

Section 4 Power transmission

Group 41 Clutch

Pressure plate, max. out-of-true	mm	0.2
Clutch fork clearance, hydraulic control		not adjustable
with return spring at cylinder (play forwards)	mm	1–3
with return spring at pedal (play rearwards)	mm	1–3
Clutch pedal stroke	mm	160

Group 43 Transmission

Manual transmission

Type	M 46	M 47	M 90
Ratios:			
1st gear	4.03 : 1	4.03 : 1	3.54:1
2nd gear	2.16 : 1	2.16 : 1	2.05:1
3rd gear	1.37 : 1	1.37 : 1	1.38:1
4th gear	1.00 : 1	1.00 : 1	1.00:1
5th gear	0.79 : 1	0.82 : 1	0.81:1
Reverse gear	3.68 : 1	3.68 : 1	3.45:1
Play			
between reverse gear and gear selectormm	0.1 – 1.0	0.1 – 1.0	
axial play			
input shaftmm	0.01 – 0,20	0.01 – 0.20	
countershaftmm	0.03 – - 0.05*	0.01 – 0.10	
primary shaft.....mm	0.01 – 0.20	0.01 – 0.20	
5th synchro. hubmm		0.01 – 0.20	
*pre-tensioning			
Lubricating oil			
Type: ATF	F, G, Dexron II D/E, Ford Mercon	F, G, Dexron II D/E, Ford Mercon	
Type: SyntheticVolvo P/N			97 308
Oil volume, approx. litres	2.6	1.6	1.75

Oil pressure - overdrive			
Type	J	J/P	P
Top gear MPa(kp/cm ²)	0.15 (1.5)	0.15 (1.5)	0.15 (1.5)
Overdrive engaged..... MPa(kp/cm ²)	2.8 – 3.1 (28 – 31)	2.7 – 2.9 (27 – 29)	2.8 – 3.1 (28 – 31)

Automatic transmission

	AW 70/71	AW 72	AW 30-40	AW 30-43
Ratio:				
1st gear.....	2.45 : 1	2.83 : 1	2.80 : 1	2.80 : 1
2nd gear.....	1.45 : 1	1.49 : 1	1.53 : 1	1.53 : 1
3rd gear.....	1 : 1	1 : 1	1 : 1	1 : 1
4th gear.....	0.69 : 1	0.73 : 1	0.71 : 1	0.75 : 1
Reverse gear.....	2.21 : 1	2.70 : 1	2.39 : 1	2.39 : 1
Torque converter				
K-factor.....	190, 206, 217	206	206	177
diameter.....mm	248 ⁴⁾ , 254 ⁵⁾	254	254	254
torque amplification.....	1.72 - 2.40:1	2.4:1	2.4: 1	2.1:1
Lubricant				
oil volume, approx. litres	7.50	7.50	7.75	7.75
difference between MAX-MIN..... litres	0.5	0.5	0.5	0.5
quality, ATF-oil..... type	Dexron II D/E Ford Mercon	Dexron II D/E Ford Mercon	Dexron II E/D Ford Mercon	Dexron II E/D Ford Mercon
	ZF4HP22¹⁾	ZF4HP22³⁾		
Ratio:				
1st gear.....	2.73 : 1	2.48 : 1		
2nd gear.....	1.56 : 1	1.48 : 1		
3rd gear.....	1 : 1	1 : 1		
4th gear.....	0.73 : 1	0.73 : 1		
Reverse gear.....	2.09 : 1	2.09 : 1		
Torque converter				
K-factor.....	218 ²⁾	195 ³⁾		
diameter.....mm	260	260		
torque amplification.....	2.3:1	2.3:1		
Lubricant				
oil volume..... litres	7.5	7.5		
difference between MAX-MIN..... litres	0.5	0.5		
quality, ATF-oil..... type	Dexron II D/E Ford Mercon	Dexron II D/E Ford Mercon		

1) D 24, D 24 T/TIC

2) D 24

3) Others

4) without lock-up

5) with lock-up

Type, part number and stall speed			
Engine	Type	Volvo P/N	Normal stall speed r/s(rpm)
B 200 E	AW 70	12 08 415	35.0 (2100)
B 200 F/G	AW 70	12 08 659	37.0 (2200)
B 200 FT	AW 71	12 08 684, 12 08 739	31.7-40.0 (1900-2400)
B 230 E	ZF 4HP 22	12 08 662	36.0 (2150)
B 230 F/G	AW 70	12 08 604, 12 08 652	33.0 (2000)
B 230 FB	AW 71	12 08 682	33.0 (2000)
	ZF 4HP 22	12 08 686	33.0 (2000)
B 230 FD	AW 71	12 08 768	40.0 (2400)
B 230 FT	AW 71	12 08 642, 1 208 751	33.0 - 45.0 (2000 - 2700)
B 230 GT	AW 71	12 08 643	33.0 - 45.0 (2000 - 2700)
B 234 F/G	AW 72	12 08 667, 12 08 666	40.8 (2450)
B 6304 F/G	AW 30-43	12 08 657, 12 08 744	35.0 (2100)
B 6304 F	AW 30-40	12 08 738, 12 08 745	45.0 (2700)
D 24	ZF 4HP 22	12 08 594	36.0 (2150)
D 24 T	ZF 4HP 22	12 08 664	31.7-39.0 (1900-2350)
D 24 T, EGR	ZF 4HP 22	12 08 665	30.0-33.3 (1800-2000)
D 24 TIC	ZF 4HP 22	12 08 663	31.7-40.8 (1900-2450)

System and stall speed pressures					
Engine (final drive)	Gearbox	System pressure, idling MPa		System pressure, stall speed, MPa	
		Gear position D	Gear position R	Gear position D	Gear position R
B 200 E/F/G B 200 FT	AW 70 AW 71	0.35 - 0.44 0.46 - 0.54	0.50 - 0.64 0.70 - 0.82	1.00 - 1.20 1.00 - 1.20	1.37 - 1.70 1.50 - 1.90
B 230 F/G B 230 FB/FT/GT B 230 E B 230 FB B 230 FD	AW 70 AW 71 ZF 4HP 22 ZF 4HP 22 AW 71	0.46 - 0.54 0.46 - 0.54 0.60 - 0.76 0.60 - 0.76 0.46 - 0.54	0.70 - 0.82 0.70 - 0.82 1.10 - 1.40 1.10 - 1.40 0.70 - 0.82	1.00 - 1.20 1.00 - 1.20 0.83 - 1.03 0.83 - 1.03 1.00 - 1.20	1.50 - 1.90 1.50 - 1.90 1.51 - 1.72 1.51 - 1.72 1.50 - 1.90
B 234 F/G	AW 72	0.44 - 0.52	0.64 - 0.76	1.12 - 1.32	1.55 - 1.95
B 6304 F/G	AW 30 - 43 AW 30 - 40	0.40 0.40	0.64 0.64	1.21 1.21	1.59 1.59
D 24 D 24 T (3.91:1) D 24 T (3.73:1) D 24 TIC	ZF 4HP 22 ZF 4HP 22 ZF 4HP 22 ZF 4HP 22	0.60 - 0.76 0.60 - 0.76 0.60 - 0.76 0.60 - 0.76	1.10 - 1.40 1.10 - 1.40 1.10 - 1.40 1.10 - 1.40	0.86 - 1.06 0.81 - 1.01 0.99 - 1.10 0.96 - 1.06	1.57 - 1.76 1.48 - 1.67 1.61 - 1.82 1.57 - 1.76

Governor pressure AW 70/71/72

Rear axle ratio					
3.73 : 1		3.91 : 1		4.10 : 1	
km/h	MPa	km/h	MPa	km/h	MPa
30	0.09 - 0.15	29	0.09 - 0.15	27 25*	0.09 - 0.15
55	0.16 - 0.22	53	0.16 - 0.22	50 45*	0.16 - 0.22
108	0.41 - 0.53	103	0.41 - 0.53	98 95*	0.41 - 0.53

* AW 72 L

Gear changing speeds, km/h

AW 70/71/72, ZF 22 HP

Engine	Type	Final drive	Gear lever / throttle opening (KD= kickdown)						Lock up	
			1 – 2 (KD)	2 – 3 (KD)	3 – 4 (75%)	4 – 3 (0%)	3 – 2 (KD)	2 – 1 (KD)	in	out
B 200 E	AW 70	3.91:1	67	113	114	40	107	55	—	—
B 200 F/G	AW 70	4.10:1	57	101	110	37	94	46	—	—
B 200 FT	AW 71	3.73:1	65	112	130	27	106	54	92	90
B 230 E	ZF 22	3.73:1	62	107	128	43	98	52	85	83
B 230 F/G	AW 70	4.10:1	57	99	110	36	93	45	86	84
B 230 FB	AW 71	4.10:1	60	103	119	25	94	45	90	88
B 230 FB	ZF 22	3.91:1	64	107	131	38	102	54	85	83
B 230 FD	AW 71	3.73:1	57	99	110	36	93	45	77	73
B 230 G	ZF 22	3.91:1	64	107	131	38	102	54	85	83
230 FT/GT	AW 71	3.73:1	64	116	135	29	108	48	98	96
B 234 F/G	AW 72	4.10:1	56	102	116	33	93	41	86	84
D 24	ZF 22	3.91:1	46	83	98	34	79	39	76	74
D 24 T	ZF 22	3.91:1	46	83	98	34	79	39	73	71
		3.73:1	48	87	103	35	82	41	87	85
D 24 TIC	ZF 22	3.73:1	48	87	103	35	82	41	87	85

Gear changing speeds, km/h

AW 30-43, AW 30-40

Mode selector in position ECONOMY (E) . Gear lever in D . (Throttle opening in %)									
Engine	Type	Final drive	1-2 100+KD	2-3 100+KD	3-4 75	3-4 100+KD	4-3 100+KD	3-2 100+KD	2-1 100+KD
B 6304	30-43	3.73:1	58	114	148	180	175	105	45
B 6304	30-40 ¹⁾	3.31:1	65	130	140	208	193	115	55
	30-40 ²⁾	3.31:1	65	130	167	208	193	115	55

Mode selector in position SPORT (S) . Gear lever in D . (Throttle opening in %)									
Engine	Type	Final drive	1-2 100+KD	2-3 100+KD	3-4 75	3-4 100+KD	4-3 100+KD	3-2 100+KD	2-1 100+KD
B 6304	30-43	3.73:1	58	114	177	180	175	105	45
B 6304	30-40 ¹⁾	3.31:1	66	130	206	208	193	120	55
	30-40 ²⁾	3.31:1	66	130	206	208	193	120	55

Mode selector in position WINTER (W) . Gear lever in D . (Throttle opening in %)									
Engine	Type	Final drive	1-2* 100+KD	2-3* 100+KD	3-4 75	3-4 100+KD	4-3 100+KD	3-2* 100+KD	2-1* 100+KD
B 6304	30-43	3.73:1	50	90	89	170	160	70	20

* 1st and 2nd gear are used only with kickdown.

Mechanical locking (LOCK-UP), km/h. Gear lever in D . (Throttle opening in %)															
		ECONOMY (E)						SPORT (S)						WINTER	
Engine/ Type	Final drive	2		3		4		2		3		4		3	
		100+KD in	100+KD out	15-98 in	15-98 out										
B 6304/ 30-43	3.73:1	85	77	130	123	180	175	85	77	130	123	180	175	50	40

1) – 1993: Control module 35 15 785 2) 1993 – : Control module 91 44 038

Components

AW 30-43, AW 30-40

Control module	AW 30-43	AW 30-40	AW 30-40
- Year model.....	1991 –	– 1993	1993 –
- Volvo P/N	35 15 646-2	35 15 784-1	91 44 038-8
- Aisin Warner P/N	30 40 301 004	30 40 301 013	3040301013W
Gear position sensor			
- Volvo P/N	35 15 639-7		
- Aisin Warner P/N	30 40 320 005 X		
Mode selector			
- Volvo P/N	35 15 640-5		
Solenoids:			
Gearchange solenoid 1 (S1) and 2 (S2)			
- Volvo P/N	35 15 643-9		
- Aisin Warner P/N	30 40 310 003 H		
Lock-Up solenoid (SL)			
- Volvo P/N	35 15 644-7		
- Aisin Warner P/N	30 40 313 001 J		
System pressure solenoid (STH)			
- Volvo P/N	35 15 645		
- Aisin Warner P/N	30 40 315 002 U		
Resistance at +25°C (77°F)Ω	2 - 4		
Engine speed (RPM) sensor			
- Volvo P/N	35 15 641-3		
- Aisin Warner P/N	30 40 330 005 T		
Oil temperature sensor			
- Volvo P/N	35 15 642-1		
- Aisin Warner P/N	30 40 352 005 X		
Resistance at			
+160°C (320°F).....Ω	20.7 ± 2.9		
0°C (32°F).....Ω	2067 ± 396		
< 0°C (32°F).....Ω	> 2067		

Tightening torques

Location	Dim	Nm	ft lb
AW 70/71/72, AW 30/43, AW 30/40			
Torque converter–engine	M 10	48	35
Drive plate–torque converter	M 8	30	21
Transmission – oil filler pipe	M 8	24	18
Lever for gear selector	M 8	16	12
Nipple for coolant pipe	M 14	30	22
ZF 22 HP			
Drive plate – torque converter	M 8	17 - 27	13 - 20
Drive plate – torque converter	M 10	41 - 50	30 - 37
Torque converter housing – engine	M 10	35 - 50	26 - 37
Torque converter housing – engine	M 12	55 - 90	41 - 66
Valve body ass. – transmission housing	M 6	7 - 9	5.2 - 6.6
Lock plate – parking lock	M 6	9 - 11	6.6 - 8.1
Rear housing – transmission housing	M 8	20 - 26	15 - 19
Strainer – valve body ass.	M 6	7 - 9	5.2 - 6.6
Governor – counterweight – ratchet wheel	M 6	9 - 11	6.6 - 8.1
Oil pump – connecting plate	M 6	9 - 11	6.6 - 8.1
Companion flange – output shaft	M 20	85 - 115	63 - 85
Cylinder B4 – transmission housing	M 6	9 - 11	6.6 - 8.1
Plug – connecting plate	M 14	34 - 46	25 - 34
Plug – connecting plate	M 20	43 - 57	32 - 42
Torque converter housing – connecting plate, transmission housing	M 10	40 - 52	30 - 38
Oil sump – transmission housing	M 6	5 - 7	4 - 5
Plug, oil sump	M 10	13 - 17	10 - 13
Oil filler pipe – oil sump	M 24x1.5	85 - 115	63 - 85

Group 45 Propeller shaft

Tightening torque, companion flange	Nm	ft. lb
Steel universal joint, M 8, stage 1, diagonally	30	22
stage 2, diagonally angle-tighten	60°	60°
M 10	50	37
Rubber universal joint	80	59
CV universal joint, stage 1, diagonally	8	6
stage 2, diagonally	30	22

Group 46 Rear axle

Final drive 740/940/965 (1031/1041)		
Alternative ratios	3.31:1, 3.54:1, 3.73:1, 3.91:1, 4.10:1	
Axial runout, ring gear, max.mm	0.08	
Backlash	0.10 - 0.16	
Torque, pinion bearing, new bearing	2.5 - 3.5	
used bearing	1.5 - 2.5	
Pre-tensioning of differential bearing	0.05 - 0.08	
Clearance, speedometer sensor (VSS) - induction gear...mm	0.5 - 1.2	
Radial runout outer diameter, induction gear, max. .mm	0.3	
Lubricant, see page 16.		
Tightening torques	Nm	ft. lb
Companion flange, pinion with spacer washer	200 - 250	148 - 184
pinion with pre-tensioning sleeve*	180 - 280	133 - 207
Note! pinion with used pre-tensioning sleeve* ..max	180 - 200	133 - 148
Bearing cap	35 + 60°	26 + 60°
Ring gear**	35 + 60°	26 + 60°
Inspection hatch - final drive (screw)	20 - 30	15 - 22
Driveshaft (bolts for pressure plate)	40	30
Wheel nuts	85	63
* Check that torque is not exceeded.		
** The bolts may only be used once.		

Final drive Multi link, 960 (1035 /1045)		
Alternative ratios	3.54:1, 3.73:1, 3.91:1	
Axial runout, ring gear, max.....mm	0.08	
Backlash	0.10 - 0.16	
Torque, pinion bearing, new bearing	1.2 - 2.8	
used bearing	1.0 - 2.5	
Pre-tensioning of differential bearing, 1 + 1 "notches" on each side		
Clearance, speedometer sensor (VSS) - induction gear... mm	0.35 - 0.75	
Radial runout diameter, induction gear, max.mm	0.2	
Lubricant, see page 16.		
Tightening torques	Nm	ft. lb
Companion flange, pinion (nut)*	180 - 280	133 - 207
Note! pinion with used pre-tensioning sleeve* ..max	180 - 200	133 - 148
Ring gear - differential housing (bolt)** . angle-tighten	35 + 60°	26 + 60°
Inductive sensor - rear hatch (bolt)	8 - 12	6 - 9
Inspection hatch - final drive (bolt)	20 - 30	15 - 22
Side bracket - final drive (bolt)	40 - 56	30 - 41
Lock washer - adjustment nut (bolt)	40 - 56	30 - 41
Weight - final drive (bolt)	20 - 28	15 - 21
Oil drainage plug.....	27 - 40	20 - 30
Oil filler plug	27 - 40	20 - 30
Driveshaft (bolt)	angle-tighten 30 + 90°	22 + 90°
Wheel nut, driveshaft - driveshaft	angle-tighten 140 + 60°	103 + 60°
Wheel nuts	85	63

* Check that torque is not exceeded.

** The bolts may only be used once.