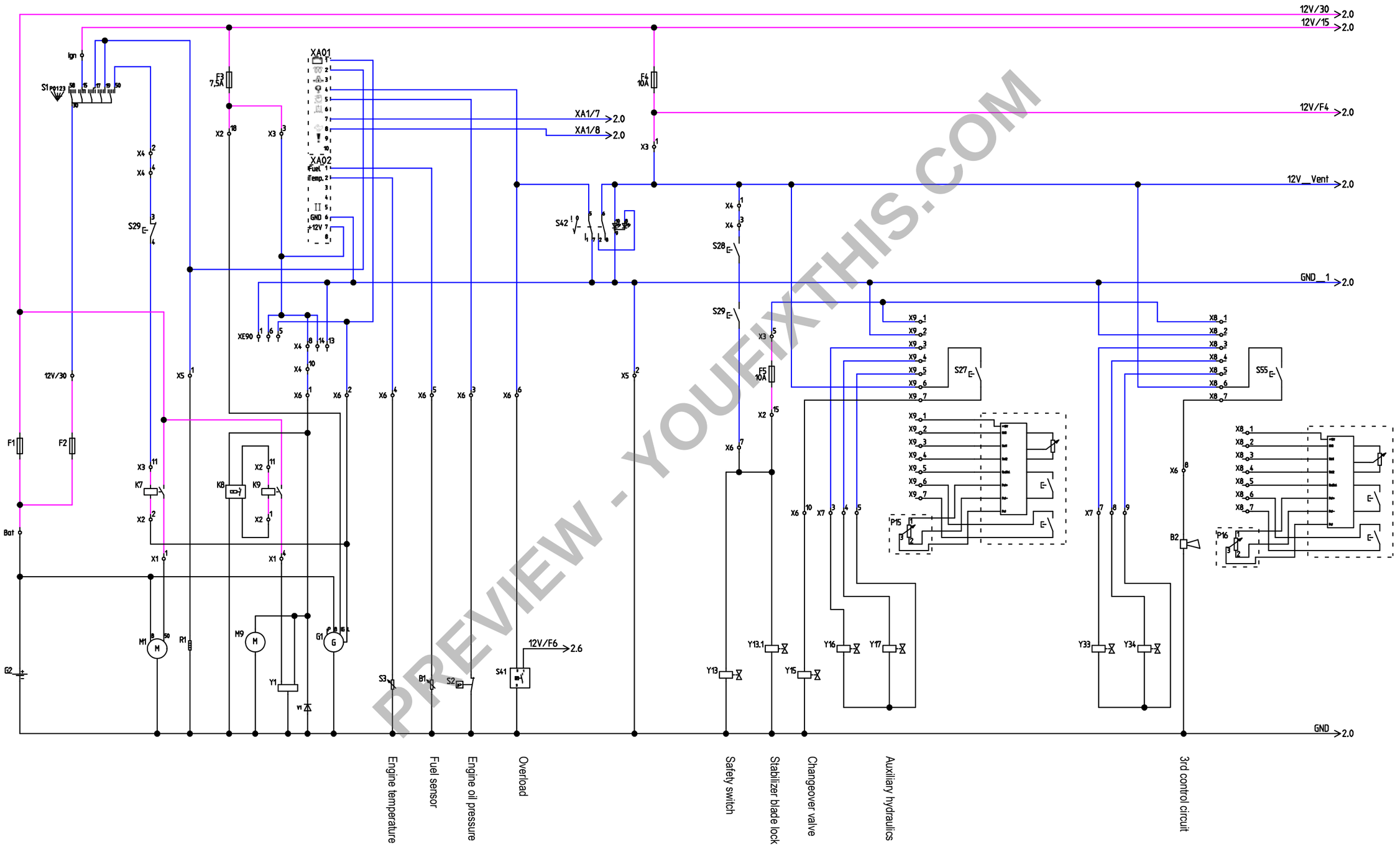
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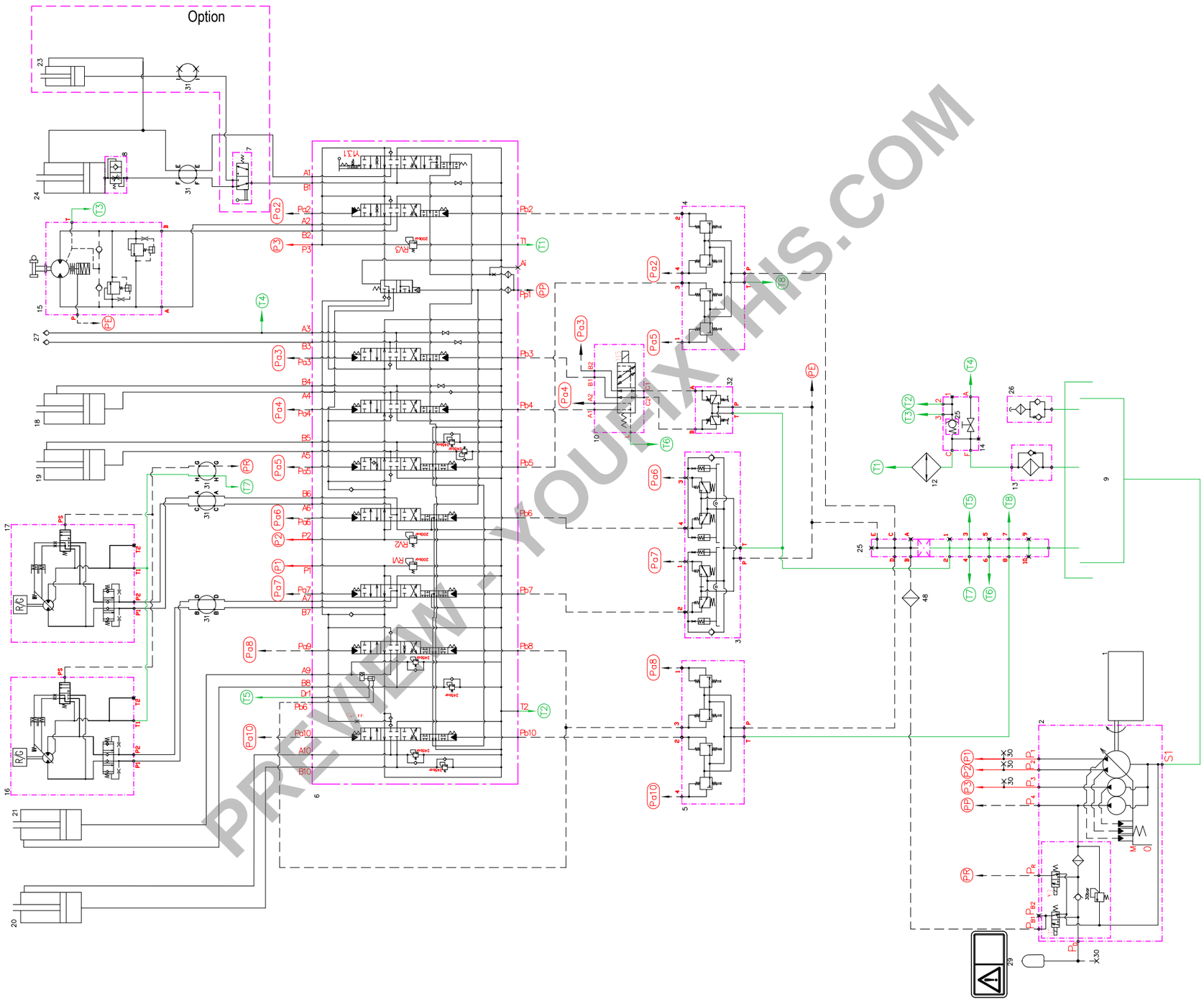
7.29 Wiring diagram



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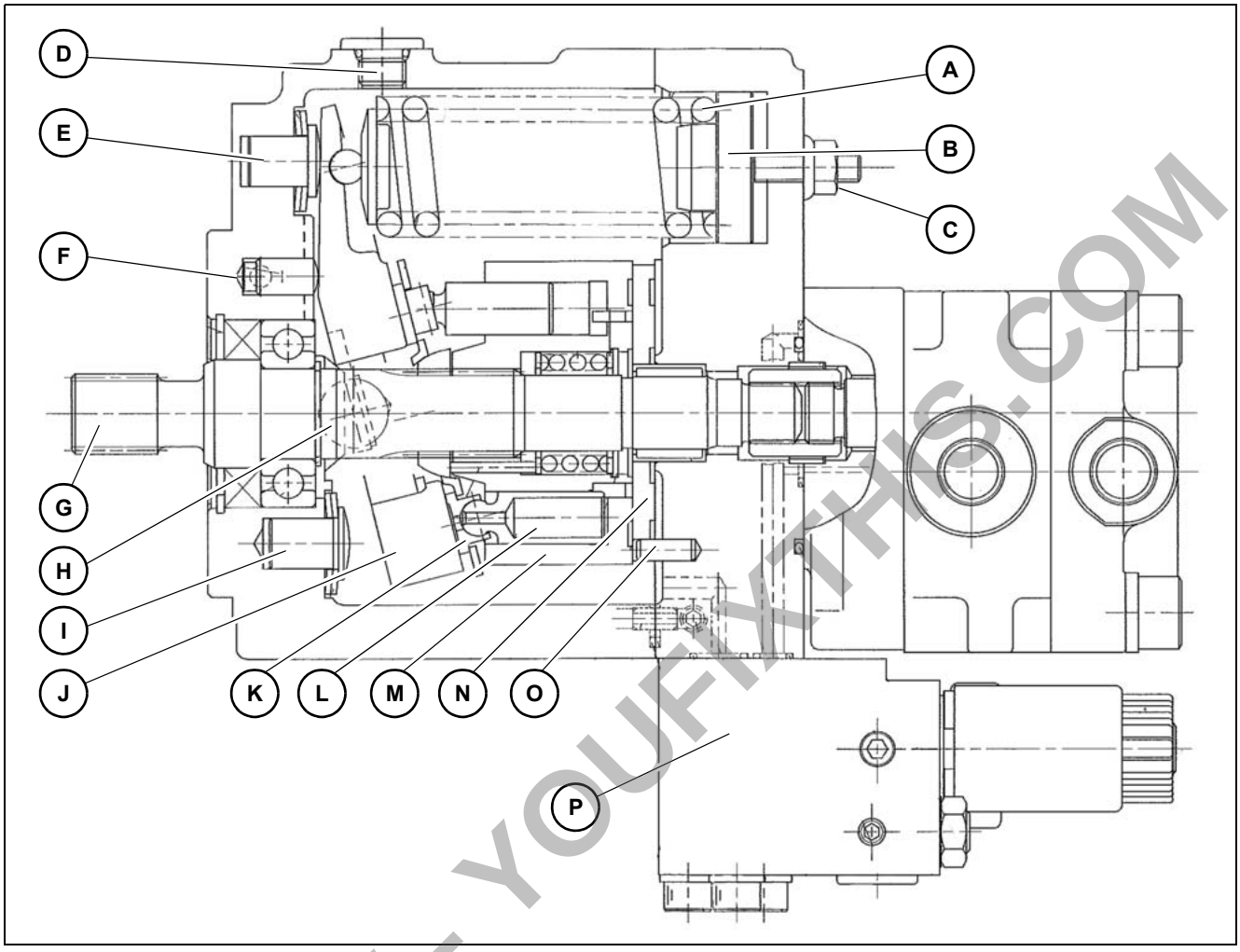
7.2 Hydraulics diagram ET18



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Exploded view of hydraulic pump



Pos.	Designation	Pos.	Designation
A	Control spring	I	Screw Qmin
B	Spring guide	J	Cradle
C	Control initiation adjusting screw	K	Slide
D	Bleed screw	L	Piston
E	Screw Qmax	M	Cylinder
F	Control piston	N	Control plate
G	Drive shaft	O	Control plate lock
H	Cradle bearing	P	Pilot oil supply unit

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2.13 Tightening torques

General tightening torques

Property class	8.8	10.9	12.9	8.8	10.9
Screw dimension	Screws according to DIN 912, DIN 931, DIN 933, etc.			Screws according to DIN 7984	
	Nm (ft.lbs.)	Nm (ft.lbs.)	Nm (ft.lbs.)	Nm (ft.lbs.)	Nm (ft.lbs.)
M5	5.5 (4)	8 (6)	10 (7)	5 (4)	7 (5)
M6	10 (7)	14 (10)	17 (13)	8.5 (6)	12 (9)
M8	25 (18)	35 (26)	42 (31)	20 (15)	30 (22)
M10	45 (33)	65 (48)	80 (59)	40 (30)	59 (44)
M12	87 (64)	110 (81)	147 (108)	69 (51)	100 (74)
M14	135 (100)	180 (133)	230 (170)	110 (81)	160 (118)
M16	210 (155)	275 (203)	350 (258)	170 (125)	250 (184)
M18	280 (207)	410 (302)	480 (354)	245 (181)	345 (254)
M20	410 (302)	570 (420)	690 (509)	340 (251)	490 (361)
M22	550 (406)	780 (575)	930 (686)	460 (339)	660 (487)
M24	710 (524)	1000 (738)	1190 (878)	590 (435)	840 (620)
M27	1040 (767)	1480 (1092)	1770 (1305)	870 (642)	1250 (922)
M30	1420 (1047)	2010 (1482)	2400 (1770)	1200 (885)	1700 (1254)

Tightening torques/fine-pitch thread					
Property class	8.8	10.9	12.9	8.8	10.9
Screw dimension	Screws according to DIN 912, DIN 931, DIN 933, etc.			Screws according to DIN 7984	
	Nm (ft.lbs.)	Nm (ft.lbs.)	Nm (ft.lbs.)	Nm (ft.lbs.)	Nm (ft.lbs.)
M8X1.0	25 (18)	37 (28)	43 (32)	22 (16)	32 (24)
M10X1.0	50 (37)	75 (55)	88 (65)	43 (32)	65 (48)
M10X1.25	49 (36)	71 (52)	83 (61)	42 (31)	62 (46)
M12X1.25	87 (64)	130 (96)	150 (111)	75 (55)	110 (81)
M12X1.5	83 (61)	125 (92)	145 (107)	72 (53)	105 (77)
M14X1.5	135 (100)	200 (148)	235 (173)	120 (89)	175 (129)
M16X1.5	210 (155)	310 (229)	360 (266)	180 (133)	265 (195)
M18X1.5	315 (232)	450 (332)	530 (391)	270 (199)	385 (284)
M20X1.5	440 (325)	630 (465)	730 (538)	375 (277)	530 (391)
M22X1.5	590 (435)	840 (620)	980 (723)	500 (369)	710 (524)
M24X2.0	740 (546)	1070 (789)	1250 (922)	630 (465)	900 (664)
M27X2.0	1100 (811)	1550 (1143)	1800 (1328)	920 (679)	1300 (959)
M30X2.0	1500 (1106)	2150 (1586)	2500 (1844)	1300 (959)	1850 (1364)

Engine tightening torques

Tightening torques	Nm (ft.lbs.)
Cylinder head bolt (M9x1.25)	53.9 – 57.9 (40 – 43)
Connecting rod bearing screw (M7x1)	22.6 – 27.5 (17 – 20)
Main bearing screw (M10x1.25)	75.5 – 81.5 (56 – 60)
Flywheel screw (M10x1.25)	80.4 – 86.4 (59 – 64)

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4.36 Engine malfunctions

Problem	Possible causes
Engine does not start or is not easy to start	Incorrect engine oil
	Fuel grade does not comply with specifications
	Malfunctioning or empty battery
	Loose or oxidized cable connections in starter circuit
	Malfunctioning starter, or pinion does not engage
	Wrong valve clearance
	Malfunctioning intake or exhaust valve
	Malfunctioning starting relay
	Malfunctioning glow plug
	Malfunctioning solenoid switch
	Malfunctioning fuse
	Dirty fuel filter
	Very dirty air filter
	Cutoff solenoid does not attract
	Air in fuel system
	Stuck or broken piston ring
	No fuel
	Poor injection
	Stuck or malfunctioning system components
	Water or air in fuel system
	Foreign bodies in combustion chamber
Engine starts, but does not run smoothly or faultless	Fuel grade does not comply with specifications
	Wrong valve clearance
	Injection line leaks
	Malfunctioning fuel injector
	Dirty fuel filter
	Air or water in fuel system
	Incorrect setting of speed control
	Poor fuel supply to injection pump

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Engine	ET18	ET20	ET24
Product	Yanmar diesel engine		
Type	3TNV80F-SSNS1		
Design	Water-cooled 4 stroke diesel engine		
Number of cylinders	3		
Fuel injection system	Indirect injection		
Aspiration	Natural aspiration		
Cooling system	Water-cooled/aspirating fan		
Lubrication system	Force-feed lubrication with trochoidal pump		
Displacement	1266 cm^3 (77.3 in^3)		
Nominal bore and stroke	80 x 84 mm (3.2 x 3.3 in)		
Power	13.4 kW at 2200 rpm (18 hp at 2200 rpm)		
Max. torque	65.8 Nm at 1600 rpm (48.5 ft.lbs. /1600 rpm)		
Max. engine speed without load	2375 +/− 25 rpm		
Idling speed	1300 +/− 25 rpm		
Fuel injection system	Indirect injection		
Starting aid	Glow plug (preheating time 4 seconds)		
Valve clearance (intake = outlet)	0.15 – 0.25 mm (cold) / (0.006 – 0.01 in)		
Compression	23.1 +/− 1 bar (335 +/− 15 psi)		
Engine oil pressure (at rated speed)	3 – 4.5 bar (43.5 – 65.3 psi)		
Pressure switch for engine oil pump	0.5 +/− 0.1 bar (7.25 +/− 1.45 psi)		
Thermostat opening temperature	70 – 73 °C (157 – 163 °F)		
Thermal switch	107 – 113 °C (225 – 235 °F)		
Firing order	1 – 3 – 2		
Fuel tank	24.2 l (6.4 gal)		
Direction of rotation	Anticlockwise (as seen from the flywheel)		
Specific fuel consumption	< 272 g/kWh (0.60 lb/hph) at rated output		
Exhaust values according to	EPA – TIER IV final (from 2012)		

Notice!

The machine has about 17 % less output at altitudes over 800 m (2625 ft) above see level. However, this does not affect operation.

2.3 Engine capacities

Capacities	
Engine oil	3.5 l (0.9 gal) (up to max. mark) 1.8 l (0.48 gal) (up to min. mark)
Coolant (without radiator)	0.9 l (0.24 gal) (engine only)
Radiator	2.6 l (0.68 gal)

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3.5 Maintenance plan

Daily maintenance (user)	
Inspection work (Check the following fluids and lubricants, check the oil levels after a test run and add oil if necessary)	Page
Check the fluids and lubricants (engine oil, engine coolant, hydraulic oil)	*3-27*, *3-31*, *3-51*
Check the radiator and hydraulic oil cooler for dirt, clean them if necessary	*3-34*
Lubricate the machine according to the lubrication schedule	*3-61*
Check the dirt indicator on the air filter [1]	*3-35*
Check the water separator and fuel filter: drain water if necessary (see sight glass)	*3-22*, *3-22*, *3-22*
Check the track tension and retension the tracks if necessary	*3-58*, *3-59*
Check the engine air intake	*3-37*
Check pin lock	--
Check line fixtures	--
Check indicator lights for correct function	*1-15*
Check the hydraulic couplings for dirt	--
Check the threaded fittings of the protective structures (for example the cabin) for tightness[2]	--
Option	
Adjust the mirrors correctly, clean them and check them for damage, check the fastening screws and tighten them if necessary	--
Leakage check	
Check for tightness, leaks, and chafing: pipes, flexible lines and threaded fittings of the following assemblies and components. Repair if necessary	Page
Engine and hydraulic system	--
Traveling drive	--
Cooling systems, heating, and hoses (visual check)	--
Option	
Hydraulic quickhitch (Easy Lock) and Powertilt (hoses, valve)	--
Visual check	
Correct function, deformation, damage, superficial cracks, wear and corrosion	Page
Check the exhaust system for damage	--
Check the insulating mats in the engine compartment for damage	--
Check the cabin and protective structures for damage (for example the front guard, FOPS)	--
Check the tracks for damage	--
Check the travel gear for damage (for example the track roller, insert rolling bearings)	--
Check the piston rods of the cylinders for damage	--
Check the seat belt for damage	--
Option	
Check the load hook, joint rod and lifting eye	*3-65*
Check the hydraulic quickhitch (Easy Lock) for damage	--
Check the Powertilt for damage	--

1. Air filter replacement according to the dirt indicator, every 1000 o/h or once a year at the latest. (Replace after 50 o/h when in extensive use in environments with acidic air, such as acid production facilities, steel and aluminum mills, chemical plants and other nonferrous-metal plants, independently of the dirt indicator)
2. Check the screw connections and corresponding components/assemblies visually or manually (without using tools) for tightness (operator).
   If in case of irregularities a tool still has to be used for checking, have the screw connection re-established by an authorized service center with new material (screws, nuts).

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1 Operation

1.1 Information on this service manual

This service manual contains important information on how to work safely, correctly, and economically with the machine. Therefore, it aims not only at new personnel, but it also serves as a reference for experienced personnel. It helps to avoid hazardous situations and reduce repair costs and downtimes.
Furthermore, the reliability and the service life of the machine will be increased by following the instructions in the Operator's Manual.

Careful and prudent working is the best way to avoid accidents!

Operational safety and readiness of the machine do not only depend on your skill, but also on maintenance and servicing of the machine. This is why regular maintenance and servicing is absolutely necessary.

Extensive maintenance and repair work must always be performed by a Wacker Neuson service center. Use only original spare parts for repairs. This ensures operational safety and readiness of your machine, and maintains its value.

- We reserve the right to improve the technical standard of our machines without adapting the service manual.
- Modifying Wacker Neuson products and fitting them with additional equipment and attachments not included in our delivery program requires Wacker Neuson's written authorization, otherwise warranty and product liability for possible damage caused by these modifications shall not be applicable.
- Subject to modifications and printing errors.

Your Wacker Neuson dealer will be pleased to answer any further questions regarding the machine or the service manual.

1.2 Identification of warnings and dangers

Important indications regarding the safety of the personnel and the machine are identified in this service manual with the following terms and symbols:



Danger!

Failure to observe the instructions identified by this symbol can cause injury or death for the operator or other persons.

☞ *Measures for avoiding danger*



Caution!

Failure to observe the instructions identified by this symbol can cause damage to the machine.

☞ *Measures for avoiding danger for the machine*

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1.7 Cabin

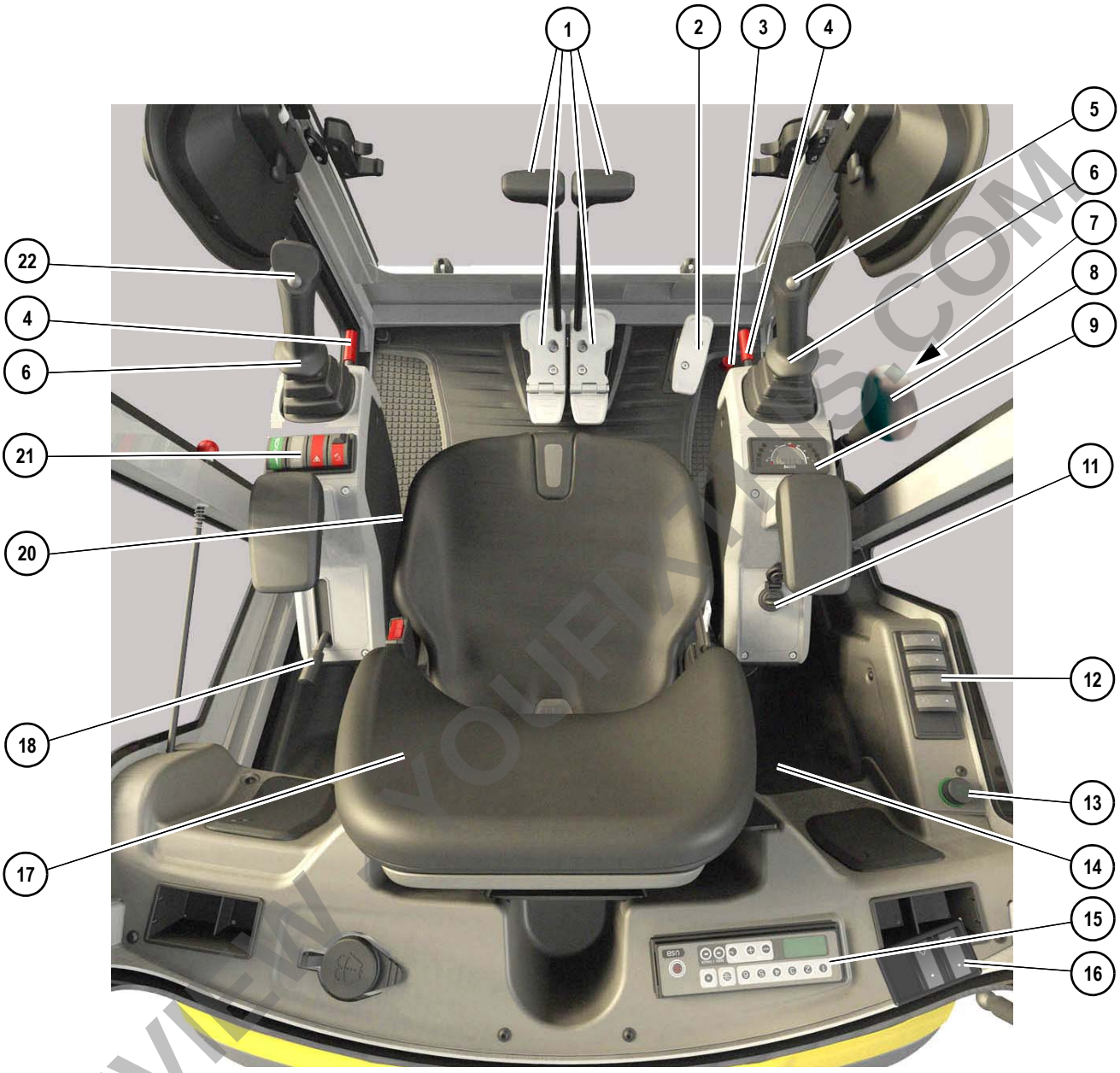


Fig. 17: Overview of control elements



Fig. 17: Overview of control elements – proportional controls

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2 Technical data

2.1 Models and trade names

Machine model/machine designation	Trade name
E12-02	ET18
E12-03	ET20
E12-04	ET24

2.2 Engine

Engine	ET18	ET20	ET24
Product	Yanmar diesel engine		
Type	3TNV76-SNSE12		
Design	Water-cooled 4 stroke diesel engine		
Number of cylinders	3		
Displacement	1116 cm^3 (68.1 in^3)		
Nominal bore and stroke	76 x 82 mm (2.9 x 3.2 in)		
Power	13.4 kW/2200 rpm (18 hp/2200 rpm)		
Max. torque	65.6 Nm/1600 rpm (48.4 ft.lbs. /1600 rpm)		
Max. engine speed without load	2375 +/− 50 rpm		
Idling speed	1300 +/− 25 rpm		
Fuel injection system	Indirect injection		
Starting aid	Glow plug (preheating time 4 seconds)		
Aspiration	Natural aspiration		
Cooling system	Water-cooled/blowing fan		
Lubrication system	Force-feed lubrication with trochoidal pump		
Valve clearance (intake = outlet)	0.15 – 0.25 mm/(0.006 – 0.01") cold		
Compression	34.3 ± 1 bar (498 ± 15 psi) at 250 rpm		
Engine oil pressure (at rated speed)	2.9 – 4.4 bar (42 – 64 psi)		
Pressure switch for engine oil pump	0.5 +/− 0.1 bar (7.25 +/− 1.45 psi)		
Thermostat opening temperature: fully open at:	80.5 – 83.5 °C (176.9 – 182.3°F) 95 °C (203 °F)		
Thermal switch	107 – 113 °C (225 – 235 °F)		
Firing order	1 – 3 – 2		
Fuel tank	24.2 l (6.4 gal)		
Direction of rotation	Anticlockwise (as seen from the flywheel)		
Specific fuel consumption	< 272 g/kWh (0.60 lb/hph) at rated output		
Exhaust values according to	EPA Tier 4 (up to 31 December 2012)		

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